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Using Generalized Linear Model to Determine the Impact of Oil Price Fluctuations on the Egyptian Public Budget

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ABSTRACT

Oil is regarded as one of the most significant energy sources in the world due to the enormous impacts it has on the level of the economy as a whole in both developing and developed countries and for both producing and importing countries. So, this study aims to know the effects of fluctuations in oil prices on the Egyptian public budget during the period from 2000 to 2022. For this purpose, the study used the GLM (Generalized linear Model) model, which is one of the first studies to use this model in economics. The study concluded that oil price fluctuations negatively affect the public budget, which means that there is a positive relationship between oil price fluctuations and the general budget deficit in Egypt as a result of Egypt being one of its importing countries. Therefore, the rise in oil prices leads to an increase in the public budget deficit, and its low prices may contribute to a decrease in this deficit.

Keywords: oil Price, Public Budget, Egypt, Generalized Linear Model
JEL Classifications: E39, C5, H6

1. INTRODUCTION

Oil is an essential element in all different economic operations and activities due to the important role it plays in operating machinery and equipment, as it helps convert raw production materials into outputs that meet different needs. In economic sectors, petroleum products are used for their activities and operations or to transfer their production from manufacturers to markets.

Oil is not only the best-selling product in the world, but it is also the most important source of energy for economic activity. Changes/fluctuations in oil prices have always become a research problem. Also, the impact of oil prices on the main macroeconomic variables such as energy subsidies, economic growth, inflation and unemployment is an economic problem that must be addressed (Peng and Drakeford, 2020; Mostafa, 2021; Mostafa and Mater, 2021; Mostafa and Selmy, 2022).

Fluctuations in oil prices occur mainly due to imbalances between demand and supply, which result from the interaction of many factors that directly affect the global oil market (such as global production capacities-global economic growth-OPEC production-change in crude oil stocks and market structure) or indirectly (such as future expectations in the oil market and the state of uncertainty). Other reasons that lead to fluctuation in the global price of oil include fluctuations in production due to political factors such as wars and conflicts, as well as economic sanctions that are imposed on some countries, especially oil-producing countries, which may sometimes have a greater impact on oil prices than economic factors and lead to its volatility. Ascending and descending. In addition to environmental problems, issues of technological progress, and the dominance of a few major exporters and importers of the global oil market. Likewise, the lack and unavailability of information on some aspects such as the elasticity of income demand and prices in the long term, and the reactions of OPEC countries and other countries that are likely to affect the supply of oil, resulting in a state of uncertainty regarding the supply of oil and the future production plans of the countries of the organization and the producing countries The other (Jawad, 2013).

Moreover, the global collapse in oil demand due to the COVID-19 pandemic has put pressure on the budgets of oil exporting countries, while the excess demand for oil during the first and second oil crises in 1973 and 1979 had a detrimental effect on the budgets of importing countries (Zulfigarov and Neuenkirch, 2020). Hence, the prospects for recovery in oil prices are highly uncertain. Whereas, oil futures contracts are expected to witness a slow and partial recovery (IMF, 2021). Moreover, escalating geopolitical tensions between Russia and Ukraine and in the Middle East are adding to oil supply concerns, and this is contributing to rising inflation and concerns about economic recovery (World Economic Forum, 2022).

From here, we find that the fluctuation in oil prices has great economic repercussions, and these repercussions cause effects on the economy in general through many channels, including the budget deficit channel, the transportation costs channel, the external debt channel, etc. (IMF, 2021; Peng and Drakeford, 2020). Oil prices greatly affect transportation costs in general, including marine transportation. Where the rise in oil prices leads to an increase in the costs of maritime transport and the increase in the costs of international trade in developing countries, and reduces the importance of competitive advantages resulting from low costs, which works to move and change production sites. Especially since 2004, the flexibility of container transport prices has increased to changes in oil prices, which means that its impact has become greater, because of its significant impact on the high cost of fuel for ships, and then the high shipping costs.

As for the general budget channel, we find that the studies that dealt with the impact of fluctuations in oil prices on it were divided into two types. The first of which is (Abimanyu, 2016; Akhmedov, 2019; Saud et al., 2020; Laan et al., 2021) and believes that the fluctuation in oil prices positively affects the public budget, and this happens either to oil-exporting countries on the one hand, as this fluctuation is due to the rise in oil prices. Oil, as it is expected that the state's revenues will increase from its export process, which positively affects the budget or the importing country, in the event of a decrease in oil prices, as this contributes to achieving a surplus in the funds directed to finance the purchase of oil, which positively affects the general budget. And the second type is like a study (IMF, 2015; Afangideh et al., 2018; Al Shukri, 2021; Sun et al., 2022) and considers that the fluctuation in oil prices negatively affects the general budget, and this is either for the exporting countries in the event of a decrease in prices Oil or to importing countries, in case of high prices.

In the recent period, especially after the Corona pandemic in 2020, interest has increased in searching for the effects caused by fluctuations in oil prices on the economies of different countries. This study is distinguished from others in that it is one of the few studies that focus on the general budget, especially in Egypt as an importing country that depends on oil on the one hand, and that it is one of the first studies to use the GLM model and apply it in the economy on the other hand.

Accordingly, these fluctuations in oil prices raise many questions about the challenges and opportunities that could face the general budget in Egypt as a result. Hence, the main objective of this study is to analyze and measure the impact of fluctuations in international oil prices on the general budget in Egypt during the period (1990-2022).

This study has been divided into five sections as follows: Section (I): Introduction and literature review. Section (II) Data and methodology. Section (III): Data and Methodology. Section (IV) empirical result and discussion. section (V) conclusion.

2. LITERATURE REVIEW

2.1. Studies Dealing with the Positive Impact of Oil Price Fluctuations on the General Budget of Exporting and Importing Countries

There is no doubt that the downward fluctuations in oil prices have positive effects on the budgets of oil-importing countries as a result of the surplus achieved by these countries from the funds directed to purchase oil, in addition to the fact that the decline in oil prices exerts other indirect effects on the public budget through the decrease in subsidies directed to energy materials and the decrease in costs Transport, low inflation rates and other indirect effects on the general budget. This matter does not stop at this point, but the previous effects result in positive social effects that exert positive effects on the general budget.

On the contrary, for oil-exporting countries, the positive effects occur in the event of a rise in oil prices, as this contributes to an increase in the revenues generated from the oil export process, which leads to positive effects on the public budget.

Many studies have discussed the positive effects of fluctuations in oil prices on the public budget, and among these studies is a study (Abimanyu, 2016; Saud et al., 2020), which showed that there is a positive relationship between fluctuations in oil prices and public expenditures in the short term, while this relationship is negative in the long run.

In Kazakhstan, a study (Akhmedov, 2019) showed that the rise in oil prices during the period (2011-2013) led to unprecedented levels of government revenues. The effect of the additional revenue generated by the increase in oil prices depends critically on the wise management of these oil resources (Lakuma, 2020).

On the other hand, the decline in oil prices always benefits the importing economies as an incentive to align domestic prices with international prices, as well as gradually raising taxes, which increases the state's public revenues (Laan etal., 2021).

2.2. The Negative Impact of Oil Price Fluctuations on the Public Budget

The negative effects of oil price fluctuations on the public budget occur either in the case of low prices for oil-exporting countries or in the case of high prices for oil-importing countries.

The decline in oil prices constitutes a triple macro-financial shock for exporting countries as a result of: a significant loss of revenues received by the state, a negative economic impact on domestic non-oil activity, and increased spending pressures arising from the policy response to the effects of COVID-19 (IMF, 2015).

A study (Kandil and Markovski, 2020; Al Shukri, 2021) concluded that fluctuations in global crude oil prices negatively affect exporting countries through the public budget channel and the public debt channel. In the United Arab Emirates, the decline in oil prices at $35.6 in 2020; this led to a sharp deterioration in the public budget surplus, in light of the oil price estimate in the public budget at $67.1.

The decline in the global price of crude oil, which began in mid-2014, had major repercussions in all countries of the Middle East, not only for net oil exporters, but also for net oil importers, such as Egypt, Jordan and Lebanon, which are linked in one way or another to the oil-producing Gulf countries. The drop in oil prices represents a second major shock to the region in the early twenty-first century-as it imposes constraints on public finances, specifically lower public revenues (Beck and Richter, 2021).

In Nigeria, a study (Afangideh et al., 2018) revealed that crude oil prices and terrorism have a significant negative impact on government revenues in the short and long term.

As the study (Adedokun, 2018) demonstrated, there is a negative relationship between oil revenues and total government expenditures in the short term, and it is also clear that oil shocks greatly affect political variables in the short term and transmit effects on other macroeconomic variables in the long term.

(Raouf, 2021) confirmed the impact of oil shocks on current and capital government spending. It was found that oil price shocks as a result of its high prices affect government capital expenditure positively in oil-exporting countries and negatively in oil-importing countries. In China, when the price of crude oil changes, public investment in the public utility sector decreases (Sun et al., 2022). In addition, the study showed that fluctuations in oil prices are among the important factors affecting the performance of the public budget. This study concluded that there are two different effects of these fluctuations on the oil-exporting countries: The first is positive through increasing their financial returns and achieving financial surpluses in the financial budget when oil prices rise. As for the second, it is considered negative due to the decrease in their financial returns and the accompanying increase in the general budget deficit, when oil prices drop.

3. DATA AND METHODOLOGY

3.1. Data

Table 1 shows the variables used in the study. Figure 1 shows data on the oil price and the public budget deficit ratio to the GDP in Egypt during the period from 2000 to 2022.

Table 1: Variables and source of data

Variables	Kind	Source
Budget deficit	Dependent variable	Egyptian central bank
Oil price	Independent variable	Statista database

Source: Author

3.2. Methodology

To determine the impact of oil price fluctuations on the Egyptian public budget, generalized linear regression models were used.

The generalized linear model (GLM) is seen as a regression model, in which the dependent variable follows one of the probability distributions that belong to the exponential family, and these models are less restrictive than the traditional regression models. The generalized linear models are based on a set of assumptions, which are as follows (Murphy et al., 2000; Al-Hosary and Mohammed, 2017):

1. The dependent variables are not required to follow a normal distribution, but they are supposed to follow an exponential distribution
2. In generalized models, heteroskedasticity is allowed
3. In the generalized models, the relationship is not required to be linear between the dependent variable and the independent variables, but it is assumed that there is a linear relationship between the link function and the independent variables, and then some non-linear models can be reconciled using the generalized linear models
4. Random errors are independent and are not required to follow a normal distribution
5. Parameters are estimated using the Maximum Likelihood Estimation method as well as the Ordinary Least Squares (OLS) method.

The generalized linear model differs from the linear regression model in that the expected value of the response variable is replaced by a link function ($g(\mu)=\eta$), where η is a linear combination of explanatory variables, and the main objective of using the link function is to make the error variance more stable.

The general picture of generalized linear models is as follows (Murphy et al., 2000; Al-Hosary and Mohammed, 2017):

$$Y_i = g(X_i \beta_i) + \varepsilon_i$$

Where:

X_i: The set of independent variables that affect the value of the dependent variable.

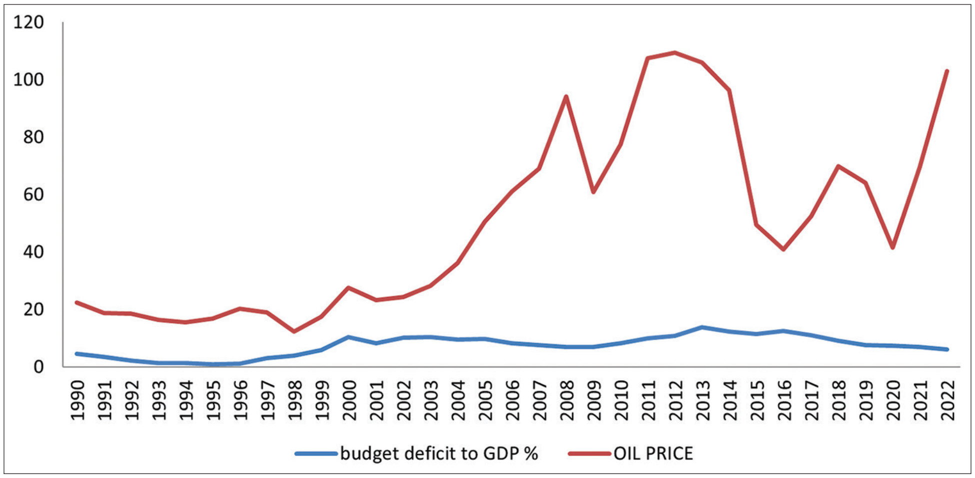
g: Is the link function, and it is a function used to show the relationship between the expected value of the response variable and the explanatory variables.

ε: It is the random error and represents the unexpected variables.

Y_i: Is the dependent variable, which is a random variable that follows one of the exponential family distributions:

- Normal distribution
- Gamma distribution
- Poisson distribution
- Binomial distribution
- Negative binomial distribution
- Inverse gaussian distribution
- Tweedie distribution.

Figure 1: Egyptian economic data



Source: Statista data base and Egyptian central bank

Components of the generalized linear model (Al-Hosary and Mohammed, 2017):

The generalized linear model consists of three components ():

1. Random component: It means the distribution followed by the dependent variable Y, as it is assumed in generalized models that the dependent variable follows one of the exponential distributions.
2. Systematic component: That is, the linear predictor (η) Linear Predictor, which means the set of features (β) and the set of explanatory variables (x_1, x_2,…, x_p), and then $\eta = X_i^T \beta$ represents the regular element.
3. Link function: It is a function used to link the random component to the regular component, and it is used to clarify the relationship between the expected value of the dependent variable and the linear predictor, and the linking function is denoted by the symbol g (.).

$$= g(\mu_i)_i$$

$$\because \; = X_i^T \beta_i \eta_i$$

$$\therefore \; (\mu_i) = X_i^T \beta_i g$$

Where

g(·): Link function

X_i: Vector of independent variables

$$X_i = \begin{bmatrix} X_{i1} \\ \vdots \\ X_{ip} \end{bmatrix}) : 2 : X_i$$

X_i^T : Transpose of vector of independent variables

$$\left[X_{i1}, \ldots, X_{ip}\right] : X_i^T$$

β: Vector of parameters

$$\beta = \begin{bmatrix} \beta_1 \\ \vdots \\ \beta_p \end{bmatrix}$$

Hence, it is important to address both the exponential distributions and the exponential dispersion distributions briefly, as well as addressing what the linking function is; This is as follows:

1. Exponential Family Distribution

Assuming that we have a random variable Y with one parameter, θ, it is said that this distribution follows one of the exponential distributions if the probability function can be written for it in the following form (Al-Hosary and Mohammed, 2017):

$$+C(y_i)] f(y_i;\theta_i) = \exp[y_i(\theta_i) - b_i(\theta_i)$$

Θ: Natural parameter

Exponential distributions include a set of probability distributions as follows:

a. Poisson distribution

Assuming that we have a discrete random variable (y) with parameter (λ), then this variable follows a Poisson distribution if its probability function is as follows:

$$\mathrm{f}(\mathrm{y_i};\lambda_i) = \frac{\lambda_i \mathrm{y_i} \mathrm{e}^{-\lambda_i}}{\mathrm{y_i}!}$$

The probability function of the Poisson distribution can be put on the general form of the probability function of exponential distributions, as follows (Al-Hosary and Mohammed, 2017):

$$f(y_i;\lambda_i) = \frac{\lambda_i y_i \theta^{-\lambda_i}}{y_i!}$$

$$f(y_i;\lambda_i) = \exp\left[y_i \log(\lambda_i) - \lambda_i - \log(y_i)\right]$$

Hence

$$f(y_i;\lambda_i) \qquad =$$

$$= \log(\lambda_i)\theta_i$$

$$b(\theta_i) \qquad = \lambda_i = \exp(\theta_i)$$

$$c(Y_i) \qquad = -\log(y_i!)$$

b. Binomial distribution

Assuming that we have a discrete random variable (y) with parameter (r_i), this variable follows a binomial distribution if its probability function is as follows (Al-Hosary and Mohammed, 2017):

$$f\left(y_i;r_i\right)=\binom{n_i}{y_i}r_i^{y_i}\left(1-r_i\right)^{n_i-y_i}$$

The probability function of a binomial distribution can be put in the general form of the probability function of exponential distributions, as follows:

$$f\left(y_i;r_i\right)=\binom{n_i}{y_i}r_i^{y_i}\left(1-r_i\right)^{n_i-y_i}$$

$$f\left(y_i;r_i\right)=\exp\left[\log\binom{n_i}{y_i}+y_i\log\left(r_i\right)+n_i\log\left(1-r_i\right)+y_i\log\left(\frac{1}{1-r_i}\right)\right]$$

$$f\left(y_i;r_i\right)=\exp\left[y_i\log\left(\frac{r_i}{1-r_i}\right)+n_i\log\left(1-r_i\right)+\log\binom{n_i}{y_i}\right]$$

Hence

$$=\log\left(\frac{\tau_i}{1-\tau_1}\right)\theta_i$$

$$b\left(\theta_i\right)=-n_i\log\left(1-r_i\right)=n_i\log\left[1+\exp\left(\theta_i\right)\right]$$

$$c\left(Y_i\right)=\log\binom{n_i}{y_i}$$

2. Exponential dispersion family

Exponential dispersion distributions differ from exponential distributions in that the former contains a ϕ scale parameter (constant) (also called dispersion parameter) in addition to the natural parameter of the distribution (θ), and then the distribution is said to follow One of the exponential dispersion distributions if the probability function can be written in the following form (Al-Hosary and Mohammed, 2017):

$$f\left(y_i;\theta_i,\phi\right)=\exp\left[\frac{y_i\theta_i-b\left(\theta_i\right)}{a_i(\phi)}+c\left(y_i,\phi\right)\right]$$

Examples of such distributions are:

a. Normal distribution

Suppose we have a random variable connected (Y) with two parameters (μ_i,θ_i^2), then this variable follows a normal distribution if its probability density function is as follows(Al-Hosary and Mohammed, 2017):

$$\mathrm{f}\left(\mathrm{y_i};\mu_i,\sigma^2\right)=\frac{1}{\sqrt{2\pi\sigma^2}}\mathrm{e}^{\frac{-(\mathrm{y_i}-\mu_i)^2}{2\sigma^2}}$$

The probability density function of the normal distribution can be put in the general form of the probability function of the exponential dispersion distributions as follows (Al-Hosary and Mohammed, 2017):

$$f\left(y_i;\mu_i,\sigma^2\right)=\frac{1}{\sqrt{2\pi\sigma^2}}e^{\frac{-(y_i-\mu_i)^2}{2\sigma^2}}$$

$$f\left(y_i;\mu_i,\sigma^2\right)=\exp\left[-\log\left(\sqrt{2\pi\sigma^2}\right)-\frac{\left(y_i-\mu_i\right)^2}{2\sigma^2}\right]$$

$$f\left(y_i;\mu_i,\sigma^2\right)=\exp\left[-\log\left(\sqrt{2\pi\sigma^2}\right)-\frac{y_i^2}{2\sigma^2}+\frac{y_i-\mu_i}{\sigma^2}-\frac{\mu_i^2}{2\sigma^2}\right]$$

$$f\left(y_i;\mu_i,\sigma^2\right)=\exp\left[\frac{1}{2}\left(y_i\cdot\mu_i-\frac{\mu_i^2}{2}\right)-\frac{y^2}{2\sigma^2}-\frac{1}{2}\log\left(2\pi\sigma^2\right)\right]$$

Hence

$$=\mu_i\theta_i$$

$$b\left(\theta_i\right)=\frac{\mu_i^2}{2}=\frac{\theta_i^2}{2}$$

$$a(\phi)=\sigma^2$$

$$=\frac{y_i^2}{2\sigma^2}-\frac{1}{2}\log\left(2\pi\sigma^2\right)=\frac{y_i^2}{2\phi}-\frac{1}{2}\log(2\pi\phi)c\left(y_i,\phi\right)$$

b. Gamma distribution

Assuming that we have a continuous random variable (Y) with two parameters (α, n), then this variable follows a gamma distribution if its probability density function is as follows (Al-Hosary and Mohammed, 2017):

$$y_i^{\alpha-1}f\left(y_i;\lambda_i,\alpha\right)=\frac{\lambda_i^a}{\mathrm{r}(\alpha)}e^{-\lambda_i v}$$

The probability density function of the gamma distribution can be put in the general form of the probability function of exponential dispersion distributions as follows (Al-Hosary and Mohammed, 2017):

$$y_i^{\alpha-1}f\left(y_i;\lambda_i,\alpha\right)=\frac{\lambda_i^\alpha}{\Gamma(\alpha)}e^{-\lambda_i y_i}$$

Suppose: $\lambda_i=\alpha/\mu_i$

$$y_i^{\alpha-1}f\left(y_i;\lambda_i,\alpha\right)=\frac{\lambda_i^\alpha}{\Gamma(\alpha)}e^{-\lambda_i y_i}$$

$$f\left(y_i;\lambda_i,\alpha\right)=\exp\left[\alpha\log\alpha-\alpha\log\mu_i-\log\Gamma(\alpha)+(\alpha-1)\log_{y_i}-\frac{\alpha y_i}{\mu_i}\right]$$

$$f\left(y_i;\lambda_i,\alpha\right)=\exp\left[\alpha\left(-\frac{y_i}{\mu_i}-\log_{i_i}\right)+(\alpha-1)\log_{y_i}+\alpha\log\alpha-\log\Gamma(\alpha)\right]$$

Hence

$$b(\theta_i) = \log(\mu_i) = -\log(-\theta_i)$$

$$a(\phi) = \frac{1}{a}$$

$$= (\alpha - 1)\log y_i + \alpha \log \alpha - \log\Gamma(\alpha) c(y_i, \phi)$$

c. Negative binomial distribution:

Assuming that we have a random variable connected (Y) with a marker (r_i), this variable follows a negative binomial distribution if its probability density function is as follows (Al-Hosary and Mohammed, 2017):

$$f(y_i; r_i) = \binom{y_i + n_i - 1}{y_i} r_i^{n_i} (1 - r_i)^{y_i}$$

The probability density function of a negative binomial distribution can be put in the general form of the probability function of exponential dispersion distributions as follows (Al-Hosary and Mohammed, 2017):

$$f(y_i; r_i) = \binom{y_i + n_i - 1}{y_i} r_i^{n_i} (1 - r_i)^{y_i}$$

$$f(y_i; r_i) = \exp\left[\log\binom{y_i + n_i - 1}{y_i} + n_i \log(r_i) + y_i \log(1 - r_i)\right]$$

supose

$$= \log(1 - r)^{\theta}$$

So

$$e^{\theta} = 1 - r.$$

$$= 1 - e^{\theta} \therefore r$$

$$f(y_i; r_i) = \exp\left[\log\binom{y_i + n_i - 1}{y_i} + n_i \log(1 - e^{\theta}) + y_i \log\right.$$

$$\left.\left(1 - \left(1 - e^{\theta}\right)\right)\right]$$

$$f(y_i; r_i) = \exp\left[\log\binom{y_i + n_i - 1}{y_i} + n_i \log(1 - e^{\theta}) + y_i \theta\right]$$

Hence

$$= \theta_i \theta_i$$

$$b(\theta_i) = n_i \log(1 - e^{\theta})$$

$$a(\phi) = 1$$

$$= \log\binom{y_i + n_i - 1}{y_i} c(y_i, \phi)$$

4. RESULTS AND DISCUSSION

4.1. Test of Goodness of fit for the Data

In the beginning, test of Goodness of fit for the data is made for the data to find out the probability distributions of the dependent variable (the general budget deficit), based on the Kolmogorov-Smirnov, Anderson-Darling test, and the results are as follows:

It is clear from Table 2 that the data on the dependent variable (the general budget deficit) according to (Kolmogorov-Smirnov, Anderson-Darling) follows a Log-Gamma distribution at the significant level (0.2), (0.1), and (0.05) and (0.02) and (0.01).

We note from Table 3 that the analysis of the linear regression model can be performed depending on the Gamma distribution by linking the independent variables to the expected value of the dependent variable through the Log link function.

4.2. Test of Goodness of fit for Whole Model

The researcher conducted the Omnibus Test to see if the model is significant or not, as shown in the Table 4.

We note from Table 4 that the model is significant at 5% and 10%.

4.3. Model Parameters Estimation

Estimates of the model parameters and standard errors were obtained for the model with the value of the statistic and its significance as in the Table 5.

Table 2: Test of goodness of fit for the data to find out the probability distributions of the dependent variable (the general budget deficit)

Log-Gamma					
Kolmogorov–smirnov					
Sample size			22		
Statistic			0.18912		
P			0.05618		
A	0.2	0.1	0.05	0.02	0.01
Critical value	0.1513	0.17302	0.19221	0.21493	0.23059
Reject?	Yes	Yes	No	No	No
Anderson–darling					
Sample size			22		
Statistic			1.7302		
α	0.2	0.1	0.05	0.02	0.01
Critical value	1.3749	1.9286	2.5018	3.2892	3.9074
Reject?	Yes	No	No	No	No

Source: Easy fit program output

Table 3: Model information

Model information	
Dependent variable	**Budget deficit**
Probability distribution	Gamma
Link function	Log

Source: SPSS v. 23 output

Table 4: Omnibus test

Omnibus test[a]		
Likelihood ratio χ^2	**Df**	**Significant**
123.102	21	0.001**

Source: SPSS v. 23 output **significance at α= 5% ; 10%

Table 5: Parameter estimation

Parameter estimates						
Parameter	**B**	**SE**	**Wald χ^2**	**Df**	**Significant**	**R^2**
Intercept	12.342	0.7506	497.981	1	0.000	0.42
Oil price	9.544	2.526	14.268	1	0.002	

Source: SPSS v. 23 output. SE: Standard error

The previous table shows that oil price fluctuations have a negative impact on the Egyptian public budget, meaning that there is a positive relationship between oil price fluctuations and budget deficit in Egypt, and these effects are significant at $\alpha = 5\%$. This is due to the fact that fluctuations in oil prices raise a wide controversy because of their important effects, given that Egypt is an oil importer (for crude oil and petroleum derivatives), and therefore it is more vulnerable to the shocks that occur in its prices, especially in light of the recent decisions that were taken regarding the gradual reduction to support energy within the framework of its reform program since 2016. This happens through several channels, including.

*The fluctuations in international oil prices negatively affect the industry in Egypt, and this means that the occurrence of a positive shock or the increase in oil prices led to a decrease in the growth rate of industrial output, in proportion to the nature of the inverse theoretical relationship between the two variables in an oil-importing country such as Egypt that suffers from There is a gap between production and domestic consumption of oil. There is no doubt that the negative impact of industrial output leads to an increase in the budget deficit as a result of the subsidies that the state may direct to support this sector and the reduction that may be witnessed in taxes collected from this sector.

**Fluctuations in oil prices increase lead to a rise in the prices of energy materials and then a rise in the rate of inflation, which in turn leads to an increase in public spending directed to social support in order to overcome the negative effects that may be caused by inflation.

***Rising transportation costs and demanding higher wages, which may lead to an increase in public expenditures on the one hand, and a decrease in public revenues on the other hand.

The estimated model is as follows:

$$\text{Log}\ \mu_y = (12.342) + (9.544)\ x_1$$

Where

μ_y: Expected value for budget deficit

X: Oil price

5. CONCLUSION AND POLICY IMPLICATIONS

The study is an attempt to contribute to the debate about the impact of fluctuations in international oil prices on the public budget, as it is one of the important issues raised at all global, regional and local levels, which is still a matter of great controversy, especially after the succession of fluctuations in recent years. Where most of the applied studies in this field focus on the oil-exporting countries, as well as focus on the impact on economic growth in general without more focus on the Egyptian public budget.

At the level of the Egyptian economy, these fluctuations in oil prices raise a wide controversy because of their important effects as an oil-importing country, and therefore it is more vulnerable to the shocks that occur in its prices, especially in light of the recent decisions that were taken regarding the gradual reduction of energy subsidies within the framework of its program the reformist reform movement since 2016. Thus, these fluctuations are likely to affect many aspects of the Egyptian economy, the most important of which are: transportation costs, the value of oil imports, subsidies for oil products, inflation and other important variables.

This study aimed to analyze and measure the impact of fluctuations in international oil prices on Egyptian public budget during the period (2000-2022) using generalized linear model (GLM). To achieve this goal, the theoretical background of the relationship between oil prices and the general budget was addressed, and previous literature was reviewed.

The study concluded that oil price fluctuations negatively affect the public budget, which means that there is a positive relationship between oil price fluctuations and the general budget deficit in Egypt as a result of Egypt being one of its importing countries. Therefore, the rise in oil prices leads to an increase in the public budget deficit, and its low prices may contribute to a decrease in this deficit.

Based on the foregoing, therefore, the study recommends that hedging against uncertainty regarding fluctuations in international oil prices is an important element in order to maintain economic stability in Egypt and then the stability of the general budget by facing fluctuations in oil prices in the event of a rise, and trying to maximize benefit from them. In the event of a decline in the short term, work on developing a multi-pronged plan in the long term.

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