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## Article

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## Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

*Reference:* Alkahteb, Tarek Tawfik/Mahmood, Haider (2020). Oil price and capital formation nexus in GCC countries : asymmetry analyses. In: International Journal of Energy Economics and Policy 10 (6), S. 146 - 151.

<https://www.econjournals.com/index.php/ijepp/article/download/10013/5429>.

doi:10.32479/ijepp.10013.

This Version is available at:

<http://hdl.handle.net/11159/8011>

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## Oil Price and Capital Formation Nexus in GCC Countries: Asymmetry Analyses

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Received: 02 June 2020

Accepted: 01 September 2020

DOI: <https://doi.org/10.32479/ijeeep.10013>

### ABSTRACT

Oil price (OP) may support the oil dependent economies in term of macroeconomic performance. We investigate the asymmetrical effect of OP on capital formation of gulf cooperation council (GCC) countries. We found long and short relationship in all GCC models. Increasing OP has positive effect on capital formation of all GCC countries except Oman and Qatar in long run. Decreasing OP has positive effect on capital formation in UAE, Saudi Arabia and Bahrain. Increasing OP has positive effect on capital formation of Bahrain and UAE and carries negative impact in Kuwait and Qatar in short run. Decreasing OP positively affects the capital formation of Bahrain and Saudi Arabia and has negative effect in Kuwait, Oman and UAE. Moreover, asymmetrical effect of OP on capital formation is verified in GCC countries except UAE in long run and in all GCC countries except Bahrain and Kuwait in short run.

**Keywords:** Oil Price, Capital Formation, Asymmetry

**JEL Classifications:** P28, E22, D82

### 1. INTRODUCTION

Oil price (OP) is a major contributor of economic and social development of oil-exporting GCC economies as most of income of these countries are depending on oil revenue to support the whole economy. Therefore, economic growth, capital formation, social development and trade performance of GCC are depending on the oil prices and revenues. Hence, it is also vital to test the effect of OP on investment level of these country. In addition, it is very important for the policy perspectives to see the separate impact of positive and negative movements of OP on capital formation to care the possible asymmetry in the relationships. Because, the decreasing OP has different impact on capital formation of the countries with compare to the increasing OP. The recent prolong OP crisis believes to have a severe impact on capital formation as it is heavily affecting income, saving and investment capacity of the GCC countries. Therefore, our research could

have strong implications to lessen negative impact of OP crisis on the capital formation and it is a well contribution to the GCC countries' literature as no study is conducted on this issue. The estimated results would also help in providing strategic guidelines to the GCC economies to adopt a sustainable growth path in the long run to ensure the minimum required capital formation, and to support the production and economic activities of the economies during crisis.

The theoretical literature has established that increasing oil price is good news in the oil exporting countries' capital market (Siddique et al., 2019). Because, increasing oil price could generate more income into the oil producing and exporting countries because of its inelastic nature of oil demand in world market. Considering inelastic demand, the percentage of oil demand decline would be lesser than the percentage increase in oil price. In mathematical sense, the oil revenue would be more in the oil price rise's period.

On the other hand, the percentage of oil demand rise is lesser than the percentage fall in OP in the oil price crisis's period. Therefore, oil income of producing and exporting countries would decline in crisis period and decreasing OP can be a bad news for capital and investment market. So, any variation in OP in world market has great consequences for local economies of GCC region in terms of business activities, investment, exports, government revenue, social development and income level.

Above discussion establishes a theoretical relationship in the OP and capital market and empirical literature has corroborated the connection in OP and stock market of both oil-exporter and importer economies. Moreover, the recent literature has signified the OP and stock market relationship in recent OP crisis period. For example, Ahmad (2019) investigated the OP and stock return relationship of GCC countries using weekly data during 2008-2017. They found the strong relationship among OP, OP variation and stock return in GCC countries during current OP crisis. On the other hand, Khamis et al. (2018) examined impact of OP on stock return of Saudi Arabia during 2012-2015 in the sectoral analyses. They found that Saudi Arabian stock market showed a relative lesser sensitivity to dropping OP than the expectations and insignificant relationship was found in some sectors.

In the light of above discussed studies, OP and stock market relationship is an empirical question due to evidences of both significant and insignificant relationship of OP and stock market. Moreover, the impact of OP on stock market does not reflect overall investment climate and capital formation of a country. Global and local GCC literature is missing an empirical investigation of OP and capital formation. Moreover, the governments of GCC countries are trying to establish the policy regarding diversification of the economies from the oil-dependence in their future visions. In this regard, the capital formation in non-oil sector would help to generate the non-oil production capacity in the GCC countries and to support the diversification policy. A recent study conducted in the Saudi economy also corroborated that increasing capital formation was found helpful in the diversifying the Saudi exports from oil to non-oil sector (Alkhathlan et al., 2020).

This present research would help the policy makers of GCC countries in tracing the optimum policy regarding diversification of economy from oil to the non-oil sectors. Particularly, the present prolong oil price crisis requires an urgent need to put the investment and capital formation in other sector to save oil-based economies from the oil price crisis, by shifting production and investment in non-oil sectors. Our estimated model would guide the magnitude of effects floating from the oil price to capital formation. It would guide the amount of investment required in each GCC country in response of any fluctuation in oil price. Our estimated asymmetrical effect of oil price on the capital would particularly helpful in deciding different investment policy in case of different direction of movements in oil price.

## 2. LITERATURE REVIEW

The literature has investigated the effect of OP on the different macroeconomic variables of GCC countries. The most important

contribution of the OP may be considered in the economic growth of oil dependent GCC region and some studies have investigated this issue. For example, Foudeh (2017) investigated the effect of OP on the income growth of Saudi Arabia using quarterly data during 1995-2015. The positive relation between OP and income was observed. Moreover, Japan's trade positively affected the growth and South Korea's and UK's trade showed negative effect on the growth. Maalel and Mahmood (2018) investigated asymmetrical effects of oil-dependence on GCC region's growth. Asymmetrical positive impact of oil's income dependence on income and asymmetrical negative impact of export's dependence on income were found.

Nyngarika et al. (2018) examined OP and income nexus and found the strong relationship between OP and income in Saudi Arabia and Russia. Nusair (2016) probed OP and income nexus in GCC region. He found inelastic effect of OP on income in most of GCC countries and in GCC panel. De et al. (2019) explored OP and remittances connection in GCC region. They found the positive relationship in the OP and remittances in GCC region. Moreover, positive relationship between income and remittances is also corroborated and income from non-oil sectors was found responsible for increasing remittances. Alkhateeb and Sultan (2019) investigated the effect of OP on the income of India. They found that OP has negative effect on the income of as India is oil importing economy and increasing OP could have supply shock in the economy. They also found the Granger causality from OP to income.

Metwally and Perera (1995) investigated the OP and government spending relationship in GCC countries. They found that government spending increased in the periods of OP declines to target the growth rates. Erdogan et al. (2020) explored the OP variations and military government spending in some GCC countries and corroborated positive association in most of investigated economies. Moreover, declining OP pushed up the military government spending. El Mahmah and Kandil (2019) investigated OP and fiscal policy relationship in GCC region. They found that rising OP raised the budget surplus in GCC region. Moreover, the public debts were also found helpful to support the budget.

Mahmood and Zamil (2019) investigated the role of OP on the personal consumption of Saudi Arabia during 1970-2016 and found the positive association. However, the effect of OP slump was found insignificant on the personal consumption. Algaeed (2018) investigated the asymmetrical effect of OP on the imports in the Saudi Arabia during 1970-2015. He found the negative effect of OP on the imports. The result was opposite to the theoretical predictions as increasing OP could increase the income and imports of the oil exporter economy. Moreover, the positive effect of income was also found.

Mahmood and Alkhateeb (2018) investigated OP and foreign investment nexus in Saudi Arabia during 1970-2015. They found positive effect of OP on the foreign investment and financial market also supported the foreign investment in the Kingdom. Alkhateeb et al. (2017) investigated the role of OP on the employment in

Saudi Arabia during 1980-2015. They corroborated the positive and asymmetrical effect of OP on the employment. The effect of increasing OP on employment is found greater than the effect of decreasing OP. The effect of income on the employment was also found positive. Alkhateeb et al. (2017) investigated oil revenue and employment nexus and found the Granger causality from oil revenue and government expenditures to the employment generation during 1991-2016 in Saudi Arabia.

Metwally (1993) explored the effect of OP on the trade performance of GCC region. They found that decreasing OP deteriorated exports and external surplus as well. Al Rasasi (2017) investigated the OP and exchange rate relationship in GCC region. They found that rising OP helped to appreciate the GCC currencies. Mahmood et al. (2020) studied effect of OP on pollution of Saudi Arabia during 1980-2014. OP had positive effect on pollution in long-run but insignificant impact in short-run. Mahmood et al. (2020) examined effects of gasoline price and oil and non-oil income on pollution and corroborated positive impact of oil and non-oil income on pollution and negative effect of gasoline price. The effect of oil income was found asymmetrical and increasing oil income showed greater environmental effects.

Arouri and Rault (2011) probed the OP and stock market relationship in GCC region and found the strong relationship. The OP could affect five GCC countries' stock markets. In GCC region, Siddiqui et al. (2019) investigated asymmetric effect of OP and found that decreasing OP had greater impact on stock prices in oil price slump periods. However, the increasing OP had also positive impact but asymmetry in the OP and stock price nexus was observed. Mokni and Youssef (2019) investigated the effect of recent OP decline of 2014 in GCC region. They corroborated a strong relationship in the OP and stock prices. Moreover, this relationship was improved after the OP declines of 2014.

El-Chaarani (2019) investigated the effects of political instability and OP on stock market of GCC countries during 2011-2017. They found the asymmetrical effects of OP on the stock returns. The decreasing OP showed the greater effects on the stock returns than that of increasing OP in three GCC countries. Moreover, political instability became a cause to increase the effect of decreasing OP. Fayyad and Daly (2011) probed OP and stock price relationship in GCC region. They found that forecasting of returns improved in the OP rising days and stock markets were found sensitive to OP. Nusair and Al-Khasawneh (2018) inspected the OP and stock price relationship in GCC region. They found the positive and asymmetric association between OP and stock price. Louis and Balli (2014) probed the OP and stock variations in GCC region and found the reasonable adjustments in the variables.

After reviewing the literature, OP showed a significant relationship with many macroeconomic indicators in the GCC region. Effect of OP on stock prices is also well-explored and the effect of OP has been investigated on the foreign investment of Saudi Arabia. But, the effect of OP on aggregate investment or capital formation is still missing in literature of GCC countries. So, this present study explores this relationship to bridge the literature gap. To ensure a reasonable contribution, we also test the asymmetry in

the hypothesized relationship. Therefore, the present research is highly motivated in testing and differentiating the influences of positive and negative OP changes on capital formation of GCC economies and also wants to test the possible asymmetries as well.

### 3. METHODOLOGY

To meet the objectives of asymmetrical effects of oil price on capital formation, we are relying on nonlinear auto regressive distributive lag (ARDL) recommended by Shin et al. (2014). This technique is sufficient to investigate and to differentiate the impact of positive OP movements and negative OP movements on capital of GCC economies. Further, this technique is of ARDL nature, which is dynamic in nature and control for possible endogeneity in the model and hence it is very suitable to achieve our objectives. Before describing the nonlinear ARDL model, it is necessary to see unit root issue in variables. We are using Augmented Dickey and Fuller (ADF) test of Dickey and Fuller (1981) in following way:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^k \theta_i \Delta y_{t-i} + e_t \quad (1)$$

In equation 1,  $y_t$  is time-series to be tested for unit root. A negative and significant  $\delta$  would corroborate the stationary series  $y_t$ . Equation 1 shows the test without intercept (C) and trend (T) in analysis and equation 1 may augment C and C&T in the analysis to incorporate potential effects of intercept and trend in the unit root analyses. After that, we may generate the positive and negative series of oil price following Shin et al. (2014):

$$NOP_t = \sum_{i=1}^t \Delta Oil Price_i^+ = \sum_{i=1}^t \max(\Delta Oil Price_i, 0) \quad (2)$$

$$NOP_t = \sum_{i=1}^t \Delta Oil Price_i^- = \sum_{i=1}^t \min(\Delta Oil Price_i, 0) \quad (3)$$

$POP_t$  and  $NOP_t$  are partial sum of positive and negative changes in natural logarithm of oil price series, respectively. Utilizing these series in the ARDL framework of Pesaran et al. (2001), the nonlinear ARDL may be expressed as follows:

$$\Delta CF_t = \beta_0 + \beta_1 CF_{t-1} + \beta_2 POP_{t-1} + \beta_3 NOP_{t-1} + \sum_{j=1}^{n1} \gamma_{1j} \Delta CF_{t-j} + \sum_{j=0}^{n2} \gamma_{2j} \Delta POP_{t-j} + \sum_{j=0}^{n3} \gamma_{3j} \Delta NOP_{t-j} + \psi_t \quad (4)$$

$CF_t$  is natural logarithm of capital formation. Equation 4 would be applied on each GCC country' model and thus it is a time series analysis for each GCC country.  $t$  is time period 1970-2018 for KSA, Kuwait and Oman, 2001-2018 for UAE, 1980-2018 for Bahrain and 1994-2018 for Qatar. Maximum periods are investigated as per availability of capital formation data of each GCC country and data is sourced from World Bank (2019). World oil price series is sourced from Government of Saudi Arabia (2019). We ensure long run equilibrium path relationship in each model with Bound test on  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$ . Afterwards, we calculate the estimated impacts of our proposed variables of oil price on capital. Then, we test the statistically significance of

possible asymmetrical impact of  $POP_t$  and  $NOP_t$  using Wald test with  $H_0$ : symmetry. The rejection of such would ensure the asymmetrical effects of oil price.

#### 4. DATA ANALYSES

ADF test, in Table 1, is performed on  $POP_t$  and  $NOP_t$  at once in case of Kuwait, Oman and Saudi Arabia because of same variable with same sample period. However, the test is performed on  $POP_t$  and  $NOP_t$  separately in case of Bahrain, Qatar and UAE due to different time periods. The results from all countries' analyses show that all series are non-stationary at level and stationary at first difference.

Table 2 shows the bound test on the equation 4 for each country. The cointegration is corroborated in models of Saudi Arabia, Kuwait and UAE. The critical F-values, efficient for small sample, are taken from Kripfganz and Schneider (2018). For rest countries' cases, bound test could not establish the cointegration but cointegration is proved alternatively, suggested by Pesaran et al. (2001), from the negative coefficients of  $ECT_{t-1}$  in the Table 3. Hence, cointegration is corroborated in case of all countries and diagnostic tests are also corroborating the statistically reliability of the results as p-values are more than 0.10 in all tests in all countries' models.

The long run impact of OP on the capital formation is shown in Table 3.  $POP_t$  has positive impact on the capital formation of all

**Table 1: ADF test**

Country	Variable	Level			First difference		
		C	C&T	None	C	C&T	None
Bahrain	$CF_t$	-2.1268	-2.8577	-0.4503	-9.3964***	-9.5678***	-9.5180***
	$POP_t$	1.0205	-2.5003	5.3643	-4.6264***	-4.8373***	-3.0797***
	$NOP_t$	-0.4145	-2.4242	2.5136	-6.2820***	-6.1844***	-4.9789***
Kuwait	$CF_t$	-1.7209	-1.8886	0.6990	-6.2655***	-6.1887***	-6.2658***
	$POP_t$	-1.3984	-2.7862	3.4682	-6.0120***	-6.0270***	-4.4063***
	$NOP_t$	0.6619	-2.6023	2.8329	-6.6843***	-6.8082***	-5.6281***
Oman	$CF_t$	-2.4224	-2.9049	0.0813	-7.5640***	-7.4731***	-7.6833***
Qatar	$CF_t$	-2.6118	-3.2378	0.4435	-4.0997***	-4.0307**	-4.2183***
	$POP_t$	-0.5946	-1.6346	4.5992	-3.8294***	-3.7682**	-2.1548**
	$NOP_t$	0.0236	-1.7802	2.3555	-4.3424***	-4.2771***	-3.6058***
Saudi Arabia	$CF_t$	-1.9212	-2.9282	-0.1437	-5.8145***	-5.7582***	-5.8855***
UAE	$CF_t$	-2.4468	-0.6959	-0.0835	-4.3281***	-4.4955**	-4.5092***
	$POP_t$	-1.0553	-1.3220	4.2640	-2.8848*	-3.7399**	-2.1889*
	$NOP_t$	0.2531	-1.8378	1.8626	-3.3033**	-3.3833**	-2.8827**

**Table 2: Bound test**

Country	Bound test	Heteroscedasticity	Serial correlation	Normality	Functional form
Bahrain	1.2213	0.9664 (0.4198)	1.9223 (0.1628)	4.5692 (0.1018)	1.3795 (0.2486)
Kuwait	10.6410	0.5280 (0.7836)	0.3113 (0.7344)	2.9509 (0.2415)	0.9848 (0.3271)
Oman	1.5247	1.6203 (0.1962)	1.3137 (0.2805)	2.2793 (0.3199)	1.6152 (0.1910)
Qatar	2.4346	0.1730 (0.9804)	0.7889 (0.4735)	4.0746 (0.1391)	0.8084 (0.4315)
Saudi Arabia	4.0390	1.9438 (0.1078)	1.3857 (0.3020)	0.3606 (0.8350)	0.1512 (0.6994)
UAE	5.8255	0.7967 (0.5981)	4.2613 (0.1301)	0.3621 (0.8344)	0.3605 (0.5671)
Critical F-values					
At 1% 4.0934-4.9199					
At 5% 3.0836-3.8155					
At 10% 2.6175-3.2969					

**Table 3: ARDL results**

Variable	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Long run						
$POP_t$	0.4104 (0.0052)	0.1235 (0.0533)	0.0488 (0.2990)	0.0130 (0.9145)	0.1224 (0.0221)	0.1251 (0.0010)
$NOP_t$	0.5885 (0.0067)	0.1524 (0.1380)	0.0154 (0.8116)	-0.2548 (0.1776)	0.1854 (0.0030)	0.1217 (0.0003)
Intercept	2.2920 (0.0000)	2.6167 (0.0000)	3.0119 (0.0000)	2.6870 (0.0000)	3.0233 (0.0000)	2.6398 (0.0000)
Short run						
$\Delta CF_{t-1}$		0.2918 (0.0287)		0.4991 (0.0002)		0.4950 (0.0003)
$\Delta CF_{t-2}$						0.6661 (0.0013)
$\Delta POP_t$	0.2248 (0.0157)	-0.4397 (0.0001)	0.0082 (0.3261)	-0.3236 (0.0883)	0.0753 (0.5537)	0.1277 (0.0103)
$\Delta POP_{t-1}$				0.6807 (0.0059)	-0.3229 (0.0054)	
$\Delta NOP_t$	0.3224 (0.0237)	-0.3294 (0.0119)	-0.2964 (0.0000)	-0.0995 (0.1973)	0.0839 (0.0055)	-0.1886 (0.0008)
$\Delta NOP_{t-1}$			0.4896 (0.0002)			
$ECT_{t-1}$	-0.5478 (0.0004)	-0.6024 (0.0000)	-0.1677 (0.0001)	-0.3905 (0.0000)	-0.4527 (0.0001)	-1.0206 (0.0001)

GCC countries except Oman and Qatar. It means that increasing OP has increased the income, saving and investment of most of GCC countries. So, increasing OP accelerates the capital formation in turn and is a good news for the capital and investment market of these countries.  $NOP_t$  has positive effect on the capital formation in UAE, Saudi Arabia and Bahrain. It means that decreasing OP has depressed the income, saving and investment of three GCC countries. So, decreasing OP has depressed the capital formation also, and is a bad news for the capital and investment market of these countries. The effects of both  $POP_t$  and  $NOP_t$  are found insignificant in case of Oman and Qatar. So, increasing or decreasing OP could not affect the capital and investment markets of Oman and Qatar. The insignificant impacts of  $POP_t$  and  $NOP_t$  on capital formation are found for Kuwait hence asymmetry is proved. The effects of both  $POP_t$  and  $NOP_t$  are found positive for Bahrain, Saudi Arabia and UAE. Therefore, asymmetry in magnitude of effects is tested through Wald test. Symmetry is corroborated in the effects of  $POP_t$  and  $NOP_t$  with estimated Chi-square (P-value) = 1.4258 (2499) in the model of UAE. However, Chi-square (P-value) = 6.9261 (0.0085) and 12.4524 (0.0010) corroborate asymmetric impact in Bahrain and Saudi Arabia, respectively.

In the short run results, parameters of  $ECT_{t-1}$  are negative in case of all countries' models hence short run relationships are corroborated. Further, the lags of capital formation have positive effect on the leading capital formation in the models of Kuwait, Qatar and UAE.  $POP_t$  has positive impact on capital formation of Bahrain and UAE and positive effect is also found from 1-year lag in the model of Qatar. Further, the  $POP_t$  has negative effect on the capital formation of Kuwait and Qatar and negative effect is also found from 1-year lag in the model of Saudi Arabia.  $NOP_t$  has positive effect on the capital formation in Bahrain and Saudi Arabia and positive effect is also found from 1-year lag in the model of Oman.  $NOP_t$  has negative effect on the capital formation in Kuwait, Oman and UAE.

The either effect of  $POP_t$  or of  $NOP_t$  is found insignificant for Oman, Saudi Arabia and Qatar. Hence, asymmetry in short run relationship of OP and capital formation is found in these countries' models. The effects of  $POP_t$  and  $NOP_t$  are found positive and negative on capital formation respectively in model of UAE so asymmetry is proved. The effects of both  $POP_t$  and  $NOP_t$  are found positive for Bahrain and impact of  $POP_t$  and  $NOP_t$  are found negative for Kuwait. Hence, the direction of effects of  $POP_t$  and  $NOP_t$  are same in case of Bahrain and Kuwait so we apply Wald test. Symmetry is corroborated in the effects of  $POP_t$  and  $NOP_t$  with estimated Chi-square (P-value) = 2.6994 (0.1004) in the model of Bahrain and with estimated Chi-square (P-value) = 0.4994 (0.4839) in the model of Kuwait.

## 5. CONCLUSIONS

A lot of literature explored the role of OP in different macroeconomic performance. But, exploring impact of OP on capital formation has not been probed. This present research investigates the impact of OP on capital formation in GCC region considering asymmetry. In long run, rising OP has positive impact on capital formation in all GCC countries except Oman and Qatar. So, increasing oil

price has generated the capital formation in four GCC countries and is a good news for the capital and investment market of these countries. However, increasing OP's effect is neutral for capital and investment market of Oman and Qatar. The decreasing OP has positive impact on capital formation in UAE, Saudi Arabia and Bahrain. So, decreasing oil price has depressed the capital formation of three GCC countries and is a bad news for the capital and investment market of these countries. The effects of both  $POP_t$  and  $NOP_t$  are found insignificant in case of Oman and Qatar. Hence, both increasing and decreasing oil price could not affect the capital and investment market of Oman and Qatar. Moreover, asymmetry in OP and capital formation nexus is found in all GCC countries except UAE.

In short run, the lag of capital formation has positive impact on the leading capital formation in Kuwait, Qatar and UAE. The increasing OP has positive impact on capital formation of Bahrain and UAE but has negative impact in case of Kuwait and Qatar. The decreasing OP positive has impact in case of Bahrain and Saudi Arabia, and negative impact in case of Kuwait, Oman and UAE. Asymmetry in relationship of OP and capital formation is corroborated in four GCC economies. Moreover, symmetry is statistically significant in case of Bahrain and Kuwait. The decreasing OP has positive effect on capital formation in UAE, Saudi Arabia and Bahrain. It is alarming situation for these countries in this low oil price period. Because, these low prices would lead to low capital formation which can negatively affect the overall macroeconomic performance.

## 6. FUNDING ACKNOWLEDGMENT

This project was supported by Deanship of Scientific Research at Prince Sattam bin Abdulaziz University Alkharj, Saudi Arabia under the project No. 2020/02/16618.

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