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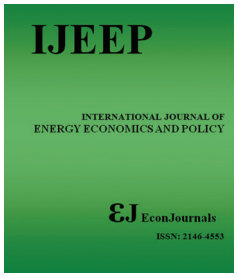

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Oil Price Volatility and Economic Growth: Evidence from the Middle East

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ABSTRACT

This paper investigates the effect of oil price volatility on economic growth in the Middle East countries (Jordan, Turkey, Kuwait, Saudi Arabia, Qatar, and the United Arab Emirates). The study's aims were achieved by utilizing a range of econometric methodologies. IPS and LLC procedures are used to study unit root qualities, while Westerlund and Edgerton's (2008) test is used to study co-integration. The findings demonstrate a long-term correlation between oil price volatility, inflation, investment, and economic growth. The study concludes with more detailed findings regarding how oil prices affect gross domestic product growth. As such, policymakers can use it to support their decision-making.

Keywords: Oil Price Volatility, Investment, Inflation, Cross-Sectional
JEL Classifications: C330, E230

1. INTRODUCTION

Energy plays a crucial role in the global economy. While there is an ongoing discussion about alternative renewable energy sources, oil remains vital for many countries. As a result, fluctuations in oil prices can have significant macroeconomic implications for both oil-importing and oil-exporting nations (Al-Kasasbeh et al., 2022). The academic community has paid significant attention to the impact of oil price volatility on economic activity. This interest is justified because oil is the most traded commodity worldwide and remains the primary energy source globally (Al-Kasasbeh et al., 2023). Like other commodity prices, oil prices are known for their volatility and associated uncertainties. Notably, studies have found that oil price swings tend to be larger than other mineral resources. This emphasizes the need to thoroughly investigate and understand the dynamics of oil prices, as they have far-reaching effects on policymakers and market participants.

From an economic standpoint, it can be argued that a rise in oil prices within oil-exporting nations has the potential to be perceived as a favorable occurrence. This is because it would lead to an increase in revenue for these countries. Conversely, an escalation in oil prices within oil-importing nations may have a detrimental impact on economic activity. The theory of irreversible investment under uncertainty, originally proposed by Henry (1974) and Bernanke (1983), commonly explains the impact of fluctuating oil prices on economic activity. According to this theory, investors are expected to delay making irreversible investments during periods of uncertainty. The deferral of investment, consequently, results in transitory reductions in the overall level of aggregate output. Hamilton (2003) highlights the economic phenomenon wherein consumers, akin to producers, defer their expenditures in response to heightened volatility in the oil market. The volatility of oil prices creates uncertainty, causing consumers and firms to delay spending and investments. This can lead to costly resource reallocation.

Several studies suggest that rising oil prices may negatively impact a nation's macroeconomic growth potential, leading to increased inflation and unemployment rates, as well as devaluation of financial assets in oil-importing countries (Sharma and Dahiya, 2023. However, the empirical evidence supporting this claim is inconclusive. Hooker's (1996) empirical analysis revealed a lack of correlation between oil prices and macroeconomic variables in the post-1986 time frame. Several studies, including Ferderer's (1996) and Lardic and Mignon's (2008), provide empirical evidence supporting the existence of a non-linear and asymmetric correlation between oil prices and economic activity. Specifically, an increase in the price of oil can potentially hurt economic activity, while a decrease in oil prices does not necessarily guarantee a corresponding increase in output levels. It can be argued that a decrease in oil prices may lead to increased uncertainty regarding oil price fluctuations, which could ultimately result in decreased output levels, offsetting a portion of the augmented output. Fluctuations or ambiguity in oil prices may be correlated with overall output level, rather than being solely influenced by the magnitude of oil prices.

Hence, this study examines the profound interdependence between oil price volatility and economic growth in Middle Eastern nations by employing the panel co-integration approach. To the best of our knowledge, there is a lack of research on how oil prices affect the economic growth of countries in the Middle East. In 2008, Westerlund and Edgerton explained the co-integration approach in their important work. The Westerlund and Edgerton methodology is an improvement over traditional linear models as it comprehensively examines the complex dynamics that underlie the relationship between oil prices and economic growth, offering several advantages. This approach enables the efficient detection of CD, examination of heterogeneity, and analysis of serially correlated errors. The study focuses on the impact of crude oil price fluctuations, volatility, and the asymmetry of crude oil price changes in the Middle East on economic growth. The purpose of this paper is to answer some important questions and provide insights into them. The fluctuations in oil prices have a significant impact on the economies of the Middle East region, causing volatility. Therefore, when assessing or projecting the economic growth of Middle Eastern countries, it is crucial to consider the magnitude of fluctuations in oil prices and their associated volatility.

2. LITERATURE REVIEW

The correlation between oil price and economic growth has garnered considerable attention from scholars after the groundbreaking study by Hamilton (1983), wherein he deduced that oil price hurts the actual output. This analysis posits that the oscillations in oil prices significantly influence the well-being of individuals worldwide (Mgbame et al., 2015). Nevertheless, alternative studies posit that the implementation of economic policies has the potential to mitigate the impact of oil price shocks on the actual output (Gershon et al., 2019; Vespignani et al., 2019; Tala and Hlongwane, 2023; Chen, 2021). Moreover, Odhiambo (2020) conducts a comprehensive analysis of the extant literature about the impact of oil price fluctuations on economic growth. He posits that the magnitude of this effect exhibits considerable heterogeneity across nations or distinct samples.

Empirical evidence from various authors suggests a correlation between heightened oil price uncertainty and a decline in overall macroeconomic performance. The initial research by Sadorsky (1999) and Guo and Kliesen (2005) revealed a noteworthy and adverse impact of oil price volatility on gross domestic product growth. Elder and Serletis (2010) conducted a study to examine how oil price uncertainty affects investment in the US. They employed a multivariate GARCH in-mean VAR model and discovered that changes in oil prices harm certain aspects of investment in developing countries. Yoon and Ratti (2011) also showed that increased uncertainty in energy prices can harm the economy through the demand channel. These findings align with the principles of irreversible investment theory. Despite some studies suggesting that rises in oil prices could potentially increase income levels (Foudeh, 2017; Dabachi et al., 2020; Jahangir and Dural, 2018), the evidence supports the notion that oil price uncertainty can have negative effects on investment. According to empirical research, as demonstrated by Hamilton (2003), it has been determined that favorable fluctuations in global oil prices exhibit a more pronounced impact on economic performance compared to unfavorable variations. Similarly, the empirical study conducted by Maalel and Mahmood (2018) reveals that fluctuations in oil prices exhibit an asymmetrical effect on the economies of the Gulf Cooperation Council (GCC) member countries.

Nevertheless, several empirical studies have concluded that oil price fluctuations have a detrimental impact on the growth of gross domestic product (GDP), particularly in nations that heavily rely on oil imports and consider it a pivotal factor of production (Rahman and Majumder, 2020; Murshed and Tanha, 2021).

The empirical findings presented by Blanchard and Gali (2007) and Nakov and Pescatori (2010) highlight a noteworthy observation regarding the diminished correlation between oil price volatility and economic performance. The observed decline in the correlation can be ascribed to many factors, notably the implementation of more effective monetary policies and a diminished dependence on oil within production frameworks. Although Bjørnland et al. (2018) do not endorse the diminishing significance of oil price volatility, they tend to agree that implementing a more proactive monetary policy regime by the US Federal Reserve has had an impact.

About the MENA nations, Mehrara and Oskui (2007) found that the high volatility of oil prices is the main cause of macroeconomic instability in Saudi Arabia.

According to Berument et al. (2010), oil price variations impact economic growth differently across MENA countries. Cashin et al. (2016) used a global vector auto-regression (GVAR) framework to analyze the potential effects of macroeconomic disturbances in the major economies of the Middle East and North Africa (MENA) region. It is deduced that perturbations in the Chinese economy substantially impact the economies of the Middle East and North Africa (MENA) region. According to Mahmood and Zamil (2019), the volatility in oil prices significantly impacts the Gross Domestic Product (GDP) of Saudi Arabia, primarily through its influence on the budget deficit.

3. DATA AND METHODOLOGY

3.1. Data

This study uses annual data from a panel of six Middle Eastern countries: Kuwait, Jordan, United Arab Emirates, Saudi Arabia, Qatar, and Turkey. The data covers the period from 1990 to 2020 and includes volatility in crude oil prices (VOT), inflation (INF), investment (INV), and economic growth (GDP). The natural logarithms of OIL, INV, and INF are commonly used in mathematical calculations for this analysis. WTI serves as a representative measure for the price of crude oil, expressed in USD per barrel. The investment-to-GDP ratio is a representative measure of investment. The consumer price index is employed as a representative measure of inflation. Gross domestic product per capita in constant prices, specifically in USD, is used to measure economic growth in 2010.

3.2. Methodology

The study aims to analyze the impact of crude oil price volatility (VOT), investment (INV), and inflation (INF) on economic growth (GDP) in Middle East countries in the long run. To achieve this, the researchers have used the base model of Mankiw et al. (1992). The model is formulated as follows:

$$GDP = \beta_0 + \beta_{1,} VOT_{it} + \beta_2 INV_{it} + \beta_3 INF_{it} + \varepsilon_{it} \quad (1)$$

Where t years, i = Jordan, United Arab Emirates, Saudi Arabia, Kuwait, Qatar, and Turkey, β_0, β_1, β_2, and β_3 are coefficients and ε_{it} represents the random disturbance item.

This study can be undertaken by utilizing the cross-sectional dependence of the model parameters. The results will reveal the relevance of either the first or second generation of root unit tests. This study involved conducting root tests on the second-generation unit, which were validated by cross-sectional dependency analysis. Unit root analysis is used to discover the integration order of variables and uncover their stationary properties. Similarly, to Adekunle (2021) and Quayes (2019), unbalanced panel data were utilized in our sustainability research. In the subsequent paragraphs, detailed information was provided about the examinations.

3.2.1. Cross-sectional dependence test

Panel data sometimes displays cross-sectional dependence (CD) due to interactions between countries. To obtain accurate estimates, it is important to remove cross-sectional dependence (Phillips and Sul, 2003). This study investigates the use of cross-sectional dependence by employing two metrics introduced by Pesaran (2021). The following equation represents Pesaran's (2004) initial test for cross-sectional dependence:

$$CD = \sqrt{\frac{2T}{N(N-1)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N} pij\right)} \quad (2)$$

Where N is the sample size, T denotes the period, j countries and pij indicates the correlation of errors of i.

Breusch and Pagan (1980) created the Lagrange multiplier (LM) test to evaluate cross-sectional dependence. To illustrate this test, the following equation can be employed:

$$y_{it} = a_i + \beta_i x_{it} + \varepsilon_{it} \quad (3)$$

Where i represents the cross-sectional proportions, while t denotes the duration of time. The null hypothesis posits that cross-sections are independent, whereas the alternative hypothesis posits that cross-sections are mutually dependent.

3.2.2. Panel unit root tests

Assessing the presence of a unit root is essential before applying co-integration and regression methods to analyze the equilibrium and long-run elasticities between the variables under investigation. In the initial stage, two-panel unit-root tests were employed: The Im, Pesaran, and Shin test (IPS) proposed by Im et al. (2003) and the Levin, Lin, and Chu test (LLC) developed by Levin et al. (2002). The null hypothesis for the two-panel unit root tests is H_0: The time series possesses a unit root, indicating non-stationarity. Both unit root tests reject the null hypothesis if the P-value of the test statistic is below the significance level of 1%, 5%, or 10%.

3.2.3. Panel co-integration test

This study employs the co-integration method developed by Westerlund and Edgerton (2008). This test considers the presence of cross-sectional dependencies and structural weaknesses. Additionally, it allows for the use of various long-term and short-term error correction models. This study uses the coefficient (ϕN) and t-test version (τN) of co-integration tests developed from LM unit root tests. These two methodologies provide reliable results, particularly for datasets with limited scope.

4. EMPIRICAL RESULTS

The descriptive statistics of the variables are shown in Table 1. Before conducting econometric estimation, examining the descriptive statistics of the four variables being considered is advisable. This description is crucial as it provides a concise summary of the characteristics of the series within the model. Table 2 presents the descriptive statistics for the Middle East region. The table shows that the variables have low dispersion and reasonable volatility regarding their standard deviation.

It is important to check for any sectional dependency before evaluating the stationarity of the variables being studied. Table 3 displays the evaluation's results using the CD and LM approaches. By disproving the null hypothesis, these empirical results show that there is a cross-sectional dependency between the panel data's cross-sections. It was necessary to take certain steps, so we used the IPS and LLC tests. Table 3 shows the results.

Table 1: Variables and data source

Variable	Abb.	Period	Source
Crude oil price volatility	VOT	1990-2020	EIA
Investment	INV	1990-2020	WDI
Inflation	INF	1990-2020	WDI
Economic growth	GDP	1990-2020	WDI

Source: WDI World Bank development indicators. VOT: Volatility, INV: Investment, INF: Inflation, GDP: Gross domestic product

Table 2: Descriptive statistics of core variables

Variable	Mean	SD	Minimum	Maximum
VOT	2.662	2.448	1.339	2.965
INV	9.004	3.304	5.304	10.046
INF	8.405	4.960	6.613	12.436
GDP	15.471	6.805	0.960	14.229

VOT: Volatility, INV: Investment, INF: Inflation, GDP: Gross domestic product

Table 3: Cross-sectional dependence test results

Variable	Breusch-Pagan LM	Pesaran scaled LM	Pesaran CD
VOT	1975.11*	117.79*	39.07*
INV	1034.78*	53.13*	10.62*
INF	1211.12*	92.72*	29.75*
GDP	1005.09*	76.11*	11.31*

VOT: Volatility, INV: Investment, INF: Inflation, GDP: Gross domestic product

Based on the results of unit root tests outlined in Table 4, it was found that the oil price volatility, inflation, investment, and economic growth series were non-stationary and not integrated at the same level. However, after taking the first difference, they became integrated and stationary.

The Westerlund and Edgerton (2008) methodology is used in this work to examine the long-term relationship between the modelled variables in the presence of CD. There are dual applications for the technique Westerlund and Edgerton (2008) created in econometric estimations. In addition, this approach allows for the efficient detection of CD and the examination of heterogeneity and serially correlated errors.

This approach can also be used to examine structural breaks in panel data. The Westerlund and Edgerton (2008) test is recommended for this study because it accounts for co-integration, the possibility of structural break, and heterogeneity. The co-integration relationship between variables is examined using three different models in this Westerlund and Edgerton (2008) method: No shift, mean shift, and regime shift. The null hypothesis, which states that no co-integration relationship exists between the variables in any model, is rejected in light of Table 5. The results indicate a persistent link between oil price volatility, inflation, investment, and economic growth.

Theoretically, any uncertain internal or external disturbance can result in structural breaks; these shocks have long-term impacts on the economy by causing persistent alterations in socioeconomic factors (Karaki et al., 2023). The speed and manner in which structural adjustment occurs, either towards a path of convergence or divergence, is contingent upon the vulnerability of the economic system. It is crucial to bear in mind that a robust economy can withstand disruptions if it is on a path toward convergence. In this case, Westerlund and Edgerton (2008) independently and endogenously determined the break periods for each country. The test results of structural breaks, obtained using Westerlund and Edgerton's (2008) methodology, are shown in Table 6 and confirm the existence of cointegration following the inclusion of structural breaks in the analysis.

Table 4: Panel unit root test

Variables	IPS		LLC	
	Constant	Constant and linear trend	Constant	Constant and linear trend
VOT	1.234**	2.495**	3.334*	4.495*
D (VOT)	6.674*	6.024*	7.074*	5.988*
INv	8.235*	9.821*	7.537*	9.119*
D (INV)	5.293*	-3.068*	5.732	2.836**
INF	0.179	0.141	2.047	0.988
D (INF)	2.881*	2.703*	3.613*	3.517*
GDP	4.220	3.396	3.770	3.833
D (GDP)	4.474*	5.804*	−5.044	6.421*

*, **, and *** Denotes rejection of the null hypothesis at 1% and 5% and 10% significance level. VOT: Volatility, INV: Investment, INF: Inflation, GDP: Gross domestic product

Table 5: Results of Westerlund and Edgerton co-integration test

Model	cNo shift		Mean shift		Regime shift	
	Statistic	P-value	Statistic	P-value	Statistic	P-value
LMϕ	−5.828	0.000	−6.127	0.000	−4.002	0.000
LMτ	−5.055	0.000	−6.011	0.000	−4.038	0.000

Models are run with a maximum number 5 factors

Table 6: Westerlund and Edgerton cointegration test

Countries	Mean shift	Regime shift
Jordan	2019	2014
United Arab Emirates	2013	2014
Saudi Arabia	2020	2017
Kuwait	2019	2020
Turkey	2019	2018
Qatar	2018	2019

5. CONCLUSION

Crude oil is a crucial commodity in the global economy that is needed by all nations for transportation, power generation, and production machinery. The price of crude oil can be volatile, rising and falling, which can affect other macroeconomic factors, such as economic growth. The current study investigates how the volatility of crude oil prices impacts Middle Eastern countries' economic growth. We employ the Westerlund and Edgerton approach to achieve this. Annual time series data were used from 1990 to 2020. Cross-sectional panel data were collected from six countries: Saudi Arabia, Jordan, the United Arab Emirates, Kuwait, Qatar, and Turkey. The test results demonstrate a co-integration between the volatility of oil prices and economic growth. The co-integration of the four variables points to a long-term relationship.

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