Real GDP Reliance of the Top-Three Oil Producing Countries (U.S.A., Saudi Arabia, Iraq) to Oil-Production: A Test for Linearity

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Appendix A.

Data Points (U.S.A, Saudi Arabia, and Iraq respectively)

Year	Field Production of Crude Oil (Thousand Barrels Per Day)	Average Market Price of WTI Crude Oil (\$/barrel)	Inflation, Consumer Prices (% Annual)	Real GDP (current US\$)
1991	7,417	21.54	4.234963965	6.15813E+12
1992	7,171	20.57	3.028819678	6.52033E+12
1993	6,847	18.45	2.951656966	6.85856E+12
1994	6,662	17.21	2.607441592	7.28724E+12
1995	6,560	18.42	2.805419689	7.63975E+12
1996	6,465	22.16	2.9312042	8.07312E+12
1997	6,452	20.61	2.337689937	8.57755E+12
1998	6,252	14.39	1.552279099	9.06282E+12
1999	5,881	19.31	2.188027197	9.63117E+12
2000	5,822	30.26	3.376857271	1.02509E+13
2001	5,801	25.9	2.826171119	1.05819E+13
2002	5,744	26.17	1.586031627	1.09291E+13
2003	5,649	31.01	2.270094973	1.14564E+13
2004	5,441	41.25	2.677236693	1.22172E+13
2005	5,184	56.44	3.392746845	1.30392E+13
2006	5,086	66	3.225944101	1.38156E+13
2007	5,074	72.26	2.852672482	1.44742E+13
2008	5,000	99.06	3.839100297	1.47699E+13
2009	5,357	61.73	-0.355546266	1.44781E+13
2010	5,484	79.39	1.640043442	1.5049E+13
2011	5,674	94.88	3.156841569	1.55997E+13
2012	6,524	94.05	2.069337265	1.6254E+13
2013	7,497	97.98	1.464832656	1.68432E+13
2014	8,793	93.17	1.622222977	1.75507E+13
2015	9,442	48.66	0.118627136	1.8206E+13
2016	8,848	43.29	1.261583206	1.86951E+13
2017	9,359	50.88	2.130110004	1.94796E+13
2018	10,953	64.94	2.442583297	2.05272E+13
2019	12,315	56.99	1.812210075	2.13726E+13
2020	11,318	39.16	1.233584396	2.08937E+13
2021	11,254	67.99	4.697858864	2.29961E+13

Year	Field Production of Crude Oil (Thousand Barrels Per Day)	Average Market Price of OPEC Crude Oil (\$/barrel)	Inflation, Consumer Prices (% Annual)	Real GDP (current US\$)
1991	8,115	18.62	4.861111111	1.32223E+11
1992	8,332	18.44	-0.077006006	1.37088E+11
1993	8,198	16.33	1.055795314	1.32968E+11
1994	8,120	15.53	0.564325479	1.35175E+11
1995	8,231	16.86	4.868431031	1.43343E+11
1996	8,218	20.29	1.222069885	1.58662E+11
1997	8,362	18.86	0.057154704	1.65964E+11
1998	8,388	12.28	-0.371269735	1.46775E+11
1999	7,833	17.44	-1.333763502	1.61717E+11
2000	8,403	27.6	-1.124994779	1.89515E+11
2001	8,031	23.12	-1.120944775	1.84137E+11
2002	7,634	24.36	0.247186514	1.89606E+11
2003	8,775	28.1	0.612194395	2.15808E+11
2004	9,100	36.05	0.515506767	2.58742E+11
2005	9,550	50.59	0.479230398	3.2846E+11
2006	9,152	61	2.209024079	3.769E+11
2007	8,721	69.04	4.167823301	4.15965E+11
2008	9,259	94.1	9.870247913	5.19797E+11
2009	8,217	60.86	5.057223147	4.29098E+11
2010	8,176	77.38	5.339416806	5.28207E+11
2011	9,382	107.46	5.826216088	6.71239E+11
2012	9,792	109.45	2.866268875	7.35975E+11
2013	9,653	105.87	3.532524707	7.46647E+11
2014	9,695	96.29	2.236290315	7.5635E+11
2015	10,128	49.49	1.206073222	6.5427E+11
2016	10,420	40.76	2.068840361	6.44936E+11
2017	10,089	52.51	-0.83819458	6.88586E+11
2018	10,380	69.78	2.45814158	8.16579E+11
2019	9,778	64.04	-2.093333333	8.03616E+11
2020	9,211	41.47	3.44545826	7.03368E+11
2021	9,113	69.72	3.063289889	8.33541E+11

Year	Field Production of Crude Oil (Thousand Barrels Per Day)	Average Market Price of OPEC Crude Oil (\$/barrel)	Inflation, Consumer Prices (% Annual)	Real GDP (current US\$
1991	305	18.62	180.952381	407796349.7
1992	425	18.44	83.61581921	553671957.7
1993	511	16.33	207.6923077	1031944881
1994	552	15.53	448.5	3991349283
1995	555	16.86	387.3108478	12894029888
1996	573	20.29	-16.11732575	10433698621
1997	1,150	18.86	23.06319968	20764857056
1998	2,145	12.28	14.76877356	20617405044
1999	2,502	17.44	12.57776234	36881601584
2000	2,565	27.6	4.978962132	48364250944
2001	2,385	23.12	16.3740815	36176430129
2002	2,018	24.36	19.3166946	32928454672
2003	1,304	28.1	33.6162106	21921569479
2004	2,008	36.05	26.96190682	36627901762
2005	1,874	50.59	36.95948092	49954890353
2006	1,992	61	53.23096291	65140147197
2007	2,083	69.04	-10.06749258	88837055195
2008	2,370	94.1	12.66285283	1.31614E+11
2009	2,371	60.86	6.873615472	1.11658E+11
2010	2,374	77.38	2.877747253	1.38517E+11
2011	2,600	107.46	5.801455371	1.8575E+11
2012	2,958	109.45	6.089096416	2.18002E+11
2013	3,029	105.87	1.879498007	2.34638E+11
2014	3,343	96.29	2.235974079	2.28416E+11
2015	4,029	49.49	1.393330288	1.66774E+11
2016	4,426	40.76	0.556521397	1.66602E+11
2017	4,440	52.51	0.184058899	1.87218E+11
2018	4,597	69.78	0.367441489	2.27367E+11
2019	4,695	64.04	-0.19896538	2.33636E+11
2020	4,064	41.47	0.574162679	1.8437E+11
2021	4,059	69.72	6.041864891	2.07889E+11

Appendix B.

Regression Analysis (U.S.A, Saudi Arabia, and Iraq respectively)

Intercept																	
Multiple R Square 0.831403499 Aglisted R Square 1.083403888 Aglisted R Square 1.083403888 Aglisted R Square 1.081403899 Aglisted R Square 1.081403899 Aglisted R Square 1.081403898 AROVA A AROVA df SS MS F Significance F Regression 3 6.083254-26 2.027756-76 4.572776-74 Regression 3 6.083254-76 Total 30 7.2696-26 Coefficients Standard Error 1.180567-26 1.180589-12	MMARY OUTPUT																
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Matiple R 0.015130318 8 8 9 9 9 9 9 9 9	Regre	ession Statist	tics														
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## Regression df SS																	
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0.01699378 2.1E+07 1.98E+08 21161407 1.98E+08

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Inflation, Consumer Pri

Appendix C.

T-test, p-value test, and F-test

1. T statistics:

- a. USA B1:
- State the hypotheses:

Ho:
$$B1 = 0$$

Ha:
$$B1 \neq 0$$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if
$$t^* > 2.056$$
 or $t^* < -2.056$

- Test statistic: $t^* = 7.58 > 2.056$
- Conclusion: reject Ho
- b. USA B2:
- State the hypotheses:

Ho:
$$B2 = 0$$

Ha:
$$B2 \neq 0$$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if
$$t^* > 2.056$$
 or $t^* < -2.056$

- Test statistic: $t^* = 7.9 > 2.056$
- Conclusion: reject Ho
- c. USA B3:
- State the hypotheses:

Ho:
$$B3 = 0$$

Ha:
$$B3 \neq 0$$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = -1.82 > -2.056$
- Conclusion: do not reject Ho
- d. Saudi Arabia B1:
- State the hypotheses:

Ho:
$$B1 = 0$$

Ha:
$$B1 \neq 0$$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = 4.64 > 2.056$
- Conclusion: reject Ho
- e. Saudi Arabia B2:
- State the hypotheses:

Ho:
$$B2 = 0$$

Ha:
$$B2 \neq 0$$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = 4.17 > 2.056$
- Conclusion: reject Ho
- f. Saudi Arabia B3:
- State the hypotheses:

Ho:
$$B3 = 0$$

Ha: $B3 \neq 0$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = -0.51 > -2.056$
- Conclusion: do not reject Ho
- g. Iraq B1:
- State the hypotheses:

Ho: B1 = 0

Ha: B1 \neq 0

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = 11.48 > 2.056$
- Conclusion: reject Ho
- h. Iraq B2:
- State the hypotheses:

Ho: B2 = 0

Ha: $B2 \neq 0$

• Degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if $t^* > 2.056$ or $t^* < -2.056$

- Test statistic: $t^* = 10.28 > 2.056$
- Conclusion: reject Ho
- i. Iraq B3:
- State the hypotheses:

Ho:
$$B3 = 0$$

Ha:
$$B3 \neq 0$$

• Degrees of freedom = n -
$$(k + 1) = 30 - (3 + 1) = 26$$
 and t of $.025 -> t^{cv} = 2.056$

Decision Rule: reject Ho if
$$t^* > 2.056$$
 or $t^* < -2.056$

• Test statistic:
$$t^* = 2.54 > 2.056$$

2. P-value:

• State the hypotheses:

Ho:
$$B1 = 0$$

Ha:
$$B1 \neq 0$$

• State the hypotheses:

Ho:
$$B2 = 0$$

Ha:
$$B2 \neq 0$$

l. USA - B3:

• State the hypotheses:

Ho:
$$B3 = 0$$

Ha:
$$B3 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 0.08
- Conclusion: do not reject Ho

m. Saudi Arabia - B1:

• State the hypotheses:

Ho:
$$B1 = 0$$

Ha:
$$B1 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 0.000081
- Conclusion: reject Ho

n. Saudi Arabia - B2:

• State the hypotheses:

Ho:
$$B2 = 0$$

Ha:
$$B2 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 0.00028
- Conclusion: reject Ho

o. Saudi Arabia - B3:

• State the hypotheses:

Ho:
$$B3 = 0$$

Ha:
$$B3 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 0.614
- Conclusion: do not reject Ho

p. Iraq - B1:

• State the hypotheses:

Ho:
$$B1 = 0$$

Ha:
$$B1 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 6.73E 12
- Conclusion: reject Ho

q. Iraq - B2:

• State the hypotheses:

Ho:
$$B2 = 0$$

Ha:
$$B2 \neq 0$$

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 7.87E 11
- Conclusion: reject Ho

r. Iraq - B3:

• State the hypotheses:

Ho:
$$B3 = 0$$

Ha: B3
$$\neq$$
 0

- Decision Rule: reject Ho if p-value < 5%
- Test statistic: p-value = 0.017

• Conclusion: reject Ho

3. F-test:

s. USA:

• State the hypotheses:

Ho:
$$B1 = B2 = B3 = 0$$

Ha: At least one of the coefficients $\neq 0$

• Numerator of degrees of freedom = k = 3

Denominator of degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26

$$\rightarrow F^{cv} = 2.98$$

Decision Rule: reject Ho if $F^* > F^{cv}$

• Test statistics: $F^* = 46.37 > 2.98$

• Conclusion: reject Ho

t. Saudi Arabia:

• State the hypotheses:

Ho:
$$B1 = B2 = B3 = 0$$

Ha: At least one of the coefficients $\neq 0$

• Numerator of degrees of freedom = k = 3

Denominator of degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26

$$\rightarrow F^{cv} = 2.98$$

Decision Rule: reject Ho if $F^* > F^{cv}$

• Test statistics: $F^* = 42.49 > 2.98$

• Conclusion: reject Ho

u. Iraq:

• State the hypotheses:

Ho:
$$B1 = B2 = B3 = 0$$

Ha: At least one of the coefficients $\neq 0$

• Numerator of degrees of freedom = k = 3

Denominator of degrees of freedom = n - (k + 1) = 30 - (3 + 1) = 26

$$\rightarrow F^{cv} = 2.98$$

Decision Rule: reject Ho if $F^* > F^{cv}$

• Test statistics: $F^* = 163.03 > 2.98$

• Conclusion: reject Ho

Appendix D.

Multicollinearity (U.S.A, Saudi Arabia, and Iraq respectively)

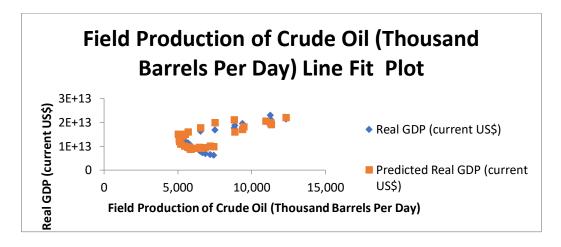
Field Production	on of Crude Oil (Thousand Bo	cet Price of WTI Crude	flation, Consumer Prices (% Annuc	Real GDP (current US\$)
Field Production of Crude Oil (Thousand Barr	1			
Average Market Price of WTI Crude Oil (\$/ba	0.066494269	1		
Inflation, Consumer Prices (% Annual)	-0.152581696	-0.051728526	1	
Real GDP (current US\$)	0.658768964	0.661774681	-0.265631354	1

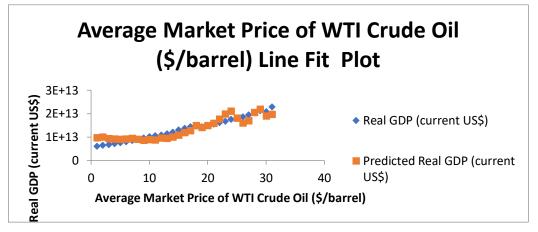
Field P	Real GDP (current US\$)			
Field Production of Crude Oil (Thousa	nd 1			
Average Market Price of OPEC Crude	0.60507152	1		
Inflation, Consumer Prices (% Annual)	0.094237162	0.542932753	1	
Real GDP (current US\$)	0.818039974	0.807753426	0.284573461	1

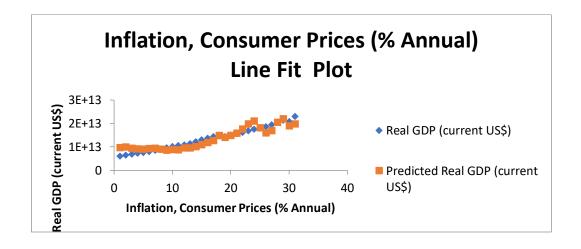
Field Production of Crude Oil (Thousand Barre: Market Price of OPEC Crude Oil (\$/ion, Consumer Prices (% Aneal GDP (current US\$)									
Field Production of Crude Oil (Thousan	1								
Average Market Price of OPEC Crude O	0.515336274	1							
Inflation, Consumer Prices (% Annual)	-0.575978283	-0.420651705	1						
Real GDP (current US\$)	0.861373022	0.820562318	-0.469539154	1					
					1				

Appendix E.

U.S.A Line Fit Plot Graphs

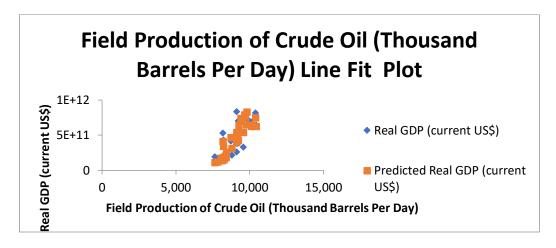


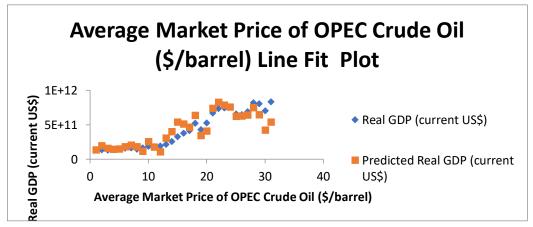


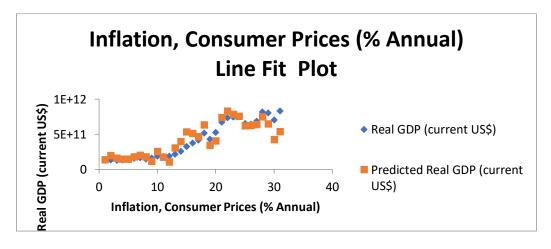


Appendix F.

Saudi Arabia Line Fit Plot Graphs







Appendix G.

Iraq Line Fit Plot Graphs

