



Investigating the Effect of Oil Price Fluctuations on the Budgets of Oil Exporting Countries, Case study / Iraq

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تحقيق تأثير تقلبات أسعار النفط
على موازنات الدول المصدرة للنفط
دراسة خاصة \ العراق

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Abstract

With changes in oil prices, many macroeconomic variables in oil-exporting countries become unstable. The budgets of oil-exporting countries are one of the macroeconomic variables that are very vulnerable to oil price volatility. The federal budget of Iraq, as an oil exporting country, is also very sensitive to fluctuations in oil prices. Fluctuations in oil prices affect all components of the budget, including current expenditures and investment costs of the Iraqi federal budget. Of course, the impact of oil price fluctuations on the investment costs of the Iraqi federal budget is greater. Accurate estimation and quantification of the impact of crude oil price shocks on the Iraqi budget is very important. In this regard, in the present study, using the statistical evidence of Iraq for the period 2018-1982, first, crude oil price fluctuations are estimated using the ADF model. Then, using the vector autoregression approach, the effect of crude oil price turmoil on the Iraqi federal budget is estimated. The results of the ADF model estimate show that the price of crude oil had the highest volatility in 1998 and the lowest volatility in 2016. The results of estimating the vector autoregression model also show that among the variables in the model, oil price fluctuations have the greatest impact on the Iraqi federal budget and have increased the country's budget deficit. Given the sensitivity and vulnerability of the Iraqi budget to oil price fluctuations, it is suggested that by increasing the share of taxes and other sources of budget revenue and by diversifying the sources of government budget revenue, the Iraqi budget is vulnerable to oil shocks. Reduce significance.

Keywords: Oil price volatility, ADF model, Budget, Oil exporting countries, VAR model, Iraq.



المستخلص

مع التغيرات في أسعار النفط، أصبح العديد من متغيرات الاقتصاد الكلي في البلدان المصدرة للنفط غير مستقرة، وتعتبر موازنات الدول المصدرة للنفط من متغيرات الاقتصاد الكلي المعرضة بشدة لتقلب أسعار النفط. الموازنة الفيدرالية للعراق، كدولة مصدرة للنفط، حساسة للغاية لتقلبات أسعار النفط، وتؤثر تقلبات أسعار النفط على جميع مكونات الموازنة، بما في ذلك النفقات الجارية وتكاليف الاستثمار في الموازنة الاتحادية العراقية، وبطبيعة الحال، فإن تأثير تقلبات أسعار النفط على تكاليف الاستثمار في الموازنة الفيدرالية العراقية أكبر. وإن التقدير الدقيق والتقدير الكمي لتأثير صدمات أسعار النفط الخام على الموازنة العراقية مهم للغاية في هذا الصدد، وفي هذه الدراسة، وباستخدام الدليل الإحصائي للعراق للفترة 1982-2018، أولاً، تم تقدير تقلبات أسعار النفط الخام باستخدام نموذج ADF. و بعد ذلك، وباستخدام نهج الانحدار التلقائي المتجه، يتم تقدير تأثير اضطراب أسعار النفط الخام على الموازنة الفيدرالية العراقية، تظهر نتائج تقدير نموذج ADF أن سعر النفط الخام كان له أعلى تقلب في عام 1998 وأدنى تقلب في عام 2016، كما أظهرت نتائج تقدير نموذج الانحدار التلقائي المتجه أنه من بين المتغيرات في النموذج، كان لتقلبات أسعار النفط أكبر تأثير على الميزانية الفيدرالية العراقية وزاد عجز الموازنة العراقية. نظراً لحساسية وضعف الموازنة العراقية لتقلبات أسعار النفط، يُقترح أنه من خلال زيادة حصة الضرائب وغيرها من مصادر إيرادات الموازنة وتنويع مصادر إيرادات الموازنة الحكومية، تكون الموازنة العراقية عرضة للصدمات النفطية.

الكلمات المفتاحية: تقلب أسعار النفط، نموذج ADF، الموازنة، الدول المصدرة

للنفط، نموذج VAR، العراق.



Introduction

Budget is one of the important and determining variables of the ability of governments to create economic infrastructure as well as public facilities for individuals. The higher the level of government budgets, the easier access to public facilities and welfare of individuals is possible, so fixed revenue is essential for governments to build prosperity and provide the infrastructure to activate the private sector. In many countries, the budget is based on tax revenues, and in many, due to higher oil resources, it is based on oil revenues, which provide a significant share of government spending, so any fluctuations in oil prices lead to fluctuations in oil revenues and So will the budget. One of the main features for oil economies is facing fluctuations in oil prices in world markets. On the one hand, rising oil prices increase the income of oil-exporting countries, which leads to an increase in their budgets, and on the other hand, by increasing the role and share of oil prices in the budgets of countries, increases their vulnerability to changes in oil prices.

Accordingly, the need to pay attention to non-oil revenues to stabilize foreign exchange earnings and, accordingly, meet the basic needs of imports, as well as government spending to provide services to individuals and institutions is of great importance. In fact, single-product economies are always faced with the problem that oil price fluctuations that are beyond their control can potentially threaten the economic stability of society. The Iraqi economy is one of the economies that is highly dependent on oil exports and over 90% of the government's revenue sources are financed by the government. According to the Central Bank of Iraq, Iraqi oil exports have experienced a relatively upward trend in recent years since the end of the war. Iraq's oil exports have increased from \$ 51 billion in 2010 to \$ 87 billion



in 2018. In addition, up to 97% of government revenue in 2018 comes from oil. Accordingly, it is important to examine the relationship between price fluctuations and the Iraqi government budget in order to provide effective policies to reduce the budget's vulnerability to oil price volatility.

The structure of the present research is such that first the theoretical foundations of the research in relation to the factors affecting the budget are examined, then the studies presented in this field are discussed, and in the fourth section, the model is estimated and the results are analyzed. The general conclusion of the article is given.

Theoretical foundations

Budget is one of the economic variables that affected by several variables in the economy, so that part of its changes depends on the structure of the economy. Numerous theories and theories have been proposed to explain the factors affecting the budget, oil price fluctuations, GDP, money supply and inflation are among the variables that affect the budgets of countries. Oil price fluctuations are one of the most important factors in the economic fluctuations of oil producing countries. In fact, the channel of overflow of economic and political crises in the world market to oil countries is oil price fluctuations. The sudden rise in oil prices leads to an increase in foreign exchange earnings, and thus prices rise, as do wages and imports. As a result of these changes, the share of non-tradable sectors in the economy increases, which can be identified in the economic literature as the Dutch disease. The government, as an oil exporter and economic agent, receives oil revenues and directs them to productive activities through various types of budgets.



In such an environment, political and social expectations of the government, which generally have no economic basis, often cause the impact of government capital expenditures to be the same as current expenditures. This means that even if the government wants to increase

To spend the income from the increase in oil prices by directing it to the development budget, because of these expectations, the major government investment does not follow its codified schedule; the volume of investment exceeds the projected figure. And inefficient government management also weakens the development effects of these investments. Also, since oil revenues are not a product of the performance of economic sectors, so their increase does not indicate economic prosperity, so increasing these revenues and injecting them into society will quickly lead to higher prices and thus increase revenues generated locally. The shock of rising oil prices as it should not be able to stimulate the economies of these countries. But on the other hand, at a time when falling oil prices (negative shocks) are casting a shadow over world markets and oil governments are facing declining foreign exchange earnings, the economies of these countries are severely challenged due to non-realization of revenues. The currency projected in the budget, the achievement of the projected goals in it is also in an aura of ambiguity and the resulting budget deficit becomes the starting point for imbalances in various aspects of the economy of these countries (Al-Tajai and Afzali, 69, 1391).

The relationship between inflation and the budget deficit can be examined through two effects of Tanzi and the Patinkin: the effect of Tanzi is due to a decrease in real revenues due to rising inflation, and the effect of Patinkin is to a decrease in real government spending due to inflation. According to the mechanism of these two effects are opposite and their final effect depends on



the dominance of each of them, the structure of the economy will determine the dominance of each of them. Tanzi (1977) argues that in developing countries, rising inflation may reduce real tax revenues following tax delays and increase the likelihood of a larger deficit, the greater the delay in paying taxes, which is common in these countries, the less flexible the tax system. The effect of inflation on tax revenues will be followed by the widening of the budget deficit. However, inflation in industrialized countries is usually accompanied by a real increase in tax revenues and the main issue in these countries is only to organize how to deal with the negative effects of this increase (Farzin Vash *et al.*, 50, 2003). On the other hand, Patinkin claims that the effect of inflation on the budget deficit may be reversed. He showed how pressures such as political interests could lead to the use of inflation to remove the heavy burden of the government's nominal expenditure discrepancy from its revenues. In a way, when government expenditures exceed its revenues, the government can borrow from the central bank to cover its expenditures, which in turn leads to higher inflation and subsequent reduction in real government spending, and with low inflation. In his opinion, this effect will be a strong stabilizer in high inflation rates. In countries that have experienced inflation, the effect of Tanzi and Patinkin is associated with different intensities and weaknesses according to economic conditions. In fact, inflation on the income side and with the activation of the effect of Tanzi, causes the accumulation of government budget deficit and its intensification (Zarouki *et al.*, 34, 1399).

Research background

(Faraji Dizaji 2014) In a study for Iran in the period 1990-2009 and the approach of the error correction model show that the effect of oil revenue



shock on government spending is stronger than oil price shock. Using Saudi statistical evidence for the period 1981–2014 and the Johansen-Silius integration approach. (Shamun 2015) shows that there is a long-term relationship between oil price fluctuations and the budget as a percentage of GDP, increasing by 10%. At the price of crude oil, the budget deficit or surplus changes by 0.39 percent. (Rahma *et al.*, 2016) examine the effect of oil price shock on Sudan's budget for the period 2000–2011. It is effective, but rising oil prices do not have a significant effect on the budget. (Addekan, 2018) examines the effect of oil shock on government expenditure and revenue in Nigeria for the period 1981–2014 and the structural vector autoregression approach. Evidence suggests that oil price shock in the short term cannot predict government spending, but This shock strongly predicts oil revenues in the short and long term. (Krishan *et al.*, 2018) examine the dynamic relationship between oil revenues and the state budget in Bahrain for the period 1990-2017 and the integration approach. Their results show that a one percent increase in oil revenues leads to a significant increase in government spending. It becomes 1.37 percent. Deg *et al.* (2019) examine the relationship between oil revenues and the budget in Iraq for the period 2016-2006, and the results show that 97% of government revenue sources come from oil exports.

(Tarang *et al.*, 2017) examine the effect of oil prices on the budget deficit in Vietnam for the period 2000-2000, the results of their study show that increasing a standard deviation in oil prices increases the budget deficit by 0.11 to the period, the third is Zakaria and Shamsuddin (2017) in a study for Malaysia show that oil variables do not have a long-term effect on government spending, but have a significant effect on government revenue. But in the short run, only the consumption of crude oil affects government



spending. In addition, there is a short-term causality of the variables of production, exports and imports to government revenue.

(Khanian *et al.*, 2017) study the asymmetric effect of inflation on the budget deficit in Iran for the period 1370-1393 using the quantitative regression approach. The results of their study show that with increasing inflation, the government budget deficit decreases. Asgharpour and Khanian (2015) investigate the asymmetric effect of oil revenues on the budget deficit in Iran. The budget deficit is not equal, and in all multiples the amount of the budget deficit increases as oil revenues increase. Molaei and Abdian (2015) examine the factors affecting the budget deficit of Iran for the period 1368-1394, the results of their study show that economic growth reduces the budget deficit and inflation increases the budget deficit.

(Kazemzadeh *et al.*, 2015) study the effect of tension and anti-tension in the Iranian economy for the period 1396-1396, the results of their study show that in the time horizons of more than 8 years, there is a two-way relationship between inflation and budget deficit And in inflation less than 6.28 percent, the budget deficit increases more with increasing inflation. (Zerouki *et al.*, 2016) test the effect of Tanzi and Patinken on the Iranian economy for the period 1990 to 1397. The results of their study show that in the long run, increases and decreases in inflation have an adverse effect on the budget deficit and is confirmed by Patinkin.

Research modeling

The purpose of this study is to investigate the effect of oil price turmoil on the Iraqi federal budget for the period 1982-2018, for this purpose, based on the study by Guy and Quadio (2018), Equation (1) is used.

$$BD = f(\text{voil.m2.inf.GDP}) \dots \dots \dots (1)$$

In the above relation, inflation (inf), liquidity (m2), federal budget (BD), oil-free production (GDP) and oil price volatility (voil). The VAR model approach is used to estimate Equation (1). By estimating the VAR model, the effect of oil price shocks on the Iraqi budget is analyzed by analysis of variance.

The ADF model is used to estimate oil price volatility. Therefore, using the Arch effects test, the requirement to implement conditional heterogeneous variance models is examined. The results of the Arch effects test show that the value of the Arch test is 73.9, which has a probability value of zero, and this shows that the null hypothesis that there are no Arch effects has been rejected and therefore can be used from variance models. Used conditional heterogeneity. The results of estimating oil price volatility in Figure (1) show that in the period 1995 to 2009, oil price fluctuations were at a high level. But in 2016, it has the least turbulence and compared to previous and subsequent years, it has the least turbulence.

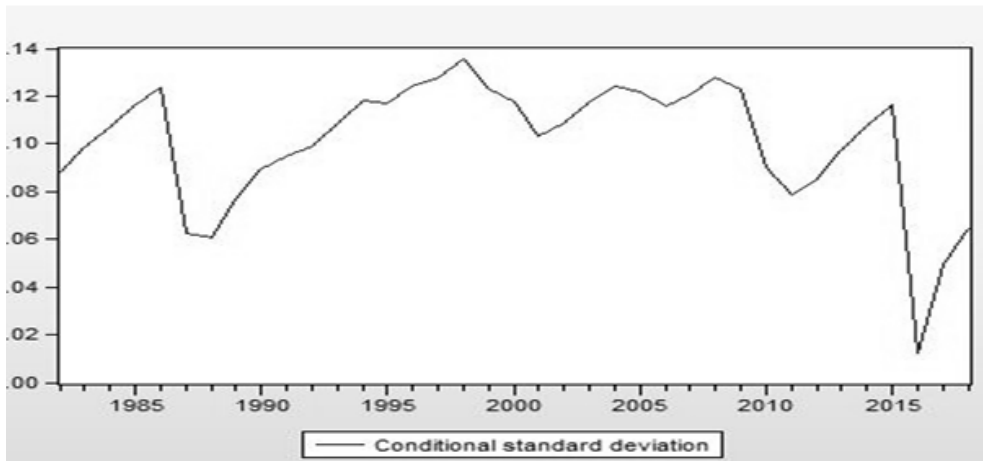


Figure (1): Estimation of oil price volatility

Source: General Directorate of Statistics and Research, Central Bank of Iraq



One of the problems with using time series data is the presence of meaning in the data. Meaning is used as a function of the timelessness of the variable used, because if there is anonymity, false regression occurs, and many of the changes in the variables are due to time changes, so the net effects of each variable cannot be determined, data-based interpretations Namana is wrong, so the meaning of the data is checked first. The results of mana in Table (1) show that all research variables have a mana difference and a combination is used to avoid false regression.

Table (1), Maneuver test

	Level variables	Variables with a difference
The budget	84/1- (35/0)	22/5- (00/0)
Oil price turmoil	4/2- (14/0)	88/5- (00/0)
GDP	46/1- (53/0)	94/7- (00/0)
Inflation	78/2- (07/0)	73/6- (00/0)
Money supply	49/1- (52/0)	96/5- (00/0)

Source: Research findings

Use the ADF as a test

The basic idea in co-integration analysis is that although many economic time series are anonymous, they may be meaningful in the long run due to the linear combination of these variables. Co-integration analysis helps us to test and estimate these long-run equilibrium relationships. If an economic



theory is correct, a special set of variables identified by that theory are related in the long run. In addition, economic theory only defines relationships statically and does not provide information about short-term dynamics between variables. If the theory is valid, we expect a linear combination of these variables to be meaningless and without a random process, despite the fact that the variables are anonymous. The results of the Johansson-Silicon co-integration test in Table (2) show that there are a maximum of eigenvalues for the two tests and a maximum of 3 co-accumulated vectors for Tris. Therefore, model estimates with research variables are valid for analysis.

Table (2), Integration test

$\begin{cases} H_0: r = 0 \\ H_1: r \geq 0 \end{cases}$	8/86 (00/0)	93/41 (00/0)
$\begin{cases} H_0: r = 1 \\ H_1: r \geq 1 \end{cases}$	87/44 (00/0)	44/24 (016/0)
$\begin{cases} H_0: r = 2 \\ H_1: r \geq 2 \end{cases}$	42/20 (008/0)	98/18 (00/0)
$\begin{cases} H_0: r = 3 \\ H_1: r \geq 3 \end{cases}$	44/1 (22/0)	44/1 (22/0)
Result	There are up to 3 stacked vectors.	

Source: Research findings

The results of the immediate reaction based on the estimation of the vector auto-regression model are given in Figure (2). According to the research findings, inflation and money supply have a negative effect on the



budget deficit. The effect of inflation on the reduction of real expenditures is less than the reduction of taxes received. Because the share of tax revenues in the Iraqi economy is very limited and inflation changes cannot have a significant effect on the budget, but the effect of inflation on real expenditures is always true in all countries and therefore the immediate reaction of the budget deficit to inflation and money supply is plotted negatively.

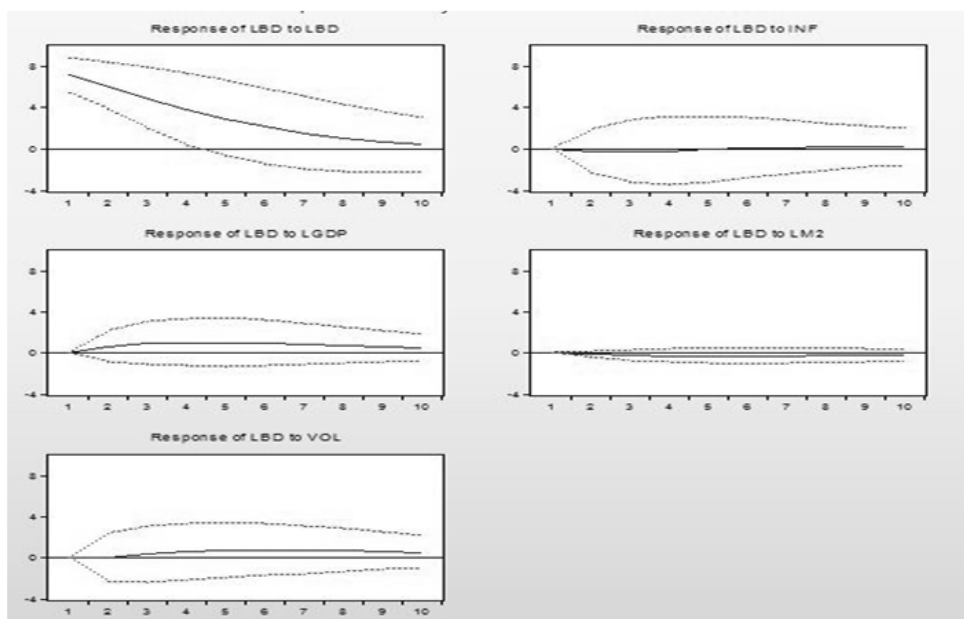


Figure (2): Instant reaction

Source: General Directorate of Statistics and Research, Central Bank of Iraq (1982-2018)

Examining the future response of the budget deficit to GDP is increasing, because with the increase in economic growth and the creation of new needs in society, government spending must meet to meet their needs. Although an increase in GDP increases tax revenue through the expansion of



the tax base, the effect of production on the government's requirement to spend on the welfare of society is more prevalent, thus increasing the budget deficit.

Examining the effect of oil price turmoil on the Iraqi government budget shows that the Iraqi economy is very sensitive to changes in oil prices, so that an increase in oil price turmoil leads to an increase in the government budget deficit, in fact increasing uncertainty about changes in Oil prices and the corresponding uncertainty about oil revenues cause budget deficits due to declining government revenues.

Table (3) shows the results of analysis of variance. According to estimates, in 10 time periods, the share of oil price turbulence in the budget deficit has increased from 0.46% in the second period to 3.92% in the tenth period, and in other words the most It has an effect on changes in the budget deficit. This indicates that oil price turmoil in the long run has far greater effects on the budget deficit and raises the need to pay attention to production criteria in the economy to attract budget revenues.

The second important variable affecting the budget deficit is GDP. According to estimates, the share of changes in GDP on the budget deficit has increased from 0.323 in the fourth period to 2.1% in the tenth period. Since the share of GDP changes in the budget deficit is very small, one important reason can be stated that the Iraqi budget is based on oil revenues and the share of tax revenues in 2018 is equal to 2.37. It is a percentage, and therefore changes in GDP do not have a significant effect on the Iraqi budget.

Finally, the two important variables of money supply and inflation have a share of less than 1% in 10 time periods and have a small share in changes in the budget deficit. One of the main reasons for the low impact of inflation



on the budget deficit is the small fluctuations in inflation in the Iraqi economy that it has experienced in recent years.

Table (3), Analysis of the variance of the Iraqi budget deficit

The period	The budget	Inflation	GDP	Money supply	Oil price turmoil
1	100				
2	45/99	06/0	0003/0	0208/0	46/0
3	64/98	11/0	089/0	061/0	09/1
4	69/97	123/0	323/0	112/0	75/1
5	7/96	117/0	656/0	168/0	35/2
6	76/95	11/0	025/1	22/0	87/2
7	94/94	126/0	37/1	268/0	28/3
8	28/94	15/0	68/1	307/0	58/3
9	76/93	18/0	92/1	34/0	79/3
10	4/93	205/0	104/2	36/0	92/3

Source: Research Findings

Use the VECM model

Conclusion and Recommendations

The Iraqi economy is one of the oil-dependent economies where changes in oil revenues play a significant role in financing Iraq. According to Iraqi statistics, the share of oil revenues in the total revenue of the Iraqi government in recent years is over 95%. As the oil market is one of the markets that has experienced the most price fluctuations in recent years, so the vulnerability of oil-dependent economies will be more than other economies. One of the most important components of oil price changes is the government budget, which is the main source of government revenue programs based on the flow of oil revenues. The results of the present study show that the turmoil in oil prices has increased the budget deficit in Iraq



and has had the greatest impact on budget changes. In addition, inflation and the money supply have reduced the budget deficit, and GDP has increased the budget deficit. Therefore, in order to reduce the vulnerability to fluctuations in oil prices, the Iraqi economy must first develop higher value-added activities so that the share of oil exports in total exports can be reduced. Second, the tax system should be proportionate to the development of productive activities in the economy so that the source of government revenue is diversified and the damage caused by oil price fluctuations is minimized.

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