The Impact of Oil Price Changes, Economic Growth, Financial Development and Trade on Iraq's Economy: A VAR-VECM Approach

Hemin T. Aziz[1], Hemn A. Wali[2], Ali A. Abbas[3]

[1,3] Department of Business Administration Garmian Polytechnic University, Kurdistan Region, Iraq
[2] Department of Psychology, College of Education. University of Garmian, Kurdistan Region, Iraq

ABSTRACT

This research investigates the profound and multifaceted oil price changes' impact on Iraq's economy. As a nation heavily reliant on oil exports, Iraq's economic stability is highly affected by global oil price fluctuations. This study employs VECM approaches using annual time series data from 1969 to 2020. As noted from the findings, an increase in oil prices positively impacts economic growth but the volatility adversely affects it. Further findings revealed that improvements in Iraq's financial development and trade have positive effects on economic growth. The results showed that GDP recovers from oil shocks in the 1st lag and from trade in the 3rd lag while GDP does not recover from financial development shocks. The study findings suggest that the Iraqi government should strengthen regulatory institutions and frameworks, modernize banking systems, develop capital markets, and promote financial inclusion to stir significant improvements in economic growth from its financial development initiatives. Vast theoretical and practical contributions are conceivable as economic policies are aligned to reflect changes in oil prices, economic growth and exchange rate, which create a solid foundation for developing future studies.

KEYWORDS: Economic Growth, Financial Development, Iraq, Oil Prices, Trade.

1. INTRODUCTION

Iraq is one of the world's major oil-producing countries, with its economy heavily dependent on oil exports. With Iraq being ranked 6th in the world in terms of global oil production producing 4,443,457 barrels per day (Bamber et al., 2023), the impact of volatile changes in oil prices on its economy is undoubtedly large.

Meanwhile, the ongoing financial crisis and the depreciation of the Iraq dinar stand to be major factors that can exacerbate the adverse effects of volatile oil prices. The major problem is that the multifaceted impact of oil price changes on Iraq's economy still remains to be ascertained. This issue gains huge credence at a time when Iraq's economic growth measured by GDP, financial development and exchange rate are increasingly becoming of huge concern. Such challenges manifested at a time when severe challenges to foster economic growth and development were being experienced in Iraq. This adversely restricted the Iraqi government's ability to promote sustainable development. Incorporating a variety of factors, such as oil prices, economic growth, financial development, and trade, enables a thorough examination of the diverse elements impacting the economic landscape of Iraq. While prior studies might have concentrated on singular aspects, this investigation delves into the interrelated

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Corresponding author's e-mail: hemintofiq19877@gmail.com , hemn.adl@garmian.edu.krd & ali.adilabbas86@gmail.com

nature of these factors, presenting a comprehensive viewpoint (Arouri et al., 2014; Maghrebi et al., 2018). In that regard, the current study's emphasis is to offer a detailed examination of oil prices' impact on Iraq's exchange rate, financial development and GDP. Consequently, the manuscript also sheds insights into the resultant policy implications on political dynamics, social welfare and fiscal stability.

Determining oil price's impact on Iraq's economy enhances understanding concerning the sensitivity of the Iraqi economy to changes in oil prices. This knowledge is crucial in developing effective risk management strategies and economic policies. It is well known, that Iraq is one of the major oil producers worldwide. Hence, understanding oil price's impact on Iraq's economy plays an instrumental role in examining global oil supply dynamics and stability, especially in a broader spectrum of the Middle East Region. The manuscript stands to offer significant ideas necessary for developing strategies and policies to diversify the Iraqi economy and reduce its dependency on petroleum products. This can lead to the enhancement of the robustness of policy decisions tailored to promote economic growth and sustainable development. As a result, vast theoretical and practical contributions are conceivable as economic policies are aligned to reflect changes in oil prices, economic growth and exchange rate, which creates a solid foundation for developing future studies.

2. LITERATURE REVIEW

2.1 Theoretical Framework

To illustrate the repercussions of fluctuations in oil prices, economic growth, financial development, and trade on Iraq's economic landscape, we utilize the Resource Curse Theory (RCT). This theory posits that nations endowed with ample natural resources, particularly oil, may encounter impediments in attaining sustained economic development (Di John, 2010). Although the abundance of natural resources can yield economic advantages, it simultaneously introduces risks related to volatility, dependency, and mismanagement, thereby influencing economic growth, financial development, and trade (Di John, 2010). Given Iraq's significant status as an oil-producing nation, the RCT proves instrumental in clarifying how oscillations in oil prices might impact economic indicators such as GDP growth, financial robustness, and the overall trade equilibrium. Furthermore, the theory provides insights into how policy measures and institutional frameworks can either alleviate or intensify the challenges linked to dependence on natural resources.

Theoretically, changes in oil supply and demand affect its price as illustrated by the theory of demand and supply. Factors influencing oil prices include geopolitical events, production disruptions, economic growth and energy policies (Ji, 2012; Su et al., 2020). Therefore, when applied in this context, the theory of demand and supply unpacks that geopolitical events, production disruptions, economic growth and energy policies influence changes in oil supply and demand. Consequently, volatile changes in oil prices can be observed in such circumstances (Benramdane, 2017; Chien et al., 2021; Gazdar et al., 2019; Li, 2023). Such a level of understanding is essential in distinguishing the influence of natural shocks, economic factors and social forces on oil prices. Hence, the incorporation of the supply and demand theory enhances the study's validity. However, Vector Autoregression (VAR) models and Autoregressive Integrated Moving Average models will be incorporated as well so as to provide a nuanced analysis.

Meanwhile, studies documenting changes in oil price's impact on oil-dependent economies richly exist, but the specific contexts under which they are applied limit their generalizability. Iraq has been a casualty of such empirical voids as studies linked to oil prices have not been forthcoming in this regard. Amid such observations and other empirical gaps that are yet to be uncovered, the next sections of the study analyse empirical studies on structural connections linking oil prices with the exchange rate, financial development and economic growth.

2.2 Literature Review

2.2.1 The impact of oil prices on economic growth

The impact of oil prices on economic growth is well documented in academic studies. For instance, a study by Nwanna and Eyedayi (2016) used a multiple regression model to analyse crude oil price's impact on economic growth in Nigeria from 1980 to 2014. In their study, it was demonstrated that economic growth was positively and significantly linked with increases in oil prices. However, it was discovered that oil price changes do not have a positive impact on the economy compared

to oil prices. This is contrary to the findings of some earlier studies (Aliyu, 2009). Such lack of contrasts needs clarification and this study contributes to existing studies by clarifying such impacts within the context of Iraq.

Benramdane (2017) applied a VAR model to data from 1970 to 2012 in Algeria. The results revealed that an oil boom positively impacts economic growth while an oil price volatility adversely affects growth. Such bi-directional effects place a demand for studies to examine the exact nature of impact observable in countries that are widely sidelined in academic debates and yet are of huge significance to the world in terms of supplying petroleum products. Upon such discoveries, the current manuscript builds on these notions and tests their validity when applied in a distinct economic context of Iraq.

Van Eyden et al. (2019) applied a multiple methods analysis in analysing oil price volatility's impact on economic growth using evidence from OECD economies. Similar to Aliyu (2009), oil price volatility was discovered to adversely affect the growth of OECD economies. These findings are in contrast to Nwanna and Eyedayi (2016) findings and further place a demand for studies such as this current study to enhance clarity concerning oil price volatility's impact on economic growth. Nonetheless, by restricting focus to non-OECD countries, Nwanna and Eyedayi's (2016) findings projected distinct factors and dynamics affecting economic performance. Hence, their study fills major empirical voids by addressing the impact of changes in oil prices within the context of OECD countries. Furthermore, their study offers a robust and comprehensive examination of the connections and contributes to a profound understanding of the impact of oil price changes on such countries' economic performance. Overall, such discoveries are instrumental and constitute a key and parcel of testing long-withheld theoretical notions to determine their generalisability across various economies. In another study, Abdelsalam (2020) explored relatively similar issues within the context of MENA countries by deploying linear models. As denoted by the findings, Abdelsalam noted that oil price volatility adversely impacted the growth of MENA countries. These observations coincide with findings put forward by Nwanna and Eyedayi (2016) and Van Eyden et al. (2019). Hence, it can be inferred that oil price volatility adversely affects economic growth. Similar observations were echoed by studies such as Chien et al. (2021), Li (2023) and Ruan et al. (2023). As a result, it is, therefore, expected that oil price changes will negatively undermine Iraq's economic growth.

2.2.2 The Impact of Financial Development And Trade On Economic Growth

The impact of financial development and trade on economic growth has been validated in various contexts. Commencing with, Tariq et al. (2020), it was observed that Pakistan's financial development contributes more towards economic growth when it surpasses the threshold level. Such observations trigger more debates as understanding is required in determining such a threshold level and ascertaining whether or not it is the same for other countries like Iraq. In this context, determining the financial development's impact on economic growth becomes necessary but such is still yet to be conducted, especially within the context of Iraq. Therefore, the scholarship's originality is engraved in these attempts as they explore commodity, financial and economic landscapes to uncover the complex dynamics of such interactions.

In their 2021 study, Wang et al. utilized the ARDL-PMG model and found that financial development significantly and positively influences economic growth. However, the degree to which such outcomes are conceivable is questionable as Iraq operates on an Islamic economic model whose features and tenants are distinctively unique from that portrayed by the Chinese economic model. Consequently, exploring these aspects becomes an instrumental academic endeavour that this writing seeks to unpack and avail for practical academic and economic policy purposes.

Cheng et al. (2021) applied a GMM estimation on annual data from 2000 to 2015 collected from 72 countries to analyse connections between Information Communications Technology (ICT) diffusion, financial development, and economic growth. Their findings revealed that financial development is always unfavourable for economic growth. In contrast to the findings of Wang, Zhang, and Zhang (2021), their ARDL-PMG model revealed that financial development has a notable positive influence on economic growth. Thus, to enhance clarity, this study will apply a VAR-VECM approach and as such, the study's originality and novelty are engraved in this approach.

It remains vital to observe that changes in oil prices

can also impact financial development. For instance, Allegret et al. (2014), panel smooth transition regression models applied to 27 oil-exporting economies from the 1980–2010. It was revealed that a financial deepness of 25% was caused by oil price increases. To validate this finding in a different context, robust methods like impulse response functions and Granger causality test are required and this study fills this void in this regard.

Regarding, trade's impact on economic growth, Doğan et al. (2020) panel quantile regression model results obtained from the examination of 32 European countries from 1995–2014 revealed that economic growth is enhanced by trade openness. In a Vietnamese context, Nguyen (2020) discovered that trade is of vital importance for economic growth. Rahman's (2021) multivariate framework results obtained from the analysis of the dynamic nexus of economic growth, international trade and energy consumption in ASEAN and BRICS economies showed that the economic growth of these countries is positively impacted by international trade. Therefore, it can be held that there are positive effects spanning from international trade to economic growth and such effects are anticipated in countries like Iraq. Having identified connections linking trade, financial development, economic growth and oil prices, the next section of the study offers insights into the methodological procedures carried out to determine the exact nature of such connections.

3. METHODOLOGY

3.1 Method

This study used a standard VECM model to estimate the short-run and long-run impact of changes in oil prices on Iraq's economic performance as measured by changes in GDP. In this section, we examine the applied unit root tests, statistical tests, variables and data collection procedures. Firstly, the Augmented Dickey-Fuller (ADF) and the Phillips Perron (PP) tests were applied to determine whether the data has unit roots. Correlation coefficient tests were further computed to examine the correlations between LOP, LGDP, LFD and LTR. The Johansen cointegration test was applied so as to determine whether a stable relationship persists between OP, GDP, FD and TR. Lastly, a VECM approach was applied with this study to address such a discrepancy and capture short and long-term dynamics. Consequently, both short and long-term dynamics can be forecasted and distinguished within the context of oil price volatility to provide a better understanding of economic variables' responses to such changes across time. Moreover, this study applied a VECM method so as to determine policy measures' effectiveness in reducing the impact of oil price volatility. This combined approach allowed our study to offer a better picture of oil price volatility's impact on the Iraqi economy highlighting their immediate effects and adjustments occurring in the long run. To broaden the study's implications, the impact of financial development and trade on the Iraq economy were integrated into the VAR model to capture their effects resulting in a VAR model projected as follows:

$$lnGDP_t = a + \sum_{i=1}^{k} \beta_1 lnGDP_{t-1} + \sum_{i=1}^{k} \beta_2 lnOP_{t-1} + \sum_{i=1}^{k} \beta_3 lnFD_{t-1} + \sum_{i=1}^{k} \beta_4 lnTR_{t-1} + \mu_{1t} \quad (1)$$

Where GDP is Gross Domestic Product, OP is oil prices, FD is financial development and TR is trade. The estimated parameters are represented by β_1 to β_4 while the error terms are denoted by μ_{1t} to μ_{4t}. According to equation 1, the logged value of GDP is a function of its lagged values as well as the lagged values of OP, GDP, FD and TR. As part of the data analysis, VECM was integrated to incorporate the error correction term (ECT) and the ECT's specification is as follows:

$$\Delta Y_t = \propto (Y_{t-1} - \beta_{xt-1}) + \gamma \Delta x_t + \delta ECT_{t-1} + \varepsilon_t \quad (2).$$

Where:

- ΔY_t = Change in the dependent variable at time.
- $\propto$ = the speed of adjustment parameter representing the proportion of the deviation from the equilibrium corrected in one period.
- Y_{t-1} = lagged value of the dependent variable.
- β is the coefficient associated with the lagged value of the independent variable.
- $xt-1$ = lagged value of the independent variable.
- γ = the coefficient associated with the change in the independent variable.
- Δx_t = the change in the independent variable at the time
- δ = the coefficient associated with the error correction term.
- ECT_{t-1}= lagged error correction term.
- ε_t = error term at time.

By applying the VECM procedure, we were able to determine the speed of adjustments. Other tests in the

form of Granger causality tests were applied to determine whether oil prices, GDP, financial development and trade Granger cause each other.

3.2. Unit Root Tests

Unit root tests involving the ADF and the PP tests were applied to determine whether the data has unit roots. Both tests were conducted at levels and first differences. Consequently, we found out that the data did not have unit roots and that the obtained results were not spurious (Herranz, 2017).

3.3. Statistical Tests

In order to ensure that the model is free from serial correlation, a serial correlation LM test was performed. This was also performed using the Durbin-Watson test, which required the value to be close to 2 to warranty results that are serial correlation-free. Along similar lines, we tested the model for heteroscedasticity using the Breusch-Godfrey test and the Arch test.

Lastly, a normality test was also conducted to ensure that the data was normally distributed. A normality test was also performed using the Jarque Bera test.

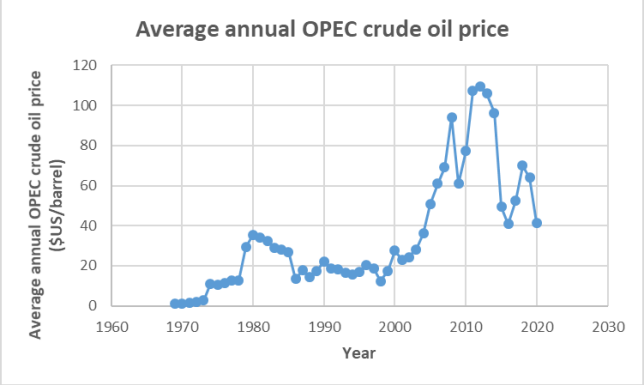
3.4. Variables And Data Collection

Iraq is a major oil-producing country, and its economy is heavily dependent on oil exports. Changes in oil prices have a profound impact on government revenues, foreign exchange earnings, and overall economic stability. Studying the fluctuations in oil prices allows for insights into the vulnerability and resilience of Iraq's economy to external shocks. To capture volatile changes in oil prices, the Average annual OPEC crude oil price in US dollars was used. According to Figure 1b, volatile patterns in oil prices are highly observable especially from 2003 to 2020. As a result, the possibility of such volatile changes in oil prices affecting Iraq's economy was highly anticipated. In the study, GDP was used to measure changes in Iraq's economic performance following the observed volatile oil prices.

Economic growth (GDP) was included in the examination because, through the analysis of economic growth within the Iraqi context, analysts can evaluate the comprehensive well-being and functionality of the economy, discern patterns, and comprehend its responsiveness to a myriad of internal and external influences. By including GDP in this study, the study can be able to design policy responses that cushion the Kurdistan economy from oil shocks. As such, declines in GDP reflected poor economic performance while upward swings indicated good economic performance (see Figure 1b). Moreover, through the incorporation of financial development, we can offer insights into the effectiveness, accessibility, and stability of financial institutions, pivotal in nurturing investment, entrepreneurship, and holistic economic advancement.

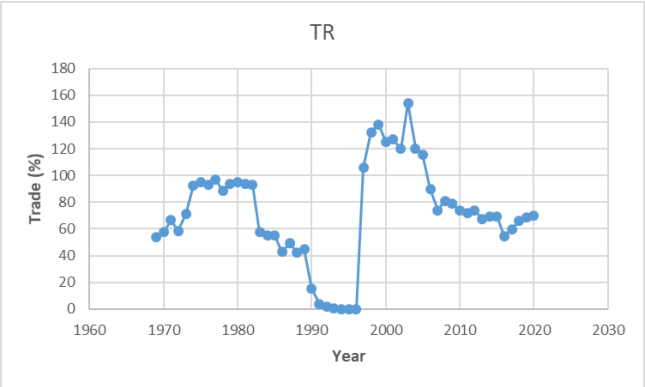
Lastly, the active participation of Iraq in global trade plays a crucial role in fostering its economic advancement. Examining the intricacies and trends of trade allows analysts to evaluate how worldwide market dynamics, trade strategies, and geopolitical influences affect the Iraqi economy. Comprehending the dynamics of trade relationships aids in recognizing both prospects and obstacles for promoting economic diversification and developmental initiatives.

Data from 1960 to 2020 were used because the selected duration offers a historical viewpoint, enabling the analysis of extended-term trends, patterns, and changes in Iraq's economic dynamics. This proves important when evaluating the influence of variables over numerous decades. Additionally, the chosen timeframe encompasses the progression of Iraq's energy sector, encompassing significant occurrences, policy adjustments, and economic shifts linked to oil production and pricing.

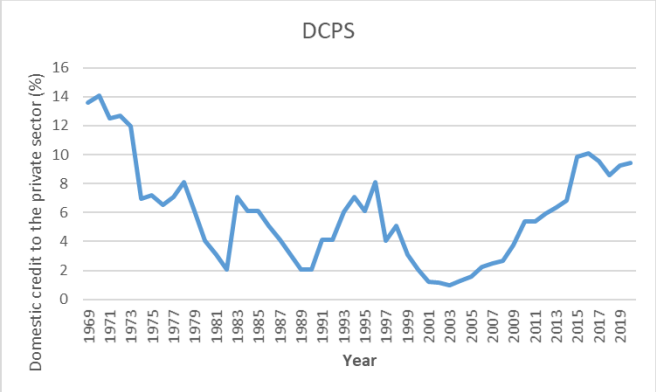


(a) Average annual OPEC crude oil price

(b) GDP growth



(c) Trade growth



(d) Domestic credit to the private sector

Fig. 1. Variable description (Source: Researcher, 2023)

Based on Figure 1, improvements were observed as Iraq's trade rose to 115.74% in 2005. This places a huge demand to examine these changes within the context of economic performance measured by changes in GDP. According to Mlachila et al. (2016), financial development refers to the process and policies that promote the growth, efficiency, stability, and accessibility of financial systems within a country or region. In this study, Domestic Credit to the Private Sector (DCPS) was used as a proxy for financial development. With an increase in financial development in Iraq from 1.23% in 2001 to 9.44% in 2020, changes in Iraq's economic performance were highly anticipated. However, not much has been done to examine these changes. Hence, as a contribution to existing literature, the combined effects of oil prices, financial development and trade on Iraq's economy were examined. This was done using annual data from 1960 to 2020 that was analysed using Eviews 12.

4. RESULTS AND ANALYSIS

4.1 Descriptive statistics

Descriptive statistics were computed for the variables LOP, LGDP, LFD and LTR. According to Table 1, on average, the logarithm of LOP, LGDP, LFD and LTR are approximately 3.125, 4.193, 1.571 and 3.663, which indicate high levels of elasticity. Consequently, elastic responses to economic policies are highly expected. Skewness values of -1.042 (OP), -5.839 (GDP), -0.583 (FD) and -2.735 (TR) indicate that their distribution is highly skewed to the left, indicating that extreme values are pulling the distribution in that direction. LTR has a kurtosis value of 9.541, which is very high and indicates a distribution with extremely heavy tails and potential outliers. Such will be diagnosed using heteroscedasticity tests.

TABLE 1: Descriptive statistics

	LGDP	LOP	LFD	LTR
Mean	4.193	3.125	1.571	3.663
Maximum	4.811	4.695	2.644	5.038
Minimum	-0.051	0.191	-0.041	-3.912
Std. Dev.	0.637	1.088	0.687	2.002
Skewness	-5.839	-1.042	-0.583	-2.735
Kurtosis	39.411	4.102	2.549	9.541
Observations	52	52	52	52

Where OP= Oil prices, GDP = Gross Domestic Product, FD = Financial development and TR = Trade.

4.2 Unit root test

Unit tests involving the ADF and the PP test reveal that the variables LOP, LGDP, LFD and LTR are stationary at both levels and the first difference is shown in Tables 2(a) and 2(b). This entails that the applied variables are warranted to offer results that are not spurious. Hence, the study proceeded further to analyse the computed descriptive statistics.

TABLE 2(a): ADF unit root intercept and trend test results

	@ level		@1st difference	
	t-statistics	**Probability**	**t-statistics**	**Probability**
LGDP	-8.405	0.000	-9.071	0.000
LOP	-7.315	0.000	-6.899	0.000
LFD	-9.635	0.000	-6.899	0.000
LTR	11.256	0.000	-5.842	0.000

TABLE 2(b): PP unit root intercept and trend test results

	@ level		@1st difference	
	t-statistics	**Probability**	**t-statistics**	**Probability**
LGDP	-8.458	0.000	-8.458	0.000
LOP	-7.313	0.000	-7.313	0.000
LFD	14.675	0.000	14.675	0.000
LTR	-5.469	0.000	-5.469	0.000

4.3 Correlations

Correlation coefficient tests were further computed to examine the correlations between LOP, LGDP, LFD and LTR. The results from the correlation show weak to very weak relationships between the independent variables and the dependent variable. For instance, changes in oil prices are weakly positively and significantly correlated with GDP and financial development by 0.007 and 0.037, respectively while trade is weakly correlated with OP, GDP, FD and FD by 0.042, 0.064 and 0.018, respectively. The weak correlations may reflect the influence of external factors that are not captured by the selected independent variables. External shocks, such as COVID-19, global economic downturns, geopolitical events, or unexpected changes in market conditions, can significantly impact the economy. Furthermore, weak correlations may indicate that the relationships are better described by nonlinear models or that other variables contribute to the observed outcomes.

TABLE 3: Correlations

Correlation Probability	**LOP**	**LGDP**	**LFD**	**LTR**
LOP	1.000			

LGDP	0.007	1.000		
	0.962	-----		
LFD	0.037	0.054	1.000	
	0.007	0.705	-----	
LTR	0.042	0.064	0.018	1.000
	0.468	0.419	0.199	-----

Meanwhile, insignificant positive correlations are possible because economic and social phenomena are influenced by various factors, and random fluctuations or noise can obscure the true relationships between variables. For instance, insignificant positive correlations between oil prices and GDP and trade of 0.007 and 0.042 were recorded, respectively. This is expected as oil-exporting countries like Iraq often rely heavily on revenues from oil exports to fund government budgets. Higher oil prices mean increased revenues for the government, enabling higher public spending on infrastructure projects, education, healthcare, and other areas. This increased spending can boost GDP. Moreover, increased spending in the oil sector and related industries can trigger a multiplier effect. As income generated from the oil sector circulates through the economy, it can generate additional rounds of spending and economic activity, further boosting GDP.

4.4 Cointegration Test

The Johansen cointegration test was applied so as to determine whether a stable relationship persists between OP, GDP, FD and TR (move together in the long run). Following the application of the Johnsen cointegration test, the study concluded that the variables were cointegrated with each other in the long run. This is evidenced by the Trace and the Maximum Eigenvalue Test results that indicated the existence of 1 cointegrating equation.

TABLE 4: Cointegration test criterion

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.558818	67.43726	47.85613	0.0003
At most 1	0.283301	26.52235	29.79707	0.1138
At most 2	0.131336	9.867370	15.49471	0.2911
At most 3	0.054979	2.827422	3.841466	0.0927
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
None *	0.558818	40.91491	27.58434	0.0006
At most 1	0.283301	16.65498	21.13162	0.1889
At most 2	0.131336	7.039948	14.26460	0.4844
At most 3	0.054979	2.827422	3.841466	0.0927
Trace test and Max-eigenvalue test indicate 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

4.5 Granger causality

It was discovered that upon the successful application of the Granger causality test, none of the variables Granger caused each other as demonstrated in Table 10. Therefore, the study concludes that neither oil prices nor GDP, financial development nor trade granger caused each other. This is in contrast with previous studies' findings in which causality was established by GDP and oil prices (Maghrebi et al., 2018), financial development and oil prices (Tursoy & Simbarashe, 2021) and oil prices and trade balance (Arouri et al., 2014). This redirects policy attention to other drivers of economic growth, which monetary authorities are either prioritising or having a dominant effect on Iraq's economic performance.

TABLE 5: Granger causality

Dependent variable: LGDP			
Excluded	Chi-sq	df	Prob.
LOP	0.250855	2	0.8821
LFD	2.866830	2	0.2385
LTR	1.722974	2	0.4225
All	5.321602	6	0.5033
Dependent variable: LOP			
Excluded	Chi-sq	df	Prob.
LGDP	0.640123	2	0.7261
LFD	0.911292	2	0.6340
LTR	2.623464	2	0.2694
All	5.116656	6	0.5289
Dependent variable: LFD			
Excluded	Chi-sq	df	Prob.
LGDP	2.380711	2	0.3041
LOP	1.775460	2	0.4116
LTR	0.050650	2	0.9750
All	4.141145	6	0.6576
Dependent variable: LTR			
Excluded	Chi-sq	df	Prob.
LGDP	1.368012	2	0.5046
LOP	0.920719	2	0.6311
LFD	1.178964	2	0.5546
All	3.203824	6	0.7829

4.6 A lag order selection criterion

A lag order selection criterion was used to determine the number of lags required in estimating the VAR model. Table 6 shows that 1 lag was necessary for estimating the VAR model as supported by the LR, FPE, AIC, SC and HQ test results.

TABLE 6: Lag order selected by the criterion

Lag	LogL	Sequential modified LR test statistic	Final prediction error	Akaike information criterion	Schwarz information criterion	Hannan-Quinn information criterion
0	-249.4782	NA	0.453893	10.56159	10.71752	10.62052
1	-135.6041	204.0244*	0.007712*	6.483505*	7.263172*	6.778143*
2	-124.6456	17.80765	0.009658	6.693566	8.096966	7.223913
3	-113.5808	16.13609	0.012316	6.899201	8.926336	7.665258
4	-97.36808	20.94147	0.013129	6.890337	9.541205	7.892104

* indicates lag order selected by the criterion

4.7 VECM short-run model estimation results

An acceptable threshold for the (t-statistics) value of 1.96 (5%) was used in interpreting both the VECM results. The VECM model results showed that previous oil prices have inelastic effects on future GDP of - 0.0350 and 0.0139. In this context, the previous first year's oil prices can be said to hamper Iraq's economic performance compared to the second year. In support of the first lag's results, Aliyu (2009) discovered that changes oil prices adversely affect the growth of OECD economies.

The overall impact of lagged financial development, GDP and trade have positive effects on future GDP growth levels in the short-run, respectively. This is supported by previous related studies linked to financial development (Wang, Zhang & Zhang, 2021) and trade (Doğan, Balsalobre-Lorente & Nasir, 2020; Nguyen, 2020; Rahman, 2021). Thus, 90.82% of changes in GDP are explained by OP, GDP, FD and TR. The results are displayed in Table 7. Unlike GDP, overall changes in OP, TR and FD are adversely affected by changes in variables in the second lag in the short run. Table 7 further shows that 62.24% of the changes in GDP are explained by OP, TR and FD as denoted by the R-square value of 0.622374.

TABLE 7: Short-run VECM estimat

Error Correction:	D(LGDP)	D(LOP)	D(LTR)	D(LFD)
COINTEQ1	-1.335087	0.281814	1.532496	-0.258686
	(0.37305)	(0.18909)	(0.68095)	(0.18515)
	[-3.57884]	[1.49037]	[2.25053]	[-1.39717]
D(LGDP(-1))	0.086422	-0.213218	-1.062941	0.223571
	(0.27742)	(0.14062)	(0.50640)	(0.13769)
	[0.31152]	[-1.51627]	[-2.09902]	[1.62373]
D(LGDP(-2))	0.040809	-0.094214	-0.607447	0.085069
	(0.16815)	(0.08523)	(0.30693)	(0.08345)
	[0.24270]	[-1.10541]	[-1.97911]	[1.01935]
D(LOP(-1))	-0.035037	0.104805	0.300012	-0.079540
	(0.32567)	(0.16507)	(0.59446)	(0.16163)
	[-0.10759]	[0.63490]	[0.50468]	[-0.49210]
D(LOP(-2))	0.013867	-0.023857	-0.100091	0.084149
	(0.32215)	(0.16329)	(0.58803)	(0.15989)
	[0.04304]	[-0.14611]	[-0.17021]	[0.52631]
D(LTR(-1))	0.066552	-0.061281	0.288147	0.005760
	(0.08809)	(0.04465)	(0.16079)	(0.04372)
	[0.75551]	[-1.37247]	[1.79202]	[0.13176]
D(LTR(-2))	0.030994	0.054705	-0.249074	-0.034706
	(0.09007)	(0.04565)	(0.16441)	(0.04470)
	[0.34412]	[1.19827]	[-1.51500]	[-0.77639]
D(LFD(-1))	-0.171394	0.066264	1.368483	-0.052963
	(0.37850)	(0.19185)	(0.69089)	(0.18785)
	[-0.45283]	[0.34539]	[1.98074]	[-0.28193]
D(LFD(-2))	0.393153	0.200177	-0.488444	0.083029
	(0.37002)	(0.18756)	(0.67542)	(0.18365)
	[1.06251]	[1.06729]	[-0.72317]	[0.45211]
C	-0.003692	0.061179	-0.007725	-0.005765
	(0.10470)	(0.05307)	(0.19112)	(0.05196)
	[-0.03526]	[1.15279]	[-0.04042]	[-0.11095]
R-squared	0.622374	0.139616	0.208674	0.134346
Adj. R-squared	0.535229	-0.058934	0.026061	-0.065421
Sum sq. resids	18.62347	4.784774	62.05187	4.587459
S.E. equation	0.691032	0.350266	1.261378	0.342968
F-statistic	7.141852	0.703177	1.142709	0.672514
Log likelihood	-45.82674	-12.53164	-75.31367	-11.49988
Akaike AIC	2.278643	0.919659	3.482191	0.877546
Schwarz SC	2.664728	1.305745	3.868277	1.263632
Mean dependent	-0.007250	0.065191	0.001024	-0.005697
S.D. dependent	1.013628	0.340380	1.278142	0.332272

4.7 VECM short-run model estimation results

As a contribution and novel approach to this study, VECM results presented in Table 8 were produced. The ECT reveals that it takes 133.5% for the variables to revert to equilibrium. As such, trade opens up new markets for Iraqi goods and services, providing opportunities to expand sales and increase revenue. As such, access to a broader customer base helps stimulate production and economic growth.

TABLE 8: Long-run VECM results

	Coefficient	Std. Error	t.statistic	Probability	VIF
CointEq 1	-1.335	0.023	-12.767	0.000*	-
C	3.445	0.206	16.749	0.000*	-
LOP	0.150	0.0018	12.706	0.000*	1.037
LFD	0.142	0.027	11.273	0.000*	0.892
LTR	0.006	0.021	13.114	0.000*	1.156

* and ** significant at 0.01 and 0.05 levels, respectively.

The long-run VECM results indicate that LOP, LFD and LTR have positive effects on GDP of 0.150, 0.142 and 0.006, respectively. This shows that the Iraqi economy benefits significantly from an increase in oil prices, and improvements in financial development and trade. These results support previous related examinations about the relationships between GDP and oil prices (Maghrebi et al., 2018), financial development and oil prices (Tursoy & Simbarashe, 2021) and oil prices and trade balance (Arouri et al., 2014). In another instance, Doğan et al.'s (2020) results showed that trade openness enhanced economic growth in 32 European countries from 1995–2014. In a Vietnamese context, Nguyen (2020) discovered that trade is of vital importance for economic growth. This possibly suggests that Iraq's monetary authorities have been creating a conducive economic, financial and trading environment that promotes and fosters economic growth. Hence, it is at this stage that the study infers that both changes in oil prices together with Iraq's financial development and trade policies are of huge importance to the safeguarding and improvement of its economic performance. The Variance Inflation Factor (VIF) results of 1.037 (LOP), 0.892 (LFD) and 1.156 (LTR) were less than 3 indicating that no multi-colinearity problems were detected.

4.8 Impulse Response function determination

According to Winarno, Usman and Kurniasari (2021), an impulse response function traces the incremental effect of a 1 unit (or one standard deviation) shock in one of the variables on the future values of the other endogenous variables. Figure 2 shows that both oil prices or GDP, financial development and trade give each other shocks. GDP recovers from oil shocks in the 1st lag and from trade in the 3rd lag. However, GDP does not recover from financial development shocks.

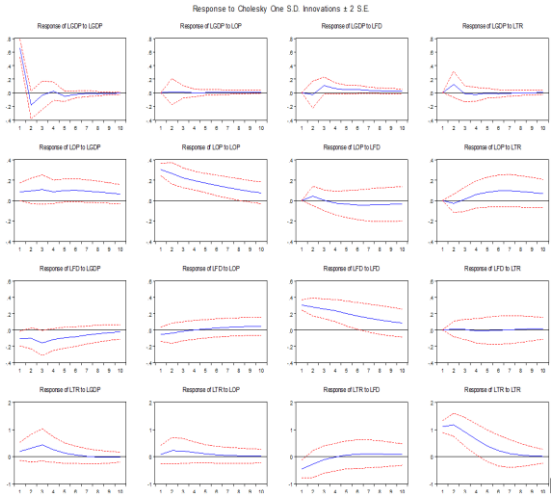


Fig. 2. Impulse response test (Source: Researcher, 2023)

4.9 Diagnostics tests

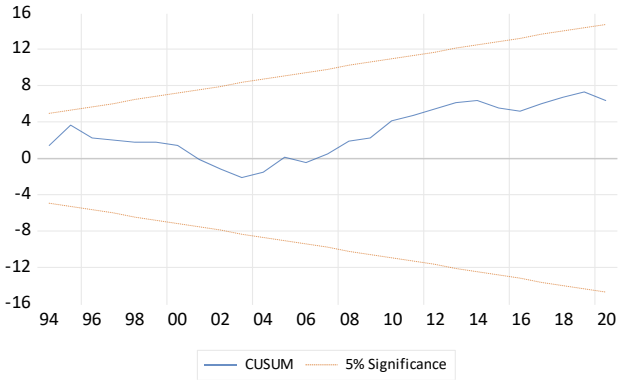
To ensure that the estimated model is correctly specified, diagnostic tests were conducted. Firstly, the applied Residual Serial Correlation LM test with an LM statistic of 10.745 has a probability value of 0.8249 as shown in Table 4. This implies that the null hypothesis of no serial correlation is accepted. Hence, the model is free from serial correlation. Both the Breusch-Godfrey Pagan (BR) test and the Arch Test (AR) reported insignificant p-values of 0.8169 and 0.7007 at 5%, respectively. This indicates that the null hypothesis of heteroscedasticity is rejected at 5% and hence, we conclude that there were no heteroscedasticity problems affecting the model.

TABLE 4: VEC Residual Serial Correlation LM Tests

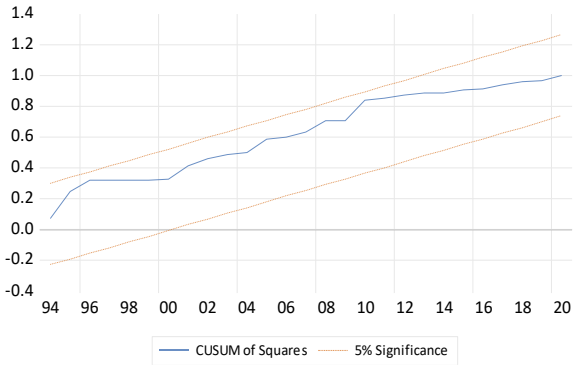
	SC	BR	AR	Jarque Bera	RR
Value	10.745	0.6738	0.1496	7.246	3.212
Probability	0.8249	0.8169	0.7007	0.623	0.000

SC: Serial correlation; **BR:** Breusch-Godfrey; **AR:** Arch test and **RR:** Ramsey Reset.

The Jarque Bera value of 7.246 has a probability value of 0.623, which means that the model follows a normal distribution. Therefore, the estimate is correctly specified and well-positioned to offer reliable results. As a result, the next section proceeds to analyse the estimated model results. The Ramsey Reset (RR) value of 3.212 is statistically significant at a 1% level, indicating that the variables OP, GDP, ER and TR collectively play a significant role in explaining the effects of changes in oil prices, economic growth, financial development, and trade on Iraq's economy. In further support of the findings' ability to provide reliable inferences, the Cusum and Cusum of squares results shown in Figure 3 show that the estimated model was stable. This implies that the results can be deployed for policy and strategic decision-making purposes.



(a) Cusum test



(b) Cusum of squares

CONCLUSION

This research article explored the complex connections linking oil price changes to Iraq's economy. Iraq, a country heavily dependent on oil exports, has been profoundly affected by fluctuations in oil prices over the years. By employing a VAR-VECM quantitative analysis, this article aimed to offer rich information on changes in oil prices' short-run and long-run dynamics, financial development and trade to Iraq's economic stability and development prospects. As such, the following conclusions were drawn:

- When oil prices are high and stable, Iraq experiences robust economic growth due to increased government revenue and investment in infrastructure and public services. Conversely, during periods of low oil prices, economic growth often stagnates, leading to fiscal challenges.
- Financial development is well poised to have huge positive effects on Iraq's economic performance on condition that Iraq has stronger regulatory frameworks, well-modernized banking systems, well-developed capital markets and high levels of financial inclusion.
- Trade is an essential element in boosting Iraq's economic performance as it opens up new markets for Iraqi goods and services, provides opportunities to expand sales and increase revenue.

As recommendations according to the study findings, the Iraq government should:

- Strengthen regulatory frameworks and institutions, modernize banking systems, develop capital markets and promote financial inclusion to stir significant improvements in economic growth from its financial development initiatives.
- Implement trade policy reforms, trade facilitation and streamlining procedures and diversify export markets so as to boost the positive benefits of trade leading to substantial improvements in economic growth.

The study advances theoretical modelling by capturing the temporal and dynamic aspects of oil prices and different economic indicators in Iraq. Apart from studying the long-term equilibrium relationships between variables, applying the VECM approach contributes to theoretical discussions on the persistence and adjustment processes in Iraq's economy following changes in oil prices, aiding in the formulation of economic policies. This produces theoretical insights essential for guiding policymakers by highlighting potential areas of vulnerability and suggesting policy measures to mitigate oil price fluctuations' adverse effects. Concerning the practical contributions, the study informs the development of risk management strategies for businesses and the government, helping them prepare for and respond to economic uncertainties stemming from oil price changes. Moreover, investment planning and decision-making initiatives are hereby supported as the study offers insights into the impact of oil price changes on economic conditions thereby rationalizing the decision-making process. Regarding socio-economic development planning, the findings project the impact of oil price changes on finance and trade sectors and this can enhance socio-economic development planning as vital sectors are prioritized, and resources are allocated efficiently to promote sustainable development.

Policy Implications

To counteract the negative effects of changes in oil prices, Iraq's economy must diversify and become less reliant on oil exports. It additionally involves investing in non-oil sectors like agriculture, industry, and services to make the economy far more diversified and resilient. Furthermore, implementing appropriate fiscal policies, like a wealth fund, can aid in stabilising government finances amid times of volatile oil price changes. It is also critical for the government to encourage the establishment and implementation of financial mechanisms for hedging from oil price changes. The premise is that firms and governments can utilise hedging strategies to reduce financial risks associated with volatile oil prices.

Limitations and suggestions for future studies

Linearity and stationarity are primary assumptions underlying the VAR-VECM models' application. As such, these assumptions may fail to hold and any violation of such assumptions undermines the credibility of the results. Knowing well that changing the variables' lag length changes the obtained results, the purported connection linking changes in oil prices with Iraq's economy can be distorted. Therefore, future studies must explore other multivariate time series models distinct from VAR models like state-space models of Bayesian VAR to compare and validate the estimated model results. Additionally, the importance of employing longitudinal studies is essential as this helps in tracking economic changes over a longer period to allow an extensive study of the impact of oil price changes on the economy.

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