The effect of oil price changes on some macroeconomic variables in Iraq

Ali Hameed Shati qariri

Department of Economics, Isfahan (Khorasgan) Branch,
Islamic Azad University, Isfahan, Iran

Hossein Sharifi Renani

Isfahan (Khorasgan) Branch, Islamic Azad University,
Isfahan, Iran

Sara Ghobadi

Isfahan (Khorasgan) Branch, Islamic Azad University,
Isfahan, Iran

Munaf Marza Neama

Al-Qadisiyah University

Corresponding Author : Hossein Sharifi Renani

***Abstract* :** This research aims to investigate the oil price changes and their effects on the macroeconomic variables in Iraq for the period between 1990-2021. For this purpose, in this study, a Vector Error Correction model (VEC) is used to investigate the impact of oil price changes on macroeconomic variables including GDP, money supply, exchange rate, government size, and non-oil trade. Then, using instantaneous reaction functions, the reaction of macroeconomic variables in the event of a shock in the cost of crude oil has been studied. The findings of the research showed that although factors influencing oil prices have fluctuated the macroeconomic variables investigated in the research in the short term, they have ultimately led to the improvement of the economic situation of Iraq during the period under investigation**.**

Keywords: oil price changes, macroeconomic variables, vector error correction model (VEC), Iraq

1. Introduction

According to the available research, governments (such as central banks), businesses, and individuals all have a vested interest in accurately forecasting oil prices and their subsequent , consequences for the Real economy. It affects a wide range of facets of the economy. Indeed, the research suggests that shifts in oil prices may have far-reaching consequences for economic growth, the international trade balance, and inflation expectations, as well as offering insights into the predictability of these and other economic variables and feelings. ([1]Digniacias & Filis, 2023). For example, Baumeister and ([2]Kilian 2014) Since The fluctuating price of imported crude oil is a major factor in the health of the economy real-time oil price forecasts are frequently used by central banks around the world economic forecasts and policy choices by international bodies such as the International Monetary Fund. Companies consumers, and governments at all levels may benefit from accurate, up-to-the-moment predictions of oil prices, as noted by Baumeister et al. (2014). ([3]Kertelli et al., 2023).

Oil price changes are linked to the stability of the macroeconomy by international organizations, central banks, and the global media. For instance, the International Monetary Fund (2022) agrees that a considerable drop in oil prices was to blame for the disinflationary pressures seen inproducers.

the early 2010s, especially in oil-importing nations. Low interest rates and resulting disinflationary pressures make it difficult for central banks to stimulate growth in countries that are particularly susceptible to shocks. It also implies that nations dependent on oil exports may have slower economic development during extended periods of low oil prices. The European Central Bank provides evidence of how oil price decreases have affected the fiscal policy stance of oil producers. (2021). Oil prices are now far below financially viable levels for several oil Considering the mentioned factors, Clearly, oil price variations will have far-reaching repercussions on a wide range of macroeconomic indicators. Among the supply-side shocks, oil price volatility has been one of the most influential

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[1] Stavros Degiannakis a d, George Filis

[2] Baumeister and Kilian

[3] Rennan Kertlly de Medeiros a b, Edilean Kleber da Silva Bejarano Aragón b, Cássio da Nóbrega Besarria

factors shaping the global economy since the 1970s. The increase in oil prices has caused economic recessions, elevated unemployment rates, inflation, and exacerbated budgetary challenges for many countries. Factors such as the share of oil in national income, the level of dependence on imported oil, the ability of consuming countries to reduce their oil consumption, and their approach towards alternative energy sources all play a direct role in the impact of oil price increases and the vulnerability of oil-exporting nations.

In this context, Iraq, being an oil-exporting country, can be affected by changes in oil prices, leading to the influence of its macroeconomic variables, which necessitates exploring the relationships between these variables. Therefore, the present research focuses on investigating the effects of fluctuating oil prices on key macroeconomic indicators in Iraq from 1990 to 2021.

This article begins by presenting the theoretical foundations related to the relationship between oil price changes and macroeconomic variables. It then reviews the empirical research background. Following the introduction of the model and the definition of the research variables, the collected data will be analyzed. Finally, the findings will be summarized, and recommendations will be provided.

Research problem: The significant deterioration in crude oil prices on the global market in recent times has raised concerns about oil economies, especially rentier ones, and their approaching state of collapse and instability because they linked the fate of their economies to the crude oil supplier, which made them pay a high price for those policies. The fears were more acute in the economies that It has relied on oil as the sole resource for its annual budgets, and a major source of its gross domestic product.

Research hypothesis: The research is based on the hypothesis that there is an impact of oil price changes on some macroeconomic variables in Iraq

Research objectives: There are several objectives, the most important of which is:

1- Identify the importance of crude oil in the Iraqi economy.
2- There is an impact of crude oil on macroeconomic variables.

2. Theoretical foundations and research background

Several empirical studies have been published that examine the effect of oil price fluctuations on total economic activity. There are essentially three categories into which these investigations fall. The first body of studies consists of a collection of publications that show how changes in oil prices influence a country's GDP via several avenues. ([4]Kilian & Vigfusson, 2011; [5]Rahman & Serletis, 2012; [6]Cross & Ngoin, 2017).

According to the second kind of study, rising oil prices cause inflationary pressures to be applied to the economy through the supply channel, which leads to increased prices for final products and outputs. Therefore, the purpose of this study is to investigate how oil price shocks affect inflation in different nations ([7]Alvarez et al., 2011; [8]Walcharsel & Wohlrabe, 2013; [9]Abu Nouri et al., 2014; [10]Sultan, 2020).

The third type of research focuses on how an increase in crude oil prices can raise exports of petroleum products (final goods) in an oil-exporting country (an oil-importing country) and subsequently improve (weaken) the country's trade balance, ultimately impacting the domestic currency's strength ([11]Algert et al., 2014; [12]Rafiq et al., 2016; [13]Beck et al., 2019; [14]Muso & Waka, 2020).

In general, an increase in oil prices, and consequently, an increase in oil revenues, can influence the gross domestic product (GDP) through both demand-side effects (increased total demand) and supply-side effects (increased overall investment, including government and private investments, imports of capital goods, and new technologies, etc.). An increase in oil revenues, as a primary source of foreign reserves, promotes monetary base growth, leading to increased money supply through the multiplier effect (Farzanegan et al., 2019). Moreover, if the demand for money

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[4] Kilian and Vigfusson

[5] Rahman and Serletis

[6] Cross and Nguyen

[7] Alvarez et al.

[8] Valcarcel and Wohar

[9] Abounoori et al.

[10] Sultan et al.

[11] Allegret et al

[12] Rafiq et al.

[13] Baek et al

[14] Musau and Veka

rises due to the growth in national income from oil revenues, the central bank is compelled to increase the money supply to stabilize interest rates and prevent the demand-side effects on interest rates (Faraji, 2014).

In the event of a decline in oil revenues, the budget deficit resulting from the government's budgetary commitments leads to borrowing from the central bank, causing an increase in the monetary base and consequently, the volume of liquidity. Therefore, both in situations of increased oil revenues through higher foreign assets and in situations of decreased oil revenues through increased government debt, the monetary base expands, leading to increased liquidity. Hence, fluctuations in oil revenues consistently impact the money supply.

Regarding the fluctuations in oil prices and government construction costs, it can be said that the majority share of government revenues comes from oil revenues, which serve as the primary source of funding for the government's current construction expenditures. Therefore, a rise in oil prices and associated income, leads to an increase in government construction expenses.

Regarding the impact of oil price fluctuations on the inflation variable, it can be argued that an increase in government budget or expenditures, both current and construction, due to higher prices and consequently oil revenues, is accompanied by credit and banking facilities expansion, leading to an overall increase in demand (Rahmani, 2014). On the other hand, due to the inflexibility of the overall supply ceiling resulting from technical and infrastructural limitations, an imbalance and a wide gap between supply and demand occur, leading to inflationary pressures ([15]Simz, 2017).

In the medium term, an increase in investment demand, motivated by responding to the demand pressure for goods and services, increases production factors' demand and costs, leading to cost pressure-induced inflation, which adds to the inflation caused by demand pressure and raises the general price level.

Moreover, an increase in foreign exchange revenues from crude oil sales, as this income is not derived from the production process of domestic goods and services but is solely at the disposal of the government, leads to an increase in the monetary base and consequently, the volume of liquidity, shifting the overall demand curve upward and raising the general price level.

Furthermore, an increase in foreign exchange revenues creates the grounds for an increase in imports of raw materials and intermediaries, as imports are directly related to national income and, in turn, increase production, albeit with a time lag, but a more rapid increase in demand relative to supply and production leads to inflation.

In the context of decreasing foreign exchange revenues, the import of raw materials and intermediaries is limited, causing a leftward shift in the overall supply curve and a decrease in production, which raises the general price level.

On the other hand, due to the government's inflexible expenses, resulting from budgetary commitments, budget deficits arise, leading to borrowing from the central bank, which leads to the expansion of the monetary base and an increase in liquidity. This process causes a rightward shift in the overall demand curve, leading to inflation.

Thus, in both scenarios of increasing (decreasing) revenues from crude oil sales, and increasing (decreasing) foreign exchange revenues, inflation emerges. However, in both cases, inflation is monetarily induced but rooted in different causes (Sadeghi & Bahboudi, 2021).

Hosseinzadeh and Shamsi Mohammadi (2022) have conducted a study examining the impact of oil shocks on macroeconomic variables in Iran. The purpose of this article is to investigate the effect of oil shocks on macroeconomic variables in Iran using the VAR model during the period 1384-1399. The research uses a recursive regression model to analyze how changes in oil prices affect GDP, money supply, the inflation rate, and government spending in Iran, the world's fourth-largest oil exporter. The data show that oil price shocks have a negative impact on Iran's GDP, and that this impact grows with time. Higher foreign currency income from oil sales allow for fast inflation of prices, wages, and imports in these nations as oil prices rise.

The effects of oil price variations on Iran's economic development via numerous institutional, monetary, and financial factors have also been investigated by Khavari et al. (2021). Using a Structural Vector Autoregression (SVAR) model, they investigate the impact of changes in oil prices on Iran's economic development via a number of institutional, monetary, and financial factors between the years 1360 and 1396. The findings demonstrate that the exogenous shock from oil price volatility constrains growth in output. Since the democracy index is directly correlated with production growth, oil price swings have a negative effect on the index and ultimately on output. Government spending has the same effect, slowing economic growth. However, the increase in liquidity shows a good response to swings in the world price of crude oil, and it has beneficial impacts for production growth in the near term.

Motavaseli and Fooladi (2020) have examined the effects of the global oil price increase on Iran's Gross Domestic Product (GDP) and employment using a general equilibrium model. The coefficient of correlation in this study indicates a significant correlation between the growth of oil revenues and government expenditures, GDP, net exports,

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[15] Sims

and imports. However, the statistical correlation between the growth of oil revenues and private consumption and investment is not significant.

Using yearly data from 1960–2003, impulse response functions, and forecast error variance decomposition, Mehrara and Eskooi (2020) analyzed the dynamic impacts of oil shocks on macroeconomic variables in four countries: Iran, Saudi Arabia, Kuwait, and Indonesia. They demonstrated that oil shocks are the primary contributor to GDP changes in Iran and Saudi Arabia, but in Indonesia and Kuwait, oil price uniformity was lower. The right economic systems in Indonesia and Kuwait mean that imports are the primary driver of output changes in both nations. All nations have seen a rise in imports, GDP, and the price index as a result of oil price shocks.

([16]Kartali and colleagues,2023) have investigated how oil price swings affect macroeconomic data. They claim to be investigating the impact of oil price shocks on a variety of macroeconomic variables in the U.S. and Brazil. They created a variable that follows changes in oil prices by studying web comments. The oil price shocks are evaluated both globally and regionally. Data suggests that the US economy is more vulnerable to oil price fluctuations than Brazil's.

([17]Dignikias and Philis,2023) have looked at how varying assumptions about oil prices affect macroeconomic policy. Using conditional projections of five important US macroeconomic variables, they evaluate the economic feasibility of oil price predictions. In addition to the conditional macroeconomic predictions, the frequency-domain mixed-frequency forecasting framework is used to predict oil prices, which are led by the information accessible at high frequencies. Inflation predictions, industrial output, and producer price index estimates are seeing a rise in significance, while oil price forecasts are on the down.

([18]Beek and Yun ,2022) have looked at the effect oil price shocks have on the macroeconomy. When evaluating the connection between oil price changes and macroeconomic activity (growth, inflation, and exchange rates) in a developing country, namely Indonesia, their article stresses clearly the importance of supply and demand shocks in the global oil market. They analyze monthly data from 1998 to 2019 using an SVAR model (structural vector autoregression). The results imply that the kind of shock will determine the time, amount, and even direction of the macroeconomic reaction in Indonesia.

Tugunizda and Keskin (2022) have looked on how oil price shocks affect developing countries' macroeconomic factors. Three regions, each with its own distinct mix of resources, are analyzed to see how oil price shocks affected their underlying macroeconomies. The impact of oil price shocks on the economy as a whole, the current literature on developing countries has been unable to reach a consensus on the role that regional determinants and resource characteristics play. Evidence from this study shows that (1) oil plays a larger role in driving exports in Europe and Central Asia than it does in East Asia and the Pacific, and (2) policymakers in East Asia and the Pacific should worry about the impact of a rise in the real exchange rate after a positive oil shock on competitiveness. Oil price shocks cause substantial changes in consumption and have a lasting negative effect on real GDP, especially in nations with low resource intensity.

([19]Zolfagharo and Nokrich ,2020) have investigated the effects of oil price fluctuations on selected macroeconomic variables in Azerbaijan. They examined the relationship between oil price fluctuations and economic activity in Azerbaijan using vector autoregressive models for the period from 2002 Q1 to 2018 Q4. What they found is as follows: The first is that as the oil price rises, innovation in the oil and gas industry and the rest of the economy slows down. As government subsidies are increased or decreased in response to fluctuations in oil revenue, recessions (expansions) in the oil and gas industry also cause recessions (expansions) in other sectors. Inflation in Azerbaijan is on the rise, and oil price fluctuations are a major factor. There is a higher appreciation compared to the US dollar when monetary policies are tightened. In conclusion, an increase in oil prices has a more negative effect on GDP than on interest rates or currency exchange rates. Inflation increases after either kind of shock; if it falls, it is due to other monetary policies like falling oil prices, and if it rises, it is due to the shock itself.

([20]Bisain,2020) has delved into a study the effects of monthly oil price shocks on the economic growth of four representative countries, divided into two categories. The first category includes Japan and the United States as oil-importing countries, while the second category consists of the United Kingdom and Canada as oil-exporting countries. In this research, oil price shocks are initially calculated using an ARMA-GARCH model on the time series of nominal oil prices for each country separately. Subsequently, the effects of positive and negative oil price shocks on the

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[16] Rennan Kertlly de Medeiros a b, Edilean Kleber da Silva Bejarano Aragón b, Cássio da Nóbrega Besarria

[17] Stavros Degiannakis a d, George Filis

[18] Jungho Baek a, Jee Hee Yoon

[19] Sophio Togonidze a, Evžen Kočenda

[20] Besin

economic growth of the mentioned countries are examined using an autoregressive distributed lag (ARDL) model with interruptions. While previous studies in this area have shown a significant relationship between gross domestic product (GDP) growth and oil price shocks, this paper investigates the asymmetry of this relationship. A noteworthy aspect of this research is the utilization of a composite autoregressive process It factors in quarterly GDP growth and monthly fluctuations in oil prices. Where P signifies the interruptions used for the dependent variable and r denotes the interruptions used for the independent variables, the author adopts the ARDL(P,r) model to illustrate the composite regression process. Positive oil shocks cause recessions and GDP declines in both exporting and importing nations, according to the findings of the model's estimate. However, the effect is less severe in major exporters like Canada and the UK.

([21]Jimenez and Sanchez ,2020), in their article titled 'Oil Price Shocks and Real Output Growth in Some OECD Countries,' have used a VAR model to investigate the effect of oil price fluctuations on real activities in industrialized countries. The data used cover quarterly periods from 1972:3 to 2001:4. The variables in the model include real GDP, real effective exchange rate, real oil price, real wage, inflation, and long-term and short-term interest rates. A rise in oil prices has a negative short-term effect on real GDP in net oil-importing nations everywhere save Japan, and it causes inflation and higher long-term interest rates everywhere but Germany. Increases in oil prices have an almost threefold larger effect on UK GDP growth than decreases in oil prices. Additionally, a decrease in oil prices leads to a decline in exchange rates and an increase in wage rates, as well as a decrease in long-term and short-term interest rates and inflation in the first year. The forecast error variance decomposition (FEVD) shows that oil shocks are a significant and important source of instability in many variables of the model.

Previous research confirms the theoretical validity of the effects of oil price changes on the real economy and macroeconomic variables. However, so far, there has been no research examining this relationship specifically for Iraq. Given that Iraq is an oil-rich and oil-exporting country, and changes in oil prices can have an impact on its macroeconomic variables, investigating the impact of oil price fluctuations on the macroeconomic variables of Iraq becomes a relevant topic. The present study focuses on precisely this issue.

3. Research Methodology

The pattern used in this study is derived from the articles of [22]Chen (2017), [23]Looney (2019), and [24]Anders and Pron (2020). This research aims to examine the impact of oil price changes on macroeconomic variables in Iraq for the period 1990-2021, using a Vector Error Correction Model (VECM). A VAR model, with K endogenous variables and P time, lags for each variable, is represented as follows:

(1)

In which Yt is a vector (K×1) of endogenous variables, which in this study includes the following variables:

LGDP: The logarithm of real Gross Domestic Product at constant prices.

LOILP: Oil price fluctuations. To construct this index, the logarithm of Brent oil prices and the ARCH and GARCH methods have been used.

LMS: The logarithm of the real money supply.

LEXR: The logarithm of the real exchange rate.

LNOTRADE: The logarithm of non-oil trade volume.

LGS: The logarithm of government size, is represented as the logarithm of government expenditures.

At: For i = 1, ..., p, are matrices (K×P) of pattern coefficients, and Ut is a vector (K×1) of disturbance terms.

Additionally, this study employs impulse response functions and forecast error variance decomposition. For estimating long-term relationships and the number of cointegrating vectors, the Johansen method is used.

The data used in this research is in the form of time series data, and the Vector Error Correction Model (VECM) is employed using the EViews software version 12. The data for the research variables are collected from the World Bank WDI database.

4. Data analysis and presentation of research results

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[21] Jimenez and Sanchez

[22] Chen

[23] Loney

[24] Enders and Peron

Using appropriate descriptive statistics, one can precisely describe the characteristics of a set of data. Descriptive statistics are always employed to identify and express the features of information in research. In the following, these statistics will be presented for the main variables used in the study.

Table number (1). Descriptive statistics of the main research variables

Variable	LGDP (USD)	Loilp (USD)	LMS (USD)	LEXR (USD)	LGS (USD)	LNOTRADE (USD)
Mean	1.2E+14	48.74156	4.38E+13	1561.929	4.44E+10	9.07E+13
Median	1.12E+14	44.13	1.74E+13	1453.417	2.92E+10	1.1E+14
Maximum	2.22E+14	111.62	1.4E+14	2002.405	1.03E+11	1.53E+14
Minimum	2.45E+13	15.8	3.16E+12	1166	3.05E+08	9.44E+09
Standard Dev.	5.88E+13	30.44591	4.13E+13	384.9057	4.02E+10	5.02E+13
Skewness	0.17956	0.796573	0.726081	0.196561	0.299953	-1.0191
Kurtosis	-1.12696	-0.49427	-0.92245	-1.95707	-1.75488	-0.46672
Count	32	32	32	32	32	32

Source: research findings

Before estimating the model, it is necessary to test the stationarity of all variables used in the estimations. Because the non-stationarity of variables leads to spurious regression problems. To perform the stationarity test in this study, the Augmented Dickey-Fuller (ADF) test has been utilized, and the results of this test are presented in Table (2).

Table number (2). Examining the importance of variables

Results	Probability	T-statistic	Symbol	Variable
Stationary at level	0.012	-4.20	LGDP	Gross Domestic Product (USD)
Stationary with one difference	0.007	-6.94	Loilp	Brent Crude Oil Price (USD)
Stationary with one difference	0.293	-8.23	LMS	Money Supply (USD)
Stationary with one difference	0.016	-3.43	LEXR	Exchange Rate (USD)
Stationary at level	0.280	-2.13	LGS	Government Expenditure (USD)
Stationary at level	0.149	-5.63	LNOTRADE	Non-Oil Trade Volume (USD)

Source: research findings

The unit root test is one of the most common tests used today to diagnose the stationarity of a time series process. The stationarity results, obtained using the Augmented Dickey-Fuller (ADF) test, indicate that the variables of Gross Domestic Product (GDP), Government Size (LGS), and Non-Oil Trade Volume are stationary at the level, while other research variables exhibit stationarity with one order of differencing.

Based on these results and to avoid spurious regression, the Vector Error Correction Model (VEC) is employed to estimate the research patterns. This model establishes a relationship between short-term fluctuations of variables and their long-run equilibrium values. The estimation results of the VEC model are presented in the following table:

Table (3). The results of VEC model estimation and co-accumulation relationship between research variables

| Variables	Coefficients
LGDP(-1)	1.000000
LOILP(-1)	0.390539
	(0.31247)
	[3.24984]
LMS(-1)	-1.015020
	(0.34645)
	[-2.92977]
LEXR(-1)	-8.220552
	(1.48523)
	[-5.53487]
LGS(-1)	-1.071374
	(0.14710)
	[-7.28337]
LNOTRADE(-1)	0.216993
	(0.03747)
	[5.79174]
C	34.36793

Source: research findings

The results of the VEC model estimation indicate the existence of a long-run cointegrating relationship between the research variables. In summary, the estimated coefficients in the above table show that the variable of changes in oil prices (LOILP) has a positive and significant effect on the dependent variable, namely Gross Domestic Product

(GDP). Specifically, a one percent increase in the real exchange rate variable leads to a 0.39 percent decrease in GDP. Additionally, the variable of real money supply (LMS) has a positive and significant effect on GDP, where a one percent increase in real money supply results in a 0.11 percent increase in GDP. The exchange rate variable (LEXR) also has a positive and significant effect on GDP, with a one percent increase in the exchange rate leading to a 0.28 percent increase in GDP. The variable of government size (LGS) shows a positive and significant effect on GDP, with a one percent increase in government size leading to a 0.71 percent increase in GDP. Furthermore, the non-oil trade volume variable (LNOTRADE) exhibits a positive and significant effect on GDP, with a one percent increase in non-oil trade volume causing a 0.20 percent increase in GDP.

To examine the impact of oil price changes, impulse response functions need to be computed. The results of this test are presented below.:

Response to Cholesky One S.D. (d.f. adjusted) Innovations

Response of LGDP to LOILP
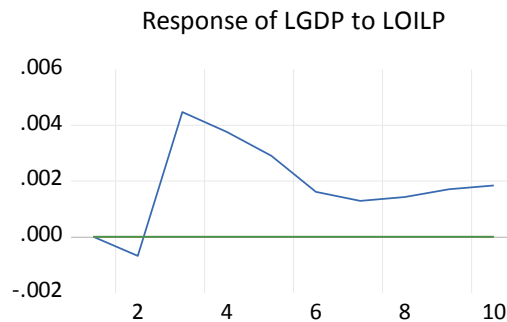
Graph(1). The response of GDP to the introduction of a unit shock to the oil price variable

As observed in the above charts, in the event of an oil price shock, the Gross Domestic Product (GDP) index shows an increasing trend until the third period, followed by a decrease until the sixth period. Subsequently, it reaches an equilibrium trend that is higher than its initial value, persisting until the tenth period. Therefore, it can be inferred and concluded that the oil price shock had a significant impact on Iraq's GDP.

Similarly, as depicted in Chart number (2), in the event of an oil price shock, the real money supply index experiences an initial increase, followed by a decline until the fourth period. Then, it exhibits an upward trend until the seventh period and finally stabilizes at a level higher than its initial value until the tenth period. Based on this evidence, it can be concluded that the oil price shock had significant effects on the real money supply.

Response to Cholesky One S.D. (d.f. adjusted) Innovations
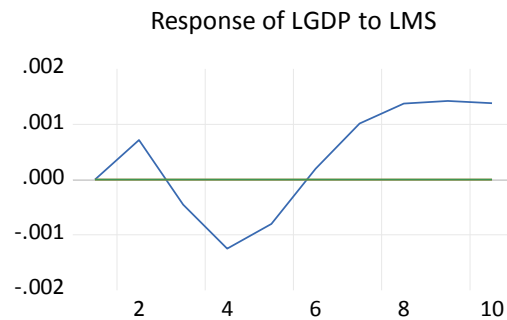

Response of LGDP to LMS

Diagram (2). The reaction of the real money supply to the arrival of a unit shock to the price of oil

Response to Cholesky One S.D. (d.f. adjusted) Innovations
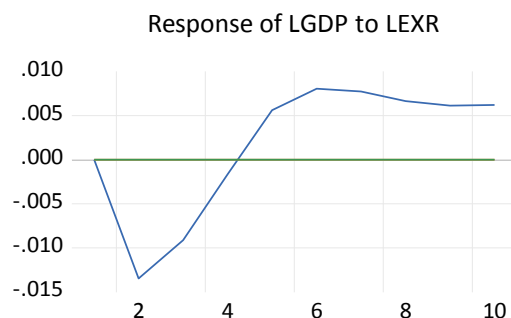
Response of LGDP to LEXR

Diagram (3). The reaction of the real exchange rate to the arrival of a shock unit to the price of oil

As observed in Chart number (3), in the event of an oil price shock, the real exchange rate experiences a downward trend until the second period, followed by an increase until the sixth period. Finally, it stabilizes at a level higher than its initial value until the tenth period. Based on this evidence, it can be concluded that the oil price shock had significant effects on the real exchange rate.

Response to Cholesky One S.D. (d.f. adjusted) Innovations
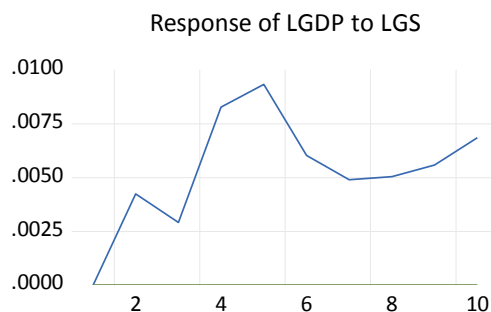
Response of LGDP to LGS

Diagram (4). The reaction of the size of the government to the arrival of a shock unit to the price of oil

As depicted in Chart number (4), in the event of an oil price shock, the government expenditure index, as a measure of government size, experiences an upward trend and finally, in the tenth period, stabilizes at a level higher than its initial value. Based on this evidence, it can be concluded that the oil price shock had significant effects on the government size variable.

Similarly, as shown in Chart (5), the entry of a one-unit shock to the oil price increases the non-oil trade volume variable after a period of decline, and ultimately, in the tenth period, it stabilizes at a level higher than its initial value. Therefore, it can be inferred that the oil price shock had significant effects on the non-oil trade volume in Iraq.

Response to Cholesky One S.D. (d.f. adjusted) Innovations

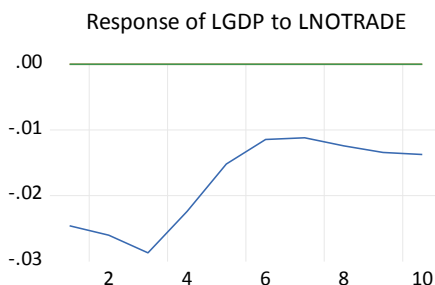### Response of LGDP to LNOTRADE

Diagram (5). The reaction of the trade volume of non-oil products to the arrival of a shock unit to the price of oil

Regarding the variance decomposition, as observed in the first period of the study, 96% of the changes in the gross domestic product (GDP) variable are explained by itself, while 0.50% of these changes are attributed to the oil price changes, 0.54% to the real money supply variable, 95.16% to the real exchange rate variable, 11.51% to the government size variable, and finally, 72.81% to the non-oil trade volume variable. Additionally, it is evident that in

the subsequent periods and ultimately up to the tenth period, the explanatory share of the GDP, real exchange rate, and non-oil trade volume variables decrease, while the explanatory share of the oil price changes, real money supply, and government size variables increases.

Table (5). Analysis of variance test results

LNOTRADE	LGS	LEXR	LMS	LOILP	LGDP	S.E.	Period
0.000000	0.000000	0.000000	0.000000	0.000000	100.0000	0.069344	1
1.728008	0.115111	1.951652	0.005486	0.005086	96.19466	0.096568	2
1.681252	0.137039	1.927294	0.005218	0.148771	96.10042	0.117332	3
1.513077	0.456874	1.547187	0.013205	0.199804	96.26985	0.131641	4
1.289072	0.791910	1.438606	0.014091	0.206738	96.25958	0.144321	5
1.117976	1.036591	1.491266	0.012159	0.186694	96.15531	0.156377	6
0.994889	1.160638	1.502585	0.014156	0.167406	96.16033	0.168105	7
0.911339	1.229183	1.459039	0.018345	0.153516	96.22858	0.179273	8
0.849329	1.281482	1.406687	0.022008	0.145023	96.29547	0.189786	9
0.798189	1.332297	1.367705	0.024668	0.139461	96.33768	0.199675	10

Cholesky Ordering: LGDP LOILP LMS LEXR LGS LNOTRADE

Source: research findings

5. Conclusions and suggestions

Empirical data suggests that commodity price co-movements have been closely linked to rising commodity demand in developing markets during the last several years. Commodity price swings in developing nations may ripple across many industries at once if the underlying markets are volatile. In order to promote the economic growth of these countries, and in particular Iraq, it is essential to examine the impacts of oil price changes on the co-movements of commodity prices in these countries at the industrial level.

This analysis looked at how changes in oil prices affected Iraq's economy overall. According to the findings, the impacts of oil price variations on the analyzed macro variables have been considerable, and although they have caused oscillations in the macroeconomic variables under examination, they have eventually contributed to improvements in these variables in Iraq.

Furthermore, it is suggested that shifts in oil prices and the resulting shifts in oil earnings may impact Iraq's GDP in a number of ways. Growth in gross domestic product (GDP) may be affected by a number of factors, including shifts in demand and government expenditure as well as supply factors including public and private investment, capital goods imports, and technological advancements.

Increased demand for imported raw materials and intermediates might temporarily boost output when oil prices are high. Inflation may arise, though, if consumer demand increases faster than producers can keep up. Conversely, when oil prices are low, countries have less money to spend on imports of raw materials and intermediates, which shifts the whole supply curve to the left and reduces output, driving up prices across the board. Unchangeable government spending plans may also cause deficit expenditure and central bank borrowing, both of which add to the money supply.

The results of the study suggest that Iraq's government should invest the proceeds from oil sales on improving the country's economic infrastructure and increasing domestic output. That way, the country's economy will be more resistant to shocks, such as large swings in oil prices.

Sources and references

توکلیان" et al., مدلسازی اثرات تکانه‌های قیمت نفت و ارتقای تکنولوژی تولید آن بر متغیرهای کلان اقتصادی ایران: رویکرد "DSGE. بررسی مسائل اقتصاد ایران 9.1 (شماره پیاپی: 17) (2022): 55-93.

حسین زاده، هدایت و شمسی محمدی، معروفی (1401) "تاثیر شوک های نفتی بر متغیرهای اقتصاد کلان در ایران"، چهارمین کنفرانس بین المللی سالانه تحولات نوین در مدیریت، اقتصاد و حسابداری.

خاوری، فلاحی، and صالح نیا. "بررسی کانال‌های اثرگذاری تلاطم قیمت نفت بر رشد اقتصادی ایران از طریق برخی متغیرهای نهادی، پولی و مالی." پژوهش‌های رشد و توسعه اقتصادی 11.43 (2021): 31-50.

محمداسماعیل، et al. "تاثیر تکانه قیمت نفت بر متغیرهای اقتصاد کلان در کشورهای حوزه جغرافیایی عضو اپک: رویکرد خودرگرسیون برداری ساختاری پانلی." فصلنامه جغرافیا (برنامه ریزی منطقه ای) (2021).

Sophio Togonidze a, Evžen Kočenda (2022) "Macroeconomic responses of emerging market economies to oil price shocks: An analysis by region and resource profile", Economic Systems, Volume 46, Issue 3, September 2022, .100988

Farid Zulfigarov a, Matthias Neuenkirch (2020) "The impact of oil price changes on selected macroeconomic indicators in Azerbaijan", Economic Systems, Volume 44, Issue 4, December 2020, .100814

Hossein Amiri, Mohammad Sayadi, Siab Mamipour (2021) "Oil Price Shocks and Macroeconomic Outcomes; Fresh Evidences from a scenario-based NK-DSGE analysis for oil-exporting countries", Resources Policy, Volume 74, December 2021, .102262

Jungho Baek a, Jee Hee Yoon (2022) "Do macroeconomic activities respond differently to oil price shocks? New evidence from Indonesia", Economic Analysis and Policy, Volume 76, December 2022, Pages .862-852

Luthfi, A., Senevirathne, C., & KANEKO, S. (2017). The impact of oil price to Indonesian macroeconomics indicators: Pre and Post Asian Crisis. Fuel, 40, .00-50

Peng Chen (2018) "Global oil prices, macroeconomic fundamentals and China'sCommodity sector comovements", Energy Policy, No. 87(2015), PP. 284–294, journal homepage: www.elsevier.com/locate/enpol.

Rennan Kertlly de Medeiros a b, Edilean Kleber da Silva Bejarano Aragón b, Cássio da Nóbrega Besarria (2023) "Effects of oil market sentiment on macroeconomic variables", Resources Policy, Volume 83, June 2023, .103642

Stavros Degiannakis a d, George Filis (2023) "Oil price assumptions for macroeconomic policy", Energy Economics, Volume 117, January 2023, .106425