Relationship between Exports and Economic Growth in Libya: Time Series Analysis Over the Period (1970 - 2010).

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Abstract:

The main purpose of the paper is to investigate the relationship between the exports and economic growth in Libya by examining the export-led growth (ELG) hypothesis using annual data for the period 1970-2010, Real non-oil GDP was used as a dependent variable, exports and imports, total capital accumulation and the terms of trade as independent variables. The unit root tests of Dickey Fuller and Phillips-Peron were used to test the stability of the variables, and the cointegration approach of the Autoregressive Distributed Lag through the ARDL method was used to estimate the model. The results of unit root tests showed that all variables are constant in their levels (0)I, except for the terms of trade, it was stable in its first difference (1)I. Whereas, the cointegration test confirmed a long-run, equilibrium relationship between variables. The error correction model was applied to estimate the short-run relationship and the results showed that the error correction term has a negative sign, its value is very high, and statistically, it is about -0.98, which states that 98% of the disequilibrium in the current year is corrected in the next year in each shock. Granger's causality test showed that there is a one-way relationship between exports and economic growth going from output to exports. Accordingly, the results of the study support the hypothesis that growth leads exports rather than exports driving growth in Libya.

Keywords: *Exports, Growth, Cointegration, Causality.*

1. Introduction:

The importance of increasing exports as an engine for economic growth has long been the subject of considerable debates in the economic development and growth literature. However, economic growth is one of the requirements for raising the standard of living and increasing the per capita GDP. There are different strategies and policies that enable an economy to grow such as export promotion and import substitution.

Exports are one of the key factors in promoting economic growth. This view suggests that an increase in productivity provides more efficient use of resources, increases specialization of export products, increases the level of skills in the export sector, and improves overall efficiency (Balassa, 1985; Ghatak, et. al., 1997). In addition, increasing productivity reallocates the economic resources from less productive sectors to more productive one based on comparative advantage and increases the sales of export products in domestic and foreign markets, and this, in turn, should generate technological improvements in response to competition in international markets (Balassa,1978; Feder, 1982; Ram, 1985, 1987; Abu-Qarn, 2004).

Empirically, the Export-Led Growth Hypothesis (ELG) has been supported by many Newly Industrialized Countries, which have doubled their standard of living in the last decades. Numerous of studies have found a significant positive relationship between exports and economic growth, and concluded that exports are highly correlated with economic growth (e.g. Emery, 1967; Balassa, 1978; Fajana, 1979; Feder, 1982; Kavoussi, 1984; and Ram, 1985, 1987).

There are many countries, including Libya, that have adopted the export policy as a major instrument for economic growth. Based on the international trade theory these countries should benefit by specializing in producing and exporting commodities according to their comparative advantage. Libya is an oil-based economy that adopted the export policy as the fundamental strategy for economic growth. Almost all of Libyan exports are from crude oil production, thus the total oil revenues are used to cover government expenditures and imports from abroad.

The objective of this paper is to measure the relationship between exports and economic growth in Libya over the period (1970-2010), to determine whether there is a long-term equilibrium relationship and to prove if there is a causal relationship between real non-oil GDP (RNOG) growth and real exports (REX) in Libya.

This paper is organized as follows: A review of literature is provided in Section II; Data Source and Unit Root test is reported in Section III; Section IV Model Specification and Methodology; In Section V Empirical Results; Section VI Conclusion of the Findings.

2. Literature Review:

Since the late sixties extensive studies have shown and confirmed a strong relationship between the growth of trade and the growth of income, suggesting that trade is the engine of growth. The trade links between the rate of growth of industrial production in developed countries and the rate of growth of output in developing countries. However, trade is regarded as the facilitating rather than the driving force in the development process. In this case, if the supply-side factors are sufficeently favorable in developing countries, there can be a very rapid growth rate of exports from such countries against unfavorable world trade trends (Evans, 1991).

In this section, we review previous studies related to the relationship between export and economic growth for selected countries around the world. Several empirical studies have been done using cross-section and time series data, aimed mainly at testing the export-led growth hypothesis. Numerous of these studies supported this hypothesis, emphasizing that exports do have a strong positive impact on economic growth. However, few studies suggested that exports did not cause economic growth.

Most of the early studies tested the relationship between real output growth as regressed variable on export levels, export/ GDP shares or export growth, and also examined the correlation coefficient between exports and economic growth. They found that export and growth are highly correlated, supporting the export-led growth hypothesis (see for example, Emery, 1967; Michaely, 1977; Balassa, 1978, 1981; Fajana, 1979; Feder, 1982; Ram, 1985; Chow, 1987; Kunst and Marin, 1989; Asafu-Adjaye and Chakraborty, 1999; Abu Eusuf, M. and Ahmed, M. 2007). However, these studies suffer from several significant weaknesses:

- All of these studies are based on production functions; some of them have included labour growth and capital growth or investment growth to measure the externality and productivity generated by this sector, which stimulated the domestic economy .

- They ignored the issue of causality and only relayed on positive correlation between exports and economic growth as an evidence of causality. In addition, they assumed that the causality runs from exports to GDP, but did not test that empirically.

- These studies used cross-sectional analysis to a single-equation production function, assuming that all countries have identical production functions, but this is not true in reality.

The recent studies used different techniques than the previous ones. Specifically, they used the co-integration tests, vector autoregression (VAR), and Granger causality tests. These techniques are important to determine the links between exports and economic growth and to verify the direction of causality. Moreover, most of these studies used time series data for each country, which casts doubts on the long-run positive impact of export expansion on economic growth. Therefore, recent studies are not as conclusive as they were previously. In addition, some of the finding of these studies have indicated that no long-run relationship between exports and economic growth, and they suggested that it arises only from a positive short-term relationship between exports growth and economic growth (see for example, Fung, 1994; Al-Yousif, 1997; Islam, 1998; Kimberly, 2011; Dreger and Herzer, 2012; Medina-Smith, 2001; Kocyigit, 2015; and Ahmad, 2016; Chia Yee Ee 2015; Guntukula 2018).

However, other studies have concluded that there is no relationship between export growth and GDP growth, to name a few (Jung and Marshall, 1985; Dodaro, 1993; Riezman, et al., 1996 in trivariate; Ghatak and Wheatley, 1997; Asafu-Adjaye and Charaborty, 1999; Chandra, 2003; Sharma and Panagiotidis, 2005; Kumari and Malhotra, 2014; Olivia and Jin, 2015; Jin and Jin, 2015). In addition, the size of the export sector in the country is very small and it has a weak linkage with other sectors in the economy. Therefore, it is unlikely that export expansion could boost the economic growth.

The paper focus on the effect of export on economic growth in general, and tests the export-led growth hypothesis in Libya in particular, we use time series technique to explore the relationship between Real Exports (REX) and Non-Oil GDP (RNOG) in Libya.

3. Data Sources and Data Stationary:

The relevant data were obtained from the Central Bank of Libya and the International Financial Statistics (IFS). The study covers the period 1970–2010. It is necessary however, before starting to perform any empirical estimations of the model, to analyze the time series data as to whether they are stationary or non-stationary. The stationarity properties of a time series (the absence of trend and long-run mean reversion) are examined by applying the unit root test to avoid spurious or nonsense regressions. There are a number of methods available for conducting a unit root test; however, we have applied the Augmented Dickey-Fuller (ADF) unit-root test and Philips Perron test.

3.1 Unit Root Test:

Nelson and Plosser (1982) argue that almost all macroeconomic time series usually have a unit root. In the absence of a unit root (constant), the series fluctuates around a long-term constant mean, indicating that the series has a limited time-dependent variation. On the other hand, the non-stationary series does not tend to return to the inevitable long-term path, and the variation of the series depends on time. The unstable series suffers from permanent effects of random shocks and thus follows a random path (Glynn, et. al., 2007). Therefore, the researcher should perform several statistical tests when dealing with time series data because it usually shows a trend of time series data over time. Also, the nature of the data indicates the type of test (s) that can be appropriate choice for the application. Therefore, you must verify that the data is stable before deciding on the method (s). For this purpose, we use different statistical tests to examine and confirm the unit root property of the variables in question (Ahmad, et. al., 2016). The tests used in our study are the Augmented Dickey Fuller test (Dickey and Fuller, 1979, 1981), and the Phillips-Peron test (1988), to check whether the data are constant in level or have a time trend that appears over time,

3.1.1 Augmented Dicky Fuller Test (ADF):

Because the error term is unlikely to be white noise, Dickey and Fuller extended their testing procedures, indicating an added version of the test that includes additional lags for the dependent variable in order to eliminate autocorrelation. The length of lags in these additional conditions is determined either by the Akaike Information Criterion (AlC) or the Schwarz Bayesian Criterion (SBC), or more usefully by the length of lags necessary to white noise. Dickey and Pantula (1987) proposed a series of unit root tests, starting with the largest number of roots under investigation (ρ), and each time the null hypothesis is rejected the lag one period should be reduced until the null hypothesis is accepted, which means the residuals of the

ADF regression are uncorrelated (white noise), then the procedure discontinued, when the null hypothesis is accepted. The possible three equations of ADF test are:

$$\Delta y_t = \mu y_{t-1} + \sum_{i=1}^{\rho} \pi_t \Delta y_{t-i} + \varepsilon_t \,, i = 1,2..\rho \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\Delta y_t = \lambda + \mu y_{t-1} + \sum_{i=1}^{\rho} \pi_t \Delta y_{t-i} + \varepsilon_t \,, i = 1,2..\rho \ldots\ldots\ldots\ldots\ldots (2)$$

$$\Delta y_t = \lambda + \theta t + \mu y_{t-1} + \sum_{i=1}^{\rho} \pi_t \Delta y_{t-i} + \varepsilon_t \,, i = 1,2..\rho \ldots\ldots\ldots (3)$$

Where λ is a drift, t represents a time tren, $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$, etc, and ρ is a large enough lag length to ensure that ε_t is a white noise process. Akaike information Criterion (AIC) is used to determine the optimal lag length or ρ. The null hypothesis that the variable y is non-stationary ($H0: \mu = 0$ or $\pi = 1$) is rejected if μ is significantly negative, versus the alternative hypothesis of $\mu < 0$ *or* $\pi < 1$, (stationary series), where $\mu = \rho - 1$. Non-rejection of the null hypothesis implies that the time series y is non-stationary, hence, applies the standard distribution t-statistic be unsuitable, therefore, the ADF $\tau - \text{statistic}$ is applicable. On the other hand, rejection of the null hypothesis signifies the time series is stationary. The difference between the three regressions is the presence of deterministic elements λ and θt, Therefore, the important question now is, whether it is more appropriate to estimate equation (1), (2) or (3)?. Dolado et. al., (1990) propose a procedure starting from estimating the more general model presented by equation (3) (Asteriou and Stephen, 2011).

3.1.2. Philips Perron Test:

The distribution theory that supports the Dickey-Fuller tests is based on the assumption that the error conditions are statistically independent and have constant variance. Therefore, when using the ADF methodology, we have to make sure that the error conditions are not related, and that there is a real difference in reality. Thus, Philips and Perron (1988) developed a generalization for an ADF test that allows fairly light assumptions regarding error distribution. Therefore, unlike the ADF method, PP test deal with serial linking in errors using a non-parametric serial linkage correction operator, which is based on a consistent assessment of the long-term variation of the error procedure (Castro, et. al., 2013). The test regression for the PP tests is:

$$\Delta y_{t-1} = \lambda_0 + \lambda_1 y_{t-1} + \varepsilon_t$$

While the ADF test corrects the top-level serial correlation, by adding varying decelerating conditions on the right side, the PP test corrects the $t-\text{statistic}$ of the y coefficient of regression to calculate the serial correlation in the (ε_t) or residuals (errors-term). Therefore, PP t-statistic is just modifications to ADF t-statistic, which take into account the less restrictive nature of the error process. However, since many statistical packages have procedures available to calculate these statistics, it is good for the researcher to test the integration order of the PP test procedure chain as well. The non-asymptotic distribution of PP t-statistic is the same as ADF $\tau-\text{statistic}$ and therefore the critical values for the PP test are the same as for the ADF test, and depend on whether the DF regression has an interrupt or a time trend (Pesaran and Pesaran, 2009). The regression results of the ADF and PP unit root tests are reported in Table 1. were each time series is stationary at level, except terms of trade, but the all series have been set to be stationary at first difference, which means that, the series integrated of order one I(1).

Table (1): ADF and PP unit roots tests

Variables	ADF unit root test				PP unit root test				Conclusion
	Level		First Difference		Level		First Different		
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
LRNOG	-4.24 (s)	-4.22 (s)	-6.22 (s)	-6.13 (s)	-4.01 (s)	-4.48 (s)	-6.98 (s)	-6.87 (s)	I(0), I(1)
LREX	-6.57 (s)	-6.83 (s)	-7.58 (s)	-6.09 (s)	-6.57 (s)	-6.98 (s)	-13.08 (s)	-12.85 (s)	I(0), I(1)
LRIMC	-7.05 (s)	-7.04 (s)	-7.57 (s)	-7.46 (s)	-7.07 (s)	-7.10 (s)	-14.07 (s)	-13.85 (s)	I(0), I(1)
LCAP	-4.28 (s)	-4.26 (s)	-6.40 (s)	-6.32 (s)	-4.19 (s)	-4.14 (s)	-8.32 (s)	-8.11 (s)	I(0), I(1)
LTOT	1.02 (NS)	-2.33 (NS)	-5.69 (s)	-5.89 (s)	1.00 (NS)	-2.33 (NS)	-5.70 (s)	-5.89 (s)	I(1)

Notes: 1. For ADF and PP tests -4.15,-3.50 and -3.18 denote critical values at 1%, 5% and 10% respectively.
2. S = stationary, NS = non-stationary.

4. Model Specification and Methodology:

Several researchers believe that mixed and conflicting evidence about the relationship between exports and economic growth (ELG) may be caused by omitted variables. In this study, we go beyond the traditional bivariate approach and follow Asafu-Adjaye and Chakraborty (1999), Abu-Qarn and Abu-Bader (2001), Awokuse (2005), and Kimberly (2011), by adding the variables of capital stock, capital imports, and terms of trade so as to test the existence of ELG hypothesis in Libyan economic. So the equation can be written as following:

$$LRNOG_t = F\ (LREX_t,\ LRIMC_t,\ LCAP_t\ ,\ LTOT_t,\ )\ \ldots\ldots\ (1)$$

Where LRNOG: Real Non-Oil Gross Domestic Product; LREX: Real Exports (+); LRIMC: Real Imports of Capital Goods (+); LCAP: Capital stock (+), LTOT: Terms of Trade (+/-).

To empirically analyze the ELG hypothesis in Libyan economic, the method of joint integration and error correction model was adopted, using the Auto-Regressive Distributed Lag Method (ARDL), which has been developed by Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001). The ARDL method is distinguished from other traditional methods of cointegration, such as that of Engle-Granger (1987), Johansen (1992) and Johansen -Juselius (1990) in different aspects. First; it can deal with time series variables regardless of whether they are integrated at I(0), or/and I(1), but none of them is integrated from the second order I(2), since the existence of such a situation would result in meaningless consequences, and the system would collapse. Accordingly, we must know the order of integrationofthe variable strings in the model before extracting the result (Nkoro and Uko, 2016).

Second, the ARDL method is more suitable and efficient and provides better results than the traditional models in the case of small samples. Third, this method is also dynamic and gives the opportunity for explanatory and dependent variable to become an internal variable with different lagged. In addition, the model reduces the problem of multicollinearity. The lagged values of the dependent variable were introduced to take into account the assignment of the dependent variable to the changes that occur in the explanatory variables (Asida, et. al., 2014). Therefore, the ARDL method enables us to separate the effects of the long and short term. The ARDL method can be written as following:

$$\Delta LRNOG = \mu + \alpha_0 D_{1t} + \beta_0 D_{2t} + + \delta_1 LRNOG_{t-1} + \delta_2 LREX_{t-1} + \delta_3 LRIMC_{t-1} + \delta_4 LCAP_{t-1} + \delta_5 LTOT_{t-1}$$
$$+ \sum_{i=1}^{n} \beta_{i1} \Delta LRNOG_{t-1} + \sum_{i=1}^{n} \beta_{i2} \Delta LREX_{t-1} + \sum_{i=1}^{n} \beta_{i3} \Delta LRIMC_{t-1} + \sum_{i=1}^{n} \beta_{i4} \Delta LCAP_{t-1}$$
$$+ \sum_{i=1}^{n} \beta_{i5} \Delta LTOT_{t-1} + \omega_t \qquad (2)$$

Where μ and ω are the constant and white noise error (residuals), respectively, δ_i , *i=1,…,n* are the long-run multipliers, $\beta_{i1},...,\beta_{i5}$ are the corresponding short-run dynamic coefficients of ARDL model. *D_1 and D_2* are dummy variables introduced to calculate the effect of restrictions imposed by the United States of America during the period 1981-2003, and to calculate the effect of increse in oil prices in the international market during the period 1980-2002, on real-non-oil GDP respectively.

According to Pesaran, et. al., (2001), the ARDL method requires a two-step procedure for estimating the long-run relationships. The first step is to examine the existence of a long-run relationship among the variables in the model, and this can be achieved by utilizing the *F*-test. For this purpose, Pesaran, et al (2001) developed two sets of critical values for a certain level of significance. The first group assumes that all variables have a rank of I(0) [Lower Bound (LB)], whereas the second group assumes that all variables have rank I(1) [Upper Bound (UB)]. If the statistical value of F > UB, then the null hypothesis, that there is no $, H_0 : \delta_1 = ... = \delta_5 = 0$ common integration will be rejected and we accept the alternative hypothesis, $H_1 : \delta_1 \neq ... \neq \delta_5 \neq 0$, that there is a common complementarily between the model variables, and vice versa. If the value of F statistic lies between the two extremes (UP > F > LB), then the result in this case is inconclusive. The second step, after ascertaining the existence of the long-term equilibrium relationship between the variables of the model, we can estimate the long-term and short-term parameters of the dynamic error correction model.

5. Empirical Results:

5.1 Bounds Test:

Based on the bounds test, the value of *F-statistic* is calculated and the result is summarized in table (2). It shows that the value of the calculated *F-statistic* is larger than the upper (critical) value (F = 4.80 > UP = 4.01) at a significant level of 5%, indicating rejection of the null hypothesis and acceptance of the alternative hypothesis which indicates that there is a long-term balance relationship. Subsequently, we can capture the ARDL test for the long term parameters (elasticities) and a related correction model, where Akaike Information Criteria (AIC) is used to choose the lagged periods in ARDL.

Table (2): Results of Bounds Testing to Cointegration

Bounds Test Results (Null Hypothesis: No levels relationship)			
F-statistic	Critical Value	Percent Level	
		5%	1%
4.80	Upper Bound I(1)	4.01	5.06
	Lower Bound I(0)	2.86	3.47
Source: Obtained by researchers using Eviews.			

5.2 Long-run and Short-run Dynamic Results:

Table 3 illustrated the long run dynamics from the ARDL (1, 4, 4, 4, 4) model, selected by the Akaike Information Criterion. The results indicate that the real exports significantly affect the real non-oil GDP in a negative way. This result was due to the fact that the Libyan economy is heavily dependent on its oil sector, where its oil exports account for more than 90% of the total exports during the study period, and this have undermined the growth of other sectors, in particular, the tradable-sector such as that of agriculture and manufacturing sectors. Specifically, the contribution of these sectors in total GDP did not exceed, on average, 3% and 5% respecttively during the period of study.

The impact of real capital import is found to be positive and statically significant. A one percentage point increase in real capital import appreciates the real-non-oil GDP by 1.07 percent. Meanwhile, capital formation negatively contributes to the real-non-oil GDP, but it is statically insignificant. This result is inconsistent with the theory that states that capital increase should produce higher output at any time due to increased production capacity and resource utilization (Balassa, 1985; Berman, et. al., 1998). A reasonable explanation can be provided for this, in terms of the fact that capital productivity in the Libyan economy as a whole did not exceed 0. 26%. While, in the oil, agriculture, and manufacturing sector is did not exceed 2.4%, 0.29% and 0.01% respectively (Al-Gayzani, 2017).

Table (3): Long-run Estimated Results of ARDL (1,4,4,4,4)

Dependent Variable is LRNOG				
Independent Variable	Coefficient	Std. Error	t-Statistic	Prob
LREX	-0.88	0.46	-1.90	0.079**
LRIMC	1.07	0.43	2.45	0.029*
LCAP	-0.22	0.26	-0.88	0.394
LTOT	0.61	0.48	1.29	0.219
µ	4.78	2.19	2.18	0.048*
D1	-0.44	0.22	-1.98	0.069**
D2	-0.67	0.33	-2.01	0.064**

Source: Obtained by researchers using Eviews.
*denotes 5% of significance. ** denotes 10% of significance.

Finally, the terms of trade sign depends on whether the terms of trade of a country improve (positive) or deteriorate (negateve). High trade rates implies that more goods can be purchased from export earnings and thus promote economic growth. In general, Libya as developing country, which is highly dependent upon primary goods to exports, it is influenced by a global deterioration of their commodity export-prices. Furthermore, developing countries import most of capital products and manufactured products whose prices rise in the international market.

If this argument holds, a negative sign for terms of trade coefficient is most likely. The results show that the terms of trade coefficient positively affect the real-non-oil GDP, but statically insignificant. The results also show that, at 5% level of significant, the D1 and D2 are negatively affected real-non-oil GDP, and they are significant at 10% significant level.

The short run dynamics of the ARDL-ECM is estimated based on the lag structure specified by the AIC, and the results of ECM are summarized in table (4). The short-run results do not correspond to the long-term effect, as the results indicate that the parameters of all variables are consistently important, and in harmony with the theory, except for the parameter of real capital imports, which was negative and significant. This can be explained by the fact that most capital imports are mainly directed at the oil sector. The physical commodity sectors have been neglected and lack of maintenance, which has resulted in poor capital productivity in these sectors, which negatively affected the growth of GDP.

Table (4): Error correction model Results of ARDL (1,4,4,4,4)

Dependent Variable is LRNOP				
Independent Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LREX)	0.54	0.18	2.97	0.010*
D(LREX(-1))	1.94	0.38	5.12	0.000*
D(LREX(-2))	1.63	0.32	4.97	0.000*
D(LREX(-3))	1.40	0.30	4.64	0.000*
D(LRIMC)	-0.33	0.12	-2.70	0.018*
D(LRIMC(-1))	-1.68	0.28	-5.94	0.000*
D(LRIMC(-2))	-1.33	0.26	-5.21	0.000*
D(LRIMC(-3))	-1.11	0.21	-5.11	0.000*
D(LCAP)	0.18	0.14	1.20	0.252
D(LCAP(-1))	0.40	0.17	2.29	0.039*
D(LCAP(-2))	0.47	0.19	2.43	0.030*
D(LCAP(-3))	-0.36	0.16	-2.33	0.036*
D(LTOT)	-0.51	0.23	-2.17	0.049*
D(LTOT(-1))	-1.85	0.40	-4.60	0.000*
D(LTOT(-2))	-1.28	0.37	-3.44	0.004*
D(LTOT(-3))	-0.46	0.26	-1.73	0.107
D1	-0.44	0.08	-5.53	0.000*

Table (4) Continued

D2	-0.67	0.12	-5.49	0.000*
μ	4.78	0.86	5.59	0.000*
ect_{t-1}	-0.98	0.17	-5.77	0.000*
R^2	0.78			
$\bar{R}^2$	0.56			
F-statistic	3.59 Prob (0.010)			
DW	1.64			
Source: Obtained by researchers using Eviews. * denotes 5% of significance.				

The ect coefficient tells us how quickly or slowly the relationship return to its path of equilibrium, it should be negative and statistically significance. Moreover, if we have a highly significant error correction term is further proof of the existence of a stable long term relationship. Furthermore, the larger the error correction coefficient (in absolute value) the faster is the economy’s return to its equilibrium, once shocked. The result of error correction model shows that the ect coefficient has a negative sign with quite highly value, and significant at 1% level of significance, we have coefficient of the ect_{t-1} as estimated equal to -0.98, suggesting that deviation from the long-term real-non-oil GDP path is adjusted by 0.98 to return to its long-term equilibrium. In other words, 0.98 percent of disequilibrium in the previous year is corrected in the current year. The result allows us to say that the adjustment takes place very fast.

5.3 Diagnostic and Stability Tests:

The diagnostic tests are shown in Table 5. The result of LM test rejects the presence of serial correlation of the residuals, Jarque-Berra test confirms the normality behavior, Breusch-Pagan-Godfrey test supports that residuals are homoscedastic, and Ramsey-Reset test confirms the correct functional form.

Table (5): Diagnostic Tests

Residual Diagnostic Tests	Statistics	Value	Probability	Significance level
Serial Correlation LM test Breusch–Godfrey	F-statistic	1.54	0.237	5 %
	Chi-Square	4.22	0.069	5 %
Normality test Jarque–Bera	Jarque–Bera	0.95	0.620	5 %
Heteroskedasticity test Breusch–Pagan–Godfrey	F-statistic	0.80	0.683	5 %
	Chi-Square	21.77	0.533	5 %
Ramsey RESET test	F-statistic	2.62	0.117	5 %
Source: Obtained by researchers using Eviews.				

In addition, due to the structural changes in Libyan economy it is likely that, the series of macroeconomic may be subject to one or multiple structural breaks. For this purpose, the stability of the short-run and long-run coefficients are checked through the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests proposed by Brown, et. al., (1975). The CUSUM test reveals the methodical alterations the regression coefficients, whilst the CUSUMSQ test is useful for capturing the unexpected dismissals from the constancy of regression coefficients. The regression equation appears to be stable when neither the CUSUM nor CUSUMSQ test statistics exceed the bounds at the 5% level of significance (Chigusiwa, et. al., 2011). The plots of CUSUM and CUSUMSQ, as given in figures 1 and 2, show that the test statistics fall within the critical bounds at 5% level of significance, indicating that the model is structurally stable.

Figure (1): CUSUM TEST

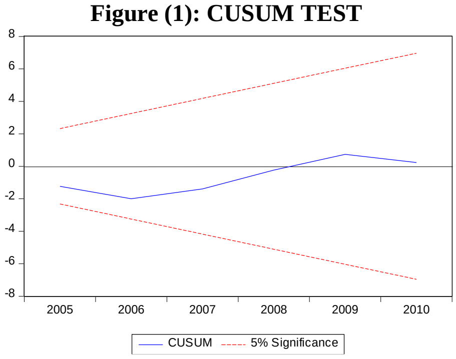
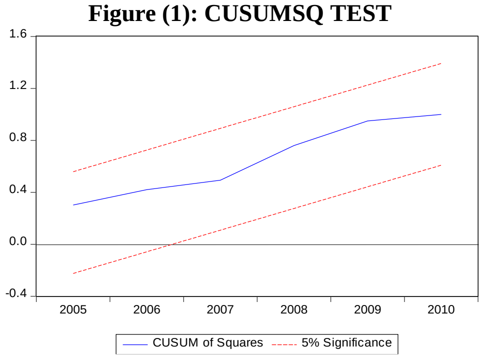


Figure (1): CUSUMSQ TEST



5.4 Granges Causality Test:

In order to measure the short-run causality between real non-oil GDP and real exports, the Granger's Causality methodology was used as follows:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 X_{t-1} + \varepsilon_t$$

This model indicates that the last period value of x_t has an illustrative power for the current value of y_t. The coefficient β_2 is a measure of the effect of x_{t-1} on y_t. If $\beta_2 = 0$, the previous x_t values have no effect on the y_t values and there is no way that x_t can cause Granger y_t. In other words, if $\beta_2 = 0$, x_t does not cause Granger y_t. This concept can be expressed in an alternative way That is, if $\beta_2 = 0$, the previous values of x_t will have no explanatory power over y_t than those provided by the previous y_t values. The OLS estimation of the regression above can be made and the $\beta_2$value of the coefficient X_{t-1} can be checked for significance. If β_2 is statistically significant (e.g. at 5% level, i.e, P-value <0.05), we conclude that x_t Granger causes y_t. The null and alternative hypothesis of the Granger causality test is: H0: $\beta_2 = 0$ (x_t does not Granger cause y_t), H1: $\beta_2 \neq 0$ (x_t does Granger cause y_t).

The results of Granger Causal test are summarized in table (6). The results of the causality suggest that there is a unidirectional causality running from Real Non Oil GDP toward Real Exports.

Table (6): Granger Causality Test

Null Hypostasis	F-statistics	Prop
LREXP does not Granger Cause LRNOG	0.1617	0.9559
LRNOG does not Granger Cause LREXP	3.4305	0.0211
Source: Obtained by researchers using Eviews.		

6. Conclusion:

The main of this paper was to confirm that there is a long term equilibrium relationship among real non-oil GDP and real exports. We examine the Export-Led Growth (ELG) Hypothesis to explore the relationship between exports and economic growth for Libya using time series data from 1970 to 2010. For the presence of unit roots using the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests, The findings indicate that all variables are stationary in the I(0), I(1). The results of the paper also suggest that there is a long term equilibrium relationship among real exports, and real-non-oil GDP. The results of cointegration tests confirm the existence of a long term relationship among these variables. The error correction model (ECM) is used to demonstrate the short term adjustment of the variables toward the long term equilibrium. The result shows that, the value of ect_{t-1} was negative and significant, which shows the speed of adjustment from disequilibrium to equilibrium. The Granger Causality test was used to determine whether export expansion promotes economic growth or economic growth promotes export growth. The results of the causality suggest that there is a unidirectional causality from real-non-oil GDP toward real exports for Libya.

Notes:

1. The most widely used measure of commodity concentration is the Gini-Hirschman coefficient which defines the degree of concentration in a country's exports as:

$$GHj = \sqrt{\sum_{j=1}^{n} \left(\frac{Xij}{Xj}\right)^2}$$

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Appendix:

Table (7): Structure of Gross Domestic Production (GDP) by economic sectors, at Current Factor Income, during 1970-2010 Million L.D.

years	Oil sector		*Agriculture sector		manufacture sector		**Other sectors		TOTAL GDP	
	value	Percentage of GDP	value	Percentage of GDP	value	Percentage of GDP	value	Percentage of GDP	value	Percentage of GDP
1970	812.6	63.07	33	2.56	22.5	1.75	420.3	32.62	1288.4	100
1979	4545.3	59.78	140.4	1.85	185.8	2.44	2731.5	35.93	7603	100
1980	6525.7	61.83	236.4	2.24	210.4	1.99	3581.3	33.93	10553.8	100
1989	2055.5	28.58	439.8	6.12	412.3	5.73	4283.4	59.57	7191	100
1990	3243.8	39.33	482.9	5.86	457.6	5.55	4062.6	49.26	8246.9	100
1999	3995.9	28.39	1449.9	10.3	863.1	6.13	7766.3	55.18	14075.2	100
2000	6661	37.8	1439.7	8.17	972.9	5.52	8546.6	48.5	17620.2	100
2010	66476.8	71.5	724.7	0.78	4463	4.8	21313.7	22.92	92978.2	100

Source: Calculated by researchers based on the annual report of the Central Bank of Libya. * Includes agriculture, hunting, forestry and fishing. ** Includes, mining and quarrying, electricity, gas and water, construction, restaurants and hotels, transportation, insurance, public services, education and health services.

Table (8): Commodity Concentration Index for Libyan oil exports from 1970-2010, based on Gini- Hirschman Index(1) .

Year	1970	1979	1980	1989	1990	1999	2000	2010
value	0.99	0.92	0.97	0.82	0.82	0.92	0.85	0.92

Source: Calculated by researchers based on the annual report of the Central Bank of Libya.