Journal of Economic Cooperation, **29**, 2 (2008), 69-84

THE LONG-RUN RELATIONSHIP BETWEEN OIL EXPORTS AND AGGREGATE IMPORTS IN THE GCC: COINTEGRATION ANALYSIS

Mohammad Rammadhan & Adel Naseeb[1]

This paper investigates the existence and nature of long-run relationships between oil exports and aggregate imports in four GCC members' countries (Kuwait, Oman, Saudi Arabia, and the United Arab Emirates), using the Johansen approach to cointegration. The investigation reveals a strong evidence of long-run relation between the two variables in three members of the GCC (Oman, Saudi Arabia, and United Arab Emirates). Furthermore, the slope coefficients in the cointegration regressions are found to be close to unity. This suggests that the above three member's trade policies were effective in sustaining long-run trade balance between oil exports and imports. Kuwait is the only country, which the Johansen method failed to recognize a unique cointegrating vector. This could be justified by the ability of Kuwait to finance its dependency on imports through its investment income from abroad.

1. INTRODUCTION

Members of the Gulf Cooperation Council (GCC) namely (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) are open economies that depend greatly on the outside world. For these countries exports as a percentage of GDP range between 35 and 45 per cent, of which oil exports contribute well over 90 per cent. Moreover, imports contribute 25-30 per cent of GDP, with the GCC countries importing most of their needs of consumer and capital goods. Compared to the developed economies, the proportion of expenditure on exports

1 Kuwait Institute for Scientific Research

and imports constitute a significant proportion of GDP in the GCC countries[1]. Because of relatively, high dependency on the world market for exports and imports, any distortion in the world price of oil or the growth of the world economy can affect the exports and imports pattern of the GCC countries.

Furthermore, policy makers in general are very concerned with maintaining a trade balance surplus or reducing the trade deficit. This issue becomes more important to the GCC economies because of the downturn in oil prices and the consequent deterioration in their terms of trade. As a result, some GCC countries experienced periods of trade deficit since 1986. Therefore, a study of the long-run equilibrium between oil exports and imports is very important in order to evaluate the effectiveness of the macroeconomic policies in general and the trade policies in particular.

Even though a trade deficit is not bad in the short run, a persistent deficit depletes foreign reserves, and if some of the imports are not directed toward investment and development the deficit can result in an *"import trap"*, i.e. a tendency to increase imports even when the value of exports is declining. On the other hand, a persistent trade deficit surplus, particularly in a developing economy, indicates that investments and development for long run economic growth are lagging behind relative to the level of imports. Therefore, the main question to be answered is whether oil exports and imports of each GCC member converge towards a long-run equilibrium given the fluctuation in oil prices. The analysis will be confined to four GCC members namely Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. Bahrain and Qatar are excluded from the study[2].

The analysis relies on new developments in econometrics to study the long-term relationship between imports and exports. (Granger, 1986) listed imports and exports among the variables to which cointegration analysis could be applied. (Husted, 1992) examined the long-run

[1] The proportion of exports and imports of goods and services to total GDP in the OECD in 2004 were around 19.2 and 18.9 per cent respectively (IFS, 2005)

[2] Bahrain is no longer an oil exporting country. Its oil production was less than 38 thousand barrel per day in 2003 compared to 2107.9, 820, 8410, and 2601 thousand barrel per day for Kuwait, Oman, Saudi Arabia, and the UAE respectively, and Qatar has problems with consistent time series data (The GCC Economic Bulletin, 2004).

relation between the U.S. imports and exports, using Engle and Granger method, and found no cointegration between the two variables. But when a dummy variable was included in the model to capture the 1983 structural change in the U.S. economy, he found an evidence of cointegration between imports and exports in the U.S.

The Granger method was applied by (Bahmani-Oskooee, 1994, 1995) on Australia's imports and exports. He found a strong evidence of cointegration between the two variables and that the cointegration coefficient is close to unity. The cointegration result indicates both the sustainability of Australia's trade balance in the long run and the effectiveness of fiscal, monetary and exchange rate policies. Bahmani-Oskooee applied both Engle-Granger method and the Johansen cointegrated approach to Iran imports and exports. He found an evidence of cointegration when the nominal (current) values of imports and exports were used and not the real (constant) values. (Narayan and Narayan, 2005) applied the bounds testing approach to cointegration on the exports and imports of 22 LDCs. It was found that for only six out of the 22 countries, exports and imports were cointegrated. Using the Johansen cointegration technique, (Irandoust and Ericsson, 2004), verified the existence of a long-run steady state relationship between imports and exports for a number of industrialized countries. The policy implications of the finding were that these countries were not in violation of their international budget constraints. The Johansen cointegrated approach was applied by others such as (Wu and Zhang, 1998), (Naude, 2000), and (Sharma and Panagiotidis, 2005).

This paper applies the Johansen cointegration approach to examine the long-run relationship between oil exports and aggregate imports in Kuwait, Oman, Saudi Arabia, and the UAE, using annual data over the 1970-2005. The paper is divided into five sections. Section II analyses the trade flow in the GCC countries Section III examines the results of the Augmented Dickey-Fuller and Phillips-Perron unit root tests. Section IV examines the results of the Johansen method of cointegration. Finally, section V summarizes the main conclusions.

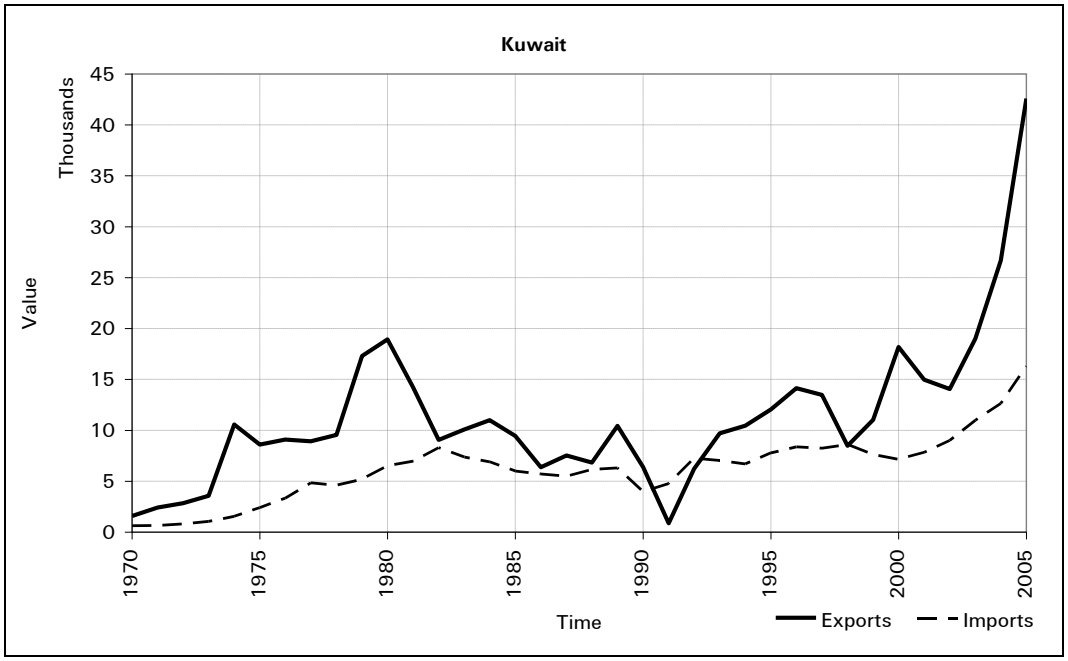
II. TRADE FLOWS IN THE GCC COUNTRIES

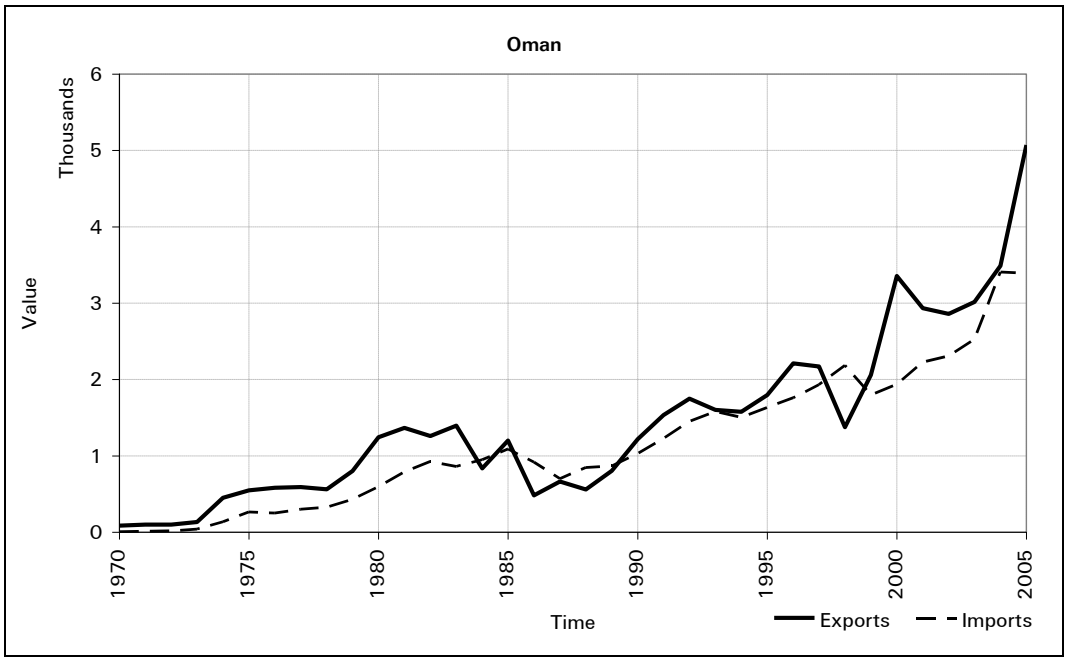
Before proceeding with the econometric analysis, it may be useful to examine the relationship between the imports and oil exports variables

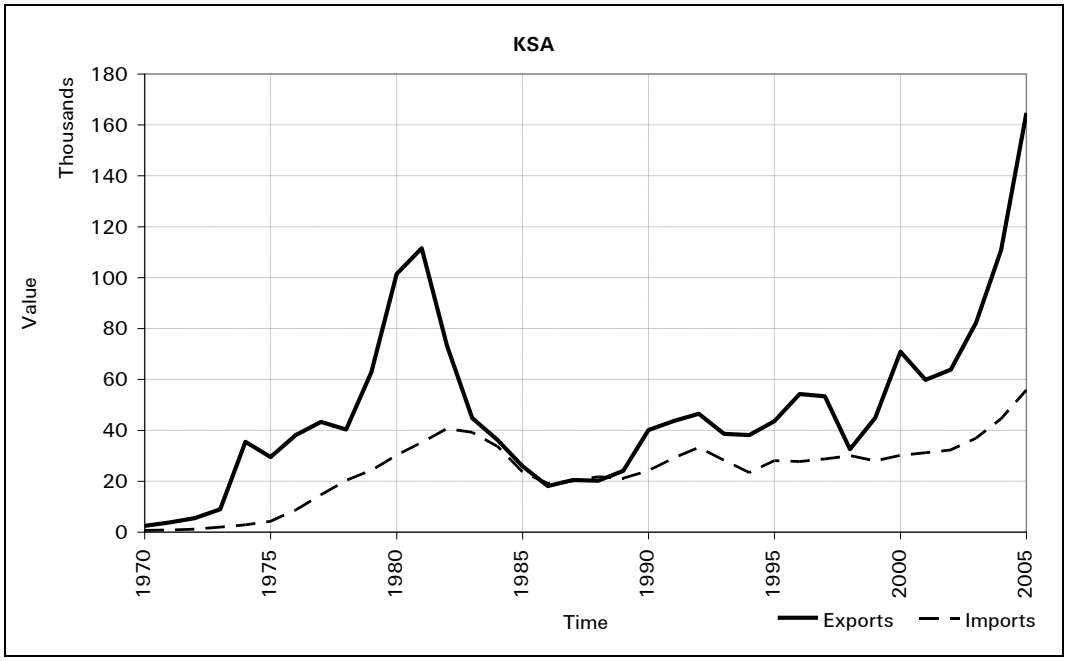
in the four GCC members graphically, over the period 1970-2005 (Figures1-4). The graph of Kuwait (Figure 1) does not show that the variables follow each other very well. The variation in exports is greater than the variation in imports throughout the period. Furthermore, there is a structural change in the variables after the year 1990, which can be attributed to the Iraqi invasion of Kuwait. From Figure 2, it is clear that in the case of Oman the two variables follow each other very well. In the case of Saudi Arabia (Figure 3), the variation in oil exports was more substantial than variation in imports during the period 1967-82. After 1982, the two variables were moving together more closely; suggesting a long run relationship between them. In contrast to Saudi Arabia, United Arab Emirates imports and oil exports (Figure 4) were moving together more closely prior to 1982. But after 1982 the two variables moved separately from each other to the point that imports surpassed oil exports since 1990. This result is unique to the UAE only, because for the remaining GCC member's, oil exports were greater than imports throughout the period. Moreover, oil exports have drifted away sharply from imports over the period 2003-2005, in all members except for the UAE, due to the sharp rise in oil prices.

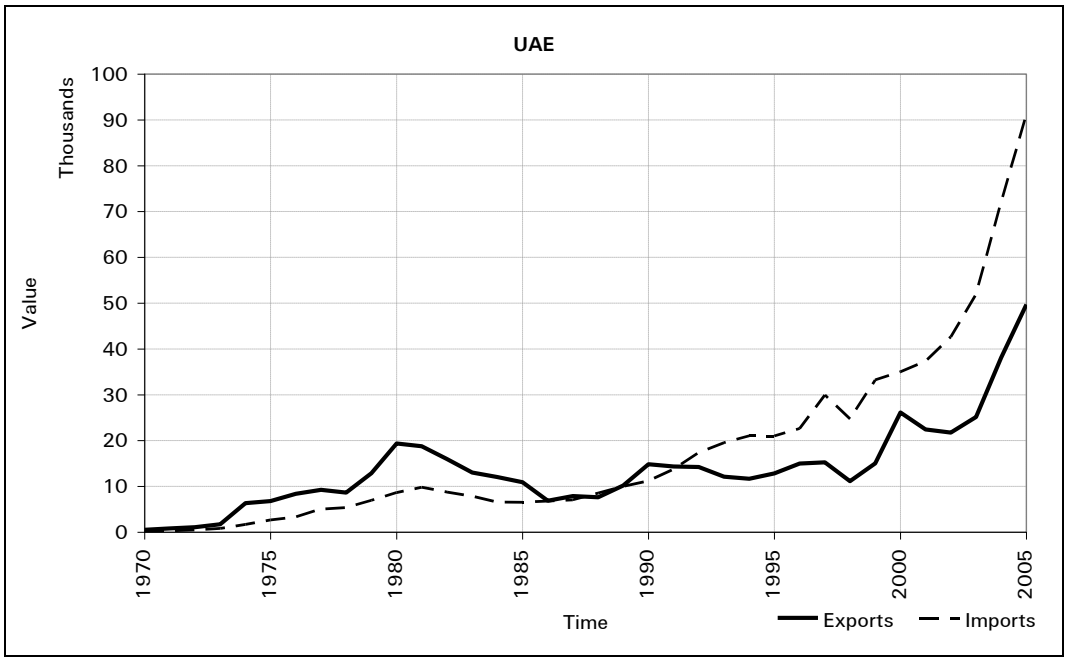
The size of the trade surplus in the members of the GCC has fluctuated sharply with changes in the world price of oil. The ratio of the trade surplus to GDP has declined in all members, except Oman, from 40-50 per cent in the early 1970s to around 15-20 per cent in the l990s. The ratio of trade balance to GDP in Oman has been stable around 20 per cent throughout the period. Saudi Arabia trade surplus declined sharply during the 1980s but improved in the 1990s as a result of stability in oil price and the increased in Saudi oil production. The UAE suffered the sharpest decline in this ratio. An extension of the deterioration of the member's trade balance is the decline in the current account balance. The decline in oil exports combined with deficit in the balance of trade in services and net current transfers depleted the gains from trade surplus in all members. This resulted in a continuous decline in the surplus on current account.

To summarize, the plots of imports and oil exports can show the direction of the relationship between the two variables in the long-run, particularly in the case of Oman. However, we must validate any assumption regarding the long-run equilibrium between oil exports and imports by applying the Johansen method of cointegration.


Kuwait
Thousands
Value
45
40
35
30
25
20
15
10
5
0
1970
1975
1980
1985
1990
1995
2000
2005
Time
Exports
Imports


Oman
Thousands
Value
6
5
4
3
2
1
0
1970
1975
1980
1985
1990
1995
2000
2005
Time
Exports
Imports


KSA
Thousands
Value
180
160
140
120
100
80
60
40
20
0
1970
1975
1980
1985
1990
1995
2000
2005
Time
Exports
Imports


UAE
Thousands
Value
100
90
80
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
Time
Exports
Imports

III. THE AUGMENTED DICKEY-FULLER AND PHILLIPS-PERRON UNIT ROOT TESTS

To establish the existence or non-existence of an equilibrium relationship between imports and oil exports, we must first test whether the two variables are integrated to the same order. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are employed to test whether the two time series are stationary.

Table 1 displays the ADF and the PP unit root tests results for the imports and oil exports time series in the four GCC countries. It is clear from table I that in the case of Kuwait, Saudi Arabia, and the UAE the calculated ADF statistic and the PP statistic are less than the critical value only for the first differenced variables. The results indicate that the variables are non-stationary at levels and have achieved stationarity after being differenced once. Thus, both imports and oil exports in Kuwait, Saudi Arabia, and the UAE are integrated of order one, I (1). On the other hand, both variables in the case of Oman are stationary at the level (integrated of order zero, I (0)). Because both variables in each GCC member are integrated to the same order, the cointegration analysis will be very practical. Therefore, Johansen approach to cointegration between aggregate imports and oil exports will be applied to four GCC members.

Table 1: Unit Root Tests for Kuwait, Oman, Saudi Arabia, and United Arab Emirates

(Kuwait)

Variable	ADF Test Statistic			PP Test Statistic		
	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-1.515	-1.952	3	-1.845	-1.951	3
Δ Oil Exports	-3.139	-1.952	2	-3.246	-1.951	1
Imports	-1.214	-1.952	3	-1.897	-1.951	3
Δ Imports	-2.152	-1.952	1	-2.871	-1.951	1

(Oman)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-2.001	-1.952	1	-3.141	-1.951	1
Imports	-2.840	-1.952	1	-3.433	-1.951	1

(KSA)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-0.743	-1.952	3	-0.911	-1.951	3
Δ Oil Exports	-3.036	-1.952	1	-2.929	-1.951	1
Imports	-0.742	-1.952	3	-0.918	-1.951	3
Δ Imports	-2.283	-1.952	1	-2.158	-1.951	1

(United Arab Emirates)

Variable	ADF Test	5% C.V.	No of Lags	PP Test	5% C.V.	No of Lags
Oil Exports	-1.885	-1.952	3	-2.449	-1.950	3
Δ Oil Exports	-3.062	-1.952	1	-3.159	-1.950	1
Imports	-1.207	-1.952	3	-6.729	-1.950	3
Δ Imports	-2.049	-1.952	1	-0.239	-1.950	1

The null hypothesis in each variable is integrated of order 1 I(1), the 5% critical values are given in parenthesis and derived from E-views econometric package. Δ denotes the first difference of a variable.

IV. The Johansen Multivariate Cointegration Test Results

Tests of the long-run relationship between economic variables using the two step procedure of Engle-Granger type cointegration test suffer from a major deficiency, in which the estimated cointegrating relationship[3] may not be invariant depending on which variable is used on the left hand side. In this respect, the multivariate cointegration technique proposed by (Johansen, 1988) and (Johansen and Juselius, 1990) is superior to the Engle-Granger approach as it fully captures the underlying time series properties of the data. The Johansen method depends on the calculation of Maximum Eigenvalue *(λ-max*) and *trace* statistics using maximum likelihood estimation procedure to identify the number of cointegrating vectors. To carry out the test we proceed sequentially by first testing for H_0: r <= 0, where r is the number of cointegrating vectors. If H_0 was rejected, we then test for r<=l and so on, until the null hypothesis could not be rejected. The *trace* test provides a test of the null hypothesis $H_0 : r \leq r_o$ against the alternative $H_a : r > r_o$, where r indicates the number of cointegrating vectors. The Maximum Eigenvalue test concerns a test of H_0: $r = r_o$ against $H_a : r = r_o + 1$. Johansen and Juselius suggest that the Maximum Eigenvalue test has greater power than the trace test, but both tests will be reported for consistency.

Prior to the application of the Johansen method, the order of the VAR (Vector-Auto-Regressive) error correction model must be determined. According to the test statistics and choice criteria for selecting the order of the VAR model, the Schwarz Bayesian Criterion (SBC) suggests a VAR of order 1, the Akaike Information Criterion (AIC) suggests a VAR of order 2. The statistical package (EViews 6.0) offers five options in applying the Johansen's method. The options correspond to different specification of intercept and trend variable in the underlying VAR model. The options are as follows:

---

[3]The most widely used method of applying cointegration analysis is based on (Engle and Granger, 1987) approach. A cointegration regression is estimated by regressing the log of oil exports on the log of imports (and vice versa) by OLS method and testing for the stationarity of the residuals using the ADF test. The Engle-Granger cointegration approach found no evidence of cointegration between oil exports and imports in the members of the GCC, except Oman.

1. No intercept or trends included in the VAR model

2. Restricted intercept, and no trends in the VAR model

3. Unrestricted intercept, and no trends in the VAR model

4. Unrestricted intercept, and restricted trends in the VAR model

5. Unrestricted intercept, and unrestricted trends in the VAR model

Option 1 assumes that there are no deterministic trends in the variables and the underlying data generating process (DGP) does not contain a trend term either. Option 2 is appropriate when the jointly determined variables do not contain a deterministic trend. Option 4 is appropriate when the jointly determined variables in the VAR have a linear deterministic trend. Option 3 and 5 can lead to error correction models with different trend properties depending on the number of cointegrated relations. In general, options 1 and 5 are irrelevant; therefore, our analysis will be limited to options 2, 3 and 4. In regard to the GCC imports and oil exports, although the underlying variables are trended, they move together, and it seems unlikely that there will be a trend in the cointegrating relations.

In the case of the cointegrating VAR option, the choice of intercepts and trends is very important in testing for cointegration. As the form of the deterministic trend can change the estimated results, extra care must be given to this subject. The principle for testing the joint hypothesis of both the rank order and the deterministic components is discussed in Johansen (1992). Following Johansen (1992), we relied on the "Pantula Principle", which can be summarized as follows. We estimate all three alternative models and move from the most restrictive model (no deterministic components) to the least restrictive model, comparing the maximal Eigenvalue test statistic to its critical value. The model will be selected only when the null hypothesis is not rejected for the first time

IV.1. The Johansen Estimation Results

Based on tests for lag order, the optimal lag length was chosen to be 2 in the VAR model. Relying on the “Pantula Principle”, restricted intercept

and unrestricted trend term should be included in the VAR model. The Johansen method will be applied to the variables using option 2 (Restricted intercept, and no trends in the VAR model). Table 2 reports the results of λ–max and *trace* statistics for Kuwait, Oman, Saudi Arabia, and the UAE.

In the case of Kuwait, the null hypothesis of no cointegration cannot be rejected under both the Maximum Eigenvalue and trace statistics (both tests are less than their 5 per cent critical values). Therefore, according to the above two criteria there is no evidence of cointegration and hence, there is no evidence of long-run relation between Kuwait's imports and oil exports

In the case of Oman, the results in Table 2 suggest that the null hypothesis of no cointegration can be rejected by both the Maximum Eigenvalue and trace tests. The results clearly indicate that the log of oil exports and log of imports are cointegrated in the long-run. The normalized cointegrating coefficient was 1.16 and for the slope coefficient to be close to unity is a strong indication of cointegration between imports and oil exports in Oman. Thus, the Johansen method of cointegration validates the assumption made from Figure 2, that imports and oil exports are cointegrated in the long-run. Saudi Arabia cointegration results are similar to Oman as can be seen from Table 2. Both the Maximum Eigenvalue and trace statistics confirm the existence of one cointegrating vector. The normalized cointegrating coefficient was around 0.91. As in the case of Oman, for the slope coefficient to be close to one is a strong evidence of cointegration between Saudi Arabia imports and oil exports. United Arab Emirates results show that the null hypothesis of no cointegration can be rejected under both the Maximum Eigenvalue and trace statistics. The normalized cointegrating coefficient was around 1.26, indicating a long run equilibrium.

The lack of long-run equilibrium in the case of Kuwait can be analyzed within this context. Kuwait depends on investment income from abroad more than the remaining three members. The Kuwait's ratio of net income from abroad to GDP was around 21 per cent in 2001, compared to -3, 2, and 9 per cent in Oman, Saudi Arabia and United Arab Emirates, respectively (EIU, 2004). The dependency on investment income allowed Kuwait to increase or maintain its import levels during the times when oil revenues were declining, particularly in the 1980s. A

major drawback with this policy is the depletion of investment income (foreign reserves) on imports of mainly consumer goods. Moreover, part of the investment income is used to balance the government budget deficit, and little is directed toward investment in the domestic economy that can lower dependency on foreign imports in the long-run, (i.e. increase the domestic absorptive capacity). The disequilibrium in Kuwait's trade policy might not be worrying in the short-run, but it can have a serious affect on the trade balance and current account in the long-run. However, it should be noted that Kuwait investment abroad in a wide range of financial instruments enhanced the scoop of diversification in an international portfolio of assets, and has reduced its specific risks (1990 Iraqi invasion).

On the other hand, Oman's net investment income was constantly in deficit. Oman depends directly on its oil revenues to finance its imports. It should be noted that Oman is not an OPEC member and therefore is not obliged to stick to a production quota. It can adjust its level of oil exports (and subsequently imports) more than the other GCC members. This resulted in Oman having the most stable trade balance among the GCC members in the last three decades. The cointegration results verified the above analysis by confirming the long-run equilibrium between Oman oil exports and imports.

The UAE imports increased significantly since 1985. Throughout the 1990s, the proportion of exports and imports of goods and services of total GDP in the UAE were around 65 and 78 per cent respectively (the highest among the GCC). A portion of these imports was used for re-export purpose. Re-exporting is a major part of the UAE total exports (around 30 per cent), (The GCC Economic Bulletin, 2004). On the other hand, Saudi Arabia maintained a steady level of imports since 1985, and this allowed the improvement of the trade balance during the 1990s as the Kingdome increased its oil production.

V. CONCLUSIONS

This paper examined the long run equilibrium between oil exports and imports in Kuwait, Oman, Saudi Arabia, and the United Arab Emirates over the period 1967-2005. The Johansen method of cointegration analysis was implemented and found a strong evidence of long-run relation between imports and oil exports in three members of the GCC

(Oman, Saudi Arabia, and United Arab Emirates). Kuwait is the only country, which the Johansen method failed to recognize a unique cointegrating vector.

The slope coefficients in the Johansen regression equations were close to unity in the cases of Oman, Saudi Arabia, and United Arab Emirates. This suggests that the long-run trade balance between imports and oil exports will be in equilibrium. Furthermore, the cointegration results suggest that the above three members' trade policies were effective in sustaining long-run equilibrium between oil exports and imports. Moreover, these countries are not in violation of their international budget constraints. In contrast, the evidence of no cointegration between imports and oil exports in Kuwait might be justified by Kuwait ability to finance its dependency on imports through its investment income from abroad. However, the disequilibrium in Kuwait's trade balance might not be healthy in the long-run due to the depletion of financial reserves and the limited domestic absorptive capacity. Economic policies such as encouraging investments in local economy and some type of import restrictions and substitutions should be considered. This can lower dependency on foreign imports in the short-run and subsequently promote exports of other goods beside oil in the long-run.

Table 3: Cointegration Test Results Based on the Johansen Maximum Likelihood Procedure [a]

Null Hypothesis	Alternative Hypothesis	Trace Value	(λ-max) Value	95% critical Value
Kuwait Period 1971 – 2005				
Trace Test				
r = 0	r ≥ 1	17.78		20.26
r ≤ 1	r ≥ 2	4.95		9.16
(λ-max) Tests				
r = 0	r ≥ 1		12.81	15.89
r ≤ 1	r ≥ 2		4.95	9.16
Oman Period 1971 – 2005				
Trace Test				
r = 0	r ≥ 1	30.204		20.26
r ≤ 1	r ≥ 2	12.67		9.16
(λ-max) Tests				
r = 0	r ≥ 1		17.52	15.89
r ≤ 1	r ≥ 2		12.67	9.16
K.S.A Period 1971 – 2005				
Trace Test				
r = 0	r ≥ 1	37.59		20.26
r ≤ 1	r ≥ 2	1.5		9.16
(λ-max) Tests				
r = 0	r ≥ 1		31.07	15.89
r ≤ 1	r ≥ 2		1.52	9.16
U.A.E Period 1971 – 2005				
Trace Test				
r = 0	r ≥ 1	29.63		20.26
r ≤ 1	r ≥ 2	8.26		9.16
(λ-max) Tests				
r = 0	r ≥ 1		21.35	15.89
r ≤ 1	r ≥ 2		8.26	9.16

[a] (λ-max) is the maximal eigenvalue test statistic for at most r cointegrating vectors(s) against the alternative of r + 1 cointegrating vector(s). Trace is the stochastic matrix trace test for, at most, r cointegrating vectors(s).

REFERENCES:

Bahmani-Oskooee, M. (1994). "Are Imports and Exports of Australia Cointegrated", *Journal of Economic Integration,* Vol. 9, pp. 525-33.

Bahmani-Oskooee, M. (1995). "Johansen's Cointegration Technique and the Long RunRelation Between Iranian Imports and Exports", *The Middle East Business and Economic Review, Vol.* 7, No. 2, pp. 1-9.

Dickey, D. and Fuller, W. (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association, Vol.* 74, pp. 427431.

Dickey, D. and Fuller, W. (1981). "Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root", *Econometrica,* Vol. 49, pp. 1057-72.

Economist Intelligence Unit, Country Report-Profile (2004), (Kuwait, Oman, Saudi Arabia, UAE), The Economist Intelligence Unit Limited.

Engle, R.F. and Granger, C.W. (1987). "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica, Vol.* 55, No. 2, pp. 251-276.

GCC Economic Bulletin, No.19 (2004), Riyadh, GCC General Secretary

Granger, C.W. (1981). "Some Properties of Time Series Data and Their Use in Econometric Model Specification", *Journal ofEconometrics, Vol.* 16, No. 1, pp. 121-130.

Husted, S. (1992), "The Emerging US Current Account Deficit in the 1980s: A Cointegration Analysis", *The Review of Economics and Statistics, Vol.* 74, pp. 159-66.

IMF, (2006), *International Financial Statistics Yearbook*, Washington, D.C., International Monetary Fund.

IMF, (2006), *Direction of Trade Statistics Yearbook*, Washington, D.C., International Monetary Fund

Irandoust, M. and Ericsson, J. (2004) "Are Imports and Exports Cointegrated? An International Comparison", *Metroeconomica*, Vol.55, No.1, pp. 49-64.

Johansen, S. (1988). "Statistical Analysis of Cointegrating Vectors", *Journal of Economic Dynamics and Control*, Vol. 17, pp. 231-54.

Johansen, S. and Juselius, K. (1990). "Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money", *Oxford Bulletin of Economics and statistics*, Vol. 52, pp. 169-210.

Maddala, G.S. (1992). *"Introduction to Econometrics"*, 2°d edition, Englewood Cliffs, N.J. Prentice-Hall

Nadue, W. (2000) "The Determinants of South African Exports: An Econometric Analysis", *The South African Journal of Economics*, Vol. 68, No.2, pp.246-264.

Narayan, K. and Narayan, S (2005) "Are Exports and Imports Cointegrated? Evidence from 22 Least Developed Countries", *Applied Economic Letters*, Vol. 12, pp. 375-378.

Phillips, P.C. and Perron, P. (1988) "Testing for a Unit Root in Time Series Regression", *Biometrika*, Vol. 75, pp. 335-346.

Sharma, A. And Panagiotidis, T. (2005) "An Analysis of Exports and Growth in India: Cointegration and Causality Evidence (1971-2001), *Review of Development Economics*, Vol. 9, No.2, pp.232-248.

The Economist, (1997) " *Guide to Economic Indicators: Making Sense of Economics* ", John Wiley & Sons, Inc.

Wu, y. And Zhang, J. (1998) "Are the U.S. Exports to and Imports from Japan Cointegrated?", *Journal of Economic Integration*, Vol. 13, No. 4, pp626-643. Dec 1998.