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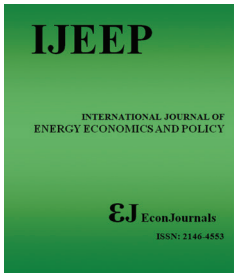

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Oil Revenue and State Budget Dynamic Relationship: Evidence from Bahrain

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ABSTRACT

The main purpose of the study is to investigate the short run and long run relationship between government revenues and government expenditures in Bahrain over the period from 1990 to 2017. Using annual data and time series analysis, the study indicated that the above two variables, government revenues and government expenditures were integrated of order one when both augmented Dickey–Fuller and Phillip–Perron (PP) unit root tests were applied. The empirical results have revealed that unidirectional causality runs from government revenues to government expenditures. Thus, there is evidence in support of "revenue-spend" hypothesis. Finally, the results revealed that a 1% increase in oil revenue induces an increase in government expenditures by 1.37%. Therefore, policymakers in Bahrain should focus to further diversify the sources of government revenues from non-oil sectors in such a way that the country will be immune to vulnerability, especially when world oil market performs poorly.

Keywords: Oil Revenues, Cointegration, Government Expenditures, Government Revenues, Granger Causality, Bahrain
JEL Classifications: E62, H20, H30, C30, C40, C51

1. INTRODUCTION

Economic development and social goals can be achieved and promoted by adopting the state budget that directs the government expenditures towards the development of infrastructure, promotion of education, healthcare and other economic and social activities for improve public wellbeing and standard of living. The size of the budget and the means of financing will eventually impact on achieving such goals. The government revenues are the most important sources of financing the public expenditures for both developed and developing countries through public budget. Understanding the relationship between government expenditures and government revenues have been the subject of extensive theoretical and empirical research in the field of public finance for decades (Ross and Payne, 1998).

The literature review shows that there are four different hypotheses that illustrate the link between government revenues and government expenditures. The first hypothesis states that causality runs from government revenues to government expenditures (Friedman, 1978; Buchanan and Wagner, 1978). The second hypothesis reveals that causality runs from government expenditures to government revenues where a temporary increase in the government expenditures would result in a permanent increase in government revenues (Peacock and Wiseman, 1961; 1979; Barro, 1974). The third hypothesis implies that there is bi-directional causality between government revenues and government expenditures, which means that government revenues decisions are not made in isolation from government expenditures decisions (Meltzer and Richard, 1981; Musgrave, 1966; Chang and Chiang, 2009). Finally, the fourth hypothesis indicates that there is no causality between government revenues and government expenditures; revenues and expenditures are independent decisions (Baghestani and McNown, 1994).

In general, there are three reasons for which the link between government revenues and government expenditures are important. First, if the hypothesis that the government revenues cause government expenditures holds, budget deficit can be avoided by applying policies that stimulate government revenues. Second, if bi-directional causality does not hold, then government revenue decisions are made independently from government expenditure decisions. Third, if the hypothesis that government spending causes revenues holds, then government spends first and pay for this spending later by raising taxes (Narayan and Narayan, 2006).

Bahrain is an open small economy and one of the oil exporting Arab countries which is heavily dependent on oil. Exports of oil is the primary source of government revenues, and its share ranges from 70% to 80% of total government revenues during the period of 1990–2017. Currently, Bahrain is facing persistent budget deficits and, therefore, to avoid or prevent chronic government budget deficits in the future, it is important to understand the relationship between government revenues and government expenditures. Therefore, the study aims at examining the validity of the various hypotheses by testing the effect of oil revenues on government expenditures in Bahrain over the fiscal years 1990/1991–2017/2018. The study employs descriptive analytical approach and econometric techniques such as unit root, cointegration and causality tests and ordinary least square (OLS) regressions. The study uses annual data published by the central bank of Bahrain, Ministry of Finance, national oil and Gas authority, ministry of electricity and water, and aluminum Bahrain.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature and previous works. Section 3 presents the main features of the government revenues and government expenditures in Bahrain. Section 4 focuses on the estimation techniques and methodology. Section 5 discusses the findings and estimated results. Finally, conclusions and recommendations are summarized in section 6.

2. LITERATURE REVIEW

Several studies have been conducted to study the relationship between government revenues and government expenditures. Some of these studies have focused on the relationship between government revenues and government expenditures for different groups of countries and regions around the world using different econometric techniques and different time periods. For example, Wallace and Warner (1986) tested the causal relationship between government expenditures and government revenues for selected developed countries and they found that the positive causality runs from government expenditures to government revenues. Therefore, the study supports the first hypothesis that is often defined as "spend-revenue causality."

At the same context, Rault and Alfonso (2009) examined the causal relationship between government revenues and government expenditures for EU countries for the period of 1960–2006 by using panel data and found that causality was running from government expenditures to government revenues for Italy, Spain, Greece, Portugal and France while the direction of causality was from government revenues to government expenditures for UK, Finland, Germany, Austria and Belgium. Furthermore, Narayan and Narayan (2006) discovered "revenue-spend causality" for Mauritius, El Salvador, Haiti, Chile and Venezuela. They argued that "if government increases expenditures, then eventually it has to find ways to increase its revenues." Chang and Chiang (2009) investigated causality for 15 OECD countries by employing panel cointegration and panel granger causality for the period of 1992–2006 and found that causality runs both ways between government revenues and government spending. Yuan-Hong and Chiung-Ju (2009) examined causal relationship between government revenues and government expenditures for 31 Chinese provinces for the period of 1999–2005 by employing multivariate panel error correction model (ECM) and found bi-directional causality between government revenues and government expenditures in the long run only. Almulali and Che (2013) investigated that an increase in oil price caused an increase in oil revenues in organization for petroleum exporting countries (OPEC) which eventually caused an increase in government spending.

For a single country case study, Manage and Marlow (1986) examined the causal relationship between government revenues and government expenditures and found that the causality runs from government revenues to government expenditures and thus supports the second hypothesis, often called "revenue-spend causality." Owoye (1995), Gounder et al. (2007) tested the third hypothesis and they found the evidence of fiscal synchronization principle. According to this hypothesis, plans for government revenues and government expenditures are jointly decided and as such, bi-directional causality runs between both government revenues and government expenditures. Hong (2009) conducted causality test for Malaysia by employing Johansen cointegration and ECM for the period of 1970–2007 and found evidence of uni-directional causality from government expenditures to government revenues. Jbir and Zouari-Ghorbel (2009) investigated the causal relationship between oil price shock and government spending in Tunisa and observed that both positive and negative oil shocks directly affected government spending. Narayan and Narayan (2006) found evidence for "spend-revenue causality" for Peru. Furthermore, Rahma et al. (2016) investigated the link and causality between oil price shocks and oil revenues, current government expenditures and budget deficits by employing vector auto regression (VAR) model for Sudan and found that the decrease in oil price influenced the above three budget variables but the increase in oil prices had no such causal impacts on the same variables.

For the oil exporting countries, Farzanegan and Markwardt (2009), Lorde et al. (2009), Ebrahim and Mohammad (2012) applied Granger causality test to examine the relationship between oil revenues, development expenditures, and current government expenditures for Kuwait, Iran, OPEC, Trinidad and Tobago. They found a decline in oil revenues, because of oil price shocks Granger caused decline in development expenditures and current government expenditures.

As for the GCCs, Al-Qudair (2005) examined the long run and short run relationship between government expenditures and

government revenues in the Kingdom of Saudi Arabia. By using Cointegration technique, ECM and the Granger causality tests, he discovered the existence of long run equilibrium between government expenditures and government revenues and found bi-directional causality between government expenditures and government revenues in both short run and long run. Eltony and Al-Awadi (2001) investigated causality between oil price fluctuations, and oil revenues on government development and current government expenditures for Kuwait economy during the period of 1984–1998 and found uni-directional causality from oil prices and oil revenues to government development and current government expenditures. Ahmad and Masan (2015) investigated short-run and long-run relationships between real gross domestic product (GDP), real government spending and real oil revenues for Oman for the period of 1971–2013 by employing cointegration techniques and found a long run relationship among the above three variables. Hamdi and Sbia (2013) investigated the dynamic relationships between oil revenues, government spending and economic growth in Bahrain by employing multivariate cointegration analysis and ECM. The authors used the time series data for the period of 1960–2010 and found that oil revenues caused both economic growth and government spending.

At the same context, Dizaji (2014) examined the relationship between oil revenue and government expenditures in Iran. Employing the impulse response functions and variance decomposition models, the results revealed that the oil revenue shocks influenced government expenditures in much more robust way than the contribution of price shocks on government expenditures. In addition, Dizaji, also employed VAR and vector error correction models and the results exhibited strong causality running from government revenues to government expenditures and found very weak causality between government expenditures to government oil revenues, and thus supported "revenue-spending" hypothesis. Finally, Oriakhi and Iyoha (2013) explored the possible causality between oil price volatility and real government expenditures, real exchange rate and real import for Nigerian economy and they used quarterly data for about 40 years, from 1970 to 2010. The results revealed that the volatility in oil price directly caused changes in government expenditures which in turn resulted in changes in economic growth rate directly.

3. OIL REVENUES AND EXPENDITURES IN BAHRAIN

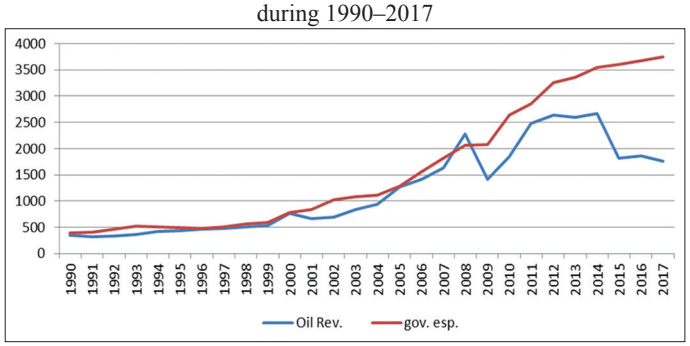
Bahrain is an oil-exporting nation even though Bahrain is not a full member of the OPEC. It is evident from Table 1 that oil revenue accounts for about 86% of total government revenues in 2010 and the share of oil revenue as a percentage of total government revenues declined to 82% in 2017. Table 1 also illustrates the connection between oil price and oil revenues as percentage of total government revenues for Bahrain from 2010 to 2017. It is also evident from Table 1 that oil price has a negative and downward trend mostly since 2014 and at the same, oil revenue has also affected by this negative price trend. It is also important to note that the low oil prices also affected Bahrain economy and particularly, it contributed to budget deficits and the reduction in government spending and such facts are clear in Figure 1.

Table 1: Oil price, oil revenue, and oil revenue as percentage of total government revenues in Bahrain for the period of 2010–2017

Years	Average annual oil price per-barrel US$*	Oil revenue as percentage of total government revenues**
2010	77.38	86.0
2011	107.8	87.8
2012	109.45	87.2
2013	105.87	88.3
2014	96.29	86.2
2015	49.45	86.9
2016	40.68	85.5
2017	52.68	82.0

Source: *The statistics portal (www.ststista.com). **Ministery of Finance (www.mof.bh.)

Figure 1: Trend of oil revenue and government spending in Bahrain during 1990–2017



Source: Ministery of finance (www.mof.bh)

Bahrain's public finances are highly dependent on oil sector and oil revenues. Figure 1 shows the trend of Bahrain's oil revenues and government expenditures for the period of 1990–2017. Both government revenues and government expenditures are moving together during the study period; however, the gap between oil revenues and government expenditures widened mainly after 2014 because oil revenues sharply declined as oil prices plummeted during the last 5 years. In 2015 government revenue declined to BD 2.0 billion compared to BD 3.1 billion in 2014 and remained stagnant at BD 2.1 billion in 2016. In Bahrain, public expenditures play a vital role. Since public expenditures are important in financing investment and consumption expenditures, the government of Bahrain has always maintained a high level of government expenditures regardless of oil revenue volatility, and therefore, government expenditures act as important stabilizers and have been used to promote and achieve both economic and social goals. Accordingly, Bahrain's fiscal position shifted from a surplus of 0.6% of GDP in 2007 to a substantial deficit of about 15.7% of GDP in 2017.

Consequently, the increase in the budget deficits has led to a rapid rise in public debt, which is currently one of the highest in the gulf cooperation council (GCC) countries. Public debt in Bahrain has reached 85 % of GDP in 2017 compared to 32% in 2011 and only 8% in 2008. This makes budget deficits a critical issue for the government. It has become an urgent issue to implement

drastic fiscal reforms for rebalancing the budget deficits as well as to prevent an unsustainable macroeconomic debts and deficits, especially in recent years. In 2015, Bahrain began implementing significant fiscal austerity measures, including reforms of energy prices, cut in meat subsidies and an increase in tobacco and alcohol taxes. In addition, government also increased user fees on some government services including primary health care. Moreover, to widen its tax base and to increase non-oil revenues further, Bahrain, along with the other members of the GCC countries agreed to introduce value-added tax jointly during 2018 (Central information Organization, 2017).

It is expected that implementing the reform plans in Bahrain may narrow government budget deficits and control debts in the coming years. Therefore, it is an interesting research question to evaluate whether such measures will improve the fiscal balance or not and what would be its impact on economic growth. It is most likely that increase in tax base may increase government revenues, but on the other hand, may decrease the total government revenues because of expected economic slowdown resulting from the increase in taxes and the net effect on government revenues may be positive or negative or may even remain the same.

4. METHODOLOGY AND MODEL SPECIFICATION

For establishing the government spending-oil revenue nexus in Bahrain economy, the study employs OLS approach. The following single equation model is specified for examining the causality between oil revenue and government spending. For uniformity in measurement and clarity in the interpretation of results, the two variables are lagged by 1 year and transformed to their natural logarithms to eliminate any serial correlation that might be present, where total government spending is denoted by LSP_t and total oil revenue is denoted by (LOR_t) as follows:

$$LSP_t=\beta o+\beta_1 LOR_t+u_t \quad (1)$$

Since the study aims to investigate the short run and long run relationship between the two variables simultaneously, the technique of the ECM is employed which requires that the two variables should be stationary and integrated of the same order. The augmented dickey-fuller (ADF) (1979) and Philips and Perron (1988) unit root tests will also be applied to examine the stationarity as well as to determine the order of integration of both variables.

To investigate whether there is any long run relationship between both the variables; the study also employs Engle and Granger (1987) two steps cointegration tests to identify how the two variables behave in the long run. According to Yuk (2005), "If several variables integrated, then they may drift apart in the short run but in the long run, economic forces will draw them back to their equilibrium relationship." Engle and Granger test includes two steps. First, we estimate the long run equilibrium equation, and secondly, we estimate the ECM to allow for short run adjustment dynamics and indicate the speed of such adjustment to the long run equilibrium state (Aregbeyen and Kolawole, 2015). To restore equilibrium, the sign of error correction term $(ECT)_{-1}$ coefficient is expected to be negative and statistically significant. The higher the negative value of the coefficient and statistically significant, the greater will be the speed in the correction process (Engle and Granger, 1987).

The direction of causality between the two variables could be determined by pairwise Granger causality test. Granger (1969) argues that "variable *X* Granger causes variable *Y* if *Y* can be better predicted by using the historical data of both *X* and *Y* than it can be predicted by using the historical data of *Y* alone. This is shown if the expectation of *Y* given the history of *X* is different from unconditional expectation of Y." The Long run causality between both variables under study depends on the significance of long run relationship and will be tested through lagged ECM.

5. RESULTS, FINDINGS AND DISCUSSIONS

Table 2 shows the results of the ADF and PP unit root tests. The results of both ADF and PP indicate that both variables are stationary after first differencing where the both test results are greater than the critical values. In other words, LSP and LOR are integrated of order one or I (1) and, therefore, they are cointegrated (Engle and Granger, 1987).

To confirm the long run relationship between both variables, the study employs the Engle and Granger's cointegration test. The test procedure involves two steps. The first step implies using least squares method to estimate the linear relationship between the two varibles. The second step involves finding a series of the residuals and after employing ADF test on the residuals. Table 3 shows the results of Engle and Granger two step test results based on ECM. We reject the null hypothesis that ECT has a unit root where the ADF test statistic value is greater than the critical values at 1% level of significance. Thus, it indicates that there is cointegration

Table 2: Unit root tests

Null hypothesis: LSP has a unit root and LOR has a unit root exogenous: Constant, linear trend								
Variables	Lag length 0 (automatic-based on SIC, maxlag=6)				Bandwidth: 2 (Newey-west automatic) using Bartlett kernel			
	ADF test statistic				PP test statistic			
	Level		Frist differences		Level		Frist differences	
	t-stat	Prob.*	t-stat	Prob.*	Adj. t-stat	Prob.*	Adj. t-stat	Prob.*
LSP	–1.794	0.679	–4.490	0.0074	–1.777	0.068	–4.56	0.0063
LOR	–2.168	0.487	–5.772	0.0004	–2.180	0.480	–5.760	0.0004
Test critical	1% level	−4.339	1% level	−4.356	1% level	−4.339	1% level	−4.356
values	5% level	−3.587	5% level	−3.595	5% level	−3.587	5% level	−3.595
	10% level	−3.229	10% level	−3.233	10% level	−3.229	10% level	−3.233

*Mackinnon (1996) one-sided P values, ADF: Augmented Dickey–Fuller, PP: Phillip-Perron

Table 3: Engel–Granger two steps cointegration test

Step I: Estimating the linear relationship between the two varibles via OLS method			
Dependent variable: LSP			
Method: Least Squares			
Sample (adjusted): 1991–2017			
Included observations: 27 after adjustments			
LSP=40.8+1.17 LOR			
(0.07)* (0.005)*			
R^2=0.73Adj. R^2=0.728 F-stat=9.38 (Prob.=0.005) DW. 1.747			
Step II: Creating a series of the residuals and testing residuals for unit root via ADF test			
Null hypothesis: ECT has a unit root			
Exogenous: Constant			
Lag length 0 (automatic-based on SIC, max lag=6)			
ADF test statistic		**t-values**	**Prob.***
		−4.307	0.0024
Test critical values	1% level	−3.711	
	5% level	−2.981	
	10% level	−2.629	
*Mackinnon (1996) one-sided P values			
ECM Equation			
Dependent variable: D (ECT)			
Method: Least squares			
Sample (adjusted): 1992–2017			
Included observations: 26 after adjustments			
D (ECT)=−1.4 −0.878 ECT (−1)			
(0.99) (0.0002)*			
R^2=0.43 Adj. R^2=0.41 F-stat=18.5 (Prob.=0.0002) DW. 1.98			

OLS: Ordinary least square, ECT: Error correction term

Table 4: Pairwise granger causality tests

Sample: 1990–2017 **Lags: 2**			
Null hypothesis	**Obs.**	**F-stat**	**Prob.**
LOR does not granger cause LSP	25	5.92	0.046
LSP does not granger cause LOR	25	1.281	0.157

between both the variables. In other words, long run equilibrium relationship exists between oil revenue and government spending.

Furthermore, the results reveal that LOR has a positive and significant effect on LSP, where the long run elasticity of government expenditures with respect to oil revenue is 1.37. It indicates that a 1% increase in oil revenue will induce an increase in government expenditures by 1.37%. This means the existence of high dependency of government spending on oil revenue. Therefore, policymakers in Bahrain can enhance the effectiveness of fiscal policy by making government expenditures less driven by oil revenues.

The ECM equation allows for short run dynamics adjustment and it indicates the speed of such adjustment to the long run equilibrium state. The coefficient of the ECT_{-1} is negative and equals to −0.878 and statistically significant at 1% level. This indicates that the speed of correction is relatively high where 87.8% of the adjustment towards the long run equilibrium relationship for government spending occurs within a year through changes in oil revenues.

Table 4 illustrates the results of pairwise Granger causality tests. The optimal lag length was selected according to the Criteria of Schwarz. The critical values are compared at the 5% level of significance. The results clearly confirm the rejection of the null hypothesis that LOR does not Granger cause LSP and indicate acceptance of the null hypothesis that LSP does not Granger cause LOR at the 5% level of significance. Accordingly, there is uni-directional causality running from oil revenue to government spending in the short run.

The lagged ECT is statistically significant at the 5% level of significance and it has been derived from the long run equilibrium relationship. It confirms the long run causality between the above two variables and causality runs from oil revenue to government spending and thus, confirms the first hypothesis of "Revenue-Spend" as duly argued by Friedman (1978), and Buchanan and Wagner (1978). The results of this study confirm the expectations that government spending depends on oil revenue. This indicates that government expenditures are heavily affected by oil revenues, as most of the government expenditures are financed by oil revenues. A fluctuation in oil revenues will, therefore, lead to fluctuations in the implementation of government spending programs. Therefore, the government must work to promote diversification in the Bahraini economy as a condition for uninterrupted economic prosperity and financial stability.

6. CONCLUSION AND RECOMMENDATIONS

The current study attempts to investigate the relationship between government expenditures and government revenues in the Kingdom of Bahrain over the fiscal years 1990/1991–2017/2018 by using time series analysis and the technique of ECM and Engle and Granger causality tests. Both unit root tests by employing ADF and PP revealed that both variables are I (1). Engle and Granger test has proved that the oil revenue and government spending are cointegrated, and hence, there is a long run relationship between oil revenue and government expenditures in Bahrain. Granger causality test found uni-directional causality in the short run and the causality runs from oil revenue to government spending while the significance of lagged ECT confirms the long run causality between both variables and the causality runs from oil revenue to government spending as well.

These results support "revenue-spend" hypothesis which suggests that changes in government revenue will lead to changes in government expenditures. On the other hand, the results also revealed that oil revenue has a positive and significant effect on government expenditures, where the long run elasticity of government expenditures with respect to oil revenue is 1.37, which clearly shows that a 1% increase in oil revenue induces the government expenditure to increase by 1.37%. Therefore, the results indicate the existence of high dependency of government expenditures on oil revenue. The study recommends that government and policymakers in Bahrain should either increase oil revenue by value added in oil exports or diversify the sources of government revenue by creating and expanding non-oil sectors or both. For example, Bahrain should seriously seek to diversify its

sources of income and its major economic activities by investing more in industrialization, education, and the expansion of private sector activities. Finally, further studies should be conducted to investigate the effect of oil revenue on different types of public expenditures and on major macroeconomic variables.

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