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HOW MUCH GROWTH, FDI, AND IMPORTS AFFECT THE ENVIRONMENT IN GCC COUNTRIES? An Empirical Analysis to Air Pollution Issue

Fatimah Kari* **and Ahmed Saddam***

Abstract: The Gulf Cooperation Council countries are among the top 25 countries in terms of their contribution to increasing the level of carbon dioxide emissions more than the average world. Furthermore, these countries emit from 45% to 50% of the total emissions of Arab countries, because of the significant role of extractive sectors, as major sources of income in these economies.

This study examines the most important factors pertaining to the increasing carbon dioxide emissions in GCC countries over the period 1998-2008. In this paper, the research objective is to determine how much the FDI inflows, economic growth, and commodity imports influenced the increasing level of emissions during the period of study, and which variable has most effect? For this purpose, an empirical model will be estimated in order to obtain the impact of the said variables of the six member countries – United Arab Emirates, Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait. The model of carbon dioxide emissions as a function of FDI inflows, per capita GDP growth rate, and commodity imports will be examined simultaneously within the panel data technique using ordinary least squares OLS.

JEL Classification: C33, F10, F21, Q56

Keywords: Carbon dioxide emissions, GCC, Growth, Panel data.

1. INTRODUCTION

The GCC countries are among the top 25 countries (Reiche, 2010), which contribute to the increasing level of carbon, and emit from 45% to 50% of the total emissions of Arab countries (ROWA, 2007).

During the period 1998-2008, the GCC countries witnessed high rates of emissions. These emissions amounted to 254 million metric tons, due to their reliance on fossil fuel and other industries associated therewith. In 2003 the UAE, Qatar, Bahrain and Kuwait emitted about 13, 9, 8, and 7 times, respectively, more than the world average. Furthermore, the emissions of these countries exceeded the world average (Chaaban, 2008). This implies that these countries are still significant contributors to environmental pollution and climate change. Therefore, this study tries to measure the important variables concerning the key reasons for air pollution. In addition, we attempt to identify how much these variables have contributed to pollution in the GCC countries over the period of study, and which variable is most significant in this respect.

* Faculty of Economics and Administration, University of Malaya-Kuala Lumpur, *E-mail: ahmed_saddam@live.com*

2. REVIEW OF LITERATURE

Mukhopadhyay (2008) found that Thailand is a pollution haven and the effect of FDI on the environment is not friendly. His study suggests several policies; the most important is paying more attention to the environmental quality of exported goods, and creating sustainable trade development, as well as providing financial incentives to establish green industries and encourage using imported technology for the production of green products in order to reduce the level of pollution in the country.

Stern *et al.* (1996) found that there is an inverse relationship between environmental degradation and per capita national income, where economic growth reduces the environmental impact resulting from various economic activities. In addition, trade has a neutral impact on environmental degradation. This study used a cross sectional regression for the per capita environmental impact on per capita income.

Thomas (2009) found a significant relationship between GDP and carbon dioxide emissions (CO_2), in which the data analysis shows that Trinidad produced 12 times the CO_2 per unit compared to Uruguay and Kenya, and over 20 times more than Sri Lanka and Uganda. The rapid movement of capital and expanding industrial base positively affect the increased level of carbon dioxide emissions.

Day and Grafton (2002) tested the relationship between per capita real GDP in Canada, and the four measures that negatively impact on environmental degradation. This proved that Carbon monoxide has a reverse negative impact in the long term with an increase in per capita GDP. This study is based on the causality test to determine the relationship. It concludes that Canada does not have a high level of per capita GDP to prevent the effects of other environmental problems associated with economic growth.

Abdulai, *et al.* (2009) found that GDP has a high positive significant impact on the environment, while the trade coefficient is not statistically significant. Moreover, the income variable indicates that there is an EKC implication. The study concluded that solving environmental problems does not necessary negatively affect economic growth when a country does not have the institutional capacity to set up proper environmental policies or protect certain sectors.

Bruyn *et al.* (1998) concluded that environmental pollution has a direct relationship with economic growth. This study indicated that the best way to reduce the effect of pollution is to increase the level of investment in high technology to achieve rapid economic growth.

Nickerson (2004) examined the linkage between per capita emissions, and per capita GDP. His study is based on the combination of two environmental theories – the environmental Kuznets curve (EKC), and the porter hypothesis.

The study found that an increase in manufacturing exports is a good factor for reducing the level of emissions through the competition between firms for high

efficiency. Furthermore, it determined that the level of carbon dioxide emissions increases with a high level of income. This conclusion is the opposite of the assumptions of the EKC theory, in which the study explains that economic growth is not supported by advanced technology.

Dinda (2005) suggested that achieving sustainable economic growth could be through the protection of natural resources and optimal exploitation, which reduces the impact of climate change. He examined several variables, which are the cumulated per capita Co_2 emission, and per capita protected forest area within the country. The study result showed that the cumulated per capita carbon dioxide emissions, and per capita area of protected forests is linked to a positive economic growth rate.

Ekins (2000) found that the relationship between economic growth and the environment could be positive, and that the government should pay more attention to the environment. Moreover, Ekins indicated that population growth combined with an increase in the level of economic activity cause harm to the environment as a result of the high level of production and consumption, which present a major challenge.

Kheder (2010) used empirical analysis to explain the relationship between FDI, environmental regulation, and pollution, in order to shed new light on the environmental impact of pollution. The study is based on using data of French FDI outflows in a mix of developing, transition, emerging and developed countries over the period 1999-2003. The study estimated three simultaneous equations.

Copeland and Taylor (2004) concluded that when GDP increases, the greater scale of production leads directly to more pollution, but at a higher level of income per capita, the demand for health and environmental quality rises with income, which could be translated into environmental regulation. The study result shows that trade liberalisation leads to an increase in the volume of economic activity by 1% and raises the level of pollution between 0.25% and 0.5%, however, this is associated with an increasing level of per capita income between 1.25% and 1.5 %, which is limited by the advanced technologies.

Wen (2007) tested the availability of the environmental Kuznets curve in China by using provincial panel data. The study analysed the relationship between GDP per capita and the emissions of five kinds of industrial pollutants, sold wastes, wastewater, SO_2, Soot, and smoke. It found that the relationship varies depending on the types of pollutant and region. Furthermore, this study confirms that the EKC hypothesis is not clear in China, where the inverted U-shaped curve cannot be generalised for all emissions.

Jie (2006) analysed the relation between FDI, emissions, and three economic determinants of emission. The estimated model of this study includes panel data for 29 industrial provinces in China. It found a small total impact of FDI on industrial

SO_2 emission, where a 1% increase on FDI capital stock will lead to an increase in industrial SO_2 emission by 0.099%. The study confirms that the increase in the level of emissions is caused by the impact of FDI on economic growth.

Frankel and Rose (2005) discussed the determinants of foreign trade and their effect on the environment by using a gravity model. This study found that trade has a beneficial effect on some measures of environmental quality, in that it supports the environmental Kuznets curve (EKC).

Lee, *et al.* (2005) examined the impact of income on the environment. The examination results showed that the income has a positive impact on pollution, where it has specific effects on most of the criteria of environmental efficiency. Moreover, this study explained that environmental policies often focus on how to control pollution, which is not sufficient. The study confirmed the importance of creating a consistent situation between the economic policy and aspects of environmental efficiency.

Research gap: According to the literature review for this study it was noted that most studies have been conducted in respect of more diversified economies, and based on the assumptions of Environmental Kuznets Curve (EKC) have addressed the environment in countries that follow a strict environmental policy. In this study, the methodology of the study is based on the assumptions of EKC and PHH, in order to identify which assumptions fit the GCC countries over the period of study.

However, continuing with the literature for the study, we link the three key topics – foreign trade, foreign direct investment and growth – and to achieve the objectives of the study, we use a specific model including significant variables, which could provide a clear picture about air pollution in GCC countries, over the period 1998-2008.

3. METHODOLOGY

This study relies on hypotheses of the Environmental Kuznets Curve (EKC), and hypotheses of the pollution haven theory (PHH). Therefore, we will test three independent variables, which are: GDP, FDI inflows and commodity imports. All data of the study will be subjected to the Augmented Dickey fuller test (ADF) in order to ensure a stationary data. However, obtaining a positive signal for FDI inflows will reflect that these inflows have not used advanced technology over the period 1998-2008 and vice versa in terms of a negative signal. In respect of GDP and commodity imports, the model will examine these variables in order to extrapolate whether the GCC countries have taken into account the environmental consideration and their impact on carbon dioxide emissions over the period of study. We will estimate the following model:

$$Air = a + b_1(GDP) + b_2(FDin) + b3(M) + ui$$

Where:

Air: Air pollution, measured by carbon dioxide emissions.

GDP: Per capita GDP growth rate.

FDI: Foreign direct investment inflows.

M: Commodity imports, measured as a ratio of total commodity foreign trade.

a: constant.

b_1, b_2, b_3, *are* coefficients to be estimated.

ui: error term.

3.1. The Model Estimation

The model was estimated by using ordinary least squares (OLS) with panel data techniques. The dependent variable is the air pollution represented by per capita carbon dioxide emissions in GCC countries for the period 1998-2008. The independent variables are GDP per capita growth rate (GDP), foreign direct investments inflows (FDin), and commodity imports (M). By using SPSS software, we have obtained the following model:

Table 1
Regression Result of the Model(*)

GCC countries	*Model*	*Unstandardized Coefficient*			
		B	*Std. Error*	*t*	*Sig.*
	(Constant)	3.325	0.112	29.615	0.000(**)
UAE	GDP	9.857E-03	0.004	2.343	0.023(***)
	M	5.974E-04	0.002	0.272	0.787
	FDin	–5.974E-04	0.009	–1.988	0.053(***)
	GDP	5.608E-03	0.005	1.171	0.247
Bahrain	M	–1.670E-03	0.002	–0.697	0.489
	FDin	3.107E-04	0.001	0.608	0.546
	GDP	–5.488E-04	0.006	–0.099	0.922
Saudi Arabia	M	–4.450E-02	0.007	–6.282	0.000(**)
	FDin	4.346E-02	0.014	3.179	0.003(**)
	GDP	–3.958E-03	0.003	–1.274	0.209
Oman	M	–3.441E-02	0.004	–9.187	0.000(**)
	FDin	4.010E-02	0.013	3.061	0.004(**)
	GDP	8.420E-03	0.003	2.679	0.010(**)
Qatar	M	1.428E-02	0.005	3.146	0.003(**)
	FDin	5.323E-02	0.016	3.229	0.002(**)
	GDP	6.924E-03	0.004	1.651	0.105(****)
Kuwait	M	3.831E-04	0.005	0.074	0.941
	FDin	0.103	0.179	0.574	0.569

Source: prepared by using SPSS software and Panel data technique.
(*) Dependent variable is Log (Air) represented by carbon dioxide emissions.
(**),(***), (****) indicate statistically significant at the (1%), (5%) and (10%) levels, respectively.
$R^2 = 0.969$ adjusted. $R^2 = 0.957$ F=82.273 Sig. = 0.000 D.W. = 1.780

The regression result of the model above is statistically significant at the (0.01) level and the (F) value amounted to 82.273. In addition, the adjusted (R^2) value is about 0.957, which reflects that the independent variables affect the air pollution by 0.957, while the other factors represented less than 0.05. Moreover, the estimated result confirms that the model has no auto-correlation problem, where the (D.W.) value amounted to 1.780. This means that the estimated model is located in the acceptable statistical area. However, we found that this model is significant, and can be used in analysing the variables of the study.

3.2. Model Results

UAE: The estimated result of per capita GDP growth rate in the UAE is statistically significant at the 0.05 level, where increasing per capita GDP growth rate by one time leads to an increase in the per capita carbon dioxide emissions by 0.0009857 times. This means that the economic growth in the UAE has increased the level of carbon dioxide emissions. In addition, the UAE is a second producer of petrochemical industry in GCC (DMCC, 2007), an industry that is considered as the main cause of air pollution in this country over the period of study.

Furthermore, the variable of FDI inflows is statistically significant at the 0.05 level. This indicates a negative relation between FDI inflows and carbon dioxide emissions, meaning that these investments have contributed to reducing the per capita carbon dioxide emissions in the UAE, where increasing FDI inflows by one time leads to a reduction in the per capita carbon dioxide emission by -0.001849 times. In this context, we can explain that this negative result is because most foreign direct investments in the UAE have concentrated on the non-oil industries, such as the building and construction sector, which represents 90% on average of the total FDI inflows to the UAE (Ministry of Economy, 2008).

The commodity imports coefficient is statistically insignificant, which confirms that these imports have no relation with the air pollution in the UAE over the period 1998-2008. We can explain that due to the most of capital goods have characterised in the high advanced technology, and help to maintain the environment. It is worth noting, that after 1999, the UAE started encouraging the establishment of projects, which are environmentally friendly, such as solar energy projects that are used for multiple purposes (Raouf, 2008).

Bahrain: In Bahrain, all the variables are statistically insignificant. We can analyse this result as the GDP of Bahrain is small. It represents only 2%(*), as ratio of the total average of GDP of GCC countries over the period 1998-2008. In addition, the low level of oil production confirms that this sector has no important role as a reason for air pollution in Bahrain. In other words, the low level of products does not lead to pollution of the environment, as reflected by the per capita GDP growth rate. Furthermore, the existence of increased carbon dioxide emissions in Bahrain results from trans-boundary pollution, especially from Qatar, Kuwait and Saudi Arabia.

Saudi Arabia: The estimated model indicates that the FDI inflows is the major cause of air pollution in Saudi Arabia, where increasing FDI inflows by one time leads to an increase in the per capita carbon dioxide emissions by 0.004346 time. In contrast, an increase in commodity imports by one time decreases the per capita carbon dioxide emissions by -0.004450 times.

In respect of the commodity imports coefficient, we note that there is a negative relation between the increased level of imports and air pollution, where increasing these imports by one time leads to a drop in the carbon dioxide emissions by -0.004450 times. This result reflects the substituted process of advanced capital goods instead of polluted capital goods (Hussien, 2010).

Finally, the per capita GDP is statistically insignificant, which affirms that there is no relation between air pollution and per capita GDP growth, as much of this growth is resulting from the increase in oil prices to achieve a high level of GDP growth in Saudi Arabia.

Oman: the coefficients of FDI inflows and commodity imports are statistically significant at the 0.01 level. This means that the effect of FDI inflows is positive, where increasing by one time will lead to an increase in the per capita carbon dioxide emissions by about 0.004010 times over the period 1998-2008.

In addition, the relation between commodity imports and the level of pollution is negative, where increasing it by one time leads to a reduction in the carbon dioxide emissions by -0.003441 times. In addition, the imported capital goods characterised in advanced technology lead to reduced per capita carbon dioxide emissions over the said period.

The estimated model also shows that the GDP coefficient is statistically insignificant, which reflects that the Omani GDP has no effect on air pollution due to its small size compared with Saudi Arabia and the UAE. Therefore, the result of the specific model confirms that the carbon dioxide emissions are resulting from the FDI inflows to Oman, which is the main reason for air pollution in Oman over the period of study.

Qatar: the three variables, (GDP, FDin, M) are statistically significant at the 0.01 level, where the per capita GDP growth rate confirms its positive relation in increased per capita carbon dioxide emission in Qatar over the period of study. Therefore, increasing the level of per capita GDP growth rate by one time leads to an increase in per capita carbon dioxide emission of about 0.0008420 times. In this context, we can say that this issue is related to the growth in the GDP in Qatar, which significantly depends on the oil and gas sector. In other words, the economic growth in Qatar has led to pollution of the environment.

Furthermore, the FDI inflows in this country are considered a secondary reason for air pollution, where increasing it by one time leads to an increase in per capita carbon dioxide of about 0.005323 times. This result can be explained in the direction

of most foreign direct investment inflows towards the gas sector, as well as the petrochemical industry, which is considered as the main reason for air pollution. It is also worth noting that Qatar has the third largest global reserve of natural gas. It is considered to be the first supplier of liquefied natural gas in the world (EIA, 2011), and this feature is the main factor that encouraged the foreign companies to invest in the gas sector. However, the comparative advantage of Qatar has led to more pollution over the study period.

In respect of commodity imports, the estimated result indicates that an increase by one time leads to an increase in the per capita carbon dioxide emission by 0.001428 times, with a positive relation between the two variables. Therefore, we can say that the main cause of increased pollution is due to importing polluted capital goods, such as transportation equipment, and other capital goods that are characterised by disadvanced technology.

Kuwait: in Kuwait, the per capita GDP growth rate has confirmed its effect on increasing per capita carbon dioxide emissions, where the estimated model indicates that increasing per capita GDP growth rate by one time leads to an increase in the per capita carbon dioxide of about 0.0008420 times. This result proves the role of economic activities, which significantly rely on the oil sector. Therefore, the existence of a high share of the oil sector and its export will not achieve sustainable economic growth in Kuwait.

In addition, the estimated model shows that the FDI inflows coefficient is statistically insignificant, which we conclude is due to the low level of FDI inflows over the period 1998-2008.

In respect of commodity imports, the result of the model indicates that it is also insignificant and that there is no relation between the air pollution in Kuwait and commodity imports because the GDP is the major cause of air pollution in Kuwait over the period of study.

4. CONCLUSIONS

(a) The GDP per capita growth rate confirms its positive effect on increasing per capita carbon dioxide emissions in Qatar, Kuwait and UAE during the period 1998-2008, where it is the main cause of air pollution in these countries.

(b) FDI inflows to the UAE are significantly contributed in reducing the air pollution over the study period. This result could be attributed to using advanced technology, as well as the fact that most of the FDI inflows are concentrated in sectors that have no major impact on increasing the level of pollution, such as real estate and the construction sector. In contrast, there is no relation between FDI inflows and air pollution in Kuwait and Bahrain because of the low level of these inflows over the period 1998-2008.

(c) The increased inflows of FDI in Saudi Arabia, Oman and Qatar significantly contribute to raising the per capita carbon dioxide emissions more than the

contribution of other independent variables, namely, GDP and imports. This result confirms that the FDI inflows to the said countries have not used advanced technology, and, consequently, did not lead to sustainable economic growth during the period 1998-2008.

(d) In both Kuwait and Bahrain, the FDI inflows and commodity imports have no relation with the air pollution, where the cause of pollution in Kuwait is related to per capita GDP growth rate, which reflects the economic activities. The Bahrain per capita GDP growth is insignificant because of the small size of GDP, and, in addition, the oil sector is not considered the main sector in Bahrain, where the model shows that the GDP has no effect on air pollution over the period 1998-2008.

(e) The variable of commodity imports shows its inverse effect in Saudi Arabia and Oman. This means that these imports have advanced technology. While in Qatar we note that there is a positive impact, which implies it leads to an increase in the per capita carbon dioxide emissions. In addition, these imports have not advanced technology. Moreover, the model shows that there is no relation between commodity imports and carbon dioxide emissions in Bahrain, Kuwait and the UAE.

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Appendix

Augmented Dickey-Fuller test statistic for the data of the study

Null Hypothesis: D(LOGAIR_U)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG = 1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-4.385383	0.0008
Test critical values:	1% level		-2.886101
	5% level		-1.995865
	10% level		-1.599088

*Air pollution in United Arab Emirates measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAIR_U,2)
Method: Least Squares
Date: 07/27/12 Time: 02:48
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(LOGAIR_U(-1))	-1.926968	0.439407	-4.385383	0.0046
D(LOGAIR_U(-1),2)	0.530557	0.262888	2.018190	0.0901
R-squared	0.810545	Mean dependent var		-0.042139
Adjusted R-squared	0.778969	S.D. dependent var		0.290293
S.E. of regression	0.136478	Akaike info criterion		-0.932985
Sum squared resid	0.111758	Schwarz criterion		-0.913125
Log likelihood	5.731940	Durbin-Watson stat		1.131820

Null Hypothesis: D(LOGAIR_B,2)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.278988	0.0003
Test critical values:	1% level	-2.937216	
	5% level	-2.006292	
	10% level	-1.598068	

* Air pollution in Bahrain measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAIR_B,3)
Method: Least Squares
Date: 07/27/12 Time: 02:50
Sample (adjusted): 5 11
Included observations: 7 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(LOGAIR_B(-1),2)	-2.253611	0.426902	-5.278988	0.0032
D(LOGAIR_B(-1),3)	0.399634	0.228954	1.745480	0.1413
R-squared	0.947244	Mean dependent var		0.044921
Adjusted R-squared	0.936692	S.D. dependent var		0.353146
S.E. of regression	0.088855	Akaike info criterion		-1.768664
Sum squared resid	0.039476	Schwarz criterion		-1.784119
Log likelihood	8.190325	Durbin-Watson stat		0.287151

Null Hypothesis: D(LOGAIR_K)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-7.279846	0.0000
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

* Air pollution in Saudi Arabia measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAIR_K,2)
Method: Least Squares
Date: 07/27/12 Time: 02:52
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(LOGAIR_K(-1))	-0.880988	0.121017	-7.279846	0.0003
D(LOGAIR_K(-1),2)	-0.272985	0.089599	-3.046746	0.0226
R-squared	0.960513	Mean dependent var		-0.032692
Adjusted R-squared	0.953932	S.D. dependent var		0.113984
S.E. of regression	0.024465	Akaike info criterion		-4.370839
Sum squared resid	0.003591	Schwarz criterion		-4.350978
Log likelihood	19.48335	Durbin-Watson stat		0.967271

Null Hypothesis: D(LOGAIR_O,2)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-10.32651	0.0001
Test critical values:	1% level	-2.937216	
	5% level	-2.006292	
	10% level	-1.598068	

*Air pollution in Oman measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAIR_O,3)
Method: Least Squares
Date: 07/27/12 Time: 02:54
Sample (adjusted): 5 11
Included observations: 7 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGAIR_O(-1),2)	-2.535313	0.245515	-10.32651	0.0001
D(LOGAIR_O(-1),3)	0.891885	0.158906	5.612667	0.0025
R-squared	0.961145	Mean dependent var		0.036751
Adjusted R-squared	0.953375	S.D. dependent var		0.333402
S.E. of regression	0.071991	Akaike info criterion		-2.189587
Sum squared resid	0.025914	Schwarz criterion		-2.205042
Log likelihood	9.663555	Durbin-Watson stat		0.795161

Null Hypothesis: D(LOGAIR_Q,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.084626	0.0003
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Air pollution in Qatar measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAIR_Q,3)
Method: Least Squares
Date: 07/27/12 Time: 02:55
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(LOGAIR_Q(-1),2)	-1.584759	0.311677	-5.084626	0.0014
R-squared	0.785716	Mean dependent var		-0.036442
Adjusted R-squared	0.785716	S.D. dependent var		0.515538
S.E. of regression	0.238647	Akaike info criterion		0.088805
Sum squared resid	0.398666	Schwarz criterion		0.098735
Log likelihood	0.644781	Durbin-Watson stat		1.993324

Null Hypothesis: D(logair_KW,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.092915	0.0069
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Air pollution in Kuwait measured by natural logarithmic of carbon dioxide emissions, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(V6_A,3)
Method: Least Squares
Date: 07/27/12 Time: 02:56
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(V6_A(-1),2)	-1.157568	0.374264	-3.092915	0.0175
R-squared	0.577442	Mean dependent var		0.000661
Adjusted R-squared	0.577442	S.D. dependent var		0.156033
S.E. of regression	0.101428	Akaike info criterion		-1.622462
Sum squared resid	0.072014	Schwarz criterion		-1.612532
Log likelihood	7.489850	Durbin-Watson stat		1.778518

Null Hypothesis: D(GDP_UAE)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-6.035698	0.0001
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita growth GDP growth rate of United Arab Emirates, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_UAE,2)
Method: Least Squares
Date: 07/27/12 Time: 02:58
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_UAE(-1))	-1.915635	0.317384	-6.035698	0.0009
D(GDP_UAE(-1),2)	0.573541	0.214021	2.679832	0.0365
R-squared	0.881350	Mean dependent var		-1.525000
Adjusted R-squared	0.861575	S.D. dependent var		18.16368
S.E. of regression	6.757900	Akaike info criterion		6.871619
Sum squared resid	274.0153	Schwarz criterion		6.891480
Log likelihood	-25.48648	Durbin-Watson stat		1.583895

Null Hypothesis: D(M_UAE,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-4.536155	0.0007
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Commodity imports of the United Arab Emirates measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_UAE,3)
Method: Least Squares
Date: 07/27/12 Time: 02:59
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_UAE(-1),2)	-1.416153	0.312192	-4.536155	0.0027
R-squared	0.742406	Mean dependent var		2.087500
Adjusted R-squared	0.742406	S.D. dependent var		18.34522
S.E. of regression	9.310875	Akaike info criterion		7.416712
Sum squared resid	606.8467	Schwarz criterion		7.426642
Log likelihood	-28.66685	Durbin-Watson stat		0.500103

Null Hypothesis: D(FDIN_UAE,2)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-3.780463	0.0026
Test critical values:	1% level	-2.937216	
	5% level	-2.006292	
	10% level	-1.598068	

*Foreign direct investment of the United Arab Emirates, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_UAE,3)
Method: Least Squares
Date: 07/27/12 Time: 03:01
Sample (adjusted): 5 11
Included observations: 7 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_UAE(-1),2)	-2.095621	0.554329	-3.780463	0.0129
D(FDIN_UAE(-1),3)	0.509078	0.328348	1.550421	0.1817
R-squared	0.799845	Mean dependent var		-0.400000
Adjusted R-squared	0.759814	S.D. dependent var		5.454662
S.E. of regression	2.673261	Akaike info criterion		5.039432
Sum squared resid	35.73162	Schwarz criterion		5.023977
Log likelihood	-15.63801	Durbin-Watson stat		1.552396

Null Hypothesis: D(GDP_BH)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-6.290814	0.0001
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita GDP growth rate of Bahrain, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_BH,2)
Method: Least Squares
Date: 07/27/12 Time: 03:02
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_BH(-1))	-2.301738	0.365889	-6.290814	0.0008
D(GDP_BH(-1),2)	0.553362	0.216726	2.553276	0.0433
R-squared	0.915442	Mean dependent var		-0.900000
Adjusted R-squared	0.901350	S.D. dependent var		20.68858
S.E. of regression	6.498006	Akaike info criterion		6.793186
Sum squared resid	253.3445	Schwarz criterion		6.813046
Log likelihood	-25.17274	Durbin-Watson stat		1.313873

Null Hypothesis: D(M_BH)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.375612	0.0002
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Commodity imports of Bahrain measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_BH,2)
Method: Least Squares
Date: 07/27/12 Time: 03:03
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_BH(-1))	-2.200608	0.409369	-5.375612	0.0017
D(M_BH(-1),2)	0.471509	0.204106	2.310119	0.0603
R-squared	0.860101	Mean dependent var		-0.237500
Adjusted R-squared	0.836784	S.D. dependent var		8.355826
S.E. of regression	3.375750	Akaike info criterion		5.483430
Sum squared resid	68.37414	Schwarz criterion		5.503291
Log likelihood	-19.93372	Durbin-Watson stat		0.852533

Null Hypothesis: D(FDIN_BH)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.096277	0.0002
Test critical values:	1% level	-2.847250	
	5% level	-1.988198	
	10% level	-1.600140	

*Foreign direct investment inflows to Bahrain, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_BH,2)
Method: Least Squares
Date: 07/27/12 Time: 03:04
Sample (adjusted): 3 11
Included observations: 9 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_BH(-1))	-1.338717	0.262685	-5.096277	0.0009
R-squared	0.760816	Mean dependent var		22.21111
Adjusted R-squared	0.760816	S.D. dependent var		188.0310
S.E. of regression	91.95933	Akaike info criterion		11.98501
Sum squared resid	67652.14	Schwarz criterion		12.00692
Log likelihood	-52.93254	Durbin-Watson stat		2.475692

Null Hypothesis: D(GDP_KSA,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-4.407166	0.0008
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita GDP growth rate of Saudi Arabia, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_KSA,3)
Method: Least Squares
Date: 07/27/12 Time: 03:05
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_KSA(-1),2)	-1.484851	0.336918	-4.407166	0.0031
R-squared	0.734431	Mean dependent var		1.112500
Adjusted R-squared	0.734431	S.D. dependent var		24.01829
S.E. of regression	12.37744	Akaike info criterion		7.986097
Sum squared resid	1072.408	Schwarz criterion		7.996027
Log likelihood	-30.94439	Durbin-Watson stat		1.991823

Null Hypothesis: D(M_KSA,2)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.117757	0.0004
Test critical values:	1% level	-2.937216	
	5% level	-2.006292	
	10% level		-1.598068

*Commodity imports of Saudi Arabia measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_KSA,3)
Method: Least Squares
Date: 07/27/12 Time: 03:06
Sample (adjusted): 5 11
Included observations: 7 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_KSA(-1),2)	-1.621462	0.316830	-5.117757	0.0037
D(M_KSA(-1),3)	0.291803	0.175045	1.667019	0.1564
R-squared	0.906707	Mean dependent var		-0.785714
Adjusted R-squared	0.888048	S.D. dependent var		2.870208
S.E. of regression	0.960348	Akaike info criterion		2.991915
Sum squared resid	4.611344	Schwarz criterion		2.976461
Log likelihood	-8.471702	Durbin-Watson stat		0.968733

Null Hypothesis: D(FDIN_KSA,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-3.883503	0.0019
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Foreign direct investment inflows to Saudi Arabia, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_KSA,3)
Method: Least Squares
Date: 07/27/12 Time: 03:08
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_KSA(-1),2)	-1.402634	0.361178	-3.883503	0.0060
R-squared	0.681694	Mean dependent var		0.125000
Adjusted R-squared	0.681694	S.D. dependent var		2.087206
S.E. of regression	1.177572	Akaike info criterion		3.281255
Sum squared resid	9.706726	Schwarz criterion		3.291185
Log likelihood	-12.12502	Durbin-Watson stat		2.180891

Null Hypothesis: D(GDP_O)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-4.262641	0.0010
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita GDP growth rate of Oman, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_O,2)
Method: Least Squares
Date: 07/27/12 Time: 03:08
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_O(-1))	-2.581403	0.605588	-4.262641	0.0053
D(GDP_O(-1),2)	0.716062	0.368547	1.942931	0.1000
R-squared	0.821094	Mean dependent var		1.112500
Adjusted R-squared	0.791276	S.D. dependent var		25.21980
S.E. of regression	11.52200	Akaike info criterion		7.938711
Sum squared resid	796.5384	Schwarz criterion		7.958571
Log likelihood	-29.75484	Durbin-Watson stat		1.890812

Null Hypothesis: D(M_O,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-6.859638	0.0001
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Commodity imports of Oman measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_O,3)
Method: Least Squares
Date: 07/27/12 Time: 03:09
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_O(-1),2)	-1.596346	0.232716	-6.859638	0.0002
R-squared	0.870093	Mean dependent var		0.787500
Adjusted R-squared	0.870093	S.D. dependent var		14.99147
S.E. of regression	5.403316	Akaike info criterion		6.328372
Sum squared resid	204.3708	Schwarz criterion		6.338302
Log likelihood	-24.31349	Durbin-Watson stat		1.670025

Null Hypothesis: D(FDIN_O,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-7.404200	0.0000
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Foreign direct investment inflows to Oman, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_O,3)
Method: Least Squares
Date: 07/27/12 Time: 03:10
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_O(-1),2)	-2.064516	0.278830	-7.404200	0.0001
R-squared	0.884148	Mean dependent var		-1.125000
Adjusted R-squared	0.884148	S.D. dependent var		7.900045
S.E. of regression	2.688943	Akaike info criterion		4.932642
Sum squared resid	50.61290	Schwarz criterion		4.942572
Log likelihood	-18.73057	Durbin-Watson stat		2.038159

Null Hypothesis: D(GDP_Q)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-4.843708	0.0004
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita GDP growth rate of Qatar, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_Q,2)
Method: Least Squares
Date: 07/27/12 Time: 03:12
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_Q(-1))	-1.822000	0.376158	-4.843708	0.0029
D(GDP_Q(-1),2)	0.578069	0.261469	2.210850	0.0691
R-squared	0.807586	Mean dependent var		-0.275000
Adjusted R-squared	0.775517	S.D. dependent var		21.51616
S.E. of regression	10.19428	Akaike info criterion		7.693849
Sum squared resid	623.5405	Schwarz criterion		7.713710
Log likelihood	-28.77540	Durbin-Watson stat		2.800578

Null Hypothesis: D(M_Q,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.036181	0.0003
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Commodity imports of Qatar measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_Q,3)
Method: Least Squares
Date: 07/27/12 Time: 03:13
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_Q(-1),2)	-1.499952	0.297835	-5.036181	0.0015
R-squared	0.781538	Mean dependent var		1.212500
Adjusted R-squared	0.781538	S.D. dependent var		12.95326
S.E. of regression	6.054337	Akaike info criterion		6.555896
Sum squared resid	256.5850	Schwarz criterion		6.565826
Log likelihood	-25.22358	Durbin-Watson stat		0.921221

Null Hypothesis: D(FDIN_Q,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-3.718253	0.0024
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Foreign direct investment inflows to Qatar, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_Q,3)
Method: Least Squares
Date: 07/27/12 Time: 03:14
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_Q(-1),2)	-1.369576	0.368339	-3.718253	0.0075
R-squared	0.636585	Mean dependent var		-0.737500
Adjusted R-squared	0.636585	S.D. dependent var		2.767122
S.E. of regression	1.668130	Akaike info criterion		3.977753
Sum squared resid	19.47862	Schwarz criterion		3.987683
Log likelihood	-14.91101	Durbin-Watson stat		1.607765

Null Hypothesis: D(GDP_KW)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-3.954884	0.0017
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Per capita GDP growth rate of Kuwait, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_KW,2)
Method: Least Squares
Date: 07/27/12 Time: 03:15
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(GDP_KW(-1))	-2.321853	0.587085	-3.954884	0.0075
D(GDP_KW(-1),2)	0.704750	0.403568	1.746300	0.1314
R-squared	0.778455	Mean dependent var		1.462500
Adjusted R-squared	0.741531	S.D. dependent var		21.66551
S.E. of regression	11.01471	Akaike info criterion		7.848658
Sum squared resid	727.9426	Schwarz criterion		7.868518
Log likelihood	-29.39463	Durbin-Watson stat		1.912613

Null Hypothesis: D(M_KW,2)* has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.509002	0.0002
Test critical values:	1% level	-2.886101	
	5% level	-1.995865	
	10% level	-1.599088	

*Commodity imports of Kuwait measured as a ratio of total commodity foreign trade, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(M_KW,3)
Method: Least Squares
Date: 07/27/12 Time: 03:16
Sample (adjusted): 4 11
Included observations: 8 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(M_KW(-1),2)	-1.554942	0.282255	-5.509002	0.0009
R-squared	0.807372	Mean dependent var		1.137500
Adjusted R-squared	0.807372	S.D. dependent var		7.295192
S.E. of regression	3.201820	Akaike info criterion		5.281784
Sum squared resid	71.76156	Schwarz criterion		5.291715
Log likelihood	-20.12714	Durbin-Watson stat		0.989683

Null Hypothesis: D(FDIN_KW,2)* has a unit root
Exogenous: None
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	*Prob.*
Augmented Dickey-Fuller test statistic		-5.040317	0.0004
Test critical values:	1% level	-2.937216	
	5% level	-2.006292	
	10% level	-1.598068	

*Foreign direct investment inflows to Kuwait, 1998-2008.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDIN_KW,3)
Method: Least Squares
Date: 07/27/12 Time: 03:17
Sample (adjusted): 5 11
Included observations: 7 after adjustments

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(FDIN_KW(-1),2)	-2.615385	0.518893	-5.040317	0.0040
D(FDIN_KW(-1),3)	0.547814	0.283921	1.929457	0.1116
R-squared	0.932030	Mean dependent var		0.057143
Adjusted R-squared	0.918436	S.D. dependent var		1.035788
S.E. of regression	0.295814	Akaike info criterion		0.636788
Sum squared resid	0.437531	Schwarz criterion		0.621333
Log likelihood	-0.228757	Durbin-Watson stat		0.243479

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