

Research Article

Geopolitical Conflict and Oil Price Volatility: Economic Consequences of the 2026 US–Israel–Iran War

Ibrahim Suleiman Roba , Maxwell Muthini Kyalo*

Department of Diplomacy and International Studies, University of Nairobi, Nairobi, Kenya.

Abstract

The study examined the impact of the US- Israel-Iran conflict on the volatility of Brent crude oil prices and how the volatility of oil prices was transmitted to the macro-economic implications in a frontier oil importing economy. The study employed the daily spot price of Brent crude oil, and the Geopolitical Risk (GPR) index. The EGARCH (1,1)-X model was estimated to determine the relationship between geopolitical risk and conditional volatility of oil prices. The results indicated high volatility persistence of returns on Brent crude oil. The geopolitical risk coefficient was positive, although not statistically significant. The persistence of price volatility that occurred during the conflict period indicated strong reaction of oil markets to the perceived risks of supply disruption caused by closure of the Strait of Hormuz. The study also determined that Kenya was highly vulnerable to external shocks in the oil market due to its high reliance on imported refined petroleum products. Oil price volatility, via trade and import channels, led to rising cost of importing refined petroleum products, rising consumer prices, exchange-rate pressures, and a growing national fuel import bill. The research recommends i) diversification of energy supplies, ii) strengthening foreign exchange management and iii) increasing investment in alternative energy sources to better prepare for future geopolitical oil shocks.

Keywords

Geopolitical Conflict, Oil Price Volatility, Brent Crude Oil, Frontier Economies, Kenya

1. Background

Geopolitical conflict refers to armed confrontation between state and/or non-state entities over territory, ideology, resources and influence in the international system, where geography and spatial factors are key determinants of power relations. Flint argued that these conflicts are played out through diplomatic stand-offs, economic warfare, proxy wars and military confrontation [10]. Some of the most prominent examples of geopolitical wars include the 1973 Arab-Israeli War, the 1990-1991 Gulf War, the attacks of 9/11, the Libyan civil

war, the war between Russia and Ukraine, and the war between Israel and Palestine and the escalation to the US-Israel-Iran war [4].

In today's interconnected and global world, the link between geopolitical conflicts and energy markets is a key component of policy discourse. Oil is one of the most strategically significant depletable commodities in the global economy, providing more than 90% of the global transport energy [32]. Oil markets are therefore very sensitive to not only the traditional supply and demand factors, but also to wider political

*Correspondence: Maxwell Muthini Kyalo (maxwellmuthini@yahoo.com)

Received: 11 May 2026; Accepted: 22 May 2026; Published: 23 June 2026



and strategic developments. Energy markets have also tended to become more volatile during times of geopolitical tension [35]. A key outcome of such uncertainty is oil price volatility. This refers to the degree of fluctuation in oil prices over time. Unlike price levels, volatility captures the intensity and unpredictability of price movements [6].

There is considerable evidence that geopolitical conflicts and oil price volatility have been closely linked in the past. In the Arab-Israeli war of 1973, for instance, Corbett noted that crude oil prices had risen from \$2.90 to \$11.65 per barrel from October of 1973 to January of 1974 [8]. Likewise, Brent Crude oil prices have jumped 8% to hit \$100 for the first time since the Russian invasion of Ukraine on 24 February 2022 [34]. These events demonstrate the swiftness of oil markets' reaction to geopolitical conflicts. But it remains to be seen how such dynamics would work in the case of the 2026 US-Israel-Iran war.

The US-Israel-Iran war is a multi-state conflict involving direct military confrontation between Israel and Iran, with the US intervening in support of Israel. Huggard and Yadwad attribute the war to a series of rising tensions between Iran and the US-Israel bloc after a series of failed nuclear talks and growing regional turmoil in the Middle East involving Tehran-backed Hezbollah and Houthis [11]. On 1st April 2024, the direct confrontation between Israel and Iran was made apparent. In early 2025, there were some short-lived ceasefires and renewed diplomatic efforts, but negotiations failed. On 13th June 2025, Iran-US negotiations were suspended; Israel launched strikes on Iranian nuclear and military facilities. The situation significantly worsened on 21st June 2025 when the

US bombed three Iranian nuclear facilities, Fordow, Isfahan, and Natanz [11].

In response to the US-Israel attacks, Iran actively launched missiles and drone attacks across all the six Gulf Cooperation Council (GCC) states. The GCC states are of strategic significance for the world, due to their oil reserves. According to Worldometer (n.d.), GCC states accounts for over 48% of the world's oil reserves: Qatar (1.43%), Kuwait (5.75%), United Arab Emirates (6.40%), Iraq (8.22%), Iran (11.82%) and Saudi Arabia (15.14%) [36]. Yet, the attacks on the GCC states have also been directed at commercial, shipping and energy infrastructure linked to the US. The damages to key energy infrastructure in the Iran-related attacks include United Arab Emirates (UAE) Ruwais refinery and Fujairah's petrochemical and storage complex; the Kuwaiti refineries, including the Mina Al Ahmedi refinery; and the transport and logistics infrastructure in Oman, including bypass routes to the Strait of Hormuz; refineries in Saudi Arabia, such as Yanbu and Ras Tanura [7].

On 2nd March 2026, Iran closed the Strait of Hormuz, which is the world's most critical chokepoints for oil transportation [13]. This Strait is a narrow sea passage, separating the Iran and Arabian Peninsula, and connecting the Persian Gulf with the Arabian Sea and the Gulf of Oman. It handles approximately 19% of global Liquefied Natural Gas (LNG) trade and about 25% of world's seaborne oil trade; an average of 5 million barrels per day (mb/d) of oil products and 20 mb/d of crude oil were exported via the Strait of Hormuz in 2025 alone [13]. Table 1 below provides a summary of the key events in the US-Israel-Iran war.

Table 1. A chronological summary of the major events in the war between the United States and Israel and Iran.

Year	Key Event in the US-Israel-Iran War
1 st April, 2024	Iran and Israel exchange missile and air strikes for the first time
September-December 2024	Hezbollah-Israel war escalates
March-May 2025	Attempts to revive nuclear diplomacy fails
13 th June 2025	Israel-Iran war breaks out; Israel attacks Iran's nuclear facilities; Iran-US negotiations are suspended
21 st June 2025	US bomb three Iranian nuclear facilities: Fordow, Isfahan, and Natanz
February 2026	US joins Israel's military operations in Iran
March 2026	Closure of the Strait of Hormuz
2026-Present	The US-Israel-Iran war is ongoing

Source: Adapted from Huggard & Yadwad [11] and No et al. [29].

Currently, the strait of Hormuz remains closed by Iran (despite a one-day reopening on 17th April 2026). In the meantime, the US has imposed a naval blockade on Iranian ports since 13th April, 2026. The closure of this Strait following the US-Israel war with Iran has brought about 10% dip in global

oil supplies with a substantial outage in oil exports from the region; hardest hit countries being Bahrain, Kuwait, Qatar, and Iraq [20]. A ceasefire has been in effect for about three weeks so far, but it is unclear whether it will last or whether the conflict will continue [33].

Based on the above, the following two research questions were raised in this study. First, how do US–Israel–Iran conflict affect the oil price volatility? Second, what are the economic implications of oil price volatility caused by geopolitical conflicts in frontier oil importing countries such as Kenya? This study is one of the few studies that examines the oil volatility transmission effects of conflict in frontier African economies.

2. Literature Review

The macroeconomic effects of oil price changes have been extensively studied, making oil shocks a significant factor in the economy, inflation, and financial markets [1, 5]. Later studies build on this by explicitly connecting changes in oil prices to geopolitical events [2, 3, 15]. In this strand, Pinchetti suggested that oil price dynamics in times of increased geopolitical uncertainty are fundamentally different from those in times of lower geopolitical uncertainty [31]. On this basis, Verduzco-Bustos and Zanetti showed that geopolitical oil price shocks have unique features [34]. These features include the ability to create unique temporal transmission patterns across macroeconomic variables, similar to severe supply disruptions, and to have higher price responses. They concluded that these shocks are magnified by forward-looking behaviour and increased uncertainty, adding to their overall economic effect.

There are some empirical studies that have confirmed the causal relationship between geopolitical factors and oil price dynamics. Li et al., using a time-varying copula approach and data obtained from 1987 to 2020, found a strong and volatile correlations between geopolitical tensions and crude oil prices [22]. Particularly, the study found that beginning and escalation of war and terror acts (depicted by the geopolitical acts index) result in oil price surges. The study also revealed that there was an unidirectional relationship between geopolitical events and price movements. Likewise, using the data from 2000 to 2023, Obadi and Korcek employed an autoregressive distribution lag (ARDL) model to identify both short-run and long-run relationships between geopolitical events and oil prices [30]. The study also revealed that economic growth and crude oil stocks in Organisation for Economic Co-operation and Development (OECD) countries and global oil production have significant short run and long run effects on crude oil prices.

Recent studies have also started to examine the particular consequences of the US-Israel-Iran conflict. In their systematic review, Laut et al. concluded that Middle East conflicts exert a positive influence on the volatility of the global oil price via market speculation, risk premiums and disruption of supply [21]. Their research also found that the price volatility of oil affects the ASEAN (Association of Southeast Asian Nations) countries' economies. This effect was mainly witnessed in the volatilities in financial markets, deterioration in trade balance, decline in GDP (Gross Domestic Product) growth and inflationary pressure. The strength of these effects, however, varied from

country to country depending on their i) policy actions, ii) industrial structure, and iii) energy importing dependency.

No et al. conducted a qualitative study, which revealed that the conflict has led to greater market volatility, higher inflationary pressures and a change in global energy strategies from “just-in-time” to precautionary “just-in-case” approaches [29]. Their qualitative approach on the other hand, gave limited insight into the price dynamics. Mansour examined the potential effects of disruption of maritime transport on oil price volatility in the Strait of Hormuz in the context of the 2026 Gulf conflict [23]. The study was based on a Generalized Autoregressive Conditional Heteroscedasticity-Mixed Data Sampling (GARCH-MIDAS) framework. The research established that the oil price volatility persistence was strong and maritime disruptions were the most important factor. Further disruption scenarios (one, three and six months) indicated that longer disruptions could result in greater and more persistent oil price rises.

Despite the studies above, there is scant empirical research on (i) the impact from the US-Israel-Iran conflict on the volatility dynamics of oil prices and (ii) the impact of US-Israel-Iran conflict on frontier oil importing economies like Kenya. Addressing these knowledge gaps is particularly important for Kenya since the country has no domestic production of refined petroleum products and is very vulnerable to external oil supply shocks.

3. Methodology

In this study, the relationship between geopolitical conflict and the volatility of oil prices was analyzed during the period of the US–Israel–Iran conflict using a quantitative time-series research design. The analysis was centered on geopolitical tensions and their effect on oil market volatility and the resulting macroeconomic consequences for frontier oil-importing countries like Kenya. The secondary data for Brent crude oil prices and Geopolitical Risk (GPR) index were processed in Excel and analysed using the R software for statistical analysis.

Spot prices for Brent crude oil were used as a proxy for oil price volatility in the study. Daily Brent crude oil spot prices were sourced from the US Energy Information Administration (EIA) from the Federal Reserve Economic Data (FRED) database. Next, oil price returns were calculated with the help of the log transformations that estimated the conditional volatility. On the other hand, geopolitical conflict was operationalized using the Geopolitical Risk (GPR) Index developed by Caldara and Iacoviello [4]. It is an index reflecting geopolitical tensions, calculated from the prevalence of geopolitical-related terms in 10 major international newspapers. The index consists of sub-components in eight dimensions: geopolitical threats (GPRT) and geopolitical acts (GPRA). The GPRT is based on 5 dimensions: terror threats (dimension 5), nuclear threats (dimension 4), military buildups (dimension 3), peace threats (dimension 2) and war threats (dimension 1). On the other hand, GPRA covers commencement of war (dimension

6), escalation of war (dimension 7) and terror acts (dimension 8).

The study period began on 1st April 2024 after the first direct missile and air-strike exchange between Israel and Iran. This was the first time that the conflict had become direct between the states and not indirect through regional tensions and proxy wars. This study opted for daily observations because of the high frequency nature of geopolitical shocks and oil price volatility.

The study estimated an Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) (1,1)-X model to examine the volatility dynamics of Brent crude oil returns and the influence of geopolitical risk (GPR) on oil market volatility. The model incorporated an Autoregressive Moving Average (ARMA) (1,1) process in the mean equation, an EGARCH (1,1) specification for the conditional variance, a student-t distribution to account for fat tails in financial returns, and the GPR Index as an exogenous regressor in the variance equation. The EGARCH framework was selected because it captures volatility clustering, accommodates asymmetric volatility effects, and avoids non-negativity constraints

$$\ln(\sigma_t^2) = \omega + \beta \ln(\sigma_{t-1}^2) + \alpha \left(\frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} - E | z_t | \right) + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \delta GPR_t,$$

where: ω is a constant, β captures volatility persistence, α measures the magnitude (size) effect of shocks, γ captures asymmetric (leverage) effects, GPR_t denotes the geopolitical risk index, δ measures the impact of geopolitical risk on conditional volatility.

The study made the following assumptions to address the excess kurtosis in oil returns:

$$z_t \sim t_\nu(0,1),$$

where ν is the degrees-of-freedom parameter governing tail thickness. This specification breaks from the restrictive normality assumption, and provides more realistic models for extreme price moves.

The non-negativity constraints on parameters are not required since the exponential form of the variance equation

typical of standard GARCH models. The model was as follows:

Let r_t denote the log return of Brent crude oil at time t . The conditional mean equation is given by:

$$r_t = \mu + \phi r_{t-1} + \theta \varepsilon_{t-1} + \varepsilon_t,$$

In this case, μ is a constant term, ε_t is the error term, ϕ represents autoregressive dynamics and θ represents moving-average dynamics. The error term is:

$$\varepsilon_t = \sigma_t z_t,$$

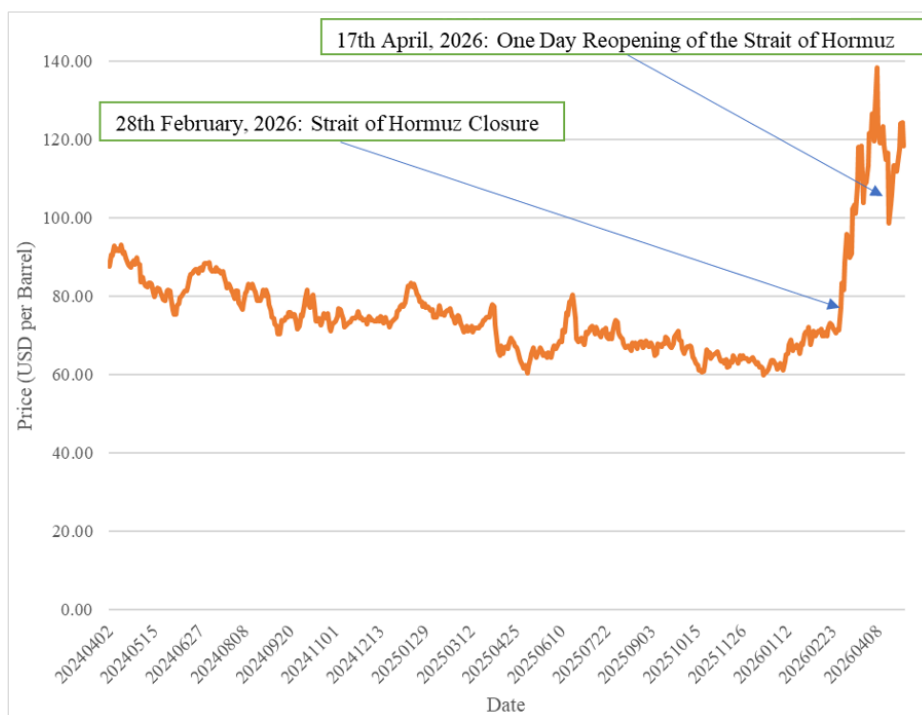
Here, σ_t^2 is a conditional variance and z_t is an independently and identically distributed (i.i.d.) random variable with a standardized Student-t distribution (mean of 0 and a variance of 1).

An EGARCH (1,1)-X involving the following specification was used to model volatility dynamics:

guarantees that the that $\sigma_t^2 > 0$. The persistence of volatility is measured by β , and the asymmetric sensitivity to shocks by γ . GPR_t is included so that direct tests can be performed to assess whether geopolitical risk has an incremental explanatory power on the volatility of the oil price beyond internal market dynamics.

4. Results and Discussion

This section presents and discusses the study's findings on the impact of the 2026 US–Israel–Iran conflict on Brent crude oil price volatility and how this impact shape economic outcomes in frontier oil-importing countries. The chart below (Figure 1) shows how prices for Brent crude oil have changed over time during the US-Israel-Iran war.



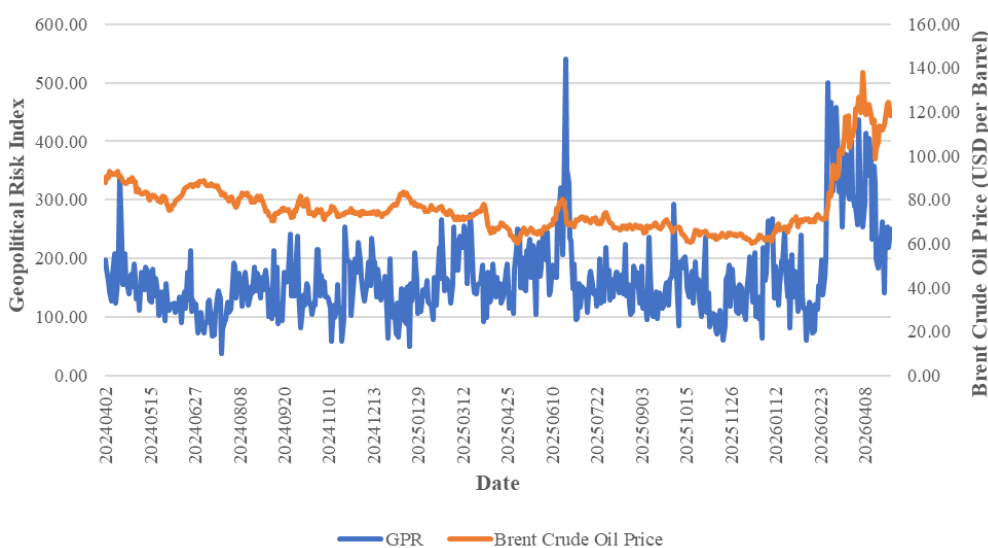
Source: Author (2026)

Figure 1. Trends in Brent Crude Oil Prices Following US-Israel-Iran War.

From Figure 1 above, Brent oil prices fluctuated moderately within the range of approximately \$60–\$90 per barrel between April 2024 and late 2025, despite key geopolitical events within the period. Some of these events included missile attacks between Israel and Iran, the escalation of the Hezbollah-Israel conflict, and the collapse of nuclear diplomacy in early 2025. This relative stability implies that markets saw these events as being contained risks in the region. But in early 2026, oil prices jumped significantly. The biggest rise was after 28

February 2026, when Iran closed the Strait of Hormuz. Markets responded to worries about significant supply shocks, with Brent prices climbing above \$120 per barrel. The one-day reopening of Hormuz on 17th April 2026 briefly calmed prices but further closure and uncertainty kept global oil markets more volatile with higher risk premiums.

The graph in Figure 2 below indicates that geopolitical risk and Brent crude oil prices move in a broadly positive direction, but not perfectly together.



Source: Author (2026)

Figure 2. Trends in Geopolitical Risk and Brent Crude Oil Prices Following US-Israel-Iran War.

The GPR index has been very volatile, peaking in highly uncertain periods, as seen in Figure 2 above, whereas the prices of Brent have been fluctuating over the same timeframe but with lesser magnitude. The pattern suggests that a rise in geopolitical tension is associated with a rise in oil prices. At the same time, the relationship is not one-to-one. Brent oil prices do not rise every time geopolitical risk spikes, which

means other forces also influence oil prices. Overall, the graph supports the conclusion that geopolitical risk has an important but partial effect on Brent crude oil price movement. This is consistent with the correlation coefficient of 0.414, which indicates a moderate positive relationship between GPR and Brent crude oil prices over the period studied.

4.1. Descriptive Statistics

Table 2. Descriptive Statistics for Brent Returns and GPR Index.

Variable	Mean	Variance	Skewness	Kurtosis
Brent Returns	6e-04	6e-04	-0.4878	10.2462
GPR Index	166.1284	4970.2559	1.7607	7.4491

4.1.1. Brent Crude Oil Returns

Mean: The average daily Brent crude oil return (Mean = 0.0006) is positive but very close to zero. This indicates that oil returns fluctuate around a relatively stable average; there is no strong persistent upward or downward daily movement during the sample period. Such small mean returns are typical in daily financial time series.

Variance: The variance measures the dispersion of returns around the mean. The relatively small variance (Variance = 0.0006) suggests a moderate day-to-day return fluctuation.

Skewness: The Brent return distribution is negatively skewed (Skewness = -0.4878). This implies that large negative returns occur more frequently than large positive returns, downside risk is slightly more pronounced. Negative skewness is common in oil and financial markets because adverse geopolitical events, supply disruptions, economic uncertainty, and market panic often generate stronger negative price movements than positive shocks.

Kurtosis: The kurtosis value (Kurtosis = 10.2462) is substantially greater than 3. This indicates that Brent returns are leptokurtic; the distribution has fat tails and extreme observations occur more frequently than under a normal distribution. Put differently, the oil market experience occasional extreme shocks, volatility spikes are more common than predicted by a normal distribution.

4.1.2. GPR Index

Mean: The average GPR level during the study period was approximately 166. This indicates a relatively elevated geopolitical tensions over the sample period. Given the 2024–2026 sample period, elevated GPR levels reflect the ongoing geopolitical conflict; the US-Israel-Iran war. The result suggests

that geopolitical risk remained persistently relevant during the study horizon.

Variance: The very high variance (Variance = 4970.2559) indicates substantial fluctuations in geopolitical risk over time. This means that geopolitical conditions changed considerably across the sample period; periods of relative calm alternated with sharp geopolitical escalations. This variability reflects the episodic nature of geopolitical events.

Skewness: The GPR index is strongly positively skewed (Skewness = 1.7607). This implies most observations were moderate but there were occasional extreme spikes in geopolitical risk. The behavior is consistent with the structure of geopolitical events because geopolitical tensions are usually dormant or moderate but major crises generate sudden sharp increases in risk indicators. The positive skewness confirms the presence of rare but severe geopolitical shocks.

Kurtosis: The kurtosis (Kurtosis = 7.4491) exceeds the normal benchmark of 3, indicating that the GPR distribution is leptokurtic. This means extreme geopolitical events occur more frequently than under normality; geopolitical shocks are concentrated and episodic rather than evenly distributed. This finding aligns with real-world geopolitical behavior where wars or global crises occur irregularly but produce disproportionately large effects.

In conclusion, Brent returns exhibit negative skewness, extreme kurtosis, non-normality, heavy tails. On the other hand, the GPR index displays high average geopolitical tension, strong positive skewness, substantial volatility, and fat tails. These features are consistent with the theoretical expectation that geopolitical tensions occur in bursts. This confirms that geopolitical risk behaves as an irregular shock process characterized by occasional extreme escalations.

4.2. Econometric Analysis Results

4.2.1. Pre-estimation Results of Stationarity Tests

The Augmented Dickey-Fuller (ADF) test was conducted on Brent crude oil returns. The study found a p-value = $0.01 < 0.05$. Consequently, the null hypothesis of a unit root at the 5% significance level was rejected. This finding implies that Brent return series was stationary; the statistical properties of the series remain stable over time and the return series is appropriate for volatility modelling.

The Autoregressive Conditional Heteroskedasticity Lagrange Multiplier (ARCH-LM) test was conducted on raw Brent returns and ARMA residuals. The ARCH-LM test rejects the null hypothesis of homoskedasticity at the 5% significance level ($\chi^2 = 141.71$, $p = 2.2e-16$). This result confirmed the presence of ARCH effects and volatility clustering in Brent crude oil returns. The ARCH-LM test performed on the residuals of the ARMA (1,1) model strongly rejected the null hypothesis of no ARCH effects ($\chi^2 = 137.22$, $p = 2.2e-16$). This indicated that conditional heteroskedasticity persists even after modelling the conditional mean. Therefore, these findings justify the estimation of an EGARCH-type volatility model.

4.2.2. Estimated Mean Equation (ARMA (1,1))

Based on ARMA (1,1) model estimation, the estimated coefficients give the conditional mean equation below for Brent crude oil returns:

$$r_t = -0.000219 + 0.225608 r_{t-1} - 0.208195 \varepsilon_{t-1} + \varepsilon_t$$

where: r_t = Brent crude oil return at time t , -0.000219 =

$$\ln(\sigma_t^2) = \omega + 0.8701 \ln(\sigma_{t-1}^2) + 0.0119 \left(\frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} - E | z_t | \right) + 0.1093 \left(\frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right) + 0.1245 GPR_t$$

where: σ_t^2 denotes conditional oil price volatility, 0.8701 represents the persistence parameter (β), 0.0119 is the ARCH effect coefficient (α), 0.1093 captures asymmetry/leverage effects (γ), 0.1245 measures the effect of geopolitical risk on volatility (δ), and GPR_t is the geopolitical risk index.

Volatility Persistence ($0 < \beta_1 < 1$)

The coefficient on β_1 (0.8701) was positive and highly significant (p-value = 0.000100, which is less than 0.05). A value of 0.87 shows that about 87% of previous period volatility carried over into the current period. This finding implies that volatility shocks generated during the conflict period dissipated slowly over time, resulting in prolonged market uncertainty. Put differently, conditional volatility was largely driven by its own historical dynamics. Therefore, there is strong volatility persistence in Brent crude oil returns.

Short-Run Shock Effect (α_1)

The ARCH coefficient ($\alpha_1 = 0.0119$) is positive but statis-

constant mean return (μ), 0.225608 = AR (1) coefficient, -0.208195 = MA (1) coefficient, ε_t = error term (innovation).

The constant term ($\mu = -0.000219$) is negative but statistically insignificant ($p = 0.785$). This indicates that the average daily Brent crude oil return is not significantly different from zero over the sample period.

Autoregressive Component ($AR(1) = 0.225608$) is positive and highly significant ($p < 0.001$). This result suggests the presence of short-run dependence in Brent crude oil returns. Put differently, past returns contain useful predictive information about current returns. Therefore, there is delayed market adjustment to geopolitical developments during the US-Israel-Iran conflict period.

Moving Average Component ($MA(1) = -0.208195$) is negative and highly significant ($p < 0.001$). The negative sign suggests that part of the effect of past shocks is reversed in subsequent periods, reflecting short-term market correction dynamics.

The statistically significant AR (1) and MA (1) terms confirm that Brent crude oil returns exhibit meaningful short-run linear dependence. Including the ARMA (1,1) structure therefore improved the specification of the conditional mean process and ensured that the volatility captured by the EGARCH model is not driven by omitted autocorrelation effects. This supports the reliability of the subsequent volatility estimates obtained from the EGARCH-X framework.

4.2.3. EGARCH-X Model: Variance Equation Results

The variance equation estimated the dynamics of conditional volatility. The estimated EGARCH (1,1)-X Variance Equation yields.

tically insignificant. Approximately 1.19% of current volatility is explained by new short-run shocks or recent innovations. This implies that immediate market shocks have limited short-run effects on Brent Crude oil price volatility. Therefore, volatility dynamics during the conflict period were largely driven by persistent market conditions rather than isolated daily innovations or transitory shocks. This indicates that oil market participants absorb new information relatively efficiently and oil price volatility evolves gradually.

Asymmetric/Leverage Effect

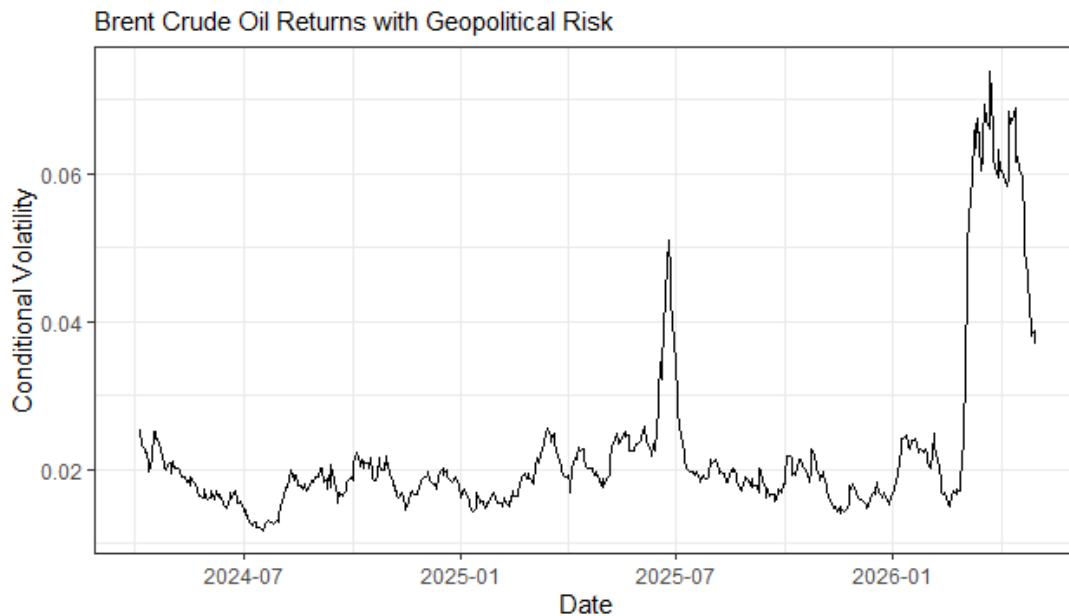
Asymmetric/Leverage Effect (γ_1) of 0.1093 implies that negative shocks increase volatility by approximately 10.93% more than positive shocks of the same magnitude. Nonetheless, there is insufficient statistical evidence (p-value = 0.28, which is greater than 0.05) to conclude that asymmetric effects actually existed during the US-Israel-Iran conflict period. The absence of a substantial leverage effect suggests that Brent price volatility responded similarly to favourable and unfavourable market news and that the sample period may not

have contained sufficiently asymmetric oil market shocks.

Effect of GPR

The estimated coefficient on geopolitical risk (0.1245) suggests that a one-unit increase in the GPR index corresponds to an approximate 12.45% rise in conditional volatility. However, the coefficient is statistically insignificant (P-value = 0.5 > 0.05). The insignificance could mirror market adaptation to

geopolitical news, diversification of global oil supply chains, limited transmission of geopolitical shocks into oil volatility during the sample period, or even relatively short sample duration. Nonetheless, the empirical evidence in this study does not support a robust volatility transmission effect over the US-Israel-Iran conflict period.



Source: Author (2026)

Figure 3. Estimated Conditional Oil Price Volatility from EGARCH-X Model.

From Figure 3 above, the conditional volatility series exhibits pronounced clustering. Periods of relative stability are interrupted by sharp and persistent volatility spikes. In particular, volatility remains subdued during 2024–2025 but increases substantially in 2026 with the closure of the Strait of Hormuz. The persistence of elevated volatility following these shocks aligns with the estimated EGARCH parameter ($\beta = 0.8701$), confirming strong volatility persistence. Notably, while volatility spikes coincide with periods of geopolitical escalation, the pattern is episodic rather than continuously driven by geopolitical risk. This is consistent with the statistically insignificant GPR coefficient (0.1245). Therefore, geopolitical uncertainty influences oil price volatility through discrete shock episodes rather than a stable linear transmission mechanism.

Distributional Characteristics

The estimated shape parameter of the student-t distribution ($\nu = 9.652994$) indicates the presence of fat tails in Brent crude oil returns. This finding suggests that extreme price movements occur more frequently than would be implied under a normal distribution, although the degree of tail heaviness is moderate. In practical terms, geopolitical shocks can still gen-

erate large price movements, but such events are relatively infrequent and not excessively extreme.

4.2.4. Diagnostic Tests

This study also conducted two post-estimation diagnostic tests: Ljung-Box test on standardized residuals and ARCH-LM test on standardized residuals. These tests evaluated whether the estimated EGARCH-X model adequately captured the underlying oil price volatility structure. In the Ljung-Box Test, the study found a p-value = 0.296; the null hypothesis of no serial correlation could not be rejected. On the other hand, the ARCH-LM Test showed a p-value = 0.958; the null hypothesis of no ARCH effects could not be rejected. The combined diagnostic tests indicate that the EGARCH-X model was well specified. This confirms that the EGARCH-X model adequately captured the volatility dynamics of Brent crude oil returns, producing statistically reliable and stable estimates.

In sum, the econometric findings from the EGARCH-X model showed that i) Brent oil volatility is primarily driven by its own persistence and ii) geopolitical risk arising from the US-Israel-Iran conflict plays a limited direct role in explaining short-run volatility fluctuations during the study period.

4.3. Economic Implications of Conflict-induced Oil Price Volatility in Kenya

Kenya is an East African lower middle-income country which is completely dependent on petroleum imports to meet its energy needs. About 90% of the petroleum imports are of refined white products such as diesel, super petrol and dual-purpose kerosene [25]. The estimated annual consumption of petroleum is around five million metric tons. The International Energy Agency attributes this consumption to 3 main sectors. These sectors comprise transport (75,4%), residential (7,7%) and industry (6%) [12].

In 2013, Kenya Petroleum Refineries Limited (KPRL), stopped processing crude oil. The KPRL is currently a storage, handling, laboratory and distribution facility [14]. Kenya is reliant on imported refined petroleum products, despite plans to build another refinery in Lamu. In 2024, Kenya imported about 128.2% of its total oil product consumption in net terms. During this period, petroleum products made up of almost 83% of Kenya's total energy imports [12]. In addition, the import of oil products rose by around 276% from 2000 to 2024 [12]. This surge demonstrates Kenya's increased vulnerability to international energy market shocks.

Kenya is also exposed to geopolitical oil market shocks due to its oil supply configuration. The country has a government-to-government (G2G) petroleum import deal with large petroleum companies from GCC states. These firms include Saudi Aramco, the Abu Dhabi National Oil Company (ADNOC), and the Emirates National Oil Company [24]. It is worth noting that all the petroleum shipments in this deal pass through the Strait of Hormuz. As such, the closure of the Strait has colossal implications for Kenya's fuel supply chain and energy security.

The earlier estimated EGARCH-X results suggested that geopolitical risk does not have a statistically significant direct impact on the volatility of Brent crude oil. However, the model showed high volatility persistence and significant volatility

spikes in the 2026 US–Israel–Iran conflict period. The results indicate that oil markets reacted primarily to the perceived supply disruption risk from the closure of the Strait of Hormuz. In Kenya, transmission of these shocks is mainly through international trade channels. Disruptions in shipping routes through the Gulf increase the cost of importing refined petroleum products to Kenya. This has further implications discussed below.

4.3.1. Rise in Consumer Prices

The oil price volatility experienced in Kenya as a result of conflict has a macroeconomic impact on the country through the increase in consumer prices due to higher cost of refined petroleum products imports. The disruption of global oil supply chains and increased uncertainty regarding the closure of the Strait of Hormuz increases the cost of oil imports which is transferred to domestic fuel prices in oil importing countries. All refined petroleum products are imported into Kenya under a price build up mechanism which includes Free on Board (FOB) costs, freight, premiums and local currency factors. This pricing factors in shocks in global oil markets. This is consistent with the observation of Muggah that Iran is internationalizing costs of the war by imposing a global surcharge via insurance and shipping costs [26].

The US-Israel–Iran conflict contributed to increased disruption of oil supply chains. This is evident in the surge in Global Supply Chain Pressure Index (GSCPI). Between January and April 2026, GSCPI increased from 0.44 to 1.82 [9]. Further, the monthly Consumer Price Index (CPI) for Kenya increased from 148.96 to 152.15 over the same period [16-19]. This points to growing inflationary pressures. Subsequently, fuel prices also rose significantly as indicated in Table 3 below. For example, petrol prices went up by 10.8% between March and April 2026. In addition, diesel prices increased by 17.9% in the same period [16-19].

Table 3. Consumer Price Indices and Prices of Selected Petroleum Products for the January-April 2026 period.

	January	February	March	April
Overall CPI	148.96	149.2	150	152.15
Petrol (KSH per Litre)	183.59	179.35	179.35	198.67
Diesel (KSH per Litre)	171.64	167.72	167.72	197.81
Gas/LPG (KSH per 13 Kgs)	3,146.51	3,134.75	3,132.34	3,361.56

Source: Kenya National Bureau of Statistics (KNBS) [16-19].

The rise in fuel prices had significant second-round inflationary impacts on the economy, including in the transport sector, which consumes about 75.4% of refined petroleum in Kenya [12]. For instance, KNBS noted that items under the

transport sector rose by 6.5% between March and April 2026 (coinciding with the closure of the Strait of Hormuz [19]). The urban public transport fares then jumped up by 7.1%, inter-town bus fares by 9.7% and motorcycle (boda boda) transport

fares by 6.1% [19].

Transportation costs are one of the major inputs in the distribution of food and other commercial activities, and thus higher transportation costs are a partial reason for the wider rise in consumer prices for other non-fuel items. The fiscal pressures already experienced in Kenya are high due to the high levels of public debt obligations, fiscal space, and limited access to affordable external financing [28]. In this context, the spillover effect of oil price volatility due to the US-Israel-Iran conflict may put further pressure on the government's finances and household incomes. Higher fuel import prices raise inflationary pressures, raise cost of living and reduce household purchasing power on the one hand. On the other hand, the increasing import prices for fuels pose a challenge to the government's macroeconomic stability as mentioned in the next Section 4.2.2 of the study.

4.3.2. Increase in Import Bill and Exchange Rate Pressures

The high price of imported petroleum products has led to the increase in the national fuel import bill in Kenya. Kenya is an economy that is fully dependent on oil imports [27]. Consequently, any global increase in oil prices, stemming from geopolitical tensions or disruption of supply in the Strait of Hormuz, has a substantial impact on the country's fuel import spending. Increase in importation cost means that Kenya has to import the same quantity of petroleum products with more foreign currency, especially U.S dollars. This will result in more import spending than export revenue. This puts pressure on Kenya's balance of payments particularly in light of the high public debt burden and financing pressures of the Kenyan economy [28].

Kenya imports refined petroleum products in US dollars [27]. An increase in the cost of fuel imports leads to a higher demand for foreign exchange reserves, especially for US dollars. This exerts depreciation pressure on the Kenyan shilling. This vulnerability was more pronounced before the enactment of the G2G petroleum import framework in April 2023 [27]. The Kenya had very tight US dollar liquidity during this time, partly due to the high cost of international fuel imports, high demand for foreign exchange and the tightening of international financial conditions after the US Federal Reserve hiked interest rates aggressively. The US dollar continued to be the settlement currency for petroleum imports under the G2G framework, but the framework changed the timing and the nature of foreign exchange demand for petroleum imports, by increasing the credit period from 30 to 180 days [23]. This has dampened the buying pressure on US dollars in the short term.

The G2G framework released around 30% of the foreign exchange to other sectors of the economy, which slowed down the shilling depreciation rate as per the National Treasury and Economic Planning [27]. But the closure of the Strait of Hormuz in the US-Israel-Iran conflict could undermine these stabilization gains. The closure of the Strait of Hormuz has heightened the supply disruption risks. Kenyans already face

higher consumer prices and higher national import bills despite the existence of the G2G mechanism. In other words, the existing G2G framework is not sufficient to protect Kenya from external oil market shocks and import cost and inflationary spillovers.

5. Conclusion

This study analysed the volatility dynamics of Brent crude oil returns in the period of the US-Israel-Iran conflict and also explored the transmission of conflict-induced oil market volatility into macroeconomic implications in a frontier oil importing economy like Kenya. The results obtained from an EGARCH (1,1) model that included the GPR index as an exogenous regressor indicated that there is strong volatility persistence in the returns of Brent crude oil. The GPR coefficient was positive, but not significant, however the significant volatility spikes that were seen during the conflict period indicate that oil markets responded strongly to perceived supply disruption risks from the closure of the Strait of Hormuz.

The study also showed that Kenya is highly vulnerable to external oil shocks due to its high reliance on imports of refined petroleum products. Oil market volatility through trade and import channels led to increased cost of oil importation, increased consumer prices, exchange rate pressures and increased national fuel import bill. These impacts illustrate the extent to which geopolitical tensions in a key global oil transit route create significant macroeconomic issues for the frontier oil-importing economies even if they have only limited direct involvement in global conflicts.

6. Recommendations

Based on the results of this study the following recommendations are made. First, frontier oil importing economies, such as Kenya, need to lessen their dependence on the Strait of Hormuz oil supply routes by diversifying petroleum import sources. In addition, frontier economies need to improve foreign exchange reserve management and create de-dollarized arrangements for energy financing to lessen the vulnerability to US dollar liquidity pressures. Finally, frontier oil importing countries should speed up investment in renewable energy and energy infrastructure. For example, Kenya needs to accelerate investments in exploration and production of hydrocarbons in the Tertiary Rift and Mandera and Lamu sedimentary basins, to cut dependence on petroleum imports.

Abbreviations

ADF	Augmented Dickey-Fuller
ADNOC	Abu Dhabi National Oil Company
AR	Autoregressive
MA	Moving Average
ARCH-	Autoregressive Conditional
LM	Heteroskedasticity Lagrange Multiplier

ARDL	Autoregressive Distribution Lag
ARMA	Autoregressive Moving Average
ASEAN	Association of Southeast Asian Nations
CPI	Consumer Price Index
EGARCH	Exponential Generalized Autoregressive Conditional Heteroskedasticity
EIA	Energy Information Administration
FOB	Free on Board
FRED	Federal Reserve Economic Data
G2G	Government to Government
GARCH-	Generalized Autoregressive Conditional
MIDAS	Heteroscedasticity-Mixed Data Sampling
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GPR	Geopolitical Risk
GPRA	Geopolitical Acts
GPRT	Geopolitical Threats
GSCPI	Global Supply Chain Pressure Index
KNBS	Kenya National Bureau of Statistics
KPRL	Kenya Petroleum Refineries Limited
LNG	Liquefied Natural Gas
OECD	Organisation for Economic Co-operation and Development
UAE	United Arab Emirates
US	United States

Author Contributions

Ibrahim Suleiman Roba: Conceptualization, Writing – original draft, Visualization, Supervision, Resources, Project administration, Investigation, Funding acquisition, Formal analysis

Maxwell Muthini Kyalo: Data curation, Methodology, Writing – review & editing, Validation, Software

Conflicts of Interest

The authors declare no conflicts of interest.

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