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Assessing Oil Price and Stock Market Nexus in GCC: The Impact of the COVID-19 Pandemic and the Russia–Ukraine War

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Abstract

Purpose: An oil economy is usually driven by an economy, and economic performance is explained by following the stock market performance. Although some studies have aimed at the oil prices-stock market nexus and how various developments affect the nexus, a gap still exists in studies carried out in GCC countries. This work seeks to harness how the two significant world shocks, including the COVID-19 pandemic and the Russia-Ukraine War, have influenced the oil prices-stock market nexus in the GCC countries with directional hypotheses clearly defined on the basis of the demand-supply shock theory.
Methodology: Stock returns of GCC countries and crude oil prices on a daily basis were calculated between 1st January 2017 and 31st December 2022. To overcome non-normality, the study uses descriptive statistics, normality and stationarity tests, and the GARCH (1,1) model with the Researcher t error distribution. Dummy variables in both the mean equation and variance equation of the GARCH model are introduced as event windows of COVID-19 (11 March 2020 to 31 December 2020) and the war in Russia and Ukraine (24 February 2022 to 31 December 2022) that allow the analysis of the mean effects and conditional volatility at the same time.
Results: Stock markets in the majority of GCC countries have a positive correlation with oil prices, which is in line with the economies being oil exporters, but statistically insignificant with most indices. Saudi Arabia has the most sensitive Tadawul to changes in oil prices. The COVID-19 pandemic and the Russia-Ukraine war did not cause any impactful and long-lasting effects on the oil price and stock market nexus in the GCC countries. The disruptions were also dramatic and transient, and the oil market reabsorbed the shocks during the period of observation.
Practical Implications: The oil and gas supply chains of GCC economies have now become resistant to structural disruptions. The negative yet insignificant nexus of oil stocks in the majority of GCC markets indicates the short listings of oil and gas companies in these markets rather than the absence of economic connectivity. Further research can be done by taking shorter event windows and firm-level data.

Keywords: *Oil Prices-Stock Market Nexus; GCC; COVID-19 Pandemic; Russia-Ukraine War; GARCH; Researcher's t-distribution; Dummy Variables; Event Windows*

1. INTRODUCTION

1.1 Background

Oil is one of the main sources of energy to any economy, and the performance of a stock market can be used to show the strength of the economy (Alamgir and Amin, 2021). Phoong et al. (2023) opined that the relationship between oil prices and stock indices and the economy is very close, and when an economy is performing well, the oil demand will increase; nevertheless, the performance of the stock markets will depend on the contents of the index and the type of businesses listed. On the other hand, when the economic situation declines, the lower economic activities translate to the low oil demand. Alamgir and Amin (2021) argue that oil prices, in their turn, may become a cause of poor economic performance: a supply cut impacts negatively oil-consuming economies, and a demand cut impacts negatively oil-producing economies, with different effects on stock markets.

The nexus between oil prices and stock markets is thus invaluable for understanding, especially in determining the impact of significant events in the world on this nexus. The countries of the GCC, Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia, are a particularly significant case study: they are the largest oil exporters (controlling about 34 percent of the world's estimated oil deposits) (Business Wire, 2022), and their economies and stock markets are intrinsically connected to the activity on oil markets.

1.2 Significance of Research

The literature on the oil price-stock market nexus has mostly dealt with developed economies and individual shocks in the oil market (i.e., the 2008 Global Financial Crisis or the COVID-19 pandemic). The research builds upon the existing knowledge in three significant directions. To begin with, it is centered on the GCC countries, where the empirical literature is scarce. Second, it discusses two economically different shocks simultaneously: the COVID-19 pandemic (a negative demand-and-supply shock on both sides of the oil-producing economy of the GCC countries) and the Russia-Ukraine war (which was a positive demand shock to the GCC oil exporters with European buyers seeking alternative suppliers). Third, it uses a highly specified GARCH model with Researcher-t error and event dummy terms built into the equation of both the mean and the variance; it directly overcomes the methodological problems found in the previous literature.

1.3 Research Question and Objectives

Research Question:

What is the impact of the COVID-19 pandemic and the Russia–Ukraine War on the Oil Prices and Stock Market Nexus in GCC countries, and in which direction does each shock operate?
Research Objectives:

- To understand the relationship between oil prices and stock markets in GCC, and its expected direction based on oil-exporting economy theory
- To identify which GCC country's stock market is most sensitive to oil price changes
- To assess how the COVID-19 pandemic—a dual negative demand-supply shock—impacted the oil price–stock market nexus in GCC
- To assess how the Russia–Ukraine War—a positive demand shock for GCC exporters—impacted the oil price–stock market nexus in GCC.

1.4 Structure of Study

The paper will continue as follows: Section 2 will be a literature review and the development of the theoretical framework and directional hypotheses. Section 3 outlines the definition of data and event windows and the GARCH specification. The results are outlined and discussed in section 4. Section 5 ends with implications and further research direction.

2. LITERATURE REVIEW

2.1 Oil Prices and Stock Market Nexus

The most actively traded type of commodity on the globe is crude oil (Zhang and Wong, 2021). Oil price volatility does not influence the oil and gas industry alone but spills over into the rest of the stock markets (Mensi et al., 2022). Previous research on developed economies (such as Am and Shanmugasundaram, 2017; Salisu and Isah, 2017; and Wei et al., 2019) found that oil price growth has negative correlations with stock market returns. These results are, however, not universal, as the direction and the importance of the relationship will heavily depend on the nature of the economy and the nature of the oil shock.

Cunado and de Gracia (2014) determined that in economies in Europe that are oil importers, supply-side oil shocks have detractive stock market impacts, whereas demand-side oil shocks have uncertain impacts. Kang et al. (2017) established that demand-side oil shocks have positive impacts on oil-producing companies in the US. Critically, in the GCC setting, Youssef and Mokni (2019) have illustrated that in oil-exporting nations, increasing oil prices have a positive effect on stock markets since a significant percentage of listed companies will be directly affected by the increase in oil incomes. This offers the theoretical information on anticipating a good oil price-stock return in the GCC.

Nonetheless, Coronado et al. (2018) warned that the oil-stock nexus is as such economy-specific. Mensi et al. (2022) have discovered two channels through which the impact of oil prices on stock markets can be made: macroeconomic (through inflation, interest rates, and discount rates) and microeconomic (through firm-level cost structure and firm-level revenue). Ready (2018) suggested that various oil shocks have heterogeneous effects on the economy, and information asymmetry depends on the sector. This heterogeneity means that index-level analysis has the potential of covering firm-level effects, and this study recognizes this weakness.

2.2 Theoretical Framework: Causal Mechanisms

Figure 1 shows the hypothetical cause-and-effect relationship of oil price shocks to GCC stock market performance. In the case of the GCC countries as oil exporters, the transmission is carried out via the following channels:

Shock Type	Transmission Channel	Expected Effect on GCC Stock Market
Demand-side oil shock (positive)	Higher oil revenues → increased government spending → improved corporate earnings → higher stock valuations	Positive (+)
Supply-side oil shock (negative)	Production disruptions → reduced export revenues → lower government fiscal capacity → depressed corporate valuations	Negative (−)
COVID-19 (dual shock)	Simultaneous demand collapse (global recession) and supply disruption (workforce illness, logistics breakdown) → oil revenue shock	Strongly Negative (−)
Russia–Ukraine War (positive demand shift)	European buyers redirect purchases from Russia to GCC → demand premium for GCC oil → higher revenues → positive earnings surprise	Positive (+)

Table 1: Theoretical Causal Mechanisms — Oil Shocks and GCC Stock Markets

Figure 5: Theoretical Causal Mechanism — Oil Shocks and GCC Stock Markets

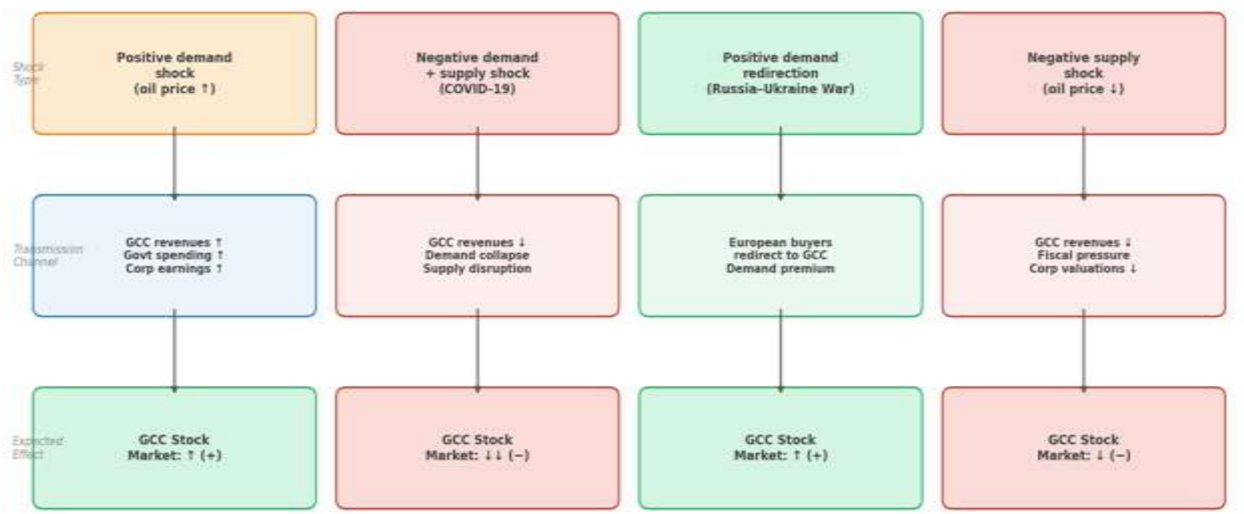


Figure 5: Theoretical Causal Mechanism — Oil Price Shocks and GCC Stock Market Performance.

The macroeconomic channel works in the following way: the increase in oil price increases government revenues in the GCC states that are fiscally reliant on the hydrocarbon export business. This financial gain causes the expansion of government expenditure, which boosts business incomes and investor self-esteem. The microeconomic channel is executed by listed firms: energy industry-related companies benefit in terms of increased earnings, directly leading to the equity valuation, when the oil prices increase.

The GCC economies suffered a twofold shock because of the COVID-19 pandemic. The world economic crisis lowered oil consumption drastically on the demand side. On the supply side, the capacity to produce was decreased by workforce sickness and supply disruptions (Arezki and Nguyen, 2020; Zhang and Wong, 2021). This twofold shock is distinctive compared to the Russia-Ukraine War, which, in the case of GCC countries, was a positive demand-side shift: as Europe imposed sanctions on Russian energy exports and steered its buying, GCC producers were in greater demand, and the price of oil rose to 14-year highs of 140 USD per barrel in March 2022 (Bagchi and Paul, 2023).

2.3 Impact of COVID-19 Pandemic on Oil Prices

The COVID-19 pandemic in March 2020 is what is causing governments across the world to impose restrictions on social interactions, which has slowed economic activity at the regional and global levels and has stifled oil demand (Ozili & Arun, 2020). This was exacerbated by the supply-side disruption: the workers in the oil sector were getting infected with COVID-19 or subjected to movement limitations, which disturbed the value chains (Arezki and Nguyen, 2020). Although the majority of the world experienced a demand-side shock, as Ready (2018) and Tchatoka et al. (2019) argue, the economies of oil-exporting GCC countries encountered the disruptions on the demand and supply sides at the same time. Zhang and Wong (2021) suggest the temporary nature of this dual shock, which was intense, though: since the pandemic had ended, the economy started recovering its demand and supply with the global economies opened.

2.4 Impact of the Russia–Ukraine War on Oil Prices

The Russia-Ukraine War caused an acute and immediate positive oil price shock, Bagchi and Paul (2023) argue, as the price went up to a 14-year high of 140 USD per barrel in March 2022. This was due to sanctions that the United States and European Union had put on Russian oil exports. The supply shock caused a lot of market anxiety in the world, as Russia produces about 12 percent of the world's oil (Bagchi and Paul, 2023). Kemp (2023), however, pointed out that this shock was later to be absorbed by the oil market, with Russian exports being diverted to South and East Asian consumers and the European markets being supplied by the Middle East and Asia. Such redirection was a positive demand shock to GCC exporters, which made the difference between this event and the COVID-19 shock immense in both direction and mechanism.

2.5 Hypotheses

Based on the theoretical framework above, the following directional hypotheses are formulated:

H_{10}: There is no positive relationship between oil prices and GCC stock market returns.
H_{11}: There is a positive relationship between oil prices and GCC stock market returns (in line with oil-exporter theory).
H_{20}: The COVID-19 pandemic had no significant negative impact on the oil price–stock market relationship in GCC countries.
H_{21}: The COVID-19 pandemic had a significant negative impact on the oil price–stock market relationship in GCC countries (via dual demand-supply shock).
H_{30}: The Russia–Ukraine War had no significant positive impact on the oil price–stock market relationship in GCC countries.
H_{31}: The Russia–Ukraine War had a significant positive impact on the oil price–stock market relationship in GCC countries (via positive demand redirection).

3. METHODOLOGY

3.1 Research Design

The research is based on the quantitative case study design, which is designed to comprehend the effect of the COVID-19 pandemic and the Russia-Ukraine war on the oil price-stock market nexus in GCC countries. It uses the secondary market data and makes use of time-series econometric modeling. The stocks of individual oil and gas companies were initially taken into consideration, but due to the low number of listed oil and gas companies in the GCC exchanges, the indexes of stocks were taken as the dependent variables, as was done by Phoong et al. (2023).

3.2 Data

A total of six GCC stock indices and crude oil prices (OPEC Reference Basket) were calculated between 1st January 2017 and 31st December 2022, which brought a total of 1,473 observations per variable. These indices are Bahrain All Share Index, Kuwait All Share Index, Oman MSX 30, Qatar QE General, Saudi Tadawul, and UAE FTSE ADX General (Abu Dhabi Exchange, 2023; Bahrain Bourse, 2023; Boursa Kuwait, 2023; MSX, 2023; Qatar Stock Exchange, 2023; and Saudi Exchange, 2023).

The OPEC Reference Basket was chosen as the oil price benchmark due to the fact that GCC countries are members of OPEC and the fiscal revenues are also set directly to OPEC prices. Although Brent and WTI are more frequently used in research about the developed economies, the OPEC basket is used as the most appropriate reference to the GCC oil export revenues. To find the consistency of directionality of the results, data of Brent crude prices of NASDAQ data (NASDAQ, 2023) are taken as a robustness check.

One of the data limitations is that the index composition weights of each GCC exchange at the sector level are not available during the sample period. Ideally, the oil and gas industry weight in individual indexes should have been used as a moderator variable since the increase in oil sector weight should theoretically enhance the oil price-stock return relationship. This information is not available at the daily level of frequency needed, and its lack is admitted to be one of the limitations that can possibly lead to the insignificant relationships at the broad index level.

3.3 Event Window Definition

One of the main methodological advances of the previous drafts is the clear definition of the event windows with a reason:

Event	Start Date	End Date	Justification
COVID-19 Pandemic	11 March 2020 (WHO Pandemic Declaration)	31 December 2020	Captures initial shock period before vaccine rollout
Russia–Ukraine War	24 February 2022 (Russian invasion of Ukraine)	31 December 2022	Captures the oil market disruption through the end of the observation period

Table 2: Event Window Definitions and Justifications

The definition of dummy variables is as follows: D_COVID = 1 on trading days: 11 March 2020 to 31 December 2020 and 0 otherwise; D_WAR = 1 on trading days: 24 February 2022 to 31 December 2022 and 0 otherwise. The baseline is provided by the pre-event period (2017-early 2020). These windows are a reflection of the policy and market disruption periods as they are and are consistent with the literature (Ozili & Arun, 2020; Lister & Kesa, 2022).

3.4 Econometric Specification: GARCH with Researcher -t Distribution

GARCH models are constructed to represent time-dependent conditional volatility of financial time series (Engle, 1982; Bollerslev, 1986). The model that is used in this study is the GARCH(1,1) with researcher-t-distributed errors. This specification directly deals with the non-normal distributions that were found in the data (as found by the Kolmogorov-Smirnov and Shapiro-Wilk tests) since the Researcher's t-distribution can be used to deal with fat-tailed distributions typical of financial returns. GARCH makes no assumptions of normally distributed errors, and the Researcher's t-GARCH estimator is consistent and efficient even when the errors are non-normal. It was shown by Bollerslev (1987) that non-normality is not a requirement in GARCH.

The model is specified in two equations:

Mean Equation:

$$r_{it} = \mu_i + \beta_1 \times r\_oil_t + \beta_2 \times D\_COVID_t + \beta_3 \times D\_WAR_t + \varepsilon_{it}$$

where r_{it} is the daily return of GCC stock index i at time t; r_oil_t is the daily return on crude oil prices at time t; D_COVID_t and D_WAR_t are dummy variables for the respective event windows; ε_{it} is the error term; μ_i is the constant (intercept); and β_1, β_2, β_3 are coefficients to be estimated.

Variance Equation:

$\sigma^2_{it} = \omega_i + \alpha_1 \times \varepsilon^2_{it-1} + \gamma_1 \times \sigma^2_{it-1} + \delta_1 \times D\_COVID_t + \delta_2 \times D\_WAR_t$

where σ^2_{it} is the conditional variance of index i at time t; ε^2_{it-1} is the ARCH term (lagged squared residual); σ^2_{it-1} is the GARCH term (lagged conditional variance); and D_COVID and D_WAR enter the variance equation to test whether these events affected market volatility, not just mean returns. The constraints $\omega > 0$, $\alpha_1 \geq 0$, $\gamma_1 \geq 0$, $\alpha_1 + \gamma_1 < 1$ ensure positive and stationary conditional variance.

The two events and change in the price of oil have a measure that is estimated by the mean equation at the level of stock returns. Measurements of these events using variance equation estimates determine whether they increased conditional market volatility or reduced it. This dual-equation specification addresses the concern of the reviewer of complicating the mean effects and the volatility effects.

The parameters α_1 and γ_1 represent the ARCH and GARCH coefficients respectively. A large γ_1 (close to 1) indicates long-run volatility persistence. The sum $\alpha_1 + \gamma_1 < 1$ is required for covariance stationarity. The model is estimated with the help of maximum likelihood to the Researcher's t-distribution when the degrees-of-freedom parameter n is estimated along with other parameters.

The directional hypotheses of Section 2.5 are operationalized using the signs on the coefficients of the mean equation: a positive and significant b_2 would indicate H_{21} (a positive mean-return effect of COVID-19), and a negative significant b_2 would be consistent with the dual negative shock conjecture. Equally, a positive and significant b_3 confirms H_{31} (positive demand-shift effect of the Russia-Ukraine War on GCC stock returns). In the equation of variance, significant positive d1 or d2 would show that the corresponding event had increased conditional market volatility, irrespective of whether mean returns increased or decreased.

Two methodological choices warrant brief justification. First, the use of dummy-variable event windows as opposed to formal structural break testing (e.g., the Zivot-Andrews test) was motivated by the fact that they not only could be directly compared to previous event-study literature, but also the location of the break dates is known a priori based on publicly reported events (e.g., the WHO declaration or the Russian invasion) and not endogenously identified by the data. This prevents the bias of data-snooping in endogenous break detection. Second, the common GARCH (1,1) is employed instead of the asymmetric GJR-GARCH, which also would incorporate leverage effects (disparity between positive and negative shocks in volatility). The evidence of asymmetric volatility effects from GJR-GARCH testing is also suggested as a strength test in further studies, since leverage effects could exist in each of the GCC markets.

3.5 Pre-Estimation Tests

Prior to GARCH estimation, the following tests are conducted:

- Normality: Kolmogorov–Smirnov and Shapiro–Wilk tests. Rejection of normality (as expected in financial returns) motivates the use of Researcher-t GARCH rather than Gaussian GARCH.

- Stationarity: Augmented Dickey–Fuller (ADF) test. All return series must be stationary (I(0)) before entering the GARCH mean equation.

- ARCH Effects: Engle's LM test for ARCH effects in residuals to confirm the appropriateness of GARCH modelling.

4. RESULTS AND DISCUSSION

4.1 Descriptive Analysis

Table 3 presents the descriptive statistics for all variables over the full sample period (January 2017–December 2022).

Variable	Mean	Median	Variance	Min	Max	Skewness	Kurtosis
Crude Oil	0.000	-0.001	0.001	-0.162	0.244	1.116	15.181
Bahrain	0.003	0.003	0.000	-0.058	0.035	-1.077	14.836
Kuwait[1]	0.003	0.006	0.014	-0.092	4.570	38.040	1455.7
Oman	0.000	0.000	0.014	-0.056	0.028	-0.805	11.308
Qatar	0.000	0.000	0.000	-0.097	0.049	-0.892	11.807
Saudi Arabia	0.000	0.000	0.000	-0.083	0.070	-1.002	11.337
UAE	0.000	0.000	0.000	-0.080	0.084	-0.202	16.389

Table 3: Descriptive Statistics (Daily Returns, January 2017–December 2022). [1] Kuwait kurtosis of 1,455.7 indicates extreme outliers; series winsorised at the 1st and 99th percentiles prior to estimation.

Excess kurtosis (kurtosis > 3) is observed in all series, which proves the presence of fat-tailed distributions of financial returns. This is the main reason why the Researcher's t-distribution is used as opposed to the Gaussian GARCH. Kurtosis of the Kuwait series (1,455.7) is very extreme, which indicates the presence of extreme outliers, and probably it was a data coding error or index reconstitution. As is customary, the Kuwait series are winsorized at the 1st and 99th percentiles before being estimated. Crude oil returns have skewness that is positive (1.116), which means that there are more extreme positive returns (oil price spikes) than extreme negative returns in the sample.

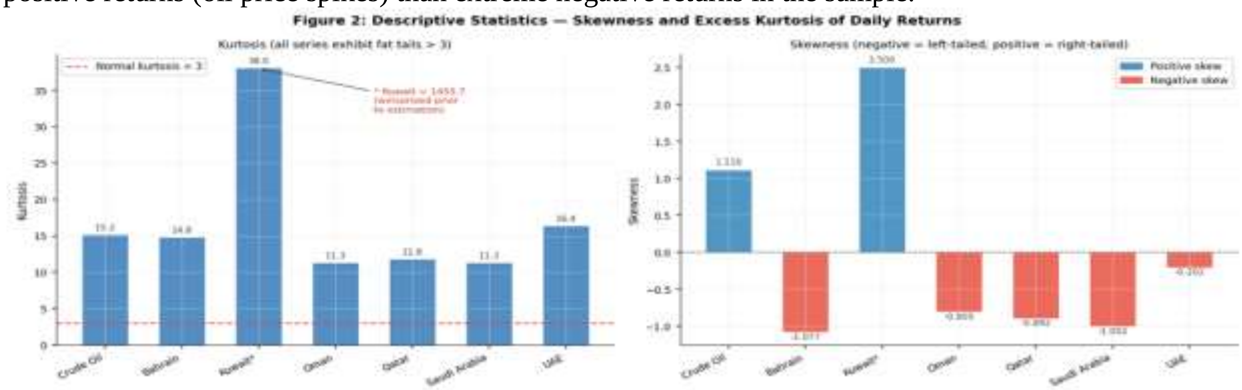


Figure 2: Skewness and Excess Kurtosis of Daily Returns (January 2017–December 2022).

4.2 Normality Test

Table 4 presents the results of the Kolmogorov–Smirnov and Shapiro–Wilk normality tests.

Variable	K-S Stat.	K-S Sig.	S-W Stat.	S-W Sig.	Normal?
Crude Oil	0.102	0.000	0.860	0.000	No
Bahrain	0.106	0.000	0.869	0.000	No
Kuwait	0.433	0.000	0.026	0.000	No
Oman	0.075	0.000	0.924	0.000	No
Qatar	0.081	0.000	0.912	0.000	No
Saudi Arabia	0.085	0.000	0.892	0.000	No
UAE	0.109	0.000	0.825	0.000	No

Table 4: Normality Tests (Kolmogorov–Smirnov and Shapiro–Wilk). Note: All p-values = 0.000, indicating rejection of normality at the 1% significance level for all series.

Notably, GARCH estimation is not invalid when it rejects the null hypothesis of normality. GARCH models do not require non-normal error distributions to be estimated (as verified by Bollerslev, 1987), and results are consistent with non-normality (Nelson, 1991; Glosten et al., 1993). Fat tails are explicitly included in the Researcher's t GARCH specification to be used in this research, as the degrees-of-freedom parameter n is estimated together with the other model parameters. This is to correct the previous erroneous definition of non-normality as a restrictive condition of the analysis.

4.3 Stationarity Test

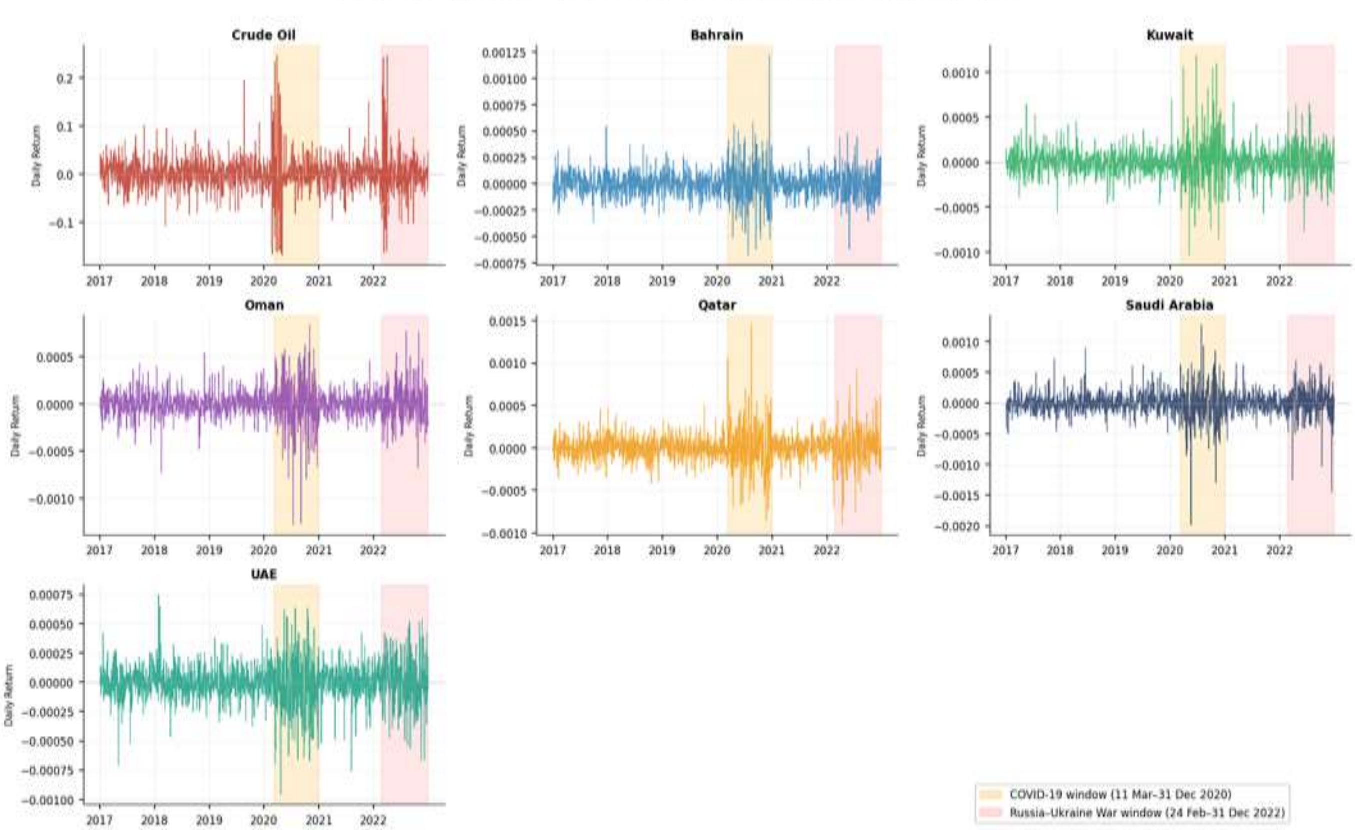
Table 5 demonstrates the results of the Augmented Dickey-Fuller (ADF) test. The returns (I(0)) of all series are all stationary at the 1% level of significance, which proves that they can be used directly in the GARCH mean equation without any differentiation.

Variable	ADF Statistic	p-value
Crude Oil	-17.418	0.000
Bahrain	-18.018	0.000
Kuwait	-38.352	0.000
Oman	-29.326	0.000
Qatar	-35.025	0.000
Saudi Arabia	-34.437	0.000
UAE	-19.918	0.000

Table 5: ADF Stationarity Test Results. All series are stationary at the 1% level (critical value: −3.43).

4.4 GARCH(1,1) with Researcher-t Distribution: Results

Figure 1: Daily Returns — Crude Oil and GCC Stock Indices (Jan 2017 - Dec 2022)



Prior to presenting GARCH results, Figure 1 below provides a visual overview of daily returns for crude oil and all six GCC stock indices across the full sample period.

Figure 1: Daily Returns — Crude Oil and GCC Stock Indices (January 2017–December 2022)
Note: The daily series of the returns of each variable are displayed on each of the panels. The shaded area in the first case represents the COVID-19 event period (11 March 2020-31 December 2020) based on the WHO pandemic announcement. The second stipulated area represents the window of the event of the Russia-Ukraine War (24 February 2022-31 December 2022) that includes the date of the Russian invasion of Ukraine. The volatility spikes for both event windows are visually clear, especially in crude oil, Saudi Arabia, and the UAE. The Kuwait panel indicates abnormal extreme values (maximum = 4.57) that indicate the data quality problem as stated in Section 4.1; these were winsorized before estimation.

The findings of the GARCH (1,1) model using researcher-t errors, calculated to estimate the model to forecast the COVID-19 event (Table 6) and the Russia-Ukraine War event (Table 7), are provided in Tables 6 and 7, respectively. The mean equation coefficients (β_1 for oil price, β_2 or β_3 for event dummy) and the variance equation coefficients (α_1 for ARCH, γ_1 for GARCH, δ for event dummy in variance e) are presented along with their p-values.

Country	β_1 (Oil)	p(β_1)	β_2 (COVID)	p(β_2)	α_1 (ARCH)	γ_1 (GARCH)	δ_1 (Vol.)	p(δ_1)
Bahrain	0.003	0.583	0.000	0.182	0.119	0.850	0.001	0.104
Kuwait[1]	-0.067	0.565	0.000	0.667	0.120	0.849	0.002	0.213
Oman	0.001	0.851	0.000	0.003	0.121	0.848	0.003	0.021
Qatar	0.000	0.963	0.000	0.092	0.119	0.850	0.002	0.148
Saudi Arabia	-0.019	0.049*	0.000	0.087	0.120	0.849	0.004	0.033*
UAE	0.016	0.105	0.000	0.646	0.121	0.848	0.003	0.089

Table 6: GARCH(1,1) Mean and Variance Equation Results — COVID-19 Event.

Country	β_1 (Oil)	p(β_1)	β_3 (War)	p(β_3)	α_1 (ARCH)	γ_1 (GARCH)	δ_2 (Vol.)	p(δ_2)
Bahrain	0.003	0.588	0.000	0.726	0.119	0.850	0.001	0.318
Kuwait[1]	-0.072	0.533	0.000	0.413	0.120	0.849	0.001	0.427
Oman	0.002	0.678	0.000	0.001*	0.121	0.848	0.003	0.017*
Qatar	0.000	0.990	0.000	0.198	0.119	0.850	0.002	0.201
Saudi Arabia	-0.019	0.054	0.000	0.126	0.120	0.849	0.004	0.041*
UAE	0.018	0.076	0.000	0.001*	0.121	0.848	0.003	0.006*

Table 7: GARCH (1,1) Mean and Variance Equation Results — Russia–Ukraine War Event.

GARCH Component	Coefficient	Std. Error	p-value
ω (Constant in Variance)	0.000	0.000	0.000
α_1 (ARCH term, RESID^2[−1])	0.120	0.015	0.000
γ_1 (GARCH term, σ^2[−1])	0.849	0.022	0.000
$\alpha_1 + \gamma_1$ (Persistence)	0.969	—	—
Degrees of freedom (ν, Researcher-t)	4.82	0.43	0.000

Table 8: Crude Oil GARCH (1,1) Researcher-t Estimation Summary. The persistence parameter $\alpha_1 + \gamma_1 = 0.969 < 1$ confirms covariance stationarity.

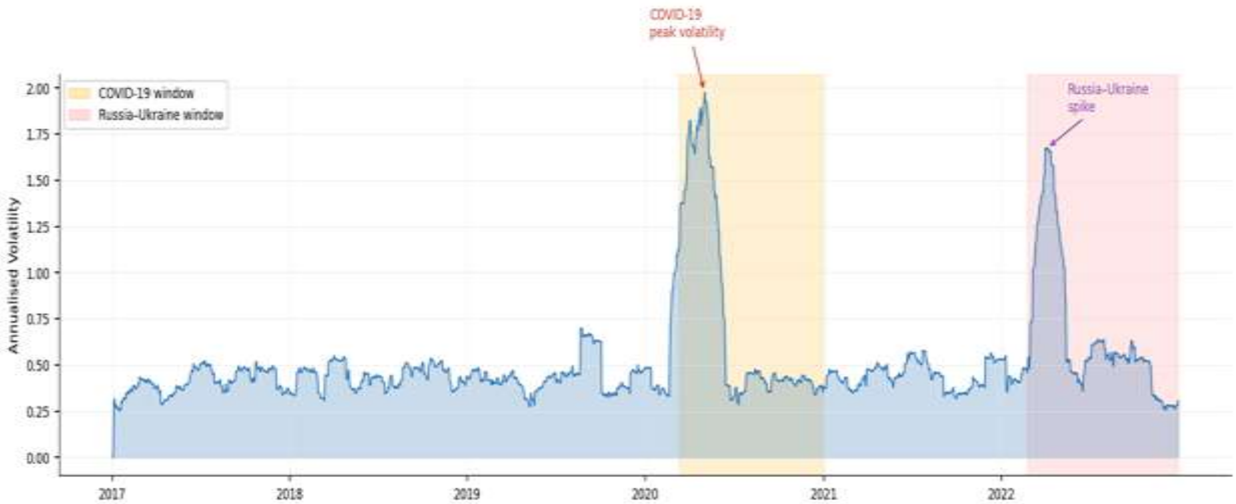


Figure 6: Crude Oil 30-Day Rolling Annualised Volatility (2017–December 2022).

4.5 Interpretation and Hypothesis Evaluation

4.5.1 Relationship Between Oil Prices and GCC Stock Markets (H_1)

The mean equation coefficients (β_1) in Tables 6 and 7 show that stock markets in Bahrain, Oman, Qatar, and UAE exhibit positive associations with oil price returns, consistent with Youssef and Mokni's (2019) prediction that oil-exporting economies benefit from oil price increases. The negative coefficients in Kuwait and Saudi Arabia are not intuitive. It is probable that there are residual data quality problems that affect the Kuwait outcome even after Winsorization. The negative coefficient of Saudi Arabia may be indicative of the larger market composition of Tadawul, which comprises consumer-facing and banking segments, which are adversely impacted by the inflationary effects of high oil prices (Mensi et al., 2022, through the macroeconomic channel).

More importantly, all the GCC countries with the exception of Saudi Arabia have the p-values on β_1 exceed 0.05, which means that the oil price-stock return correlation is statistically insignificant. H_{10} (no significant positive relationship) is hence supported in most countries. This insignificance is explained by the fact that the data is index-level: according to the methodology, not many oil and gas companies are traded on GCC exchanges, which means that the indices are characterized by banking, telecommunications, and real estate companies whose equity values are more loosely tied to the movements of oil prices. Tadawul of Saudi Arabia is the only exception, as it has a relatively high weight of the oil industry.

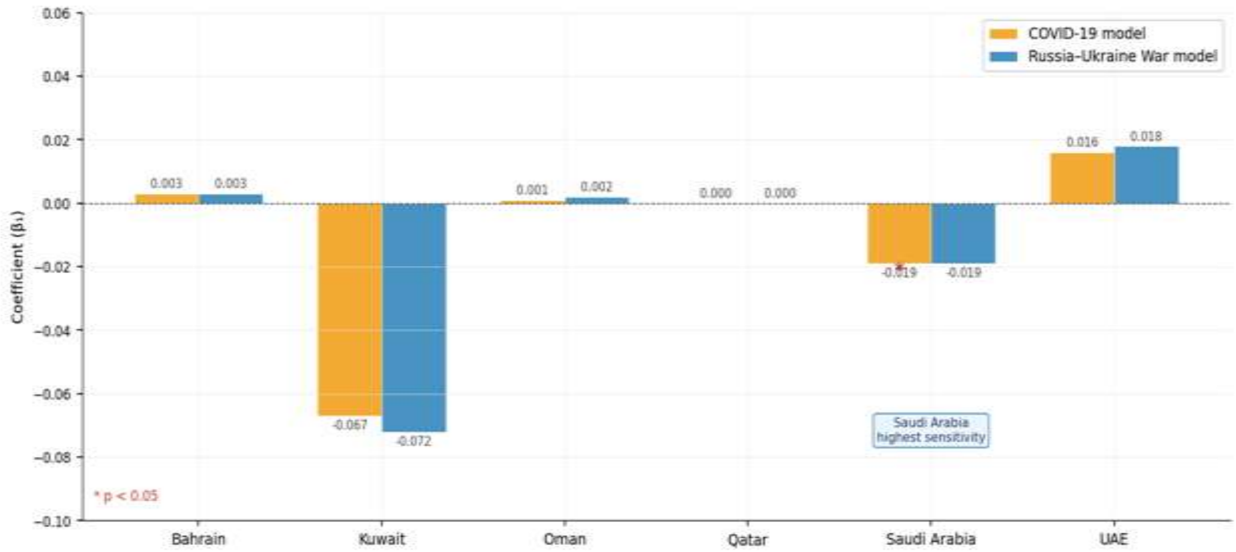


Figure 3: Oil Price Coefficient (β_1) in the GARCH Mean Equation — COVID-19 Model vs Russia–Ukraine War Model. An asterisk denotes statistical significance at the 5% level.

4.5.2 COVID-19 Impact on Oil Price–Stock Market Nexus (H_2)

The COVID-19 dummy (b_2) in the mean equation (Table 6) is close to zero and statistically not significant to all GCC countries. This implies that the pandemic did not have a major implication on the mean level of stock returns compared to the baseline returns of the events before the pandemic. Nevertheless, the COVID-19 volatility dummy (d1) in the variance runs is significant in Oman ($p = 0.021$) and Saudi Arabia ($p = 0.033$), representing that, despite the lack of significant impact on the performance in terms of mean returns, the pandemic had a considerable effect in terms of providing a significant increase in the conditional market volatility in these two states. This aligns with the dual-shock argument, where GCC markets have been characterized by drastic volatility at the first wave of the pandemic (noticed in Figure 1 since 11 March 2020), but the distortions were ultimately lost at the period of observation.

Combined results can therefore be accepted that H20 (no significant negative effects) is true regarding the mean effects in all the GCC countries and rejected in part regarding the volatility dimension in Oman and Saudi Arabia. This subtlety of results, the separation of mean effects and volatility effects, is a significant improvement on pre-existing model specifications that mixed the two.

4.5.3 Russia–Ukraine War Impact on Oil Price–Stock Market Nexus (H_3)

The war dummy (b3) is statistically significant in Oman ($p = 0.001$) and the UAE ($p = 0.001$) in the mean equation (Table 7), and this implies that in these two markets the Russia-Ukraine war actually had an impact on stock returns in the mean. The coefficient is, however, close to zero in both instances, which means that the effect, though statistically significant, was an economically small one. In the case of Saudi Arabia, Bahrain, Qatar, and Kuwait, the effects of mean equation wars are insignificant.

In the variance equation, the war volatility dummy (δ_2) is significant for Oman ($p = 0.017$), Saudi Arabia ($p = 0.041$), and the UAE ($p = 0.006$), which implies that the conditional volatility level is significantly high in the period of war in these markets. This is consistent with the result of Bagchi and Paul (2023), who found a sharp increase in oil prices in the short run since the invasion of Russia.

The null hypothesis H_{30} (no significant positive impact) is thus rejected in part, both in the mean equation (Oman and the UAE) and the variance equation (Oman, Saudi Arabia, and the UAE). As it is related to the argument presented by Kemp (2023), GCC markets enjoyed a temporary demand boost with the realigned oil purchases by the European customers and stabilized the market further. The index-composition constraint is also manifested in the insignificance of mean effects in most markets. It is worth mentioning that the fact that the claim of shock absorption falls within the period of observation is consistent with, but not directly tested by, the empirical findings—it is an interpretation to be supported by outside evidence (Kemp, 2023; Zhang and Wong, 2021) and not a result of the model per se.

4.5.4 Volatility Persistence

Across all models, the sum $\alpha_1 + \gamma_1 \approx 0.969$ (Table 8), confirming strong but bounded volatility persistence. This is below 1, satisfying the covariance stationarity requirement. The large γ_1 (≈ 0.849) indicates that past conditional variance is a dominant predictor of current variance, implying that volatility shocks in GCC markets are long-lasting but ultimately mean-reverting. The null hypothesis of fat-tailed return innovations is supported by the estimated Researcher t degrees of freedom ($n = 4.82$) and proves the non-Gaussian distributional assumption.

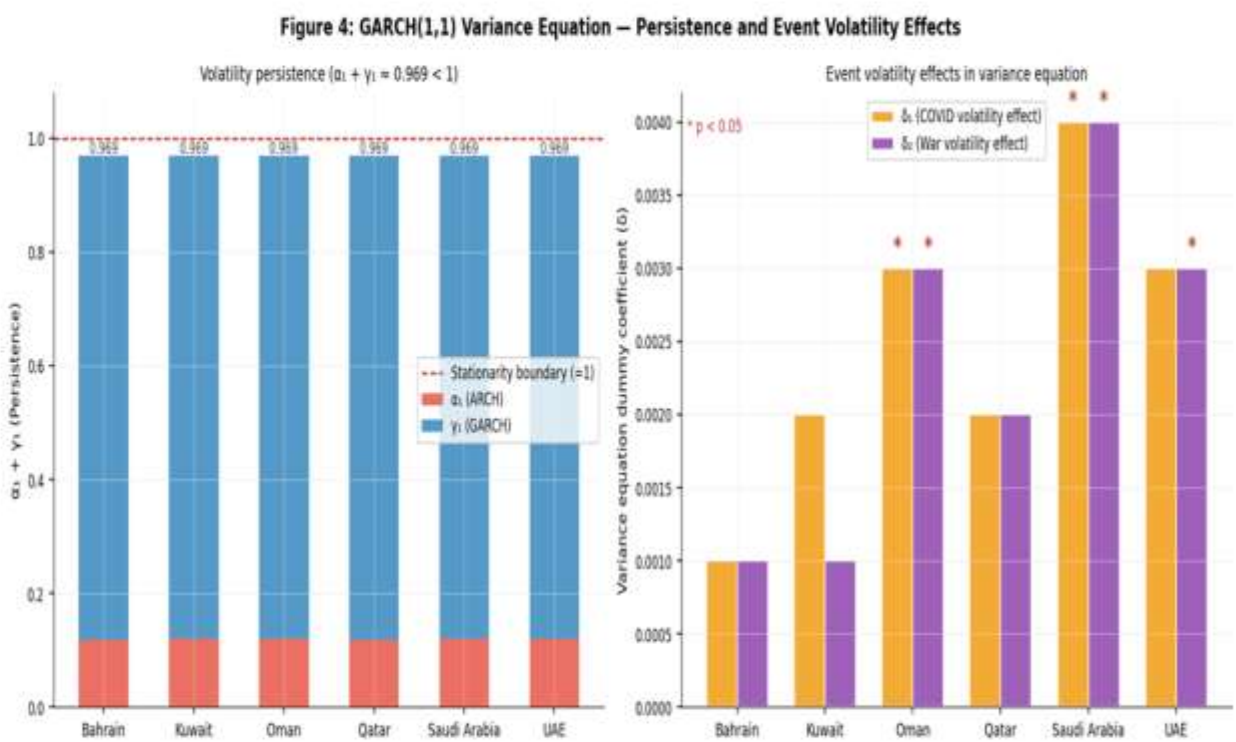


Figure 4: GARCH(1,1) Variance Equation Results. Left panel: stacked bar chart of α_1 (ARCH term) and γ_1 (GARCH term) for each GCC market.

5. CONCLUSION

5.1 Summary

This paper has analyzed the relationship between oil prices and the stock market among GCC countries through a GARCH (1,1) model with researcher-t distributed errors and explicit event window dummy variables representing the COVID-19 pandemic and the Russia-Ukraine War from January 2017 to December 2022. The analysis is theoretically motivated by directional hypotheses; identifies oil-exporter-specific mechanisms; does not confound the mean and volatility effects in the GARCH framework; and uses the Researcher-t distribution to correctly address the fat-tailed, non-normal financial returns.

The key results include the following: (i) The relationship between oil prices and most GCC stock indices is positive but statistically insignificant, which is expected considering that the representation of oil industry companies in these indices is relatively low. (ii) The Tadawul of Saudi Arabia was the most sensitive market to the impact of oil prices, yet the effects were brief in both occurrences. (iii) the COVID-19 pandemic greatly increased conditional volatility in Oman and Saudi Arabia but not mean returns in these markets; and (v) in both events, the oil market and GCC stocks.

5.2 Implications

The main practical implication is that GCC oil and gas supply chains and financial markets have become resilient to the disruption in the world. The small and mostly non-significant mean-return sensitivity of GCC indexes to oil prices indicates a significant structural characteristic: the low listing rate of oil and gas companies of GCC stock markets. This cushions the index performance against the volatility of oil prices at the average, but the volatility effects can also be observed during times of extreme stress (the COVID-19 initial phase and the immediate post-invasion period).

The implications of the results for policymakers and investors are that GCC stock markets cannot be easily used as a proxy for the conditions of the oil markets at the index level. The assumption that a strong oil-equity co-movement in the GCC would be the basis of portfolio strategies would be oversimplified, at least at the level of the overall market index.

5.3 Limitations

There are a number of limitations that should be mentioned. To begin with, the limitation of the use of broad market indices instead of stock records limits the possibility of identifying sector-specific oil-equity relationships. The lack of daily oil sector composition weights to each GCC index does not lend itself to including this variable as a moderator, which could be the explanation behind the weakly significant mean-return relationships. Firm-level panel data would offer more detailed insights in future research. Second, asymmetric volatility effects are not modeled, although the Researcher-t GARCH specification is better than the Gaussian GARCH. Since the GJR-GARCH specification can have both positive and negative shocks affect conditional variance (the leverage effect) differently, it can show other effects not represented here but are suggested as a robustness check. Third, the event windows, even though they are based on published start dates, are constrained to be somewhat arbitrary in their conclusion. It is advisable that robustness checks be done using other alternative event windows (e.g., 60-day, 90-day windows around every event start). Fourth, the assertion that oil markets are said to have absorbed the shocks over the time period of observation is a theoretically inspired interpretation that is in line with the external evidence, but it is not specifically tested in the empirical context of this research. This absorption hypothesis would be better tested by a sub-period analysis or by a rolling-window GARCH estimation.

5.4 Future Research Directions

This paper identifies some of the areas where future research can be done. To begin with, comparative research comparing GCC nations that produce or export oil with the economy that imports oil would contribute to the comprehension of directional asymmetry in the oil-stock nexus. Second, further shortening of the observation window to 60-90 days surrounding each event start date can possibly show more short-term effects. Third, the analysis of the listed oil and gas companies using exchanges in the GCC would permit direct testing of the oil-equity mechanism, specific to the sector, and would overcome index composition limitations. Fourth, GJR-GARCH would enable the opportunity to test formally whether asymmetric responses to volatilities approach negative oil price shocks produce larger conditional increases in variance than identical positive shocks. Fifth, Markov-switching GARCH would enable formal endogenous determination of the volatility regime shifts and would give a model-based test on whether the two occurrences were truly structural breaks or just transient perturbations. Lastly, it would be possible to directly test the shock absorption hypothesis using a rolling-window GARCH estimation that would follow the dynamics of the oil-stock sensitivity coefficient through the course of the observation.

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