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Validity of Thirlwall's Law in MENA Countries

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The external demand side determinant, of the Middle East and North Africa, economic growth is being studied employing Thirlwall's model. This study employs co-integration technique to test for the existence of long run relationship between real economic growth rates and real non-oil export. The results support the existence of long run relationship between the real export and real economic growth in MENA countries except for Kuwait, Qatar, Saudi Arabia, and UAE which are oil producing countries and their growth rate is driven by other factors, like capital inflow. The results divide the sample countries into two groups, Saudi Arabia, Syria, Tunisia, and UAE have positive differences between the actual and the predicted growth rates which is interpreted as high income elasticity of imports demand where there is high import volume effect as a result of any increase in real income growth. Moreover, Saudi Arabia and UAE have high capital inflow since they are oil producing countries, while the TOT in Tunisia and Syria is changing unfavorably. Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Libya, Morocco, Oman, Qatar, and Yemen have negative differences between the actual and the predicted growth rates. These negative differences can be interpreted as a slower growth rate in the capital inflow than the growth rate in exports volume, and to the positive relative price effect.

Introduction

Current account imbalances have become an obvious issue in transition economies. According to the international trade theory, the causes

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behind the growing current account deficits are loss of export competitiveness, strong imports due to domestic modernization needs, appearance of appreciation pressures either because of excessive capital inflows or mismanagement of monetary policy, and inadequate restructuring of domestic firms (Bekò, 2003).

Landesmann and Pöschl (1996) report the existence of a growing body of research which emphasizes that balance of payment (BOP thereafter) deficits cause economic growth limitations. The channels of influence of BOP on economic growth have been studied empirically by relatively large body of literature. Thirlwall (1979), Thirlwall and Hussain (1982) and Thirlwall (1983) have introduced a model to discuss the demand side influence on economic growth through BOP factors (explanation of the Thirlwall's law follows in a later section). A series of empirical research work has been performed and they support the BOP growth hypothesis. Bairam and Dempster (1991), Landesmann and Pöschl (1996), Alonso and Garcimartín (1998), Moreno-Brid and Perez (1999) and Turner (1999) have tested the impact of BOP on economic growth through testing the validity of Thirlwall's law. However, some researchers consider income as the main factor of adjustment in export–import flows and assume the ineffectiveness of prices or exchange rates to influence long-run growth, whereas others imply that if growth constraints exist in the economy, they must lie in deficient demand and not in the lack of supply. Atesoglu (1993), (1994) and (1995) and Heike (1997) apply the BOP constraint growth model to the U.S. and Canadian Economies. Their finding, support Thirlwall's model hypothesis in developed countries. They also support the existence of a long run relationship between real export and real economic growth.

Another set of research studies has been testing the validity of the BOP constraint growth model in developing countries. Moreno-Brid (1998) provides support to the BOP constraint growth model in Mexico. His results show significant and positive cointegration between Mexico's real export and real economic growth. Elliott and Rhodd (1999) extend Thirlwall's model by including the effect of debt servicing, this improvement narrow the differences between the actual and the predicted rate of economic growth. Ferreira and Canuto (2003) introduce the effect of BOP current account interest, dividends and profit on economic growth of Brazil. Their results support Thirlwall's law hypothesis. Another study by Jorgen and Virmantas (2004) examines the

BOP constrained growth model in three Baltic countries. They suggest that GDP growth rates are consistent with the balance of payment equilibrium. Arslan (2005) extend the model of Thirlwall's by relaxing the assumption of similar elasticities of substitution between goods produced in different regions. He finds similarity between actual growth rates and those BOP predicted rates. Yongbok (2006) empirically tested the validity of Thirlwall's law in case of China. His results of the study showed that Chinese growth of GDP and exports are cointegrated over the sample period. Moreover, the Chinese economy has grown in accordance with the predictions of Thirlwall's law. Arevilca V. *et. al.* (2007) find support to Thirlwall's law employing cointegration analysis in Bolivian economy. They also conclude that real exchange rate presents a negative relationship with the long run economic growth rate. Guadalupe *et al*. (2008) test whether the BOP has been important determinant of the long run economic growth over the period 1960 to 2004 for Cuban economy. The results indicate that economic growth, exports of goods and services, and terms of trade are driven by a common stochastic trend. However, they conclude that economic growth is constrained by the country's own external demand position. The findings of Fida *et al.* (2009) support Thirwall's model in Pakistan. The cointegration analysis indicates that a long run relationship exists between real export and real economic growth rate.

This study tests the BOP constraint economic growth model in the MENA countries. This model checks the demand side determinants of growth rates, namely income elasticity of export and import and foreign income level. To our knowledge this model has never been tested for this region. MENA countries sample give us the ability to classify them into oil producing and non-oil producing countries. Moreover, MENA countries are fast growing emerging economies and they are important to the rest of the world since they are trade partners to many other countries.

Materials and Methods

Data

The data sets used in this study are sourced from the International Financial Statistics CD-Rom data base. I formed sixteen data set for sixteen MENA countries, namely, Algeria (1950 – 2010), Bahrain (1975

– 2010), Egypt (1959 – 2010), Iran (1966 – 2010), Israel (1980 – 2010), Jordan (1969 – 2010), Kuwait (1962 – 2010), Libya (1980 – 2010), Morocco (1960 – 2010), Oman ((1990-2010), Qatar (1980 – 2010), Saudi Arabia (1963 – 2010), Syria (1961 – 2010), Tunisia (1960 -2010), UAE (1972 – 2010), Yemen (1990-2010). The data sets of Oman and Yemen are not used to test for unit root and co-integration due to the relatively short period length, however they are used to calculate the BOP constraint economic growth rate. The rest of the MENA countries are not included due to lack of information for reasonably acceptable period. The variables used are: real GDP, real export, real import, export unit price, import unit price, and foreign real GDP. As a proxy for foreign GDP, the summation of real GDP of the main export partners for each country[2] is used. Real export equals gross export value minus oil export proceeds (i.e., none-oil export).

Thirlwall's Model

The BOP constraint economic growth model emphasizes the idea that the availability of foreign exchange sets an upper limit on the rate of growth of domestic output Thirlwall and Dixon (1979), McCombie and Thirlwall (1994). To raise the country's BOP bounded output growth, exports serve as the main factor. Moreover, terms of trade changes will affect the balance of payments constrained growth rate both directly through their effect on import capacity and indirectly through any relative price effect on demand (Thirlwall 1983; Thirlwall and Hussain, 1982). Thirlwall and Hussain, 1982 developed a representing model with two goods and small open economy, they state the following relationships:

$$p * x + e * f^{\bullet} = p^{\bullet} * e * m \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Equation (1) represents the standard BOP identity. Where, x stands for real exports, m is real imports, p is the domestic price of exports in local currency, p• is the foreign price of imports in foreign currency, f • is the current account deficit, and e is the nominal exchange rate in units of

[2] The geographical distribution of exports and imports is based on the information published on the web site of the Arab International trade center: http://www.arabiantradecenter.com/ .

domestic currency per unit of foreign currency. Differentiating equation (1) with respect to time results into the BOP equilibrium through time.

$$\theta*(\hat{p}+\hat{x})+(1-\theta)*(\hat{f}+\hat{e})=\hat{p}^{\bullet}+\hat{e}+\hat{m}.....(2)$$

$$\text{Where, } \theta=\frac{p*x}{p*x+e*f^{\bullet}}.....(3)$$

θ is the initial share of exports in the total inflow of foreign exchange measured at current prices. The symbol (^) over the variables indicate that this variable is taken in growth format. The standard export and import demand functions are given as following:

$$\hat{x}=\eta*(\hat{p}+\hat{p}^{\bullet}-\hat{e})+\pi*\hat{w}.....(4),\ \eta<0,\pi>0$$

$$\hat{m}=\psi*(\hat{p}^{\bullet}+\hat{e}-\hat{p})+\xi*\hat{y}.....(5),\ \psi<0,\xi>0$$

where, y is real domestic income, w is the world's real income, η and π are price and income elasticity of exports demand, respectively, and ξ and ψ are income and price elasticity of imports demand, respectively.

Solving the system of equations (1-5) results the BOP constraint economic growth ($\hat{y}_{bop}$):

$$\hat{y}_{bop}=\frac{\theta*\pi*\hat{w}+(1-\theta)*(\hat{f}+\hat{e}-\hat{p})+(\theta*\eta+\psi+1)*(\hat{p}+\hat{p}^{\bullet}-\hat{e})}{\xi}.....(6)$$

Equation (6) explains the determinants of long-term economic growth according to Thirlwall's model. The model specifies the rates of change in the world's real income, foreign capital flows in real terms, the terms of trade, and by the price and income elasticities of imports and exports demands as major factors to determine the long–term economic growth.

Model's Modifications:

In order to derive the test model a set of simplifying steps and assumptions has been made. If foreign capital inflows are ignored or considered insignificant, Equation (6) becomes:

$$\hat{y}_{bop} = \frac{\pi * \hat{w} + (\eta + \psi + 1) * (\hat{p} + \hat{p}^{\bullet} - \hat{e})}{\xi} \text{.....(7)}$$

Another relation can be derived when the expression $\pi * \hat{w}$ given in Equation (4), is substituted in Equation (7). In addition, under the assumption that domestic prices of exports and of GDP are the same, the terms of trade can be equated with the real exchange rate. If the latter is expressed as the number of units of foreign currency per unit of domestic currency $(\hat{e}_r)$, the BOP constraint economic growth rate is re-specified as:

$$\hat{y}_{bop} = \frac{\hat{x} + \psi * (\hat{e}_r)}{\xi} \text{.....(8)}$$

Finally, assuming constant real exchange rates, the presented model is reduced to the expression:

$$\hat{y}_{bop} = \frac{\hat{x}}{\xi} \text{.....(9)}$$

The last equation states that the growth rate of output is dictated by the relationship between the dynamics of domestic exports $\hat{x}$ and the magnitude of income elasticity of import demand ξ.

Empirical Results and Discussions

Unit Root Test of the Variables series

The balance-of-payments growth model specified in equation (9) is estimated with help of co–integration technique. Prior to testing for long run relationship it is important to establish the properties of the time series. In particular, the order of integration and the existence of common trends are of major importance. In order to test whether the trend components are deterministic or stochastic and whether the series have any common trend, two steps are performed. First, test for unit roots vs. stationarity. Then, test for not co-integrated vs. co-integrated.

The literature on modern time-series analysis offers different methods for unit-root testing. Since each of them has some weakness, it is better not to rely on any particular test but to use more than one test. This study

employs two unit root tests, augmented Dickey Fuller test, Dickey and Fuller (1979) and (1981), and Phillips Perron test, Phillips and Perron (1988), from hereon refer to these tests as DF and PP, respectively.

Empirical results in table (1) report the result of both DF and PP for the real GDP and real export series in the logarithmic format one time and first difference format another time. The selection of optimal number of augmenting lags is based on the Akaike Information Criterion (AIC) rule. According to this rule, maximum lag = j+2, where j is the number of lags which minimizes the Akaike Information Criterion. The results suggest different levels of integration using DF and PP tests. If the data series is integrated of order two (I(2)), i.e., there are at most two unit roots, and the second difference has been taken. Generally, PP test indicates that the data series are I(1) for all countries except for Egypt and Iran they are I(2). DF test indicates that the data series are I(1) for Israel, Kuwait, Libya, Saudi Arabia, Syria, and UAE. Hence, for these seven countries there is agreement on the level of integration using both tests for both data series. Moreover, the results are contradictory between the data series for the same country using DF test given different model specifications. For instance, export series are I(1) in the case of Algeria, Israel, Kuwait, Libya, Morocco, Qatar, Tunisia, Saudi Arabia, Syria, and UAE but I(2) in the case of Bahrain, Jordan, based on some model specifications, in addition to Egypt and Iran. Furthermore, the results show different level of integration for the GDP series using different model specifications in different countries using DF test. In summary, the two tests give contradicting results and the level of integration is ambiguous in some countries. However, DF and PP tests agree that both variables series are I(1) in seven countries Israel, Kuwait, Libya, Saudi Arabia, Syria, and UAE and I(2) in two countries Egypt and Iran.

Testing for Co-integration:

Once it has been established which of the available variables have compatible orders of integration, the second step is to determine whether there is at least one linear combination of them that is stationary. If such a linear combination exists, the variables are said to be co integrated and the specific values of the stationary linear combinations are marked as co integrating vectors. Similarly, the econometric literature offers many different co-integration tests. Two of them are applied, Engle and

Granger (1987) test [EG], and Johansen and Juselius (1990) test [JJ]. The EG test is a multivariate generalization of the DF with the null hypothesis of no-cointegration. On the other hand, the JJ likelihood ratio trace test is a system method based on vector autoregression (VAR). However, in the case of low-order VAR models or small samples (n < 100) this test is seriously biased toward spuriously detecting co-integration. Again the optimal number of augmenting lags is chosen based on AIC rule.

Table (2) reports the empirical results of the co-integration tests. The [JJ] test is performed with the following two null hypotheses, H_0: no co-integration vector against H_1: there is one co-integration vector and H_0: there is at most one cointegration vector against H_1: there is two cointegration vectors. The null hypothesis of [EG] test is H_0: there is co-integration vector against H_1: no co-integration vector. The results show contradiction about the existence of co-integration between export and GDP in some countries. The JJ test support that the relationship between export and GDP is CI(1,1) in Algeria, Bahrain, Israel, Libya, Syria, Tunisia and CI(2,2) in Egypt. But there is no co-integration in the other seven countries. While the EG test indicates the existence of CI(1,1) between export and GDP in Algeria, Israel, Jordan, Libya, Tunisia and CI(2,2) in Iran. Moreover, EG test suggests no co-integration between export and GDP in the other eight countries. The last column indicates summary of co-integration results based on the two tests. It shows that there are co-integration between export and GDP in four countries and no co-integration in five countries while the results are mixed in five other countries. In summary, although there is support for not having a long run relationship between export and GDP in some countries, it remains possible to assume that export is a one major driving factor of economic growth in MENA countries since there is higher tendency to reject the null hypothesis of having no co-integration. It is interesting to mention that the null hypothesis cannot be rejected in the cases of Kuwait, Qatar, Saudi Arabia, and UAE which are oil producing countries, hence the growth rate in these countries are not export driven and there are another factors drive growth rate in these countries, such as capital inflow. Given this result, the next stage is to analyze the BOP constraint economic growth model in the MENA countries.

Testing the validity of BOP constraint economic growth model

This section explores the determinants of BOP constraint economic growth rates for MENA countries, namely income elasticity of import's demand and export level. The analysis is based on equation (9) $\hat{y}_{bop} = \frac{\hat{x}}{\xi}$. Empirical results divide the MENA countries into two groups according to the differences between the actual growth rate (y) and the predicted BOP constraint economic growth rate (y_{bop}), table (3).

The first Group: $y > y_{bop}$ *or* $(y - y_{bop} > 0)$: there are four countries in this group, Saudi Arabia (0.1232796), Syria (0.052357), Tunisia (0.0784239), and UAE (0.1562775). The mean of the positive deviations is 0.0975279. These positive differences between the actual growth rate and the BOP constraint economic growth rate might be interpreted in the following points:

1) Higher growth rate in the capital inflow than the growth rate in exports volume.

2) There might be negative relative price effect on the BOP constraint economic growth rate. The effects of relative price changes on BOP constraint economic growth rate include two elements: the pure terms of trade effect, and the volume of imports effect (both divided by the income elasticity of imports demand). The effect of relative price changes is negative on real income growth, if the term of trade decreases, then the real income is expected to increase, thus the imports volume will also increase depending on the income elasticity of imports demand. In addition, the reduction of the relative export price will positively affect the volume of export and negatively affect the volume of imports depending on the price elasticity of both import and export. Therefore, the BOP constraint economic growth rate will be slower than the actual growth rate hence the former does not account for the import volume effect and real income effect. Where the effect of relative price changes has apparently had unfavorable effect on real income growth, the explanation would be the reverse of the above arguments.

The case of the above mentioned four countries, the income elasticity of imports demand is relatively higher than other countries (2.44697 for Saudi Arabia, 2.3218 for Syria, 3.47427 for Tunisia and 2.23809 for UAE) where there is high import volume effect as a result to any increase in real income growth. Moreover, Saudi Arabia, UAE have high capital inflow since they are oil producing countries. While the TOT in Tunisia and Syria is changing unfavorably.

The second Group: $y<y_{bop}$ *or* $(y-y_{bop}<0)$*:* Twelve countries belong to this group, Algeria (-0.0519549), Bahrain (-0.1202984), Egypt (-0.0639695), Iran (-0.0735915), Israel (-0.0020035), Jordan (-0.0994441), Kuwait (-0.0585818), Libya (-0.0724131), Morocco (-0.0635415), Oman (-0.0239374), Qatar (-0.0748798), and Yemen (-0.0983366). The mean of the deviations is -0.0669. The difference is at minimum in the case of Israel ($y-y_{bop}$ = 0.002) which is a result of balanced capital inflow and export growth rates in addition to relatively small income elasticity of imports demand.. In other words, the actual growth rate in Israel is very close to those rates predicted by the BOP constraint growth model.

In General, the negative differences between actual growth rates and predicted growth rate can be interpreted in the following points:

1) Slower growth rate in the capital inflow than the growth rate in exports volume.

2) There might be positive relative price effect on the BOP constraint economic growth rate.

The income elasticity of imports demand is relatively high for Jordan and Yemen (2.59612, 2.42158 respectively) that implies negative effect on the BOP constraint economic growth rate but for the case of Jordan there is high of capital inflows in the form of foreign aids and foreign direct investments. For the rest of countries, there seems to be slower capital growth rates and smaller income elasticity of import demand.

Conclusions and Policy Implications

The empirical results divide the MENA countries into two groups according to the differences between the actual growth rate (y) and predicted BOP constraint economic growth rate y_{bop}. Saudi Arabia, Syria, Tunisia, and UAE have $y>y_{bop}$ which is interpreted to the high income elasticity of imports demand. Moreover, Saudi Arabia, UAE have high capital inflow since they are oil producing countries. While the TOT in Tunisia and Syria is changing unfavorably. Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Libya, Morocco, Oman, Qatar, and Yemen have $y<y_{bop}$. These negative differences can be interpreted to the slower growth rate in the capital inflow than the growth rate in exports volume, and to the positive relative price effect. The study finds some support for the BOP constraint growth model in the MENA countries. The countries should make balance between the growth rate in exports and the growth rate in capital inflows. That is, countries with high capital inflows rate should use these capital to finance exporting industries. Moreover, MENA countries should adopt policies and restructuring regulation to reduce the income elasticity of imports demand. As for the oil producing MENA countries it is important to emphasize the exports in industries other than oil industry.

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Table (1)[3]: Summary of unit root test using both Augmented Dickey Fuller, and Phillips Perron tests

		Augmented Dickey Fuller Test						Phillips Perron Test					
	Model[4]	LEX	DEX	Result	LGDP	DGDP	Result	LEX	DEX	Result	LGDP	DGDP	Result
	1	-1.8179	-3.3486**	I(1)	-2.827	-2.9504	I(2)	-8.568	-31.028*	I(1)	-6.9439	-29.0718*	I(1)
Algeria	2	1.2338	-3.5625*	I(1)	1.944	-2.262**	I(1)	1.244	-32.2265*	I(1)	0.7532	-21.6055*	I(1)
	3	-1.1349	-4.1877*	I(1)	-1.1636	-2.965**	I(1)	-1.669	-33.9867*	I(1)	-0.8312	-29.7305*	I(1)
	1	-1.2346	-2.6857	I(2)	-2.0622	-5.2681*	I(1)	-10.56	-19.4779**	I(1)	-17.3689	-17.846***	I(1)
Bahrain	2	2.3341	1.3181	I(2)	4.1295	-0.1291	I(2)	0.497	-25.0229*	I(1)	0.529	-11.0841**	I(1)
	3	0.652	-2.6805***	I(1)	0.1527	-2.133	I(2)	0.392	-20.1691*	I(1)	-0.9722	-15.0740**	I(1)
	1	1.8988	-2.8875*	I(2)	-1.5317	-1.883**	I(2)	-3.342	-17.223***	I(2)	-5.574	-28.5319*	I(2)
Egypt[5]	2	3.1125	-2.5847*	I(2)	1.3652	-1.58***	I(2)	0.218	-17.9655*	I(2)	0.1487	-30.6725*	I(2)
	3	-0.1162	-2.0735**	I(2)	3.1308	-1.62***	I(2)	1.545	-17.7007**	I(2)	-0.1092	-30.1831*	I(2)
	1	-2.698	-3.2700**	I(2)	-2.2785	-3.09***	I(2)	-6.764	-48.2495*	I(2)	-5.8097	-53.8743*	I(2)
Iran	2	0.8082	-2.3190*	I(2)	1.6204	-3.1753*	I(2)	0.467	-49.1363*	I(2)	0.3305	-54.7232*	I(2)
	3	-1.1799	-3.2773**	I(2)	-1.1752	-3.125**	I(2)	-2.96	-48.6858*	I(2)	-0.8978	-54.2861*	I(2)
	1	-2.135	-3.7088**	I(1)	-1.9531	-3.8761*	I(1)	-6.245	-35.6342*	I(1)	-7.2468	-30.2213*	I(1)
Israel	2	2.76	-2.2657**	I(1)	2.5825	-1.947**	I(1)	0.477	-23.2269*	I(1)	0.3213	-10.0755**	I(1)
	3	-2.4996	-3.2789*	I(1)	-1.9424	-3.5712*	I(1)	-2.252	-33.6569*	I(1)	-1.0757	-27.5097*	I(1)
	1	-2.7273	-2.2097	I(2)	-1.9566	-3.356**	I(1)	-3.564	-27.3648*	I(1)	-7.0715	-24.2436**	I(1)
Jordan	2	1.4665	-2.2050**	I(1)	2.1399	-2.3648*	I(1)	0.828	-19.3894*	I(1)	0.3868	-19.8039*	I(1)
	3	-5.4543*	-2.5527***	I(1)	-0.8537	-3.4005*	I(1)	-2.248	-26.3280*	I(1)	-0.366	-24.8593*	I(1)
	1	-1.1462	-4.5009*	I(1)	-1.2483	-3.8603*	I(1)	-8.35	-32.7797*	I(1)	-4.4106	-23.3764*	I(1)
Kuwait	2	0.171	-3.9000*	I(1)	0.598	-3.6457*	I(1)	0.1	-34.7009*	I(1)	0.124	-29.8218*	I(1)
	3	-1.3161	-3.8457*	I(1)	-0.3115	-3.7094*	I(1)	-9.03	-34.2038*	I(1)	-2.68	-29.3463*	I(1)
	1	-2.0063	-3.4163*	I(1)	-2.5156	-3.7378*	I(1)	-10.67	-26.2351*	I(1)	-6.7804	-32.7730*	I(1)
Libya	2	1.2382	-3.2787*	I(1)	1.3392	-3.1155*	I(1)	0.634	-23.5248*	I(1)	0.4515	-19.1488*	I(1)
	3	-1.5099	-3.5747*	I(1)	-2.6284	-3.5241*	I(1)	-7.426	-26.197*	I(1)	-4.3806	-25.6037*	I(1)

[3] *: reject the null hypothesis at 1%, **: reject the null hypothesis at 5%, ***: reject the null hypothesis at 10%.

[4] a) Model (1) includes both deterministic trend and constant. Model (2) doesn't include deterministic trend and constant. Model (3) includes constant but without deterministic trend.

b) the data series are taken in the following format: LEX=Log(Real Export), DEX=ΔLog(Real Export), LGDP=Log(Real GDP), DGDP=ΔLog(Real GDP)

[5] In the case of Egypt and Iran, the tests have shown the existence of unit root in the first difference variable series and I had to take the second difference to get the variable series stationary. That is the test results reported above are for the second difference.

Table (1) (cont.)[6]: Summary of unit root test using both Augmented Dickey Fuller, and Philip Peron tests

		Augmented Dickey Fuller Test						Philip Peron Test					
	Model[7]	**LEX**	**DEX**	**Result**	**LGDP**	**DGDP**	**Result**	**LEX**	**DEX**	**Result**	**LGDP**	**DGDP**	**Result**
	1	-2.094	-5.023*	I(1)	-1.923	-3.86*	I(1)	-9.434	-44.670*	I(1)	-7.861	-67.485*	I(1)
Morocco	2	-1.556	-3.306*	I(1)	0.699	-0.73	I(2)	-1.46	-37.607*	I(1)	1.459	-68.195*	I(1)
	3	1.056	-4.717*	I(1)	-0.508	-3.89*	I(1)	0.923	-44.337*	I(1)	-0.175	-67.998*	I(1)
	1	-2.04	-3.024**	I(1)	-0.708	-2.98***	I(1)	-2.594	-20.716**	I(1)	-0.681	-24.907**	I(1)
Qatar	2	1.006	-1.848**	I(1)	1.431	-0.1	I(2)	0.182	-18.565*	I(1)	0.194	-21.768*	I(1)
	3	0.102	-2.359**	I(1)	0.28	-2.67**	I(1)	0.571	-18.411*	I(1)	2.361	-16.205**	I(1)
	1	-2.081	-3.517*	I(1)	-2.297	-3.60**	I(1)	0.556	0.0375	Not I(1)	-5.466	-22.777*	I(1)
Saudi	2	-0.394	-3.019*	I(1)	0.5476	-2.54*	I(1)	-1.306	-23.260*	I(1)	0.689	-18.592*	I(1)
	3	-1.488	-3.552*	I(1)	-1.991	-3.43*	I(1)	-2.656	-25.037*	I(1)	-2.013	-22.751*	I(1)
	1	-1.995	-4.114*	I(1)	-3.69**	-3.89*	I(1)	-8.466	-39.120*	I(1)	-6.292	-38.290*	I(1)
Syria	2	2.186	-3.178*	I(1)	1.999	-1.88**	I(1)	0.38	-35.822*	I(1)	0.24	-30.414*	I(1)
	3	-0.09	-4.118*	I(1)	-0.929	-2.62***	I(1)	0.264	-39.214*	I(1)	-0.652	-38.861*	I(1)
	1	-1.952	-4.290*	I(1)	-2.856	-2.02	I(2)	-6.22	-40.548*	I(1)	-3.966	-51.903*	I(1)
Tunisia	2	2.592	-2.26**	I(1)	1.694	-1.57***	I(1)	0.719	-27.740*	I(1)	0.43	-28.304*	I(1)
	3	-1.467	-4.114*	I(1)	-0.987	-2.52***	I(1)	-0.657	-41.198*	I(1)	-0.439	-62.626*	I(1)
	1	-0.887	-3.216***	I(1)	-1.022	-3.12***	I(1)	-11.729	-21.748**	I(1)	-11.822	-13.712	Not I(1)
UAE	2	2.3	-2.071**	I(1)	1.764	-1.73***	I(1)	0.912	-18.091*	I(1)	0.785	-9.894**	I(1)
	3	1.039	-2.71***	I(1)	0.627	-3.22*	I(1)	-3.418	-22.792*	I(1)	-4.406	-13.642**	I(1)

[6] *: reject the null hypothesis at 1%, **: reject the null hypothesis at 5%, ***: reject the null hypothesis at 10%.

[7] a) Model (1) includes both deterministic trend and constant. Model (2) doesn't include deterministic trend and constant. Model (3) includes constant but without deterministic trend.

b) the data series are taken in the following format: LEX=Log(Real Export), DEX=ΔLog(Real Export), LGDP=Log(Real GDP), DGDP=ΔLog(Real GDP),

Table (2): Summary of Co-Integration tests. Using the most popular two tests (Johansen test and Engel-Granger test)

	Johansen test						Engle – Granger Test					
	Model[8]	**H0[9]:r=0**	**H0:r<=1**	**Lags**	**Result**	**No. of possible Vectors**	**Model**	**Tau**	**Lags**	**Result**	**Conclusion of two tests**
Algeria	2	20.714*	1.674	1	CI(1,1)	At most one vector	2	2.090***	2	CI(1,1)	Co-integrated (1,1)
Bahrain	3	21.847*	0.562	8	CI(1,1)	At most one vector	3	1.965	2	Not CI(1,1)	Contradicted
Egypt	1	19.848**	3.235	9	CI(2,2)	At most two vectors	2	-2.158	3	Not CI(2,2)	Contradicted
Iran	1	10.002	2.444	6	Not CI(2,2)		2	4.591*	2	CI(2.2)	Contradicted
Israel	2	23.91*	2.125*	2	CI(1,1)	At least one vector	2	2.416**	3	CI(1,1)	Co-Integrated(1,1)
Jordan	2	6.163	0.192	10	Not CI(1,1)		2	2.393***	3	CI(1,1)	Contradicted
Kuwait	1	12.573	4.734**	10	Not CI(1,1)		1	2.108	2	Not CI(1,1)	Not Co-Integrated
Libya	2	11.970**	3.521**	1	CI(1,1)	At least one vector	2	2.692***	3	CI(1,1)	Co-Integrated(1,1)
Morocco	1	10.478	0.948	1	Not CI(1,1)		1	2.036	2	Not CI(1,1)	Not Co-Integrated(1,1)
Qatar	3	8.169	0.049	7	Not CI(1,1)		3	2.491	3	Not CI(1,1)	Not Co-Integrated(1,1)
Saudi	1	10.774	5.273*	10	Not CI(1,1)		1	1.17	5	Not CI(1,1)	Not Co-Integrated(1,1)
Syria	2	14.864**	0.0153	7	CI(1,1)	At most one vector	2	0.944	2	Not CI(1,1)	Contradicted
Tunisia	1	17.234**	4.856**	10	CI(1,1)	At least one vector	1	3.843***	3	CI(1,1)	Co-Integrated(1,1)
UAE	3	11.06	0.17	6	Not CI(1,1)		3	2.797	2	Not CI(1,1)	Not Co-Integrated(1,1)

[8] Model (1) includes both deterministic trend and constant. Model (2) doesn't include deterministic trend and constant. Model (3) includes constant but without deterministic trend.

[9] *: reject the null hypothesis at 1%, **: reject the null hypothesis at 5%, ***: reject the null hypothesis at 10%.

Table (3): Comparison between the actual growth rate and the Balance of Payments constraint growth rate

The export income elasticity π and the import income elasticity ξ are estimated using the following regression models, respectively:

$$\ln EX = \alpha + \beta_1 \ln GDP_{foreign} + \beta_2 \ln\left(P_{export} / P_{import}\right) + \varepsilon, \qquad \ln IM = \alpha + \beta_1 \ln GDP_{domestic} + \beta_2 \ln\left(P_{import} / P_{export}\right) + \varepsilon$$

	ξ	π	Y	w	y / w	π / ξ	y_{bop}	$y - y_{bop}$
ALGERIA	0.90495	2.03529	0.15073	0.09012	1.67253	2.24904	0.20268	-0.0519
BAHRAIN	0.7722	0.38977	0.09365	0.42387	0.22095	0.50475	0.21395	-0.1202
EGYPT	1.10032	0.27722	0.08827	0.60427	0.14608	0.25194	0.15224	-0.0639
IRAN	0.88659	1.69863	0.14298	0.11303	1.26487	1.9159	0.21657	-0.0735
ISRAEL	0.50088	0.58284	0.07215	0.06373	1.13219	1.16363	0.07415	-0.002
JORDAN	2.59612	0.77243	0.02667	0.42387	0.06292	0.29753	0.12611	-0.0994
KUWAIT	1.04819	0.05246	0.1246	3.65956	0.03404	0.05005	0.18318	-0.0585
LIBYA	0.77854	0.64727	0.02156	0.11303	0.19078	0.83139	0.09397	-0.0724
MOROCCO	0.65897	1.10702	0.08785	0.09012	0.97485	1.67992	0.15139	-0.0635
OMAN	0.88154	0.03141	0.10645	3.65956	0.02908	0.03563	0.13039	-0.0239
QATAR	1.36893	0.38905	0.09685	0.60427	0.16028	0.2842	0.17173	-0.0748
SAUDI ARABIA	2.44697	0.29462	0.1568	0.27846	0.56311	0.1204	0.03352	0.12327
SYRIA	2.3218	1.81149	0.14055	0.11303	1.24338	0.7802	0.08819	0.05235
TUNISIA	3.4742	0.97315	0.10366	0.09012	1.15031	0.2801	0.02524	0.07842
UAE	2.238	0.4958	0.18131	0.11303	1.60404	0.22153	0.02504	0.15627
YEMEN	2.4215	0.10774	0.06449	3.65956	0.01762	0.04449	0.16282	-0.0983