THE IMPACT OF OIL REVENUES ON BUDGET DEFICIT IN SELECTED OIL COUNTRIES

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Abstract
The purpose of this research is to examine the effect of oil revenues on budget deficit in selected oil exporting countries. In this study, the budget deficit is defined as dependent variable. The considered explanatory variables are the oil revenues, Gross Domestic Production (GDP), and taxes, the data of which in the panel model are collected annually for nine countries during the period 1995 to 2011 from the IMF statistical center and the World Bank. Here we apply the Eviews software with the Ordinary Least Squares (OLS) method. The results from estimations of the model show that the influence of oil revenues on budget deficit is negative. Also, by considering the impact of oil revenues in Iran and Kuwait which are OPEC members, this variable is insignificant in other countries, and a higher explanation is achieved.
Keywords: budget deficit, oil revenue, Gross Domestic Production (GDP)

I. INTRODUCTION
One of the challenges of governments to achieve economic stability is the growth of employment, price control, and controlling their spending proportional to the income.
Oil revenues flow to exporting countries every year, but again a problem, namely the budget deficit exists in oil producing countries, and causes imbalances in the economy of these countries. This may have been due to mismanagement in fund allocations. Fiscal policies will be effective only if the instruments of these policies i.e., incomes and government spending and the relationship between them is proportional. In oil exporting countries, budget dependence to oil revenues which can be also seen in this study, leads to ineffective financial policies, and drastically reduces the impact of taxes on reducing deficits. Budget management in the correct framework of financial policies has the role of facilitator in the absorption of impulses arising from the change of government revenues in the budget and then in the whole economy. In this article the influence of oil revenues on budget deficit is assessed, and it is responded whether our expectations of these revenues are met or not.

II. REVIEW OF LITERATURES
Yoon (2012) in his article examined the adverse effects of budget deficit on the economy of America. Sill, K. (2005) in his paper found out that there is a relationship between inflation and the budget deficit. Vito Tanzi (1985) showed that the interest rate has a positive relationship with the budget deficit and public debt level. Garcia and Henin (1991) assessed the budget balancing through the choice of tax increases or government spending, and discussed the equality of the two methods in budget balancing.

Aka & Decaluwe (1999) evaluated the causality between tax rates and budget deficit in developing countries based on autocorrelation method, and concluded that firstly, variables in the study are of degree one, and are not at the durable level. Secondly, there is a mutual effect between tax rates and budget deficits.

Ghali (2003) in his study suggested that the relationship between government spending and economic growth depends on the sources of financing government spending. Thus, if government spending finance is carried out through borrowing, then the relationship between government spending and economic growth will be negative, but if it occurs through taxes, the relationship will be positive. In other words, a single result does not exist regarding the effect of government spending on the Gross Domestic Production (GDP) and economic growth.

Rogoff (1990) showed that in developing countries, inflation increases the budget deficit. Barro (1989) investigated about the relation of government spending and interest with budget deficits, and come into the conclusion that enhancement of the temporary government spending can be compensated by budget deficits, but rise in the permanent government spending can be compensated by taxes.

Komeyjani and Varhami (2012) estimated the effect of oil revenues, taxes, and economic growth on budget deficit in Iran using the Ordinary Least Squares (OLS) method with two models. Their results indicate the negative effects of these variables on the budget deficit. Niki Oskoee et al (2009) in their study of Iran based on Structural Vector Auto-Regressive (SVAR) model expressed that their analysis of variance indicated a high dependence of budget to oil revenues, and it shows that the role of tax policy in explanation of the fluctuations of a budget deficit is very low.

Jahangard & Farhadi (2002) in their research by (VEC) model proved that some historical factors such as the state's dependence on oil revenues, lack of flexibility in government spending, and also the large body of the government have led to the inefficiency of fiscal policies and thus the government budget deficit. They also concluded that in Iranian, as an oil country, the budget deficit has been largely due to the weakness of the government and not due to an inactive fiscal policy. In international investigations, it is focused less on the oil issue, and the majority of studies have examined the relation of budget deficit with economic growth, inflation, and taxes.

III. STATIONARY TEST OF THE VARIABLES

Stationary of a time series may have a significant impact on its behavior and its properties. When a shock is applied to a durable variable, the shock effect disappears with time, but if the shock effect is persistent, the variable is non-stationary.

Application of non-stationary data can lead to spurious regressions. If two variables have time trends and have no logical connection with each other, regression of one on the other has a high R^2 but it may be spurious. Therefore the variables which are regressed on each other must be durable to achieve a correct regression. Thus, first we will focus on the stationary test of variables by unit root test. The results indicate that all variables are durable in first order difference. Results for stationary of variables are presented in Table 1.

Table 1. Levin, Lin and Chu durable test

variable	**Stat- value**	**Prob**
Def	0.65231	0.7429

Tax	5.11039	0.97
Oil	6.07692	0.99
Gdp	3.79064	0.9999

Source: research computation

The results show that all variables are non-stationary, so the unit root test is performed for the first-order difference. The findings are given in Table 2.

Table 2. Levin, Lin and Chu unit root test

variable	**Stat- value**	**Prob**
Ddef	-3.10568	0.0009
Dtax	-4.03913	0.0000
Doil	-4.18004	0.0000
Dgdp	-3.36915	0.0004

Source: research computation

The table above shows that all variables after a difference become stationary, so it can be said that all variables are integrated of order 1 (I(1)).

IV. INITIAL MODEL ESTIMATION

In this section, the first-order difference of the budget deficit is considered as the dependent variable. Also, the first-order difference of variables of oil revenues, state tax revenues, and GDP are assumed as independent variables. Here, different conditions are evaluated as given in the following table.

Table 3. Factors influencing on budget deficit in selected oil countries (the dependent variable for budget deficit)

	Model	c	doil	dgdp	inf	dtax	dtax^2	dtax^3	d*oil	d1*inf
Model(1)	Coefficient	-2670.582	-562.122	-2.91043	1738.135	4.23E-10				
	Prob.	0.2813	0.0072	0	0.0002	0.0942				
	R^2	0.31095								
	Akaike info criterion	22.7642								
Model(2)	Coefficient	-2487.025	-399.588	-3.8888	1486.154	6.44E-09	-2.63E-22	2.9E-36		
	Prob.	0.3093	0.0558	0	0.0019	0.0002	0.0002	0.0005		
	R^2	0.37616								
	Akaike info criterion	22.69255								
Model(3)	Coefficient	-2578.729	-68.1731	-3.76526	1447.372	6.03E-09	-2.28E-22	2.41E-36	-756.555	
	Prob.	0.2877	0.8021	0	0.0022	0.0005	0.0018	0.0053	0.0642	
	R^2	0.391736								
	Akaike info criterion	22.68116								
Model(4)	Coefficient	-281.1885	51.44548	-4.00117	4.22E+02	4.81E-09	-2.03E-22	2.29E-36	-971.913	2035.489
	Prob.	0.9096	0.8475	0	0.4588	0.0051	0.0045	0.0065	0.0166	0.0035
	R^2	0.429092								
	Akaike info criterion	22.63167								
Model(5)	Coefficient	982.1082	77.78615	-3.98415		4.85E-09	-2.03E-22	2.27E-36	-1014.98	2344.178
	Prob.	0.5847	0.7689	0		0.0046	0.0044	0.0067	0.0115	0
	R^2	0.426758								
	Akaike info criterion	22.62186								

Source: research computation

In the above table it can be seen that model (2) is better than model (1) because it has a higher R^2 and a lower Akaike. Therefore, according to model (2), the influence of oil revenues on the budget deficit is negative and the relating coefficient is significant. Now, we aim to evaluate another hypothesis about the countries studied in this research. We will compare the extent budget deficit is affected from oil revenues in OPEC countries or the ones which are not OPEC members. For this purpose, we use a dummy variable d with two values, namely one for OPEC oil producing countries, and zero for non-member oil countries. Now, variable d*oil is defined to be inserted in the model. The result is given in model (3). Now, we assess the impact of inflation in Iranian economy on the budget deficit as another hypothesis, using another dummy variable $d1$ which is one for Iran and zero for the rest countries. For this purpose, we use variable $d1 * inf$. This situation is depicted in model (4). As it is clear, by the addition of the variable $d1 * inf$, the coefficient relating the inflation variable becomes insignificant. Thus, variable inf is removed from the model, and model (5) is estimated as below:

Ddef = 982.1082 -3.984150 DGDP + 77.78615 DOIL+ 4.85*10^{-9} DTAX
(0.547874) (-7.824497) (0.294419) (2.880750)

-2.03*10^{-22} DTAX^2+ 2.27*10^{-36} DTAX^3 -1014.983 D(D*OIL) + 2344.178 D1*INF
(-2.896339) (0.0067) (-2.563438) (4.312959)

$\bar{R}^2$= 0.426758 F-Statistic = 14.46386

The digits in the brackets give the value of t for each of the coefficients that indicate their status as significance, and have meaningful differences with zero. In addition, the probability of each coefficient is less than 0.05, implying that the variables are significant.

The value of R^2 indicates that the estimated equation could explain approximately 42.6758% of the changes in the dependent variable (Ddef), but 57.3242% of the changes is caused by random factors which could not be taken into account by the equation. The value of F shows the equation is quite significant because it is greater than the value of F in the table, and its probability is 0.00000 which is smaller than 0.05.

Panel test:

For combinational data, the first step is to identify constraints of the model. In other words, it is first determined whether the variable of regression relationship in the sample has heterogeneous intercepts and homogeneous slopes or the hypothesis of common intercepts and slopes among cross-sections (panel data model) is accepted.

Given that the data used in the model are combined data, so to identify if the model is pooling or panel, F-limer test is employed. The null hypothesis in the test implies that the model is pooling. F-limer test results are presented in Table 4. Thus, according to the statistics depicted in the table, it is found that H_0 hypothesis based on the panel model is rejected. Therefore, the model is pooling since F=0.817823; Also, its probability is equal to 0.5882 implying that H_0 is acceptable, and suggests the model is pooling.

Table 4. F-Limer test results

Effects Test	Statistic	Prob.
Cross-section F	0.817823	0.5882
Cross-section Chi-square	7.124175	0.5233

Source: research computation

Initial model estimation:

According to the test, final estimation of the model is:

Table 5. Estimation results

Dependent Variable: ddef				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob
C	982.1082	1792.579	0.547874	0.5847
DGDP	-3.98415	0.509189	-7.824497	0
DOIL	77.78615	264.2019	0.294419	0.7689
DTAX	4.85E-09	1.69E-09	2.88075	0.0046
DTAX^2	-2.03E-22	7.01E-23	-2.896339	0.0044
DTAX^3	2.27E-36	8.25E-37	2.754661	0.0067
D*OIL	-1.01E+03	3.96E+02	-2.563438	0.0115
D1*INF	2344.178	543.5195	4.312959	0
R^2= 0.426758 Durbin-Watson stat=2.485838		F-statistic=14.46386 Prob (F-statistic)=0.0000		

Source: research computation

In what follows, other conditions of the model are examined more precisely.

Autocorrelation test:

For the detection of the first order autocorrelation i.e., the autocorrelation between the values of the current and previous year, Durbin-Watson test is applied. As it can be seen, together with the values estimated from the model, DW statistic is presented as the Durbin-Watson Stat. Since DW=2.485950, it can be concluded that the model has a first order autocorrelation, which is removed using AR(1).

The results after inserting AR(1) is given in Table 6. The results indicate that DW statistic is close to 2 meaning the removal of the autocorrelation of the model.

Table 6. Autocorrelation resolving (from the research calculations)

Dependent Variable: ddef				
The variance dissimilarity test				
Variable	Coefficient	Std. Error	t-Statistic	Prob
C	856.5095	1259.508	0.680035	0.4977
DGDP	-3.829929	0.554088	-6.912129	0
DOIL	54.00116	259.7918	0.207863	0.8357
DTAX	8.75E-09	2.34E-09	3.736772	0.0003
DTAX^2	-3.41E-22	9.77E-23	-3.489723	0.0007
DTAX^3	3.57E-36	1.10E-36	3.259385	0.0014
D*OIL	-1.06E+03	3.75E+02	-2.82795	0.0055
D1*INF	1.25E+03	4.29E+02	2.903947	0.0044
AR(1)	-0.462977	0.110832	-4.17728	0.0001
				-1687.35
R^2=0.502654 Durbin-Watson stat=1.998		F-statistic=15.91806 Prob (F-statistic)=0.0000		

Source: research computation

Variance heteroskedasticity test:

For the heteroskedasticity test, LM statistic is used, a comparison of which with the table amount gives:

LM = 0.08891 < $x^2_{n=9}$=**3.33**

Therefore, the value of LM statistic is smaller than its value in the table. Thus, it can be concluded that the estimated model does not have a variance heteroskedasticity.

V. FINAL MODEL ESTIMATION

Table 7. The final estimation of the model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	856.5095	1259.508	0.680035	0.4977
DGDP	-3.829929	0.554088	-6.912129	0.0000
DOIL	54.00116	259.7918	0.207863	0.8357
DTAX	8.75E-09	2.34E-09	3.736772	0.0003
DTAX^2	-3.41E-22	9.77E-23	-3.489723	0.0007
DTAX^3	3.57E-36	1.10E-36	3.259385	0.0014
D(DD)	-1061.468	375.3489	-2.827950	0.0055
DDIN	1246.704	429.3137	2.903947	0.0044
AR(1)	-0.462977	0.110832	-4.177280	0.0001
R-squared	0.502654	Mean dependent var		-1687.350
Adjusted R-squared	0.471076	S.D. dependent var		25603.76

S.E. of regression	18620.89	Akaike info criterion	22.56630
Sum squared resid	4.37E+10	Schwarz criterion	22.75998
Log likelihood	-1514.225	Hannan-Quinn criter.	22.64500
F-statistic	15.91806	Durbin-Watson stat	1.988287
Prob(F-statistic)	0.000000		

Source: research computation

Results for the impact of oil revenues on oil deficit in selected oil countries in the period 1995-2011 can be analyzed as follows:
The $\bar{R}^2$ indicates that estimated equation is able to explain approximately 50.2654% of the changes in the dependent variable (Ddef). Also, according to the value obtained for the F-statistic and relevant probability, the significance of overall model is confirmed.

Evaluation of the model assumptions:
In this study, we sought to test the following hypotheses:

1- The budget deficit in oil producing countries studied in this investigation, is influenced by oil revenues
2- The budget deficit in OPEC oil countries studied in this research, is more influenced by oil revenues
3- The budget deficit in Iran is affected by inflation

According to Table (7) we have:
About the first hypothesis, the first order difference of oil revenues in oil countries of our study, has a positive impact on the budget deficit, i.e., the rise of oil revenues results in the increase deficit. However, seemingly, the effect of oil revenues on the deficit is negative. So, since the coefficient of variable oil revenues is insignificant at the 0.05% level, we proceed out hypotheses by removing variable DOIL.
Note that in models (1), (2), and (3) of Table (3) in which variable (D*OIL) is not included the sign of the coefficient of variable DOIL is negative, implying the negative impact of oil revenues on the deficit in selected oil countries.

Ddef = 934.3180 -3.828881 DGDP + 8.77*10^{-9} DTAX -3.41*10^{-22} DTAX^2 +3.57*10^{-36} DTAX^3
(0.779484) (-6.935218) (3.767696) (-3.517171) (3.283256)
-1008.966 D(D*OIL) + 1235.275 D1*INF -0.463401 AR(1)
(-3.657225) (2.916754) (-4.203992)

About the second hypothesis, it can be said that the effect of oil revenues in OPEC oil countries is negative, i.e., the rise of oil revenues reduces the budget deficit. Thus, in these countries, oil revenues are an instrument to eliminate the deficit.
In the third hypothesis which aimed to explore the impact of inflation on the deficit in Iran, since the variable coefficient is positive, so it can be argued that the increase of inflation in Iran will increase the deficit.

Conclusion:

The results from estimations of the model show that the influence of oil revenues on budget deficit is negative. Also, by considering the impact of oil revenues in Iran and Kuwait which are OPEC members, this variable is insignificant in other countries, and a higher explanation is achieved. Gross domestic production (dgdp): According to the estimation results, with an increase of one unit in GDP, budget deficit drops down by 3.828881 units, which is correct according to theoretical bases about GDP and the budget deficit. Tax (DTAX): According to the estimations, the addition of one unit to powers 1 and 3 of tax, leads to $8.77*10^{-9}$ and $3.57*10^{-36}$ increase of budget deficits, and addition of one unit to power 2 of taxes reduces the deficit by $3.41*10^{-22}$. The oil revenues of OPEC member countries of the research (D*OIL): By the estimations, oil revenue of Iran and Kuwait has a negative influence as much as 1008.966 on the budget deficit. Inflation of Iran (D*INF): According to the estimations, a unit increase in inflation of Iran increases the amount of the deficit by 1235.275 unites.

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