International Journal of Accounting and Economics Studies, 12 (6) (2025) 666-678

SPC

International Journal of Accounting and Economics Studies

Website: www.sciencepubco.com/index.php/IJAES
https://doi.org/10.14419/qrw48z98
Research paper

Role of Different Channels in Moderating The Impact of Oil Shocks on Iraq's Macroeconomy: An MSH-VAR Approach

Zuhair Mahmoud Kazem *, Zahra Karimi Takanlou, Hossein Asgharpur

Faculty of Economics and Business Administration, University of Tabriz, Tabriz, Iran
**Corresponding author E-mail: Zuheriq83@gmail.com*

Received: September 15, 2025, Accepted: September 27, 2025, Published: October 18, 2025

Abstract

This study examines the effect of oil price shocks on Iraq's macroeconomy through the channels of monetary policy, fiscal policy, and the exchange rate, using the Markov Switching Heteroskedastic Vector Autoregression (MSH-VAR) model. The results indicate that oil price shocks have significant impacts on macroeconomic variables. In the fiscal channel, higher oil prices directly increase the budget deficit and gross domestic product, but in unstable regimes, these effects are short-term and accompanied by stronger inflationary pressures. In the monetary channel, the interest rate has only a limited role in transmitting oil shocks, reflecting the weakness of monetary structures in Iraq's economy. The exchange rate channel also plays a marginal role in transmitting shocks, likely due to the central bank's exchange rate stabilization policies. Impulse response functions confirm that the effects of oil shocks are stronger and more persistent in stable regimes, whereas in unstable regimes, positive effects are more limited and inflationary pressures are stronger. These findings underscore Iraq's significant dependence on oil revenues and the need for coordinated fiscal and monetary policies to mitigate vulnerability to oil price shocks.

Keywords: *Oil Price Volatility; Monetary Policy; Fiscal Policy; Exchange Rate Channel; Macroeconomy; MSH-VAR Model.*

1. Introduction

Oil holds a unique position in the global economy and, beyond being a simple energy commodity, shapes significant aspects of economic processes in various countries. This global importance is particularly evident in oil-exporting economies, where economic dependency on oil resources determines the level of vulnerability of these nations. In highly dependent economies, oil revenues constitute the major share of government income and exports. Saudi Arabia derives over 80% of its total government revenues from oil, while Yemen generates nearly 70% of its government income and 80–90% of its total exports from oil (Amer et al., 2024; Abdel-Latif et al., 2017). Among these, Iraq's dependence on oil is unprecedented even within oil-dependent economies, with multiple indicators showing that the country relies almost entirely on oil resources. Oil exports account for more than 99% of Iraq's total exports—a figure that has consistently remained high across the years. For instance, crude oil exports represented 99.8% of total exports between 2011 and 2015 and have remained at similar levels in recent years. This extreme concentration on oil exports makes Iraq more dependent on oil than any other country in the Middle East and North Africa region (Marza et al., 2018; Ibrahim et al., 2019). Furthermore, oil contributes a significant share to Iraq's overall economic output, with estimates ranging from 35.5% to over 95% of GDP, depending on measurement methods. The crude oil sector alone accounts for more than 60% of the GDP, whereas other economic sectors, such as agriculture, industry, and tourism, collectively contribute less than 30% (Strachenko, 2021; Semenova & Al-Dirawi, 2022; Abd & Attia, 2024).

The macroeconomic consequences of oil price fluctuations in Iraq also reflect the complex interactions between monetary and fiscal policy channels, which exacerbate economic instability across all sectors. Oil price volatility creates spillover effects, transmitting instability from the oil sector to the non-oil economy. As a result, global economic crises are channeled into Iraq's economy through its oil resources. This sectoral transmission occurs because the economy is sensitive to all sectors contributing to GDP, and through the public expenditure channel, the vulnerability of the entire economy to external oil price shocks increases. The interaction between monetary and fiscal policy responses further intensifies macroeconomic complexities, as these policy tools often operate in opposite directions during periods of oil price volatility. Research indicates a direct relationship between crude oil prices in international markets and fiscal sustainability, while an inverse relationship exists between oil prices and the effectiveness of monetary policy in oil-exporting countries. This creates coordination challenges: fiscal policy may need to expand during periods of falling oil prices to support economic activity, while monetary policy must act more restrictively to control inflation or exchange rate pressures (Rasheed, 2023). The transmission of oil price shocks through the exchange rate channel also has significant macroeconomic consequences that extend beyond the foreign exchange market. The exchange rate channel serves as the most important pathway through which oil price shocks influence key economic sectors, particularly industrial output growth. This transmission mechanism shows that exchange rates are primarily driven by oil price shocks, while monetary policy instruments and inflation rates are highly responsive to exchange rate shocks, thereby creating a chain reaction throughout the entire economy (Omolade et al., 2019).

The present research, by employing the novel MSH-VAR approach—which allows modeling of structural changes and different economic regimes—conducts a detailed analysis of the interactions among monetary policy, fiscal policy, and the exchange rate channel in transmitting oil shocks. The significance of this study is highlighted in several respects: First, despite the extensive literature on oil shocks (Hamilton, 1983; Mork, 1989; Rasheed, 2023), the policy inconsistencies between monetary and fiscal instruments, as well as the role of the exchange rate channel, have been less systematically examined in oil-based economies. This study, utilizing the MSH-VAR model, which can analyze asymmetric and regime-dependent effects, provides a deeper understanding of the transmission mechanisms of oil shocks. Second, Iraq's geopolitical position in the global oil market and its impacts on the Middle East and North Africa region make the country a key case study, with results that can be instructive for policymaking in other oil-based economies. Third, the severe fluctuations in oil prices over recent decades and their consequences for government budgets and economic growth underscore the need for a precise understanding of shock transmission mechanisms to design effective policies. Previous studies, such as Maarouf (2016) and Faraj (2020), have shown that oil price declines lead to budgetary constraints and economic recession, but this research, with a focus on asymmetric and regime-based effects, provides a more comprehensive picture of these dynamics. Therefore, this study not only fills theoretical and empirical gaps in the analysis of monetary and fiscal policy interactions in the face of oil shocks but also, by presenting evidence based on quarterly data from 2004 to 2022, provides a scientific foundation for policymaking aimed at reducing Iraq's economic vulnerability and strengthening macroeconomic stability.

2. Theoretical Literature

The theoretical foundations of the present study are classified into four main categories:

a) The transmission mechanism of oil price fluctuations through the fiscal policy channel to the macroeconomy

The fiscal transmission mechanism is one of the main pathways through which oil price fluctuations affect macroeconomic variables. In oil-dependent economies, changes in oil prices directly affect the government budget, as a major portion of public finances comes from oil revenues. These revenues constitute the primary basis for public expenditures such as social security, employment, and healthcare services. When oil prices rise, governments experience fiscal surpluses due to increased oil and tax revenues, and by expanding their expenditures, they reinforce GDP growth. Conversely, a decline in oil prices reduces government revenues, leading to cuts in public spending, decreased aggregate demand, and lower levels of economic output. Various studies have shown that this mechanism has different effects on the government's fiscal balance in the short and long term. In the short term, oil price volatility reduces the primary fiscal balance, while in the long term, sustained changes in oil prices can improve fiscal balances (Raouf, 2021). During oil booms, governments typically adopt expansionary fiscal policies and, relying on oil revenues, implement broad social programs and subsidies (Drioche et al., 2020). However, oil price instability may lead to unsustainable fiscal behavior and budget deficits, especially when actual oil revenues fall short of projections (Danesh Jafari et al., 2021). Empirical evidence confirms the importance of the fiscal channel in transmitting oil shocks. For example, in Nigeria, oil price fluctuations affect real GDP through government expenditures, and changes in oil prices impact macroeconomic variables both in the short and long run (Okoli et al., 2018). Furthermore, fiscal policy serves as the main channel for transmitting oil shocks to inflation (Zulfigarov & Neuenkirch, 2020). In Saudi Arabia, symmetric oil price shocks first influence government revenues and then, through public expenditures, strengthen the real exchange rate (Algaeed, 2020). Overall, the fiscal channel is one of the key pathways through which oil price volatility is transmitted to the macroeconomy. It operates through changes in government revenues and expenditures, subsidy adjustments, shifts in public spending, and variations in fiscal balances. The intensity and direction of this channel's effects depend on the economic structure, financial institutions, and policy frameworks of each country. A precise understanding of this mechanism is crucial for designing effective policies to mitigate oil shocks and for analyzing the macroeconomic implications of energy price volatility.

b) The transmission mechanism of oil price fluctuations through the monetary policy channel to the macroeconomy

Monetary policy channels form the primary mechanism by which oil price fluctuations are transmitted to Iraq's macroeconomy, with the interest rate acting as the key policy instrument. The relationship between oil prices and interest rates mainly operates through inflation dynamics, where oil acts as a major cost-push factor in production sectors. An increase in oil prices directly raises production costs in many industries, as crude oil is used as an input in the production of numerous goods. This leads to what economists call "input-type inflation," which spreads across the economy (Li, 2019). Central banks respond to oil-induced inflation through their main monetary policy tool: the interest rate. When oil prices rise and generate inflationary pressures, monetary authorities typically raise interest rates to counteract price increases and mitigate the risk of overheating the economy (Mokni et al., 2021; Cakan et al., 2021; Aladwani, 2024). This policy response exerts upward pressure on interest rates, which, by increasing borrowing costs for firms and reducing expected cash flows, is transmitted to the real economy (Riaz et al., 2020). Moreover, the nature of the oil shock influences the intensity and certainty of monetary policy responses. Central banks facing oil price increases driven by demand have clearer policy choices and unambiguously raise interest rates. However, when confronted with supply-driven oil shocks, they face a complex trade-off between controlling inflation and maintaining output stability (Yoshizaki & Hamori, 2013). This inflation–interest rate linkage establishes a systematic channel through which oil market fluctuations spill over into broader economic conditions, since higher interest rates raise discount rates used in investment decisions and make borrowing more expensive for businesses and consumers (Shaheen & Almaktoom, 2023).

c) The transmission mechanism of oil price fluctuations through the exchange rate channel to the macroeconomy

The scientific literature identifies three distinct transmission channels through which oil price fluctuations affect the exchange rate, before exerting broader impacts on the macroeconomy. The terms of trade channel links oil prices to domestic price levels, which ultimately influence real exchange rates. This mechanism differentiates between tradable and non-tradable sectors: an increase in oil prices leads to a real appreciation of the currency if the non-tradable sector is more dependent on crude oil than the tradable sector, while a real depreciation occurs when the tradable sector is more oil-intensive (Sanusi, 2022). The wealth effect channel explains how changes in oil prices result in wealth transfers between oil-importing and oil-exporting countries. When oil prices rise, the wealth transfer from importing to exporting countries intensifies, leading to real exchange rate appreciation in oil exporters and depreciation in importers. This occurs through current account imbalances and portfolio reallocation effects (Ji et al., 2020). The portfolio reallocation channel focuses on how oil price fluctuations affect international investment flows and currency preferences, particularly concerning dollar-denominated assets held by oil exporters (Sanusi, 2020). These transmission mechanisms operate from both supply and demand perspectives: on the supply side, higher oil prices raise production costs for non-tradable goods, while on the demand side, exchange rate fluctuations can influence consumer spending and production decisions in export-oriented economies. Collectively, these channels transmit oil price volatility into various economic activities, including stock markets, labor markets, economic growth, and investment decisions (Al Rasasi, 2018; Bangura et al., 2021).

d) Asymmetric and regime-dependent effects of oil shocks

The relationship between oil and economic performance exhibits clear asymmetries across different economic regimes. In regimes with high oil price volatility, trade balance components respond far more strongly to oil price shocks compared to periods of lower volatility. Specifically, oil price increases weaken both the aggregate trade balance and the intermediate trade balance, while simultaneously improving the consumption trade balance (Taşseven & Poturoğlu, 2022). Industrial production also demonstrates regime-dependent relationships with oil. For example, higher industrial output may reduce the importance of domestic oil in bearish market regimes, as producers turn to oil imports to meet demand (Temkeng & Fofack, 2021). Crisis periods significantly amplify the economic effects of oil compared to normal economic conditions. In crisis regimes—including events such as the subprime mortgage crisis and the COVID-19 pandemic—the impact of global liquidity on oil markets is nearly double in developed economies and three times stronger in developing economies relative to normal periods (Zhou & Zhang, 2022). Furthermore, the nature of oil's economic effects is highly sector- and country-specific, depending on economic structures and trade positions. Oil price shocks exert greater impacts on net oil-importing countries compared to oil exporters, and oil-intensive industries are more sensitive to oil price fluctuations (Sim & Sek, 2019).

2.1. Research background

The empirical literature shows that oil price shocks have broad and multidimensional impacts on macroeconomic variables, and the role of monetary and fiscal policies in transmitting these effects is of special importance. Early studies by Hamilton (1983) demonstrated that the significant increase in oil prices after World War II was the main cause of many U.S. economic recessions, and monetary policy responses could alter the intensity of these effects. These foundational investigations established the framework for analyzing oil shocks and macroeconomic consequences and directed subsequent research toward examining the transmission mechanisms of monetary and fiscal policies. Studies indicate that in countries such as Iraq, the heavy dependence on oil revenues causes oil price fluctuations to have an immediate and direct impact on the government budget and financial capacity to cover public expenditures (Rasheed, 2023). Country-specific studies, including those on Iraq, show that the direct fiscal channel is the main route through which oil impacts macroeconomic variables. Maarouf (2016) and Faraj (2020) demonstrated that a decline in oil prices leads to budget constraints and reduced public spending, and these effects can result in economic recession and an increase in public debt. Complementary economic and fiscal channels have also gained importance; higher oil prices lead to increased production costs and inflationary pressures, which central banks may respond to by raising interest rates, and these indirect effects are transmitted to economic growth and investment through monetary policy (Olayungbo & Umechukwu, 2022). Moreover, oil price fluctuations affect macroeconomic indicators through impacts on exchange rates, financial markets, and investment uncertainty (Bouazizi et al., 2022; Yokuş, 2024). Numerous studies support the notion that the terms-of-trade channel plays a significant role in explaining exchange rate responses to oil price changes (Al-Rasasi, 2018). For oil-exporting countries, studies consistently reveal positive relationships between oil prices and currency value. Jahan-Parvar & Mohammadi (2008) show that rising oil prices caused a depreciation of the U.S. dollar against the currencies of 14 oil-exporting countries.

Studies agree that negative oil shocks (such as the 2020-2023 price drop) reduce oil revenues by up to 26%, leading to budget deficits of 4-5% of GDP in countries such as Nigeria and Saudi Arabia. In contrast, positive shocks (such as the 2024 price spike) increase government spending but exacerbate the "Dutch disease," resulting in a contraction of the non-oil sector by 1-2%. DSGE models in Okorie and Lin (2024) suggest that the pandemic, combined with the oil shock, led to a 3.4% economic contraction in emerging oil economies, accompanied by a 5% increase in greenhouse gas emissions, underscoring the connection between fiscal sustainability and environmental sustainability.

Furthermore, studies highlight the procyclical nature of fiscal policy, with spending rising during periods of economic growth (by 2.3%, as in Arezki et al. (2025)), thereby increasing long-term debt. In Oman, the oil shock accounts for 46% of output volatility; however, the government utilizes sovereign wealth funds to mitigate its impact, resulting in a 15-20% improvement in sustainability. The OBR (2024) report warns that reliance on fossil fuels exposes budgets to trade shocks, with costs up to 1.5% of output in climate scenarios. Combining these findings suggests that automatic spending rules (fiscal rules) and sovereign wealth funds (SWFs) reduce volatility by 20-30%, as in OPEC+. Long-term fiscal sustainability: In Russia, Sohag et al. (2023) found that shocks increase fiscal pressure by 0.8%, posing a threat to monetary stability. Studies recommend economic diversification to reduce oil dependence to less than 50% of revenue, with countercyclical fiscal stimulus that reduces debt by 1.2%. The MMQR model in Apergis (2024) indicates that responses are asymmetric, with negative shocks being more damaging in economies with large government sizes.

One of the most significant developments in the oil-macroeconomy literature is the attention to asymmetric responses to oil shocks. Studies have shown that declines in oil prices have less positive effects on economic activity than predicted by linear models, while increases in oil prices generate considerable negative effects. This asymmetric framework originated with the work of Mork (1989), who demonstrated that oil shocks lead to costly reallocations of resources, which offset each other in the case of falling prices but are amplified in the case of rising prices (Guney, 2013). Recent evidence confirms that oil price fluctuations predominantly hurt economic growth, exerting significant nonlinear and asymmetric effects on growth volatility (Maheu et al., 2019; Demirer et al., 2020; Jiang et al., 2021).

Empirical evidence suggests that oil price shocks have multidimensional and complex consequences for the macroeconomy, and the role of monetary and fiscal policies in mitigating these effects is crucial. In oil-dependent economies, such as Iraq, the direct fiscal channel through oil revenues is the primary route for transmitting shocks to government budgets and public spending. Meanwhile, complementary economic and fiscal channels, including cost-push and inflationary pressures, as well as monetary policy responses, have significant indirect impacts on economic growth and investment. Moreover, the exchange rate channel also plays a crucial role in transmitting oil shocks through changes in currency value and their impact on trade and investment. Recent studies indicate that macroeconomic responses to oil price changes are asymmetric and nonlinear. Specifically, decreases in oil prices have limited positive effects, while increases in oil prices generate significant negative effects. Furthermore, oil price volatility predominantly hurts economic growth. Therefore, a comprehensive analysis of the effects of oil on the macroeconomy requires simultaneous consideration of fiscal, monetary, and exchange rate channels as well as asymmetric responses. Within this context, the present study focuses on the role of monetary and fiscal policies, as well as the exchange rate channel, in transmitting oil price fluctuations to Iraq's macroeconomy. It employs the MSH-VAR approach to examine the complex and asymmetric mechanisms of these effects. This approach enables the analysis of the interactions between oil shocks, monetary and fiscal policy responses, the exchange rate, and their consequences for macroeconomic variables, while revealing dynamic differences during oil price upturns and downturns. The study's results can clarify the direct and indirect pathways of oil shock transmission, providing a scientific basis for designing effective fiscal, monetary, and exchange rate policies in Iraq's oil-dependent economy.

3. Research Methodology

3.1. Data and model specification

This study aims to examine the impact of oil price fluctuations on the fiscal position of the government and the banking system in Iraq, utilizing quarterly data from 1Q2004 to 4Q2022. The analytical framework of the research is based on the MSH-VAR model, which allows for the examination of multivariate, nonlinear, and regime-dependent relationships among variables. The main variable in this study is oil price (OP[1]), which acts as the primary source of external shocks in Iraq's economy. Oil price is defined based on quarterly values of global crude oil prices (in U.S. dollars). Budget deficit (BG[2]) represents the fiscal channel of oil shock transmission to macroeconomic variables. Real interest rate (IR[3]), as the main instrument of monetary policy, is incorporated into the model by the Central Bank of Iraq. The real interest rate is calculated by subtracting the inflation rate from the nominal interest rate to adjust for inflationary effects. The official exchange rate (ER) also represents the exchange rate channel. Real GDP and inflation rate (INF[4]) are considered macroeconomic variables to investigate the impact of oil price fluctuations through different channels on these variables. Data on budget deficit, interest rate, exchange rate, inflation, and real GDP are obtained from official sources of the Central Bank of Iraq, the Ministry of Planning, and the Central Organization for Statistics and Information Technology of Iraq.

3.2. Markov-switching vector autoregressive models (MS-VAR)

Markov-switching vector autoregressive (MS-VAR) models represent a significant advancement in the analysis of multivariate time series, as they are designed to capture complex and heterogeneous relationships among variables. The MS-VAR framework is developed as a multivariate generalization of the univariate Markov-switching autoregressive model established by Hamilton (1989), with contributions by Krolzig (1997). The key innovation of MS-VAR models lies in departing from the assumption of parameter constancy in traditional linear VAR models. Instead of assuming parameters remain fixed over time, these models allow intercepts, autoregressive coefficients, and error terms to switch across regimes, governed by a hidden Markov process (Nain & Kamaiah, 2020). This regime-switching mechanism enables the identification of structural breaks and nonlinear dynamics in economic and financial data (Li et al., 2022).
For K endogenous variables X_t, the MS-VAR model can be expressed as in Equation (1) (Nain & Kamaiah, 2020):

$$X_t = \begin{cases} \alpha_1 + \beta_{11}X_{t-1} + \cdots + \beta_{p1}X_{t-p} + A_1 v_t \text{ if } s_t = 1 \\ \vdots \\ \alpha_m + \beta_{1m}X_{t-1} + \cdots + \beta_{pm}X_{t-p} + A_m v_t \text{ if } s_t = m \end{cases} \tag{1}$$

$$v_t \sim N(0; I_K)$$

where the variables in the vector X_t are explained by the intercepts α_i, autoregressive terms of order p, and residuals $A_i v_t$. In this general framework, some or all parameters may be allowed to switch across m different regimes. Moreover, v_t is a K-dimensional vector of standard residuals with a normal distribution and zero mean. The variance of these standard residuals is normalized to one. However, the vector v_t is pre-multiplied by the regime-dependent matrix A_i. Thus, the variance-covariance matrix of the residuals $A_i v_t$ is also regime-dependent and is expressed as Σ_i:

$$\Sigma_i = E\left(A_i v_t v_t^{'} A_i^{'}\right) = A_{AI} E\left(v_t v_t^{'}\right) A_i^{'} = A_i I_K A_i^{'} = A_i A_i^{'} \tag{2}$$

The regime variable s_t is unobservable, independent of past values of X, and conditional on s_{t-1}, is assumed to follow a hidden Markov process such that:

$$\Pr(s_t = j | s_{t-1} = i) = p_{ij} \tag{3}$$

This relationship holds for all time periods t and all regimes i,j=1,2,…,m. For m regimes, s_t follows a Markov process with m states, whose transition probability matrix is as follows:

$$P = \begin{bmatrix} p_{11}\, p_{12} & \cdots & p_{1m} \\ \vdots & \ddots & \vdots \\ p_{m1}\, p_{m2} & \cdots & p_{mm} \end{bmatrix} \tag{4}$$

Where p_{ij} denotes the probability that the economy will be in regime j at time t, given that it was in regime i at time t−1, with $i,j \in \{1,2,\ldots,m\}$.
The MS-VAR model specified in the equations above is a general framework. In this study, the MSH-VAR model is employed, which is a specific type within the broad family of Markov-switching vector autoregressive models. In this version, the intercepts and VAR slope coefficients remain constant over time, but the error covariance matrix varies across regimes. This categorization is based on the notation system introduced by Krolzig (1997), which distinguishes MSH models from other types such as MSIH (where intercept vectors also vary) and MSIAH (where intercepts, VAR coefficients, and error covariance matrices all vary across regimes) (Lütkepohl & Netšunajev, 2018). The development of Markov-heteroskedastic VAR models began with the foundational work of Lanne et al. (2010) and has since been extensively expanded in subsequent research. A key feature of MSH models is their ability to achieve parameter identification through variance heteroskedasticity. This identification mechanism allows researchers to test structural restrictions through variance homogeneity hypotheses, typically implemented by constraining conditional variances to unity across all regimes.

[1]) Oil Price
[2]) Budget
[3]) Interest Rate
)[4] Unemloyment Rate

4. Results of Model Estimation

4-1 Unit root test

To examine the existence of unit roots in the time series, the HEGY[5] (1990) test was employed. Unlike traditional unit root tests such as the Augmented Dickey-Fuller (ADF), which only test for non-seasonal unit roots, the HEGY test distinguishes time-series behavior across seasonal and non-seasonal frequencies. This feature is particularly important for seasonal data, which may exhibit periodic patterns and seasonal unit roots.

The initial HEGY test results, reported in Table 1, indicate that all variables are non-stationary at the non-seasonal frequency (zero frequency), since p-values are greater than the 0.05 significance level. In contrast, at seasonal and semi-seasonal frequencies, all variables are stationary. Given the non-stationarity at the non-seasonal frequency, the first non-seasonal difference was applied to all variables. After differencing, the HEGY test was re-applied, and the results confirmed that all variables are stationary at all three frequencies (non-seasonal, seasonal, and semi-annual). It should be noted that because the first non-seasonal differencing was applied, the data for 1Q2004 were lost. Therefore, subsequent results are based on seasonal data from 2Q2004 to 4Q2022.

Table 1: Results of the HEGY Unit Root Test

Variable	Non-seasonal frequency	Seasonal frequency	Semi-seasonal frequency	Variable	Non-seasonal frequency	Seasonal frequency	Semi-seasonal frequency
LnOP	-0.397 (0.692)	38.416 (0.000)	-4.912 (0.000)	DLnOP	-3.563 (0.000)	32.493 (0.000)	-4.595 (0.000)
LnBG	-0.156 (0.877)	24.084 (0.000)	-4.303 (0.000)	DLnBG	-4.928 (0.000)	16.752 (0.000)	-3.889 (0.000)
LnIR	-0.733 (0.467)	31.096 (0.000)	-5.003 (0.000)	DLnIR	-3.787 (0.000)	29.711 (0.000)	-4.591 (0.000)
LnER	-0.2824 (0.779)	13.324 (0.000)	-3.481 (0.001)	DLnER	-2.263 (0.028)	13.543 (0.000)	-3.516 (0.000)
LnINF	-1.5204 (0.1333)	8.3817 (0.0012)	-2.4374 (0.0176)	DLnINF	-3.3600 (0.0013)	8.4088 (0.0002)	-2.4390 (0.0175)
LnGDP	-1.245 (0.217)	38.870 (0.000)	-4.954 (0.000)	DLnGDP	-2.467 (0.016)	21.496 (0.000)	-4.570 (0.000)

Source: Research findings.

4.2. Lag length and optimal number of regimes

The first step in estimating Markov-switching heteroskedastic VAR (MSH-VAR[6]) models is determining the appropriate lag length and selecting the optimal number of regimes. For this purpose, this study employs various information criteria, including the log-likelihood (LL), likelihood ratio (LR) test, final prediction error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn (HQ), and Schwarz Criterion (SC). The lag selection test results in Table 2 show that, in the fiscal and monetary channels, all three criteria (AIC, HQ, and SC) as well as the FPE reach their minimum values at lag two. In addition, the LR test also confirms lag two as optimal. In the exchange rate channel, lag one is identified as optimal by all criteria. Therefore, based on the conventional selection criteria, the optimal lag length for the VAR model in this study is two lags for the fiscal and monetary channels, and one lag for the exchange rate channel.

Table 2: Lag Length Selection Results

Channels	Lag	LL	LR	FPE	AIC	HQ	SC
Fiscal channel	0	-170.009	–	0.0010	4.703	4.753	8.828
	1	277.838	895.69	1.1e-08	-6.969	-6.720	-6.346
	2	332.382	*109.09	*3.09e-09	*-8.01	*-7.563	*-6.889
Monetary Channel	0	-128.639	–	0.0004	3.585	3.635	3.709
	1	390.218	1037.7	5.3e-10	-10.006	-9.757	-9.383
	2	501.116	*221.8	*4.1e-11	*-12.571	*-12.124	*-11.450
Exchange rate channel	0	448.778	–	4.3e-11	-12.529	-12.478	-12.402
	1	484.372	*71.187	*2.5e-11	*-13.081	*-12.827	*-12.444
	2	486.176	3.607	3.7e-11	-12.681	-12.225	-11.534

Source: Research findings.

According to the results in Table 3, in all three channels, the AIC and SC criteria indicate the lowest values at regime 3, suggesting a better model fit. Likewise, the log-likelihood is higher in the three-regime model compared to the two-regime version. However, the convergence results reveal that, in all three channels, the two-regime model demonstrates strong convergence. Specifically, under two regimes, the algorithm fully converges, and the estimated parameter values (coefficients, variances, transition probabilities) as well as information criteria (AIC and SC) are reliable. By contrast, the three-regime models exhibit weak convergence in all channels. This implies that although the MS(3) model theoretically fits better, numerically it may not be as stable as the MS(2). Overall, due to its strong convergence, the two-regime model is selected for all three channels.

Table 3: Optimal Regime Selection Results

Channels	Number of Regimes	AIC	SC	Log-Likelihood	Model Convergence
Fiscal channel	2	-15.142	-13.834	602.258	Strong Convergence
	3	*-17.136	*-15.423	*689.021	Weak Convergence
Monetary Channel	2	-18.007	-16.187	715.265	Strong Convergence
	3	*-19.816	*-17.588	*794.278	Weak Convergence
Exchange Rate Channel	2	-24.269	-22.962	939.963	Strong Convergence
	3	*-24.714	*-23.002	*969.446	Weak Convergence

Source: Research findings.

5) Hylleberg, Engle, Granger, Yoo

6) Markov-Switching Heteroskedastic Vector Autoregressive

4.3. Results of MSH-VAR estimation

This section presents and analyzes the estimation results of the MSH-VAR model for all three channels. According to the results in Table 4, the linearity test (Linearity LR-test) decisively rejects the null hypothesis of linearity in all three channels, indicating that a simple linear model is insufficient to capture the complex economic dynamics. This finding confirms the necessity of incorporating Markov-switching regimes in the models. Moreover, the two-regime models demonstrate strong convergence.

Table 4: Linearity Test Results

Channels	LR-test ($\chi 2$)	p-value
Fiscal Channel	1614.3	0.0000
Monetary Channel	1851.5	0.0000
Exchange Rate Channel	2307.4	0.0000

Source: Research Findings.

Regimes can be named and described based on key characteristics such as the level of volatility (variances), the economic conditions of the periods, and transition probabilities. The fiscal channel in Table 5 indicates two distinct economic states: one characterized by low volatility (stable regime) and the other by high volatility (unstable regime). Regime 1 (stable), characterized by low volatility, exhibits greater stability and a longer duration of persistence. Regime 2 (unstable), characterized by high volatility, exhibits instability and a shorter duration of persistence. The probability of remaining in Regime 1 is 0.64, and the probability of transitioning to Regime 2 in the next period is 0.36, which indicates a tendency for the stable state to persist. The probability of remaining in Regime 2 is 0.21, and the probability of transitioning to Regime 1 in the next period is 0.79, which is low and indicates a tendency to quickly exit this state (temporary shocks). To better illustrate the time dynamics of each regime, smoothed probabilities have been calculated and presented in Chart 1. This chart illustrates the dominant periods of each regime from the second quarter of 2004 to the fourth quarter of 2022, corresponding to the classification provided in Table 4.

Table 5: Classification of Economic Regimes and Their Characteristics in the MSH(2)-VAR(2) Model – Fiscal Channel

Regime	Economic Conditions During Periods	Key Features
Regime 1 (Stable)	Periods of stability, aftershocks, or calm economic seasons	Stability in oil prices and fiscal budget, stable economic growth with low volatility, and controlled inflation
Regime 2 (Unstable)	Unstable economic conditions, external shocks (e.g., oil price fluctuations, global crises such as 2008 or COVID-19)	High volatility in oil prices and the budget, unstable economic growth, and high and volatile inflation

Regime Transition Probabilities		
From/To	Regime 1 (t+1)	Regime 2 (t+1)
Regime 1 (t)	0.64	0.36
Regime 2 (t)	0.79	0.21

Source: Research Findings.

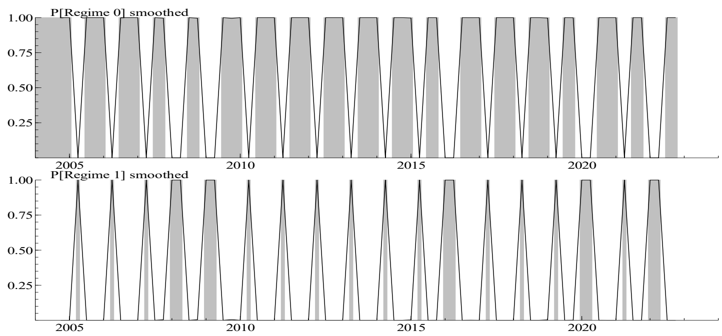

Chart. 1: Smoothed Probabilities of Economic Regimes – Fiscal Channel in the (2)VAR-(2)MSH Model.

Source: Research Findings.

The monetary channel in Table 6 indicates two distinct economic states: one characterized by high volatility (an unstable regime) and the other by low volatility (a stable regime). In this channel, Regime 1 (unstable) is characterized by high volatility and a shorter persistence duration. Regime 2 (stable), characterized by low volatility, exhibits greater stability and a longer duration of persistence. The probability of remaining in Regime 1 is 0.48, and the probability of transitioning to Regime 2 in the next period is 0.52, which is relatively low and indicates a tendency to exit this state (temporary shocks). In contrast, the probability of remaining in Regime 2 is 0.66, and the probability of transitioning to Regime 1 in the next period is 0.34, which indicates a tendency for the stable state to persist. Furthermore, the smoothed probability of the monetary channel is presented in Chart 2.

Table 6: Classification of Economic Regimes and Their Characteristics in the MSH(2)-VAR(2) Model – Monetary Channel

Regime	Economic Conditions During Periods	Key Features
Regime 1 (Unstable)	Unstable economic conditions, external shocks (e.g., global crises 2008, interest rate fluctuations, high inflation)	High volatility in oil prices and interest rates, high and volatile inflation, unstable economic growth
Regime 2 (Stable)	Stable economic conditions, steady recovery after the 2008–2009 crisis	Stability in oil prices and interest rates, stable economic growth with low volatility, and controlled inflation

Regime Transition Probabilities		
From/To	Regime 1 (t+1)	Regime 2 (t+1)
Regime 1 (t)	0.48	0.52
Regime 2 (t)	0.34	0.66

Source: Research Findings.

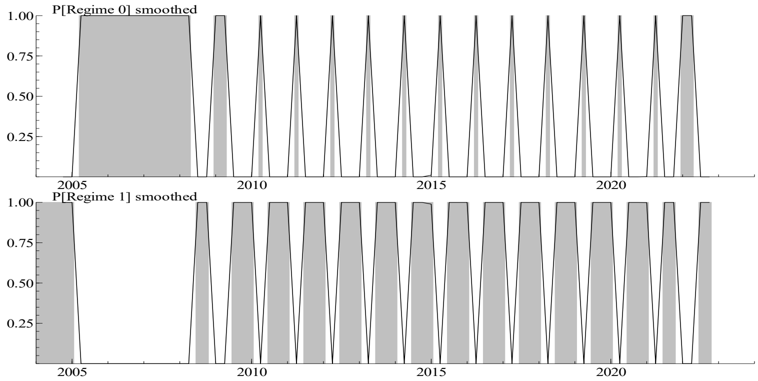

Chart 2: Smoothed Probabilities of Economic Regimes – Monetary Channel in the MSH(2)-VAR(2) Model.

Source: Research Findings.

The exchange rate channel in Table 7 also indicates two distinct economic states: one characterized by high volatility (an unstable regime) and the other by low volatility (a stable regime). In this channel, Regime 1 (unstable) is characterized by high volatility and a shorter persistence duration. Regime 2 (stable), characterized by low volatility, exhibits greater stability and a longer duration of persistence. The probability of remaining in Regime 1 is 0.18, and the probability of transitioning to Regime 2 in the next period is 0.82, which indicates a tendency to exit this state (temporary shocks). In contrast, the probability of remaining in Regime 2 is 0.65, and the probability of transitioning to Regime 1 in the next period is 0.35, which indicates a tendency for the stable state to persist. The smoothed probabilities of the exchange rate channel are presented in Chart 3.

Table 7: Classification of Economic Regimes and Their Characteristics in the MSH(2)-VAR(1) Model – Exchange Rate Channel

Regime	Economic Conditions During Periods	Key Features
Regime 1 (Unstable)	Unstable economic conditions, external shocks (e.g., the global crisis of 2008, a sharp decline in oil prices due to oversupply)	High volatility in oil prices, high inflation
Regime 2 (Stable)	Early post-war boom in Iraq, initial recovery after the 2008 financial crisis, and COVID-19	Price stability, controlled inflation, positive GDP growth, stable exchange rate

Regime Transition Probabilities		
From/To	Regime 1 (t+1)	Regime 2 (t+1)
Regime 1 (t)	0.18	0.82
Regime 2 (t)	0.35	0.65

Source: Research Findings.

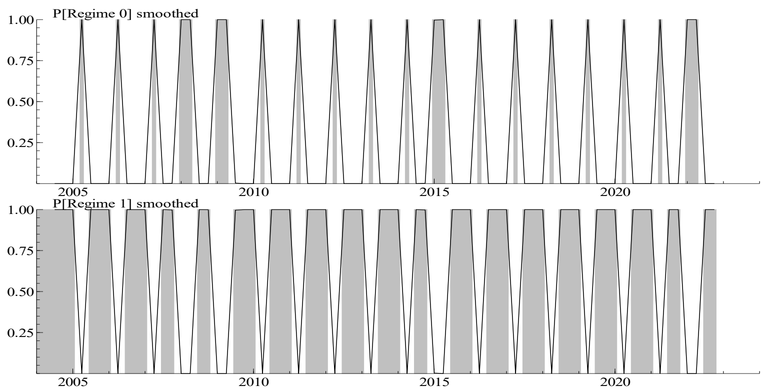

Chart 3: Smoothed Probabilities of Economic Regimes of the Exchange Rate Channel in the MSH(2)-VAR(1) Model.

Source: Research Findings.

The results of the coefficients of the fiscal channel model are presented in Table 7. The model under consideration is MSH(2)-VAR(2). In this framework, the coefficients among the variables remain constant across the two economic regimes (low-volatility regime and high-volatility regime), and only the variance-covariance matrices differ between regimes. Therefore, the dynamic relationships among the variables are independent of the regime, but the intensity of volatility changes depending on economic conditions. This approach enables the simultaneous analysis of the stability of structural relationships and the variability in volatility.

Table 8: Estimated Results for the MSH(2)-VAR(2) Model – Fiscal Channel

Dependent Variable	LnOP (-1)	LnOP (-2)	LnBG (-1)	LnBG (-2)	LnGDP (-1)	LnGDP (-2)	LnINF (-1)	LnINF (-2)	Intercept
LnBG	-0.41	0.17	**0.61	**0.13	0.94	-0.04	0.02	-0.001	**-0.08
LnGDP	**0.42	-0.002	-0.001	-0.0002	**0.94	-0.002	-0.001	-0.002	**-0.003
LnINF	-0.21	-0.11	0.02	0.0006	0.039	-0.08	**0.09	**0.10	**0.015

Note: ** indicates significance at 1%, * indicates significance at 5%.

Source: Research findings.

Based on Table 8, in the fiscal channel, the budget deficit at both lags has a positive and significant effect, indicating that Iraq's fiscal position heavily depends on its past trajectory. The coefficients for oil price, GDP, and inflation are insignificant, suggesting no direct observable effect of these variables on the budget. The negative and significant intercept confirms that fiscal policy in Iraq naturally tends toward fiscal discipline, moving the budget toward balance (deficit reduction) in the absence of oil shocks or expenditure growth. However, this effect is offset by oil shocks or expansionary policies. In the GDP equation, the effect of oil prices with a one-period lag is positive and statistically significant (0.42), indicating that positive oil shocks positively impact economic growth. The first-lag GDP coefficient is also positive and significant, showing strong persistence in economic growth. Other coefficients are not significant; fiscal policy has no significant effect on growth. The negative and significant intercept (-0.003) indicates that the baseline economy (without oil, budget, or inflation effects) exhibits slightly negative growth, meaning Iraq requires external stimuli (such as oil or government spending) for growth. Without these, baseline growth tends to stagnate or decline, consistent with Iraq's oil-dependent economy. In the inflation equation, no variables have significant effects. Inflation is highly persistent, as indicated by significant coefficients at both lags. The negative intercept suggests that, under normal conditions, inflationary pressures are not self-sustaining. In reality, the budget deficit, oil shocks, and government expenditure structures prevent this natural decline. Overall, the analysis suggests that Iraq's economy is heavily reliant on oil and past trends. The fiscal deficit is persistent and influenced by oil shocks and expansionary policies, although there is a natural tendency toward fiscal discipline. Economic growth is primarily driven by oil and government spending, while inflation is persistent but tends to decline naturally if not constrained by fiscal or oil shocks. In summary, Iraq's growth and macroeconomic stability are unsustainable without oil and external fiscal support.

Table 9: Estimated Results for the MSH(2)-VAR(2) Model – Monetary Channel

Dependent Variable	LnOP (-1)	LnOP (-2)	LnIR (-1)	LnIR (-2)	LnGDP (-1)	LnGDP (-2)	LnINF (-1)	LnINF (-2)	Intercept
LnIR	0.0004	-0.286	1.033	-0.44	0.013	0.021	-0.004	-0.024	0.0002
LnGDP	0.37	-0.001	0.008	0.005	0.95	0.003	-0.005	-0.004	-0.003
LnINF	-0.101	0.06	-0.21	0.39	0.104	-0.01	0.79	0.06	0.01

Note: ** indicates significance at 1%, * indicates significance at 5%.

Source: Research Findings.

Based on Table 9, the results of the interest rate model indicate that this variable is primarily a function of past interest rates (1.033 and -0.44) and inflation with two lags (-0.024); no direct effect of the oil shock or output on the interest rate is observed. The intercept coefficient in the interest rate equation is minimal and insignificant (0.0002). This indicates that, in the absence of the effects of other variables, there is no fixed trend or significant baseline effect for the interest rate. The oil shock, with a one-lag effect, has a positive and significant impact (0.037) on output. This result indicates that GDP is highly dependent on oil revenues. In contrast, monetary policies have no direct effect. The positive and significant effect of output with one lag (0.95) indicates strong persistence in economic growth. Moreover, the negative and significant interception coefficient (-0.003) shows that, in the absence of the effects of other variables, output has a decreasing trend. This result may indicate structural challenges in Iraq's economy, such as heavy dependence on oil revenues, which, in the absence of positive shocks (such as an increase in oil prices), leads to a fundamental decline in economic growth. In the inflation equation, oil and GDP have no significant effect on the inflation rate. The interest rate at the second lag has a positive and significant effect (0.39) on inflation, which may indicate the indirect effect of monetary policies on inflation. Inflation at both lags has a positive and significant effect on this variable, showing the persistence of inflation in the economy. The intercept coefficient in the inflation equation is negative and significant (-0.01). This suggests that, in the absence of other variables, the inflation rate exhibits a decreasing trend. This result may reflect the Central Bank of Iraq's efforts to control inflation or mitigate long-term inflationary pressures.

Table 10: Estimated Results for the MSH(2)-VAR(1) Model – Exchange Rate Channel

Dependent Variable	LnOP(-1)	LnER(-1)	LnGDP(-1)	LnINF(-1)	Intercept
LnER	0.0013	0.982	-0.003	*0.001	-0.0002
LnGDP	0.034	0.035	0.94	-0.002	-0.003
LnINF	0.007	0.42	-0.029	0.93	0.016

Note: ** indicates significance at 1%, * indicates significance at 5%.

Source: Research Findings.

Based on the results in Table 10, the positive but insignificant coefficient of oil prices (0.0013) suggests that the oil price shock (i.e., an increase in oil prices) in the previous period has no direct effect on the exchange rate. This finding is notable for Iraq, an oil-exporting country. It is expected that an increase in oil prices, through higher foreign exchange revenues (due to oil exports), would strengthen the national currency (reduce LnER). The exchange rate coefficient, close to 1 and highly significant (p = 0.982), indicates very high persistence in the exchange rate. This stability is likely the result of central bank control policies that stabilize the exchange rate (Iraqi Dinar) against the U.S. dollar. This feature is common in oil-dependent economies, as exchange rate stabilization can help prevent revenue fluctuations caused by changes in oil prices. GDP has no significant effect on the exchange rate. The positive and significant coefficient of inflation (0.001) indicates that an increase in inflation in the previous period leads to a rise in the exchange rate. This effect is consistent with the purchasing power parity theory: higher domestic inflation relative to abroad reduces the value of the national currency. In Iraq, inflation may arise from import costs or increased domestic demand resulting from oil revenues. This finding indicates that inflation is one of the key factors influencing the exchange rate, unlike the oil shock, which has no direct impact. The intercept is negative but statistically insignificant. In the GDP equation, oil prices have a positive and significant effect (0.034) on output. This direct and substantial effect is consistent with the nature of Iraq's economy as an oil-exporting country. The exchange rate has no significant effect on output. In theory, a depreciation of the national currency could boost non-oil exports, thereby contributing to GDP growth. However, in Iraq, due to the heavy dependence on oil (priced in dollars), this effect is marginal. This result again demonstrates the weakness of the exchange rate channel in transmitting effects to GDP. The GDP coefficient, which is close to 1 and highly significant, indicates a high degree of persistence in GDP. This means that Iraq's GDP is highly dependent on its past values, consistent with the nature of oil economies (with slow growth and dependence on external factors such as oil prices). The negative and insignificant inflation coefficient (-0.002) indicates that inflation has no significant effect on GDP. The negative and significant intercept reflects an underlying declining trend in GDP, which may point to structural issues in Iraq's economy (such as low economic diversification, dependence on oil, or political instability). In the inflation equation, the positive but completely insignificant coefficients of oil prices (0.007) and the exchange rate (0.42) indicate that oil price and exchange rate shocks have no direct effect on inflation. GDP also has no significant impact on inflation. The significant coefficient of

lagged inflation, close to one, confirms the persistence of inflation. The negative and significant intercept indicates an underlying declining trend in inflation, which may reflect anti-inflationary policies or reduced domestic demand in non-oil periods.
Overall, the effect of the oil shock on GDP (through the direct channel) indicates that positive oil price shocks directly increase GDP. This is consistent with the nature of Iraq's economy as an oil-exporting country, as higher oil prices increase foreign exchange revenues and government spending, leading to economic growth. In contrast, the exchange rate channel is weak in transmitting oil shocks to Iraq's macroeconomy. These findings suggest that the exchange rate in Iraq plays a marginal role in transmitting the effects of oil shocks, likely due to central bank policies that stabilize the exchange rate.

4.3.1. Impulse response function results

Impulse response functions (IRFs) trace the dynamic response of the study variables to a positive one-standard-deviation shock in oil prices (LnOP). This external shock represents oil price fluctuations, which in Iraq's oil-dependent economy are transmitted to macroeconomic variables via fiscal channels (budget deficit), monetary channels (interest rates), and the exchange rate channel.

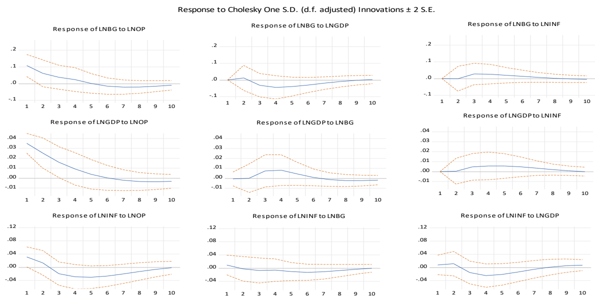

Chart 4: Impulse Response Functions of Variables to Oil Price Shock in Regime 1 – Fiscal Channel.

Source: Research Findings.

In Chart 4, it can be observed that a positive oil price shock (LnOP) initially has a significant and positive effect on the budget deficit. This indicates an increase in government oil revenues, which directly leads to higher public spending. However, the effect of this shock gradually diminishes in subsequent periods, although it remains positive. This behavior is consistent with the characteristics of the stable regime, as in this regime, the government uses oil revenues to implement expansionary fiscal policies, temporarily increasing the budget deficit. Furthermore, the positive oil price shock has a positive and significant effect on GDP, peaking in the early periods (one to two periods). This indicates stimulation of economic growth through increased oil revenues and, subsequently, higher public spending. Over time, the effect of this shock diminishes, but remains positive, reflecting Iraq's high dependence on oil revenues to stimulate economic growth. The response of inflation to the oil shock in Regime 1 is also positive, but its magnitude is lower compared to the budget deficit and GDP. This effect is likely transmitted to inflation through increased public expenditures and aggregate demand. However, the persistence of the inflation effect is limited and decreases in later periods, indicating relatively controlled inflationary pressures in this stable regime.

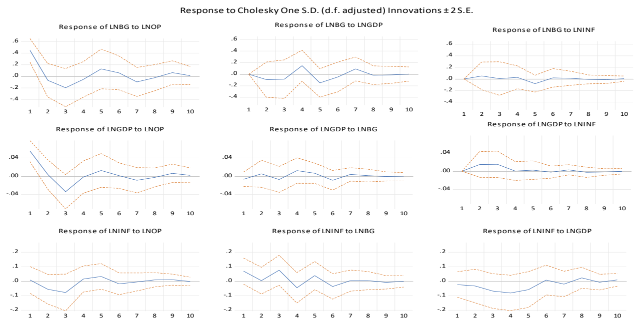

Chart 5: Impulse Response Functions of Variables to an Oil Shock in Regime 2 (Fiscal Channel).

Source: Research Findings.

In Chart 5, the results of the impulse response functions for Regime 2 in the fiscal channel are presented. It can be observed that a positive oil price shock in Regime 2 has a more substantial and more positive effect on the budget deficit compared to Regime 1. This is likely due to a sharp increase in public spending in response to oil revenues, which, under conditions of economic instability, leads to a larger budget deficit. This response is robust in the initial periods but diminishes over time; its gradual decline may indicate financial constraints or a fading of the initial shock effects. Unlike Regime 1, in Regime 2, the positive oil price shock has a negligible positive effect on GDP. The initial effect is observable in the early periods, but it quickly diminishes and may even approach zero or become negative. This situation reflects structural limitations in converting oil revenues into sustainable economic growth, likely due to economic instability and inefficiencies in the allocation of financial resources. Furthermore, a positive oil price shock in Regime 2 generates significant inflationary pressure, which is more severe than in Regime 1. This effect is likely driven by increased aggregate demand and economic instability, which reduces the government's and central bank's ability to control inflation. The inflationary response is strong in the early periods and remains persistent for several periods, indicating notable inflationary challenges in this regime.

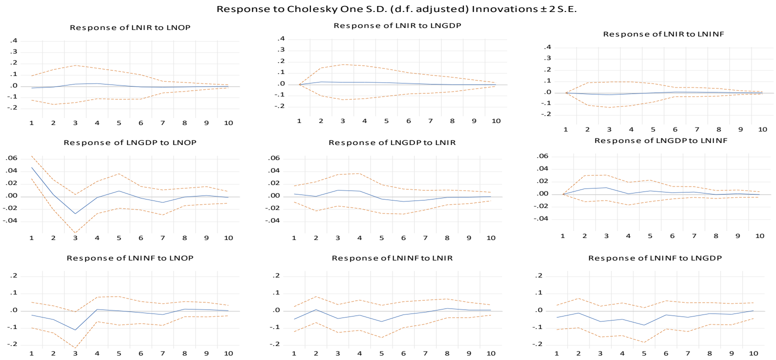

Chart 6: Impulse Response Functions of Variables to an Oil Shock in Regime 1 (Monetary Channel).

Source: Research Findings.

The results of the impulse response functions for Regime 1 in the monetary channel are presented in Table 6. According to these results, a positive oil price shock has a limited effect on the real interest rate. The initial response to the interest rate is positive but weak, and it decreases rapidly. This indicates the weakness of the monetary channel in Iraq's economy, where monetary policies, such as changes in interest rates, have a limited impact in response to oil shocks. This limitation is likely due to the economy's heavy dependence on oil revenues and weak monetary structures. At the same time, a positive oil price shock has a positive and significant effect on GDP. This response is observable in the early periods but quickly diminishes, reflecting structural limitations in transmitting oil revenue effects to economic growth under conditions of instability. Furthermore, a positive oil price shock generates significant inflationary pressure. This effect is likely transmitted to inflation through increased production costs and aggregate demand. The inflationary response is strong in the early periods and persists for several periods, indicating the challenges faced by the central bank in controlling inflation under conditions of economic instability.

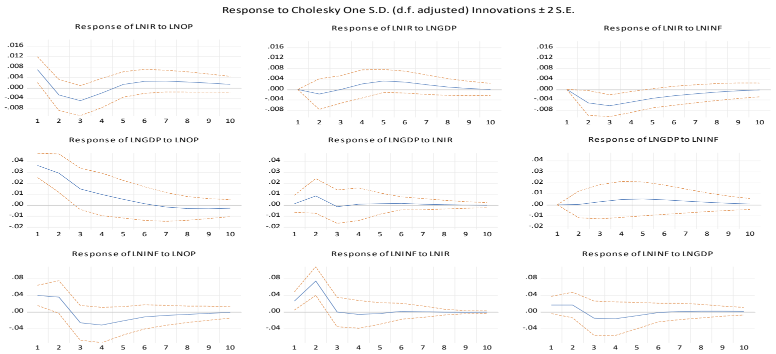

Chart 7: Impulse Response Functions of Variables to an Oil Shock in Regime 2 (Monetary Channel).

Source: Research Findings.

The results in Chart (7) show that the response of the interest rate to a positive oil price shock in the stable regime is also limited, but slightly stronger than in the unstable regime. This response is positive but small and decreases rapidly, confirming that the monetary channel in Iraq's economy plays a limited role in transmitting oil shocks even under conditions of economic stability. In contrast, a positive oil price shock has a positive and significant effect on GDP, which is stronger in the stable regime than in the unstable regime. This effect peaks in the early periods and remains persistent for several periods, indicating the economy's ability to utilize oil revenues to stimulate growth under stable conditions. The response to inflation in this regime is also positive but relatively weak and diminishes quickly, reflecting the central bank's better capacity to control inflationary pressures in the stable regime.

Overall, the analysis of impulse response functions shows that the effects of oil shocks differ between stable and unstable regimes. In the stable regime, both in the financial and monetary channels, the positive effects of oil shocks on GDP are more persistent and stronger. In contrast, in the unstable regime, these effects are shorter-lived and weaker, accompanied by more severe inflationary pressures. Furthermore, the fiscal channel plays a more dominant role than the monetary channel in transmitting oil shocks to Iraq's macroeconomy. In the fiscal channel, the budget deficit and GDP show stronger responses to shocks, while in the monetary channel, the interest rate has a limited impact. This situation is consistent with Iraq's heavy dependence on oil revenues and weak monetary structures. Finally, the impulse response functions confirm the asymmetric effects of oil shocks: in the stable regime, positive oil shocks lead to economic growth and an increase in the budget deficit, whereas in the unstable regime, the positive effects are limited and inflationary pressures are more severe. These asymmetries illustrate the complexities of transmitting oil shocks in oil-dependent economies.

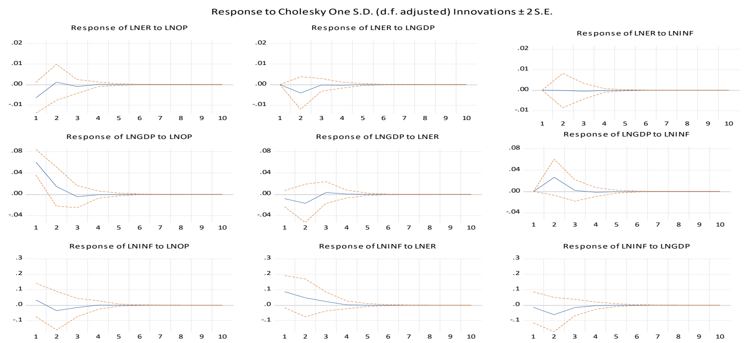

Fig. 8: Impulse Response Functions of Variables to Oil Shock in Regime 1 (Exchange Rate Channel).

Source: Research Results.

The results in Figure 8 indicate that a positive oil price shock does not have a direct and significant impact on the exchange rate. The response of the exchange rate is weak and rapidly declines toward zero, indicating the limited impact of oil shocks on the exchange rate in the stable regime. The effect of the oil shock on GDP is strong in the initial periods (one to two periods), reflecting the stimulation of economic growth through increased oil revenues and government expenditures. Over time, this effect diminishes but remains positive, consistent with Iraq's dependence on oil. In contrast, the inflation response to the oil shock is weak and quickly decreases, indicating effective control of inflationary pressures by the central bank in the stable regime.

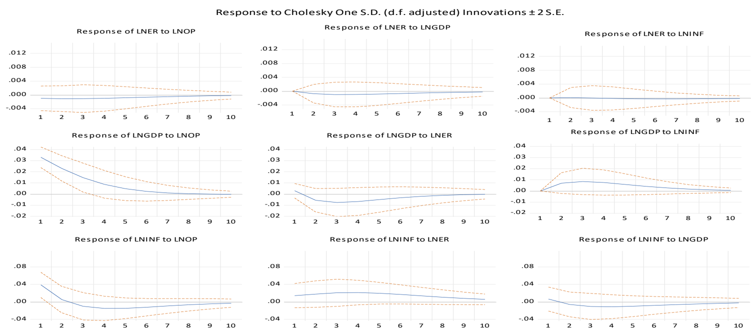

Fig. 9: Impulse Response Functions of Variables to Oil Shock in Regime 2 (Exchange Rate Channel).

Source: Research Results.

According to Figure 9, like the stable regime, a positive oil price shock in the unstable regime also has no direct effect on the exchange rate. The positive oil price shock has a weaker effect on GDP compared to the stable regime. This effect is observed in the initial periods but quickly diminishes and may even approach zero or negative values. This indicates structural limitations in converting oil revenues into sustainable economic growth in the unstable regime. A positive oil price shock creates greater inflationary pressure compared to the stable regime. The inflation response is stronger in the initial periods and remains for several periods, reflecting greater challenges in controlling inflation under economic instability and rising aggregate demand. Overall, the impulse response results indicate that the exchange rate channel plays a minimal role in transmitting oil shocks to Iraq's macroeconomy. Although oil shocks do not have a direct effect on macroeconomic variables through the exchange rate channel, their positive effect on GDP (particularly in the stable regime) underscores Iraq's high dependence on oil revenues. These findings highlight the weakness of the exchange rate channel in transmitting oil shocks and the dominant role of other channels (such as the fiscal channel) in Iraq's oil-dependent economy.

The limited roles of monetary and exchange rate policy reflect the fragility of the Iraqi economy, where responses are reactive rather than strategic. To achieve greater inclusiveness, Iraq must focus on structural reforms, strengthening the independence of the central bank, imposing fiscal rules on spending, and diversifying non-oil revenues (such as increasing non-oil taxes to 10% of GDP). Without this, oil shocks will continue to exacerbate poverty (affecting more than 25% of the population) and social tensions, as seen in the 2019 protests. An opportunity lies in investing in gas and renewable energy to reduce dependence, but this requires strong political will.

Limits to the effectiveness of monetary and exchange rate policy stem from structural and institutional factors that make responses to oil shocks insufficient. Prominent among these institutional constraints are weak governance and high levels of corruption. The Iraqi economy suffers from widespread corruption, which affects reserve management and auctions, as dollars are smuggled to Iran or Syria, reducing the effectiveness of monetary policy. Political disputes between the federal government and the Kurdistan Regional Government also hinder the sharing of oil revenues, leading to increased exchange rate volatility. Furthermore, the Iraqi economy suffers from a weak regulatory framework within government institutions. The absence of strong fiscal laws (such as fiscal rules for spending) makes monetary policy insufficiently independent, as the government interferes in the central bank's decisions to finance the deficit. This hinders the building of buffer reserves, as World Bank reports indicate.

On the other hand, central bank policies are a key determinant of the effectiveness of economic policies to absorb oil shocks. These policies focus on short-term stability, as the bank relies on selling dollars to maintain the peg; however, it lacks advanced tools, such as an effective parallel dollar market or long-term expansionary monetary policies. In 2023, anti-money laundering (AML/CFT) measures led to volatility in the exchange market, resulting in a 9% contraction in the non-oil sector. Exposure to external pressures also plays a significant role in determining the fundamental parameters of the central bank's policies. Reserves are held at the US Federal Reserve, which limits the bank's independence, especially given the impact of sanctions on Iran on currency flows. Furthermore, the economy's dependence on oil has become a limiting factor in the central bank's ability to respond to shocks. Lack of diversification: Oil represents 91% of revenues in 2024, meaning any shock (such as a drop to \$70 per barrel in 2025) would result in a fiscal deficit (4.2% of GDP in 2024). This limits the stimulus capacity of monetary policy, with the fiscal equilibrium price at \$84 per barrel. The bloated public sector also significantly reduced the effectiveness of the response, consuming 29% of GDP on salaries, reducing the fiscal space for non-oil investment, and making monetary policy vulnerable to political pressure to finance current spending.

5. Conclusion and Policy Recommendations

This study employed the MSH-VAR model and quarterly data covering the period from 2004 to 2022 to examine the effects of oil price shocks on Iraq's macroeconomy through fiscal, monetary, and exchange rate channels. The results indicate that the Iraqi economy is highly dependent on oil revenues, and oil price shocks have significant impacts on macroeconomic variables. In the fiscal channel, positive oil price shocks directly increase budget deficits and GDP; however, these effects are shorter-lived and accompanied by stronger inflationary pressures in unstable regimes. The monetary channel plays a limited role in transmitting oil shocks, as the real interest rate exhibits weak responses to these shocks, reflecting the weaknesses in Iraq's monetary structures. The exchange rate channel also plays a marginal role in transmitting shocks due to the central bank's exchange rate stabilization policies. Impulse response functions confirm that in stable regimes, the positive effects of oil shocks on GDP are more substantial and more persistent. In contrast, in unstable regimes, these effects are more limited and accompanied by more severe inflationary pressures. These findings highlight significant asymmetries in the economy's response to oil shocks and emphasize Iraq's high dependence on oil revenues as well as the weaknesses of monetary and exchange rate channels in managing these shocks. Based on the findings of this study, the following policy recommendations are proposed to reduce Iraq's vulnerability to oil price shocks and strengthen macroeconomic stability:

Economic Diversification: Invest in non-oil sectors such as agriculture, industry, and tourism, and provide fiscal incentives and investment facilitation.

Strengthening Fiscal-Monetary Policy Coordination: Allocate a portion of oil revenues to sovereign wealth funds during boom periods to reduce budget deficits and inflationary pressures during recessions.

Reforming Monetary Policy Structure: Enhance central bank instruments, develop financial markets, and increase central bank independence to manage inflation and oil shocks better.

Flexible Exchange Rate Management: Move towards a managed float exchange rate regime to mitigate the effects of oil shocks.

Development of Statistical and Data Systems: Enhance the collection and dissemination of economic data to facilitate more accurate monitoring of macroeconomic variables.

References

[1] Abd, M. K., & Attia, A. A. S. (2024). Analysis of financial sustainability indicators and their reflection on the "economic cycle" in Iraq for the period (2004–2022). South Asian Research Journal of Business and Management, 6(6), 388–401. https://doi.org/10.36346/sarjbm.2024.v06i06.005.

[2] Abdel-Latif, H., Osman Abdalla, R. A., & Ahmed, H. (2018). Asymmetric impacts of oil price shocks on government expenditures: Evidence from Saudi Arabia. Cogent Economics & Finance, 6(1), 1512835. https://doi.org/10.1080/23322039.2018.1512835.

[3] Aladwani, J. (2024). Oil volatility uncertainty: impact on fundamental macroeconomics and the stock index. Economies, 12(6), 140. https://doi.org/10.3390/economies12060140.

[4] Algaeed, A. H. (2020). Symmetric oil price shocks and government expenditure-real exchange rate nexus: ARDL and SVAR models for an oil-based economy, 1970–2018. Cogent Economics & Finance, 8(1), 1782076. https://doi.org/10.1080/23322039.2020.1782076.

[5] Al Rasasi, M. (2018). The response of G7 real exchange rates to Oil Price Shocks. International Journal of Economics and Finance, 10(4), 191-205. https://doi.org/10.5539/ijef.v10n4p191.

[6] Amer, E. A. A. A., Xiuwu, Z., Meyad, E. M. A., Meyad, A. M., Mohsin, A. K. M., & Rahman, A. (2024). The long-term relationship between oil price changes and economic growth from the perspective of the resource curse: An empirical study from Yemen. PloS one, 19(11), e0313206. https://doi.org/10.1371/journal.pone.0313206.

[7] Apergis, N. (2024). US partisan polarization and households' portfolio decisions. International Journal of Finance & Economics, 29(4), 4339-4357. https://doi.org/10.1002/ijfe.2880.

[8] Arezki, R., Kpodar, M. K. R., & Imam, P. A. (2025). Shocks and Shields: Macroeconomic Institutions During Commodity Price Swings.

[9] Bangura, M., Boima, T., Pessima, S., & Kargbo, I. (2021). Modeling returns and volatility transmission from crude oil prices to Leone-US Dollar exchange rate in Sierra Leone: A GARCH approach with structural breaks. Modern Economy, 12(3), 555-575. https://doi.org/10.4236/me.2021.123029.

[10] Bekhet, H. A., & Yusoff, N. Y. M. (2013, June). Evaluating the mechanism of oil price shocks and fiscal policy responses in the Malaysian economy. In IOP Conference Series: Earth and Environmental Science (Vol. 16, No. 1, p. 012010). IOP Publishing. https://doi.org/10.1088/1755-1315/16/1/012010.

[11] Bouazizi, T., Mrad, F., Hamida, A., & Nafti, S. (2022). Effects of conditional oil volatility on exchange rate and stock markets returns. International Journal of Energy Economics and Policy, 12(2), 53–71. https://doi.org/10.32479/ijeep.12826.

[12] Cakana, E., Demiralay, S., & Ulusoy, V. (2021). Oil prices and firm returns in an emerging market. American Business Review, 24(1), 166–187. https://doi.org/10.37625/abr.24.1.166-187.

[13] Danesh Jafari, D., Nazemian, H., Bahrami, J., & Kheiravar, M. H. (2021). Effect of oil revenues on certain macroeconomic variables in selected oil-exporting countries: A panel data approach. International Journal of Economics and Business Administration, 9(2), 3–21. https://doi.org/10.35808/ijeba/685.

[14] Demirer, R., Gupta, R., Pierdzioch, C., & Shahzad, S. J. H. (2020). The predictive power of oil price shocks on realized volatility of oil: A note. Resources Policy, 69, 101856. https://doi.org/10.1016/j.resourpol.2020.101856.

[15] Driouche, D. M., Manel, A., Moussa, C., & Mohamed, B. (2020). Asymmetric responses of oil price shocks on economic growth in Algeria: An empirical analysis through NARDL approach. Energy Economics Letters, 7(2), 74–93. https://doi.org/10.18488/journal.82.2020.72.74.93.

[16] Faraj, M. M. (2020). The Impact of Oil Price Fluctuations on the General Budget in Iraq for the Period (1990-2018): An Analytical-Econometric Study. Retrieved from www.ideas.repec.org.

[17] Hamilton, James D. (1983), "Oil and the Macroeconomy Since World War II", Journal of

[18] Political Economy, 91:228-48. https://doi.org/10.1086/261140.

[19] Ibrahim, Y. M., Hami, N., & Othman, S. N. (2019). Assessing of imbalance among economic, environmental and social sustainability: Evidence from oil and gas industry in Iraq. IOP Conference Series: Journal of Physics: Conf. Series, 1294, 072006. https://doi.org/10.1088/1742-6596/1294/7/072006.

[20] Jahan-Parvar, M. R., & Mohammadi, H. (2008). Oil Prices and Real Exchange Rates in Oil-Exporting Countries: A Bounds Testing Approach. MPRA Paper with number 13435, University Library of Munich, Germany, 1-14.

[21] Ji, Q., Shahzad, S. J. H., Bouri, E., & Roubaud, D. (2020). Dynamic structural impacts of oil shocks on exchange rates: Lessons to learn. Economic Structures, 9(20), 1–14. https://doi.org/10.1186/s40008-020-00194-5.

[22] Jiang, Q., Cheng, S., Cao, Y., et al. (2022). The asymmetric and multi-scale volatility correlation between global oil price and economic policy uncertainty of China. Environmental Science and Pollution Research, 29, 11255–11266. https://doi.org/10.1007/s11356-021-16446-1.

[23] Li, T. (2019). The impact of oil price shocks on stock markets. In Proceedings of the 4th International Conference on Economy, Judicature, Administration and Humanitarian Projects (JAHP 2019) (pp. 267–273). Atlantis Press. https://doi.org/10.2991/jahp-19.2019.58.

[24] Maheu, J. M., Yang, Q., & Song, Y. (2018). Oil Price Shocks and Economic Growth: The Volatility Link. MPRA Paper No. 83779. https://doi.org/10.2139/ssrn.3159715.

[25] Marouf, M. A. (2016). The Impact of Low Oil Prices Worldwide on the General Budget of Iraq. *Scientific Journal of Commercial and Environmental Studies*, 7(4), 643-644.

[26] Marza, M., Shaaibith, S. J., & Daly, S. S. (2018). Impact of oil price fluctuations on human development: A standard study of Iraq. The Journal of Social Sciences Research, Special Issue 5, 396–399. https://doi.org/10.32861/jssr.spi5.396.399.

[27] Mokni, K., Nakhli, M. S., Mnari, O., & Bougatef, K. (2021). Symmetric and asymmetric causal relationship between oil prices and G7 stock markets: A bootstrap rolling-window Granger causality test. The Journal of Economic Integration, 36(4), 718–744. https://doi.org/10.11130/jei.2021.36.4.718.

[28] Okoli, T. T., Tewari, D. D., & Rhodaoluwafisayomi, A. (2017). The relationship between oil price volatility and macroeconomic variables in Nigeria: A vector autoregressive (VAR) approach. Journal of Economics and Behavioral Studies, 9(6), 237–251. https://doi.org/10.22610/jebs.v9i6.2020.

[29] Okorie, D. I., & Lin, B. (2024). Global shocks and fiscal stimulus: a tale of an oil-dependent-exporting country. Financial Innovation, 10(1), 26. https://doi.org/10.1186/s40854-023-00527-w.

[30] Olayungbo, D. O., & Umechukwu, C. (2022). Asymmetric oil price shocks and the economies of selected oil-exporting African countries: A global VAR approach. Economic Change and Restructuring, 55, 2137–2170. https://doi.org/10.1007/s10644-022-09382-8.

[31] Omolade, A., Nwosa, P., & Ngalawa, H. (2019). Monetary transmission channel, oil price shock and the manufacturing sector in Nigeria. Folia Oeconomica Stetinensia, 19(1). https://doi.org/10.2478/foli-2019-0007.

[32] Rasheed, S. A. (2023). The impact of oil price volatility on economic growth and stability in Iraq through the public expenditure for the period (2003–2020). International Journal of Professional Business Review, 8(6), 1–35. https://doi.org/10.26668/businessreview/2023.v8i6.2059.

[33] Raouf, Engy (2021). Oil prices shocks and government expenditure. In: International Journal of Energy Economics and Policy 11 (5), S. 78 - 84. https://doi.org/10.32479/ijeep.11172.

[34] Riaz, M., Saeed-ur-Rahman, S., Mushtaq, S., & Atta, A. (2020). Oil price flux and macroeconomy of oil exporters. Journal of Accounting and Finance in Emerging Economies, 6(2), 651–667. https://doi.org/10.26710/jafee.v6i2.1330.

[35] Sanusi, K. A. (2020). Oil prices asymmetric and exchange rate volatility: Case of oil-exporting emerging countries. Journal of International Studies, 13(4), 109–123. https://doi.org/10.14254/2071-8330.2020/13-4/7.

[36] Semenova, T., & Al-Dirawi, A. (2022). Economic development of the Iraqi gas sector in conjunction with the oil industry. Energies, 15, 2306. https://doi.org/10.3390/en15072306.

[37] Shaheen, R., & Almaktoom, A. T. (2023). Testing monetary policy trilemma for Middle Eastern economies under a Bayesian panel VAR specification. Journal of Law and Sustainable Development, 11(2), 1–20. https://doi.org/10.55908/sdgs.v11i2.644.

[38] Sim, K. Y., & Sek, S. K. (2019). Distinguishing the Effect of Oil Shocks on the Global Economy: A Threshold Regression Approach. MATEMATIKA, 35(4), 79–97. https://doi.org/10.11113/matematika.v35.n4.1265.

[39] Sohag, K., Kalina, I., & Elsayed, A. H. (2023). Financial stress in Russia: Exploring the impact of oil market shocks. Resources policy, 86, 104150. https://doi.org/10.1016/j.resourpol.2023.104150.

[40] Starchenko, Y. D. (2021). The economy between fluctuations in oil revenues and diversifying sources of income in Arab countries. Journal of Enterprise and Business Intelligence, 1(2), 96–110. https://doi.org/10.53759/5181/JEBI202101011.

[41] Takentsi, S., Sibanda, K., & Hosu, Y. S. (2022). Energy prices and economic performance in South Africa: An ARDL bounds testing approach. Cogent Economics & Finance, 10(1). https://doi.org/10.1080/23322039.2022.2069905.

[42] Taşseven, Ö., & Poturoğlu, S. (2022). The analysis of Turkey's trade balance in response to oil price changes. Uygulamalı Ekonomi ve Sosyal Bilimler Dergisi / Journal of Empirical Economics and Social Science, 4(2), 1–21. https://doi.org/10.46959/jeess.1077246.

[43] Temkeng, S. D., & Fofack, A. D. (2021). A Markov-switching dynamic regression analysis of the asymmetries related to the determinants of US crude oil production between 1982 and 2019. Petroleum Science, 18, 679–686. https://doi.org/10.1007/s12182-021-00549-y.

[44] Tiron, K., & Zeynalov, A. (2022). Macroeconomic performance of oil price shocks in Russia. Preprint submitted to arXiv. https://arxiv.org/abs/2211.

[45] Yokuş, T. (2024). Early warning systems for world energy crises. Sustainability, 16, 2284. https://doi.org/10.3390/su16062284.

[46] Yoshizaki, Y., & Hamori, S. (2013). On the influence of oil price shocks on economic activity, inflation, and exchange rates. International Journal of Financial Research, 4(2), 33–44. https://doi.org/10.5430/ijfr.v4n2p33.

[47] Zhang, B., Ai, X., Fang, X., & Chen, S. (2022). The transmission mechanisms and impacts of oil price fluctuations: Evidence from DSGE model. Energies, 15, 6038. https://doi.org/10.3390/en15166038.

[48] Zhou, Z., & Zhang, X. (2022). Quantifying nonlinear effects of BRIC and G4 liquidity on oil prices. Humanities and Social Sciences Communications, 9, 129. https://doi.org/10.1057/s41599-022-01137-0.

[49] Zulfigarov, F., & Neuenkirch, M. (2020). The impact of oil price changes on selected macroeconomic indicators in Azerbaijan. Economic Systems, 44(4), 100814. https://doi.org/10.1016/j.ecosys.2020.100814.