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RESEARCH ARTICLE

Global Economic Shocks and their Impact on the Economies of Oil-Producing Countries: An Empirical Case Study Model for Iraq

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ARTICLE INFO	ABSTRACT
	This study aims to analyze Iraq's general budget, gross domestic product GDP, and inflation dynamics by analyzing structural shocks using the vector autoregressive model VAR from 2000-2020. The ARDL methodology was used as a linear dynamic model to study the impact of several independent variables on a dependent variable. The results revealed relationships between the variables of Economic Shocks (ES) in Iraq and total oil revenues, public debt, and the unemployment rate. Moreover, changes in the variables of ES permanently affect the dependent variables, indicating joint integration between them.

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1. INTRODUCTION

The topic of ES, one of the important topics that gained attention in the seventies of the last century after the occurrence of unprecedented increases in oil prices [1], as developed countries and non-oil developing countries suffered from the adverse effects of this shock, causing what is known as stagflation, as this phenomenon was not known before that time [1], [2], [3]. As for the oil countries, they were exposed to the effects of these shocks in the years when there was a significant decline in oil prices, for example, in the mid-eighties when coordination between OPEC members collapsed, which affected the supply of oil in global markets [4].

Iraq is one of the countries that have been exposed to this type of shock resulting from fluctuations in oil prices, as the price of oil is determined according to the conditions of the global economy, i.e., external conditions [5], [6], [7]. This makes the Iraqi economy vulnerable to fluctuations in oil prices because it is a quarterly economy that depends on the sale of oil [8]. This characteristic makes it vulnerable to external shocks [9], as happened in the mid-eighties when oil prices fell due to the collapse of coordination between OPEC members, as well as in the early nineties due to the cessation of oil exports due to the imposition of economic sanctions after the Second Gulf War [10], [11], in addition to shocks in monetary and financial policy during the study period [12], [13].

These shocks greatly affected the Iraqi economy because the oil sector's output constitutes a large percentage of the gross domestic product, which reflects an imbalance in the structure of the gross domestic product, in addition to the fact that oil revenues constitute a large percentage that exceeded 90% of public revenues in some years [14]. This reflects an imbalance in the structure of the general

budget and other imbalances that the Iraqi economy suffers from for a long time. Thus, oil price shocks have a significant impact on the economy [15].

The study (Khader & Mahdi, 2012) showed that the Iraqi economy is one of the economies that possesses great wealth, especially oil and gas. This family made the Iraqi economy a rentier economy based on the oil sector's output, with a deficiency in the output of the rest of the other sectors. This reflects a significant imbalance in the structure of the gross domestic product, which made it vulnerable to external shocks represented by oil price shocks, in addition to the imbalance in the structure of the general budget, as public spending depends mainly on the volume of oil revenues in hard currency.

In the event of a decrease in these revenues, the state will resort to increasing the public debt, as happened in the first Gulf War during the eighties, or to issue new currency, as happened during the period of economic sanctions in the nineties.

This study hypothesizes that the impact of external ES represented by oil price shocks on the macroeconomic variables used is more significant than the impact of internal ES represented by monetary and fiscal policy shocks and in this study, represented by the autoregressive VAR model, which depends on testing the stability of time series and then testing the joint integration to know whether there is a long-term equilibrium relationship between the variables and then estimating the VAR model.

In addition, the impulse response functions (IRF) and variance components analysis were used to measure the impact of short- and long-term shocks on the system. These standard methods are considered modern methods in this field. The study (Bouaouaina, Mouloud, 2018) indicated that the monetary contribution to some essential macroeconomic investments in Algeria (unemployment, oil growth, real GDP, government investment), through several increasing and dynamic models in interaction and support directly in indicators of the actual economic trend, and which including satellite channels used annual airline data covering the study period (1970-2016), and we reached several important results, the economic situation in Algeria has not continued since independence, it is a semi-paralyzed economy, and depends without controls, and is very sensitive to shocks and unique expectations, this is what is meant by achieving exceptional preparations in the fundamental economic stage, which contributes to developing levels of creativity.

Among the outstanding results that we mention is that the increase in the price of oil by one unit leads to an increase in the gross domestic product in the current year by (0.16) units. This leads to an increase in government investment by (0.056) units due to an inverse relationship between the actual marketing of investments and oil markets because the sign of the parameter is negative (0.139) and significant. Furthermore, there is a negative impact between the direction and oil prices. Of course, the Iraqi economy is a quarterly economy that depends on oil as a primary source, as the oil sector's contribution to the gross domestic product constitutes a large percentage, with a decline in the contribution of other economic sectors. This makes the Iraqi economy more vulnerable to external shocks resulting from fluctuations in global oil prices. In addition, oil revenues were not used to develop the rest of the economic sectors to increase their production, and they did not invest in the surpluses resulting from the oil abundance.

Due to the circumstances that the Iraqi economy went through during the study period, such as wars and economic sanctions, internal shocks resulted from monetary policy and the increase in new currency issuance to cover the deficit caused by the cessation of oil exports and other shocks resulting from the fiscal policy by increasing government spending to finance military activity in the eighties and meeting the food needs of citizens by supporting the agricultural sector in the nineties and increasing spending on reconstruction and improving the security situation and increasing salaries and allowances for employees after 2003, while not increasing other non-oil state revenues such as taxes, fees. Development operations in Iraq were and still are dependent on point revenues, and economic indicators declined because of the ongoing Iran-Iraq war [16], [17].

The problems in the Iraqi economy worsened due to the ongoing deficit in the Iraqi trade balance, accompanied by the accumulation of foreign loans [18]. The Iraqi economy during the nineties took a serious turn due to the almost complete cessation of oil exports and the disruption of existing

productive and investment institutions [19], [20], [21]. The deficit in the trade balance worsened due to the economic blockade after the implementation of the oil-for-food and medicine decision, which began to be implemented in all Iraqi regions [22]. Based on this decision, the government exported a limited amount of oil to meet basic needs for food and medicine.

As a result of this decision, the trade balance witnessed a relative improvement [23]. The state of political change in Iraq in 2003 imposed a new reality on the Iraqi economy. This stage witnessed a significant increase in public expenditures due to increased oil revenues in Iraq. Despite the Iraqi economy's circumstances, oil production and exports continued to increase gradually after implementing the oil-for-food decision until the highest rate of oil production and exports was recorded in the year (2013).

This increase confirms to us that changes in the price of crude oil do not appear or cause significant financial problems because any decrease is covered by increasing production or exports. As for the price of oil, oil prices went through several stages that led to their turmoil and instability, as oil prices rose due to the Iran-Iraq war and prices continued to rise during the (1994) crisis, then they began to decline as a result of the crisis in Asian countries, where the price of a barrel reached (12) dollars in (1998). Oil prices continued to be turbulent and volatile due to several economic, political, social, and climatic factors, as it is clear that oil prices are constantly increasing and have a fluctuating growth rate. The increase in oil prices results from the economic recovery in Asian countries and Russia's exit from its previous crisis.

2. METHODOLOGY

The economy is exposed to various ES, which requires decision-makers to consider the interrelationship between economic variables when formulating economic policy to reduce the adverse effects of shocks. Therefore, this study shows the reciprocal effect between macroeconomic variables and the effects of economic policies in the short and long term.

This study aims to identify the dynamic relationships between macroeconomic variables, how these variables can respond to shocks to the economic system, and the impact of these variables on real GDP growth. Therefore, this goal leads to selecting appropriate policies for the decision-maker to achieve higher growth rates for GDP, general budget, and inflation through optimal harmony between the study variables. Dynamic analysis of Iraq's general budget, GDP, and inflation through structural shock analysis utilized the VAR vector autoregressive model from 2000 to 2020.

Measuring the impact of ES on economic variables in the short and long term and using impulse response functions and variance component analysis to measure the impact of shocks on macroeconomic variables in the long term. We use the Autoregressive Distributed Lag (ARDL) methodology, as it is a linear dynamic model that aims to study the effect of several independent variables on a dependent variable, provided that the variables are stable at the origin I(0) or the first difference I(1) so that they are not stable at the second difference.

3. RESULTS
3.1 Stability test of variables

ES received increasing attention in the 1970s after unprecedented increases in oil prices, as developed and non-oil developing countries suffered from the adverse effects of this shock, causing what is known as stagflation, which was not known before that time. At the same time, oil countries were exposed to the effects of these shocks during periods of significant decline in oil prices, such as in the mid-eighties when coordination between OPEC members collapsed, which affected the oil supply in global markets. Iraq was one of the countries exposed to these ES, as it is a small economy that is open to the global economy and is linked to it through its impact on gross domestic product.

This study aims to analyze the impact of global ES represented by global oil prices, global economic growth, global financial crises, economic and monetary policies in major countries, as well as changes in global supply and demand for oil on Iraq's gross domestic product, total debt, unemployment rate, inflation rate, revenues from non-oil sectors, exchange rate against the dollar, and interest rate.

Table 1: The augmented Dickey-Fuller test for unit roots

Variable	Level			First difference		
	Constant	The constant and general direction	Without constant and general direction	Constant	The constant and general direction	Without constant and general direction
Oil prices	-1.865 (0.342)	-1.938 (0.0676)	0.0366 (0.684)	4.332- (0.0031)	-4.209 (0.0168)	-4.320 (0.0002)
Global GDP GROWTH	-5.600 (0.0002)	-5.510 (0.0011)	-0.706 (0.398)	-	-	-
VIX% Change	-5.752 (0.0001)	-5.724 (0.0007)	-5.703 (0.000)	-	-	-
US Expenditure	1.901)0.996(	0.019) 0.994(	10.825 (1)	3.744- (0.011)	4.261- (0.0152)	0.526 (0.280)
US Reserve	-0.757 (0.811)	-2.250 (0.441)	0.579 (0.833)	-3.910 (0.0081)	-3.752 (0.0420)	-3.697 (0.0009)
Rate I WOP	-4.121 (0.0046)	-4.0466 (0.0223)	-3.484 (0.0013)	-	-	-
Rate I WOCNY	-5.157 (0.0004)	-5.0349 (0.0029)	-4.344 (0.0001)	-	-	-
GDP	-0.380 (0.897)	-2.989 (0.158)	1.196 (0.935)	-3.918 (0.0079)	-3.745 (0.0426)	-2.792 (0.0077)
Oil Rent	-1.913 (0.321)	-4.427 (0.0141)	-0.515 (0.481)	-	-	-
Net foreign	0.185 (0.965)	-2.797 (0.213)	1.816 (0.980)	-3.725 (0.0119)	-3.635 (0.0522)	-3.0459 (0.0041)
GGFCE	-1.129 (0.684)	-1.598 (0.759)	0.654 (0.849)	-3.930 (0.0077)	-3.890 (0.0324)	-3.687 (0.0009)
Public Debt	-1.736 (0.4002)	-0.829 (0.947)	-2.728 (0.0088)	-	-	-
Unemployment Rate	0.731 (0.99)	-1.0789 (0.910)	2.441 (0.997)	-3.373 (0.0241)	-3.726 (0.0441)	-0.947 (0.294)
Inflation Rate	-2.780 (0.0745)	-4.002 (0.0244)	-2.205 (0.0294)	-	-	-
Non-oil Revenue	-2.033 (0.272)	-3.223 (0.1057)	-1.454 (0.1325)	-5.124 (0.0006)	-3.192 (0.1154)	-5.178 (0.000)
Exchange Rate	-2.131 (0.2354)	-0.981 (0.924)	1.288 (0.1763)	-1.505 (0.509)	-5.156 (0.0027)	-1.507 (0.1201)
Interest Rate	-2.994 (0.0511)	-4.0990 (0.0201)	-2.310 (0.0232)	-	-	-

The results of the expanded Dickey-Fuller test in Table (1) show that the time series were stationary at the level or the first difference, whether there was a cutter or a cutter and a general trend, meaning that they were free from false estimation and these variables.
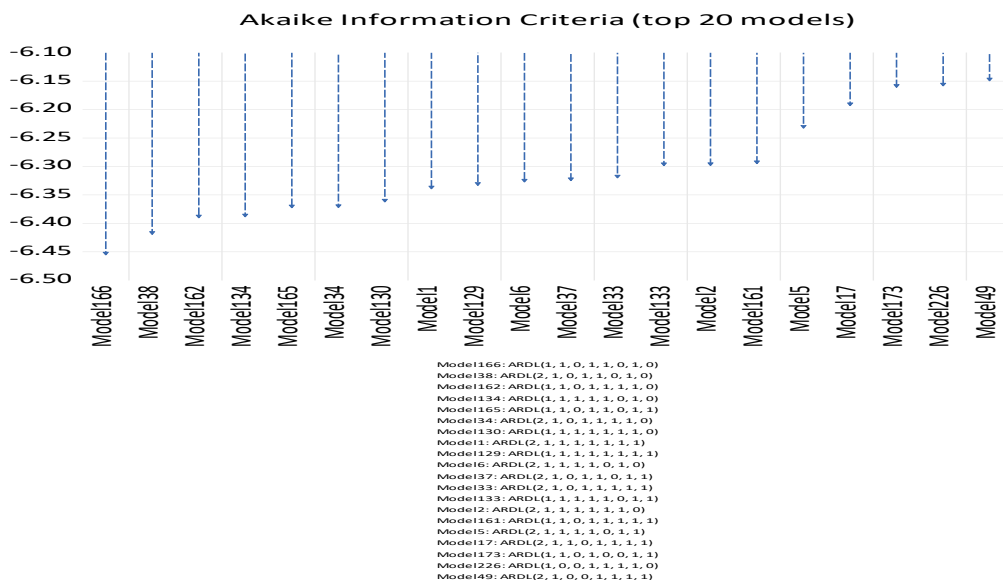
3.2 Study model

The relationship between the gross domestic product in Iraq and the economic shock variables (oil prices, global economic growth, financial crisis fears index, US total spending, total Federal Reserve, rate of change in global oil production, rate of change in global oil consumption), the joint integration test was applied by using the boundary methodology. The following Table shows the results of the calculation of the (F) statistics.

Table 2: Bound test (F bound test) with the study model.

Statistical Test	Value	K	Significance (%)	I(0)	I(1)
F	3.532	7	10%	1.92	2.89
			5%	2.17	3.21
			2.5%	2.43	3.51
			1%	2.73	3.9

Table (2) shows the results of the integration limits test, an economic model used to determine whether there is a long-run relationship between variables. This Table tests the hypothesis that no long-run relationships exist between the variables included in the model.

The tests were conducted using different bounds tests and significance measures (1%, 2.5%, and 10%). The null hypothesis (basic hypothesis) in the integration limits test is that the variables do not have a long-run relationship. This is done by comparing the value of a statistic (F statistic) with its table value within the previously proposed critical limits. If this hypothesis can be rejected based on the results in the Table, it means that there is a long-run relationship between the variables. Since the values of I(0) and I(1) are the critical limits of the test, and the value of the test statistic for the basic hypothesis is 3.532, which is greater than the upper limit of 3.21, the null hypothesis is rejected, and the alternative hypothesis is accepted. This means a long-run relationship exists between the variables included in the study model.

Model166: ARDL(1, 1, 0, 1, 1, 0, 1, 0)
Model38: ARDL(2, 1, 0, 1, 1, 0, 1, 0)
Model162: ARDL(1, 1, 0, 1, 1, 1, 1, 0)
Model134: ARDL(1, 1, 1, 1, 1, 0, 1, 0)
Model165: ARDL(1, 1, 0, 1, 1, 0, 1, 1)
Model34: ARDL(2, 1, 0, 1, 1, 1, 1, 0)
Model130: ARDL(1, 1, 1, 1, 1, 1, 1, 0)
Model1: ARDL(2, 1, 1, 1, 1, 1, 1, 1)
Model129: ARDL(1, 1, 1, 1, 1, 1, 1, 1)
Model6: ARDL(2, 1, 1, 1, 1, 0, 1, 0)
Model37: ARDL(2, 1, 0, 1, 1, 0, 1, 1)
Model33: ARDL(2, 1, 0, 1, 1, 1, 1, 1)
Model133: ARDL(1, 1, 1, 1, 1, 0, 1, 1)
Model2: ARDL(2, 1, 1, 1, 1, 1, 1, 0)
Model161: ARDL(1, 1, 0, 1, 1, 1, 1, 1)
Model5: ARDL(2, 1, 1, 1, 1, 0, 1, 1)
Model17: ARDL(2, 1, 1, 0, 1, 1, 1, 1)
Model173: ARDL(1, 1, 0, 1, 0, 0, 1, 1)
Model226: ARDL(1, 0, 0, 1, 1, 1, 1, 0)
Model49: ARDL(2, 1, 0, 0, 1, 1, 1, 1)

Figure 1: SIC standard study model

From Figure (1), the appropriate model for the study according to the SIC standard is the ARDL model (2,1,0,0,1,1,1,1), as it contains the smallest value for the mentioned standard.

3.3 Long-term relationship coefficient estimation test:

It is necessary to determine whether there is a long-term relationship between the independent variables and the dependent variable according to the joint integration model.

Table 3: Long-term relationship equilibrium (ARDL) (2,1,0,0,1,1,1,1) Dependent variable Gross domestic product in Iraq

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Oil prices	0.000561	0.000273	2.059887	0.1085
Global GDP GROWTH	0.008793	0.009077	0.968739	0.3875
VIX% Change	-7.32E-06	0.000112	-0.065608	0.9508
US Expenditure	2.84E-08	1.76E-08	1.611402	0.1824
US Reserve	0.003343	0.002529	1.321969	0.2567
Rate I WOP	-0.013126	0.004182	-3.138704	0.0349
Rate I WOCNY	-0.006231	0.011635	-0.535517	0.6207

From the results in Table (3), it is clear that the estimates of the long-term integrated relationship in the ARDL model (2,1,0,0,1,1,1,1), where GDP acts as the dependent variable. For the studied variables, the results show that there is no significant effect of global oil prices, growth in the global economy, the index of fears of financial crises, total US expenditures, total Federal Reserve, and the rate of change in global oil consumption on the GDP in Iraq at a significance level of 5% in the long run, as it shows that the level of statistical significance is greater than 5%. In comparison, the rate of change in global oil production has a negative effect on Iraq's GDP at a significance level of 5% in the long run.

Table 4: Determination of the combined error correction model (ECM) (ARDL)

Variable	Coefficient	St. Error	T-Statistics	P.value
C	1.048617	0.351278	2.985144	0.0405
D (OIL PRICES)	0.000149	0.000104	1.423861	0.2276
D (GLOBAL GDP GROWTH)	0.010602	0.001330	7.969869	0.0013
D(VIX CHANGE)	9.99E-05	2.43E-05	4.107317	0.0148
D (US EXPENDITURE)	-3.87E-07	4.23E-08	-9.146813	0.0008
D (US RESERVE)	-0.000505	0.000701	-0.721358	0.5106
D (RATE I WOP)	-0.006493	0.000860	-7.545344	0.0017
D (RATE I WOCNY)	0.002792	0.000812	3.440602	0.0263
CointEq (-1)*	-1.133124	0.116034	-9.765419	0.0006

The results in Table (4) show the short-term impact of the variables in the correction model, showing that there is no significant impact of oil prices on GDP since ($p = 0.2276 > 0.05$). At the same time, growth in the global economy has had a significant positive impact on GDP since ($p = 0.0013 < 0.05$). As for the financial crisis fears index, it showed a significant positive impact on GDP since ($p = 0.0148 < 0.05$). Mega-economy policies, such as the US government spending, significantly negatively impacted Iraq's GDP since the probability value ($p = 0.0008 < 0.05$). In contrast, the Federal Reserve showed no impact on GDP since ($p = 0.5106 < 0.05$), while the rate of change in global oil production has a significant negative impact on GDP in Iraq since ($p = 0.0017 < 0.05$). Finally, the rate of the change in global oil consumption has a significant effect on the Iraqi GDP as ($p = 0.0263 < 0.05$), the coefficient CointEq (-1) is negative and significant as ($p = 0.0006 < 0.05$), indicating the presence of a short-term significant effect between the variables, which enhances the existence of joint integration between the variables in the study model.

3.4 Residuals test

The following Table shows the results of the tests on the residuals.

Table 5: Residuals test in the study model

Test	Criterion	Value	Probability
Nature of residuals	Jarque-Bera	2.0299	0.362
Autocorrelation	Breusch-Godfrey	9.713	0.0933
Homogeneity of variance	Breusch-Pagan-Godfrey	0.265	0.976

By reading the results in Table (5), it is clear that the residuals are distributed generally according to the Jarque-Bera test, where ($p = 0.362 > 0.05$), and the absence of autocorrelation of errors Breusch-Godfrey, where ($p = 0.0933 > 0.05$), and the stability of homogeneity Breusch-Pagan-Godfrey, where ($p = 0.976 > 0.05$).

3.5 Model stability test

The cumulative sum of recurring residuals test CUMSUM was used to ensure that the variables under study and the model are free of structural changes.
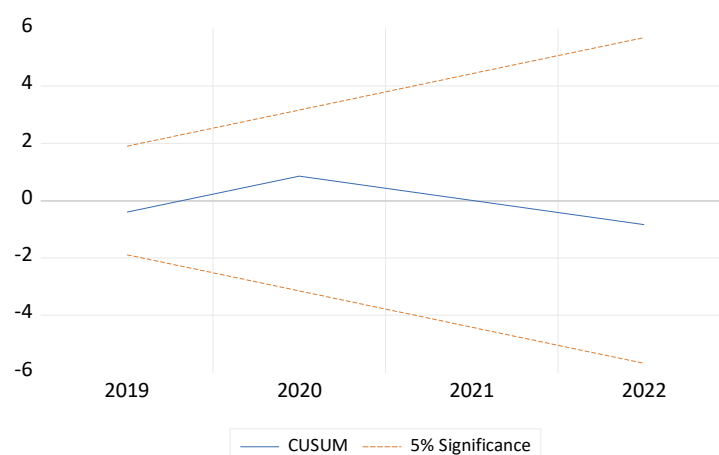
Table 7: CUMSUM test results for the study model

From Figure 7. We notice that the cumulative sum test for the recurring residuals expresses a linear meaning within the limits of the critical region, indicating the presence of a type of stability in the study model at a significance level of 5%.

4. CONCLUSION

The dollar's exchange rate against the dinars ranged between 1166 and 2002.405 during the study period. The unemployment rate in Iraq ranged between 7.965% and 16.173% during the 2000-2022—long-term relationship. The results extracted from the ARDL models showed strong long-term relationships between the variables of ES in Iraq on total oil revenues, public debt, and the unemployment rate. The results indicate that changes in the variables of ES permanently affect the dependent variables, indicating joint integration between them. The impact of oil prices the impact of the economic shock of oil prices on economic variables in Iraq is considered varied, as some models showed a significant negative impact in the short term. In contrast, other models showed no significant impact in the long term. This reflects the Iraqi economy's challenges in adapting to oil market fluctuations resulting from ES to oil prices.

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