



# Measuring the Impact of Oil Revenues on Government Debt in Selected Countries by Using ARDL Model

Mustafa Kamil Rasheed<sup>1</sup>(✉), Ahmed Hadi Salman<sup>1</sup>, and Amer Sami Mounir<sup>2</sup>

<sup>1</sup> College of Administration and Economics, Mustansiriyah University, Baghdad, Iraq  
{dr\_mustafa\_kamel, dr.Ahmadhidi}@uomustansiriyah.edu.iq

<sup>2</sup> College of Administration and Economics, Tikrit University, Tikrit, Iraq

**Abstract.** The study examined the relationship between oil revenues and government debt. Most oil-producing countries suffer from a problem in the sustainability of public debt, and the inability of these countries to manage financial resources efficiently, especially oil revenues in order to eliminate the accumulation of government debt.

The study used two indicators: the ratio of oil revenues to GDP, and the ratio of government debt to GDP, and through the use of ARDL model for co-integration, they were applied to five oil countries, and that the study period is (2004–2018). The study concluded that the relationship between oil revenues and government debt was negative, which is identical to the logic of economic theory, but some countries have exceeded the internationally safe ratio of government debt to GDP, which means the inability of the financial policy maker to manage oil revenues well.

The study recommended the importance of the oil resource in order to strengthen the structure of GDP, and encounter the obstacles and problems in the macroeconomic, and that the oil revenues are able to pay off the government debt and improve the national economy.

**Keywords:** Oil Revenues · GDP · Government Debt · ARDLModel · StationaryTest

## 1 Introduction

Oil revenues are an important financial resource in developing economies and should be managed efficiently in order to treat financial problems, the most important of which are the government debt problem, budget deficit and weak financial financing channels. Also, most developing economies suffer from many structural problems in GDP, as the domestic product suffers from weakness in its components, and the lack of total productivity of the elements of production, as well as widespread unemployment and inflation, and the futility of many economic policies, weakness of natural resources and lack of experience of the decision-maker in Managing economic resources, threatening the local economy with many crises.

The economy's reliance mainly on crude oil harms the composition of the domestic product, which weakens the linkages of economic activities, and thus the tax revenue, which forces the local policymaker to finance government spending through borrowing and then increase government debt under the accumulation of financial surpluses from Oil revenues.

The importance of the study is unbenefited from oil revenues in developing the national economy, strengthening the components of the domestic product and building strong production relationships that stimulate investment and attract local and foreign capital in building the national economy.

The problem statement is that the financial decision-maker ignores the importance of the financial resource for oil revenues, which encourages the spread of administrative and financial corruption, the accumulation of macroeconomic problems, and poor overall productivity. And then the spread of economic crises. And increasing government debt. The study hypothesizes that oil revenues negatively affect government debt. Therefore, it should be used in treating macroeconomic problems. The target of the study is to analyze the index of oil revenues to GDP in the countries of the study sample and to analyze the index of government debt to GDP, and then application econometric study to know the effect of oil revenues in government debt according to ARDL model.

## 1.1 Theoretical Side

The rise in crude oil prices on global markets leads to an increase in oil revenues, which provides an important financial resource for developing countries in general, and oil-producing countries in particular. Because it helps in facing the most important obstacles to sustainable economic development, which is the problem of low domestic saving and thus investment that stimulates national income. Oil revenues can also be directed to support the structure of the industrial sector, without resorting to borrowing, and subsequently causing government debt problems (Dreger et al. 2014, 1). If natural resources are used in a good way, the economy will be developed, economic performance will improve, economic growth rates will rise, and if natural resources are not occupied well, they will negatively affect the overall economy. Therefore, it is sometimes called "the resource curse" (Iimi 2007, p 664–681), just as the negative impact will extend to the stability of the political system, the government's behavior, the decision-maker's ability to make a positive impact. (Benyoub 2018, 4). The dependence of the economy on a single product causes many economic problems. The dependence of oil-producing countries on exporting crude oil leads to a deficit in the current account, a deficit in the general budget, and the creation of government debt that cannot be pay off. The unsustainability of government debt has major implications for the national economy. In addition to the decline in national production, the spread of corruption, the weakness of the economy in encounter fluctuations in global oil prices and external shocks in the economy. (Fatahi et al. 2014; Negahbani 2004; Davoodi 1993). Cordon and Neary (1982) put forth the Dutch disease model, in an attempt to explain the damages suffered by the economy dependent on the natural resource, they asserted that the discovery of the natural resource, and then its price increase, would cause a decline in economic activities and a rise in the exchange rate (Aslam and Shastri 2019, 196).

Government debt is a serious problem in fiscal policy, which affects the behavior of macroeconomic variables, and hence economic growth. In particular, the debate sparked by (Reinhart and Rogoff 2010), regarding the impact of government debt on economic growth. As long as the government debt raises a wide discussion and debate about the ability of the financial decision-maker to avoid problems of the government debt, or reduce its damage to a minimum. And his main question for (Buchanan 1966) is:

“When and who pays for public expenditure financed by debt issue, instead of by taxation or the printing of money?” (Alves 2015, 10).

Many researches indicate that political and economic factors determine the government’s credibility in fulfilling its debt-repayment obligations, and among these factors are the budget deficit, economic growth, inflation rates, government debt, rule of law, and the current account deficit (Reed et al. 2019, 21).

## 1.2 Practical Side

2–1- Iraq’s ranking was the first for the index (oil revenues: GDP), as Iraq’s exports of crude oil increased during the period (2004–2018), The GDP in Iraq is weak in its diversity, and crude oil occupies a large amount of it. The index reached its highest in 2004 (64.1%), and the lowest in 2016 (30.5%), due to the crude oil price crisis in 2014. Saudi Arabia was second in the index, it reached the highest in 2008 (54.3%), and the lowest in 2016 (19.4%). The United Arab Emirates was third, reaching its highest in 2011 (28.8%), and the lowest in 2016 (10.8%). While Russia was fourth, it reached the highest in 2005 (13.1%), and the lowest in 2016 (5.2%). Fifthly, Canada reached the highest in 2008 (2.6%), and the lowest in 2015 (0%). The degree of diversification of GDP is inversely proportional to the degree of dependence on crude oil. The higher the level of the rentier economy, the lower the components of GDP, and vice versa (Figs. 1 and 2).

## 1.3 Econometric Side

### 1.3.1 Specification Stage

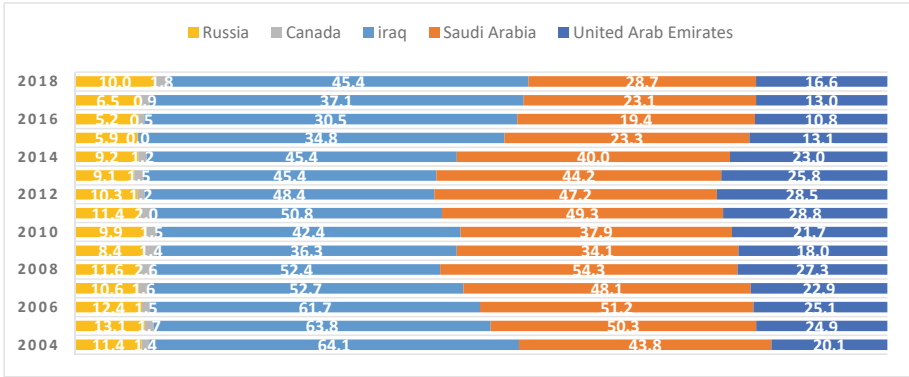
According to the logic of the macroeconomic theory, crude oil revenues are one of the components of public revenues, and when oil revenues increase, public revenues increase, and the public budget is in a surplus state, so the government debt decreases, as the government’s ability to pay off the public debt increases.

Therefore, oil revenues have an inverse relationship with government debt. The functional relationship is:

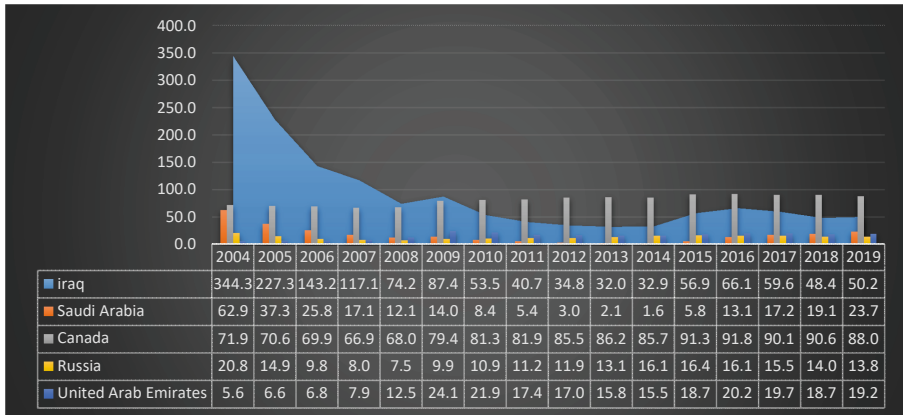
$$GVD/GDP = f(OR/GDP, e_t)$$

where:

$$GVD/GDP = \text{Government Debt} : \text{GDP}, OR/GDP = \text{Oil Revenue} : \text{GDP}, e_t = \text{random error}.$$



**Fig. 1.** The ratio of oil revenue to GDP in the study sample countries for the period (2004–2018) (%). Source: World Word, Indicators and Statistics, Various years. 2–2–Iraq first in the government debt to GDP index, as it reached the highest in 2004 (344.3%), and the lowest in 2013 (32%). This means that the government debt to- GDP ratio was very high, and more than the global standard ratio (IMF (25%–30%)). Canada second, as it reached the highest in 2016 (91.8%). The lowest in 2007 (66.9%). Saudi Arabia third, as the index ranged between (62.9%–1.6%), and Russia fourth, as the index ranged between (20.85%–7.5%). The United Arab Emirates fifth, as the index ranged between (24.1%–5.6%).



**Fig. 2.** The ratio of government debt to GDP in the study sample countries for the period (2004–2018) (%). Source: World Word, Indicators and Statistics, Various years.

### 1.3.2 Stationary Test

The time series of the variables (YIQ, YSA, YRU, YUAE) were stationary, so we reject the null hypothesis, and we accept the alternative hypothesis, while the time series of the variables (XIQ, XSA, YCA, XCA, XRU, XUAE) were nonstationary, so we accept the null hypothesis, we reject the alternative assumption. These variables have stabilized after making the first difference. All-time series became stationary (Table 1).

**Table 1.** Stationarity results for ADF for model variables

ADF Test	Level 1(0) Prob.			1 drf. 1(1) Prob.		
	Int.	Int. + T	Non	Int.	Int. + T	Non
YIQ	<b>0.000</b>	<b>0.001</b>	<b>0.000</b>			
XIQ	<b>0.3</b>	<b>0.3</b>	<b>0.2</b>	<b>0.055</b>	<b>0.12</b>	<b>0.004</b>
YSA	<b>0.6</b>	<b>0.01</b>	<b>0.5</b>			
XSA	<b>0.6</b>	<b>0.2</b>	<b>0.3</b>	<b>0.03</b>	<b>0.2</b>	<b>0.001</b>
YCA	<b>0.8</b>	<b>0.4</b>	<b>0.9</b>	<b>0.053</b>	<b>0.003</b>	<b>0.008</b>
XCA	<b>0.2</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>0.03</b>	<b>0.000</b>
YRU	<b>0.1</b>	<b>0.01</b>	<b>0.1</b>			
XRU	<b>0.4</b>	<b>0.1</b>	<b>0.4</b>	<b>0.07</b>	<b>0.3</b>	<b>0.003</b>
YUAE	<b>0.051</b>	<b>0.000</b>	<b>0.7</b>			
XUAE	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.03</b>	<b>0.001</b>	<b>0.002</b>

Source: Program (EViews 10)

### 1.3.3 Results

1-Iraq: The (OR/GDP) ratio affects the (GVD/GDP) ratio by (1.1%) in a negative direction, which means that the increase in oil revenues relative to the GDP leads to a decrease in the ratio of government debt to GDP. Thus, the Iraqi financial administration should make good use of the financial resource that comes from oil revenues, in order to enhance and support the GDP.

The results were statistically significant as a function of the T-Test, F-Test and, Probability Test. The interpretation coefficient ( $R^2$ ) as high as it reached (95%), and the Bond Test was (94.6) is higher than the minimum and the upper limit at a significant level (1%). Second-order tests were good, so there is no Autocorrelation (Breusch-Godfrey Test) The probability of an F-Test reached (0.19), nor Heteroskedasticity (Breusch-Pagan-Godfrey Test) The probability of an F-Test reached (0.49), normal distribution (Jarque-Bera Test), Prob. (0.6), as well as the stability of the model in general (CUSUM Test).

2-Saudi Arabia: The (OR/GDP) ratio affects the (GVD/GDP) ratio by (0.3%) in a negative direction, which means that the increase in oil revenues relative to the GDP leads to a decrease in the ratio of government debt to GDP.

The results were statistically significant as a function of the T-Test, F-Test and, Probability Test. The interpretation coefficient ( $R^2$ ) as high as it reached (96%), and the Bond Test was (31.3) is higher than the minimum and the upper limit at a significant level (1%). Second-order tests were good, so there is no Autocorrelation (Breusch-Godfrey Test) The probability of an F-Test reached (0.55), nor Heteroskedasticity (Breusch-Pagan-Godfrey Test) The probability of an F-Test reached (0.4), normal distribution (Jarque-Bera Test), Prob. (0.6), as well as the stability of the model in general (CUSUM Test).

3-*Canada*: The (OR/GDP) ratio affects the (GVD/GDP) ratio by (2.4%) in a negative direction, which means that the increase in oil revenues relative to the GDP leads to a decrease in the ratio of government debt to GDP.

The results were statistically significant as a function of the T-Test, F-Test and, Probability Test. The interpretation coefficient ( $R^2$ ) as high as it reached (97%), and the Bond Test was (8.76) is higher than the minimum and the upper limit at a significant level (1%). Second-order tests were good, so there is no Autocorrelation (Breusch-Godfrey Test) The probability of an F-Test reached (0.11), nor Heteroskedasticity (Breusch-Pagan-Godfrey Test) The probability of an F-Test reached (0.4), normal distribution (Jarque-Bera Test), Prob. (0.87), as well as the stability of the model in general (CUSUM Test).

4-*Russia*: The (OR/GDP) ratio affects the (GVD/GDP) ratio by (0.6%) in a negative direction, which means that the increase in oil revenues relative to the GDP leads to a decrease in the ratio of government debt to GDP.

The results were statistically significant as a function of the T-Test, F-Test and, Probability Test. The interpretation coefficient ( $R^2$ ) as high as it reached (79%), and the Bond Test was (8.9) is higher than the minimum and the upper limit at a significant level (1%). Second-order tests were good, so there is no Autocorrelation (Breusch-Godfrey Test) The probability of an F-Test reached (0.28), nor Heteroskedasticity (Breusch-Pagan-Godfrey Test) The probability of an F-Test reached (0.92), normal distribution (Jarque-Bera Test), Prob. (0.55), as well as the stability of the model in general (CUSUM Test).

4-*United Arab Emirates*: The (OR/GDP) ratio affects the (GVD/GDP) ratio by (0.1%) in a negative direction, which means that the increase in oil revenues relative to the GDP leads to a decrease in the ratio of government debt to GDP.

The results were statistically significant as a function of the T-Test, F-Test and, Probability Test. The interpretation coefficient ( $R^2$ ) as high as it reached (93%), and the Bond Test was (20.9) is higher than the minimum and the upper limit at a significant level (1%). Second-order tests were good, so there is no Autocorrelation (Breusch-Godfrey Test) The probability of an F-Test reached (0.66), nor Heteroskedasticity (Breusch-Pagan-Godfrey Test) The probability of an F-Test reached (0.34), normal distribution (Jarque-Bera Test), Prob. (0.22), as well as the stability of the model in general (CUSUM Test).

## 1.4 Discussion

The amount of the largest effect of oil revenue on the government debt was for Canada, which is reached (2.4%), Iraq, which reached the amount of effect it had (1.1%), and then Russia, which affected it (0.6%), and then Saudi Arabia and the United Arab Emirates.

The Canadian economy is strong, and it has strong links with its economic activities, both inside and outside the economy, and therefore Canada does not face a big problem in settling its debts. As its economy is good and diversified. Hence, its public revenues are also good.

The Iraqi economy is weak, and depends basically on oil, under big decline in overall productivity, and weak linkages of economic activities, and it has a good chance to correct

structural imbalances in the macroeconomic, as oil revenues reduce government debt in a better way.

Saudi Arabia's economy is large and diversified, with strong economic links with global markets, and has wide domestic and foreign investments. And have a big control of price in OPEC. Therefore, oil revenue strengthens macroeconomic. And lower government debt, and raise the efficiency of financial management.

The Russian economy is advanced, and it depends on many economic resources based on technology, and the wide diversity in the GDP provides many sources of financing for public revenues, in a way that secures the repayment of government debt, and the econometric study supports the trend of reducing government debt with each increase in oil investment and then oil revenues.

The economy of the United Arab Emirates is strong and diversified and depends on knowledge and quality investment in economic resources. It is also distinguished by the intertwining of the local and foreign sectors, which has strengthened the response to macroeconomic variables in the face of shocks and crises. Therefore, long-term planning in the UAE oil fields strengthened the structure of the GDP. Then the financial administration became able to manage financial surpluses towards strengthening the local economy and supporting its capabilities in global and regional markets, and the econometric study confirmed the ability of oil revenues to extinguish government debt, but the government debt in the UAE was at safe limits during the study period.

## 2 Conclusion

1- Iraq the first in the index of oil revenue/GDP, but it was the first in the government debt/GDP index, which means that the Iraqi economy's dependence on a single productive resource has created a government debt that cannot be repaid, the government debt/GDP index was exceeded safe limits globally. This caused the weakness of the economy, the decline in economic activities, the weakness of public revenues, the continuing deficit of the public budget, and the inability of the Iraqi economy encounter domestic and external shocks and crises.

While the econometric study results confirm that there is a good opportunity for the Iraqi economy to support the national economy, in a condition that there is rational financial management that works to manage the financial resource from oil revenues in strengthening economic activities and improving economic growth rates.

2-Saudi Arabia came second in oil revenue/GDP index, where it is acquiring the largest share of oil production within the OPEC, and its GDP was diversified, so the government debt/GDP index came within the safe limits of the world, except for the period (2004–2005). The econometric study results confirm the ability of Saudi Arabia to benefit from oil revenues in building the capabilities of the Saudi economy and controlling government debt. Therefore, the Saudi economy is one of the strongest economies in the Arab region, and it has diversified investments in many countries of the world.

3-The United Arab Emirates overcome the barrier of dependence on a single resource, its economy planned scientifically and good, in order to become one of the knowledge-based economies, which made it far the danger of government debt. The economy of the United Arab Emirates is diversified and dynamic, has links with global markets, and has

depth in the production and distribution activities of various countries of the world. So oil became one of the natural resources invested in the service of the national economy, and this was supported by the econometric study results.

4-The Russian and Canadian economy is an advanced economy, despite that part of its extractive activities depends on the extraction and export of crude oil in international markets. The developed economies general, the Russian and Canadian economies particular, are diverse and dynamic economies that depend entirely on the knowledge and the richness of high-level technology. These economies are scientifically and precisely planned, in order to ensure productive alternatives that support sustainable and environmentally friendly economic development, and the economic decision-maker has the wisdom and ability to put the economy at the forefront.

### 3 Recommendation

1-Undepend on a single resource in the economy, the GDP should be well prepared and diversified, and its production relations strengthened locally and internationally.

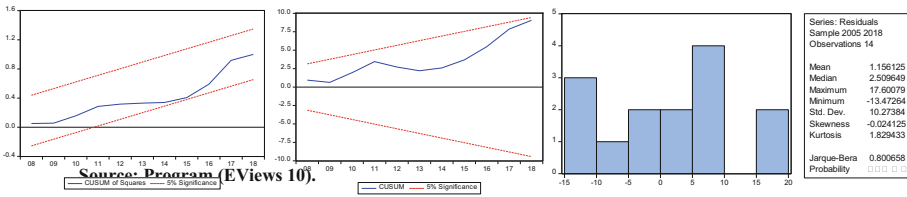
2-Strategic planning in building the national economy, based on partnerships between the private and public sectors, supporting the components of output, enhancing local economic activities, and raising the competitiveness of production and exporting goods and services.

3-The government debt does not exceed the GDP outside the safe limits, which puts the economy at economic stability and the ability to pay off the debt.

4-The Iraqi economy needs rational financial management, to save it from its many crises and problems. The GDP is completely distorted, the government is unable to fillet its financial obligations, the government debt is high, there is no sustainability in the government debt, whether domestic or foreign. The persistence of the general budget deficit, the current account deficit, and the high degree of economic exposure, under financial surpluses from oil revenues, which encouraged corruption, damage to property and public institutions, non-rule of the law.

### Appendix (1)

ARDL Model in Iraq	
YIQ = -1.123211 XIQ	
t-Statistic (-2.521100) Prob. (0.0284) $R^2$ : 0.96 $\bar{R}^2$ : 0.95	
Bond Test (F-statistic: 94.6)	ECM (CointEq(-1)*): -0.42
Breusch-Godfrey Serial Correlation LM Test (Prob. F(0.1975))	Heteroskedasticity Test: Breusch-Pagan-Godfrey (Prob. F(0.4983))



## Appendix (2)

### ARDL Model in Saudi Arabia

$$YSA = 15.8 - 0.309214 XSA$$

t-Statistic: (6.9) (-4.5)

Prob.: (0.000) (0.002)

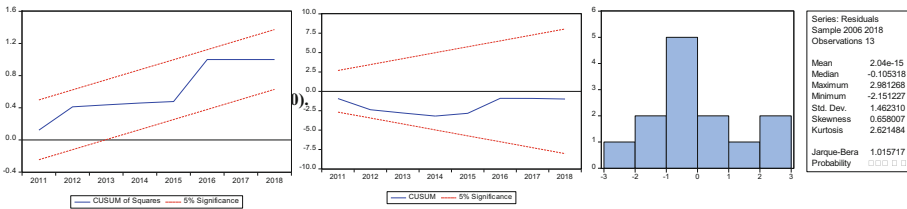
F-Statistic (50.3)  $R^2$ : 0.96  $\bar{R}^2$ : 0.94

Bond Test (F-statistic: 31.3)

ECM (CointEq(-1)\*): -0.24

Breusch-Godfrey Serial Correlation LM Test  
(Prob. F(0.55))

Heteroskedasticity Test:  
Breusch-Pagan-Godfrey (Prob. F(0.4))



## Appendix (3)

### ARDL Model in Canada

$$YCA = 43.1 - 2.466837 XCA + 1.754914 \text{ Trend}$$

t-Statistic = (2.7) (-2.5) (3.8)

Prob. (0.02) (0.04) (0.006)

(continued)

(continued)

ARDL Model in Canada

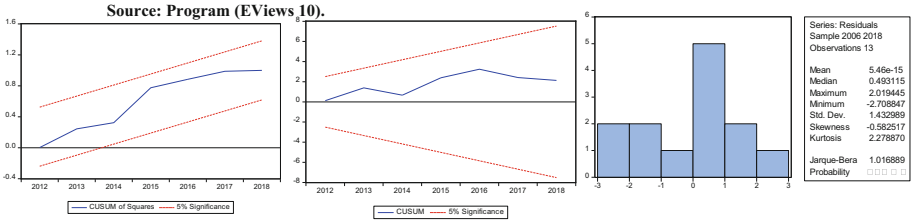
F-Statistic (52.1)  $R^2$ : 0.97  $\bar{R}^2$ : 0.95

Bond Test (F-statistic: 8.76)

ECM (CointEq(-1)\*): -0.72

Breusch-Godfrey Serial Correlation LM Test  
(Prob. F(0.11))

Heteroskedasticity Test:  
Breusch-Pagan-Godfrey (Prob. F(0.87))



Appendix (4)

ARDL Model in Russia

$$YRU = 11.24171 - 0.630381 XRU$$

t-Statistic = (4.7) (-3.8)

Prob. (0.000) (0.004)

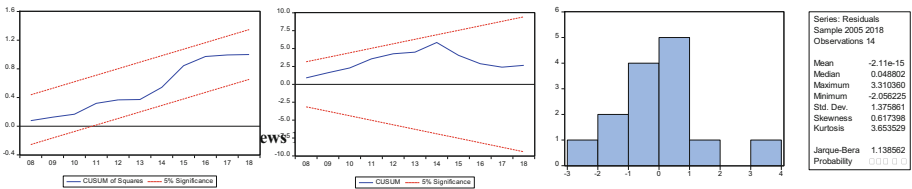
F-Statistic (21.8)  $R^2$ : 0.79  $\bar{R}^2$ : 0.76

Bond Test (F-statistic: 8.9)

ECM (CointEq(-1)\*): -0.43

Breusch-Godfrey Serial Correlation LM Test  
(Prob. F(0.28))

Heteroskedasticity Test:  
Breusch-Pagan-Godfrey (Prob. F(0.92))



Appendix (5)

## ARDL Model in United Arab Emirates

$$YUAE = 8.326582 - 0.182577 XUAE + 10.06831 DO09$$

t-Statistic = (3.5) (-2.3) (5.8)

Prob. (0.005) (0.04) (0.000)

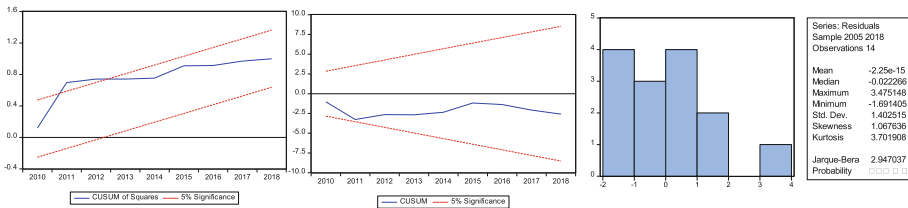
F-Statistic (48.8)  $R^2$ : 0.93  $\bar{R}^2$ : 0.91

Bond Test (F-statistic: 20.9)

ECM (CointEq(-1)\*): -0.28

Breusch-Godfrey Serial Correlation LM Test  
(Prob. F(0.66))

Heteroskedasticity Test:  
Breusch-Pagan-Godfrey (Prob. F(0.34))



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