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Revisiting the Causality between Oil Prices and Stock Markets in Selected MENA Countries: A Bootstrap Rolling-window Approach

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ABSTRACT

The main objective of this paper is to explore the dynamic causality between the fluctuations in oil prices and the trends observed in stock market indices of selected economies with oil-related characteristics. These countries include oil-importing nations such as Egypt and Tunisia, as well as one oil-exporting country, namely Oman. Our study uses monthly data spanning from January 2008 to February 2022. To investigate this causality, we adopt the rolling-window bootstrap causality test. The empirical results reveal that the causal relationship between stock market indices and oil prices is not stable, but rather fluctuates over time. Remarkably, these variations in causality coincide to important events, such as the sovereign debt crisis and the Covid-19 pandemic. This suggests that external shocks and exceptional events significantly influence the causal dynamics between oil prices and stock market in these countries. It is, therefore, crucial for policymakers and investors to take into account periods of economic uncertainty and major world events into their decision-making process. By adopting a proactive approach and carefully monitoring global economic indicators, they will be able to anticipate risks, adjust their strategies to meet economic challenges.

Keywords: Stock Market, Oil Prices, Oil Importing and Exporting Countries, Bootstrap Rolling-Window Approach
JEL Classifications: F22, Q56

1. INTRODUCTION

Our research is based on a highly debated subject that will continue to attract the attention of researchers, investors and economists namely the relationship between oil prices and the stock markets. Extensive research has been conducted to explore this significant relationship, but the field remains open to further investigation and offers continuous opportunities to advance our understanding of these crucial economic interactions.

In recent decades, many research studies have been dedicated to examining the interplay between oil prices and economic activity (Jones and WLeiby, 1996; Jones et al., 2004; Lescaroux and Mignon, 2008; An et al., 2014; Togonidze and Kočenda, 2022 and Da Silva Souza and De Mattos, 2023; among others). These investigations have notably indicated that oil price shocks exert significant effects on macroeconomic variables in the majority of developed and emerging countries (Cologni and Manera, 2008; Kilian, 2008 and Lardic and Mignon, 2006; 2008). Their findings underscore the substantial role of oil prices on shaping economic dynamics on a global scale.

Energy, particularly oil, is undeniably one of the main driving factors in world economic development, constituting the basis for industries in all countries. In 2019, it represented 33.1% of the world's primary energy consumption, as reported by the Statistical Review of World Energy. Given its critical role, any substantial movement in oil prices can have far-reaching consequences on the future economic growth and stability of both developed and developing nations. These fluctuations in oil prices can significantly impact financial markets namely stock market movements.

The causality between the oil price and the stock market indices is little studied in the context of MENA countries (Chkili, 2022; Benbachir et al., 2022; Mensi et al., 2021; Cifter et al., 2021 and Assaf, 2016. among others). Developing countries are characterized by small economies and fragile stock markets concerning the number of transactions and market capitalization. The MENA region is a developing area that comprises both oil-importing and oil-exporting countries. These distinctions in their status as oil importers or exporters can influence their sensitivity to oil price fluctuations and impact their respective stock markets. In the current economic environment, understanding how these dynamics interact is essential for policymakers and investors seeking to make well-informed decisions regarding economic policies and financial investments.

This paper contributes to the existing literature in three ways: Firstly, it stands out in the selection of the region and the three specific countries included in this study. By choosing Egypt, Tunisia, and Oman as the focus of the research, we can examine the causal dynamics between oil prices and stock market indices in economies representing different levels of oil dependence and sensitivity to global events. This selection enables a more in-depth analysis of regional specificities and variations in economic and financial behaviour. Secondly, this study highlights the significance of considering periods of major economic turbulence, such as the sovereign debt crisis and the COVID-19 pandemic. By investigating the influence of oil prices on stock markets during these critical periods, we shed further light on the impacts of external shocks on the causal relationship between these two crucial variables. Thirdly, what sets this study apart is the utilization of the bootstrap Granger causality test and rolling window estimation to examine the time-varying dependence between Brent oil prices and stock prices. This approach allows for a better understanding of the temporal evolutions of the causal relationship, taking into account possible changes in the link between oil prices and stock market indices.

The remaining structure of the study is as follows. Section 2 provides a concise overview of the existing literature concerning the relationship between stock prices and oil prices. Section 3 presents the data and preliminary analysis. In Section 4, the empirical methodology is outlined. The empirical results are presented in Section 5, while Section 6 concludes the paper.

2. LITERATURE REVIEW

In the last two decades, there has been a notable surge in empirical research examining the connections between international oil prices and stock markets. Several empirical studies have identified a negative correlation between oil prices and stock market returns (Jones and Kaul, 1996; Miller and Ratti, 2009; Chen, 2009 among others). Conversely, other investigations have highlighted the significance of a country's net position in the global oil market in determining how stock markets respond to oil shocks. These studies suggest that oil-exporting countries tend to experience positive impacts between oil prices and stock market returns, whereas oil-importing countries more commonly face negative effects (Bashar, 2006; Wu and Yang, 2013). These diverse findings underscore the complexity of the oil-market relationship and stress the importance of considering country-specific factors when analyzing the dynamics between oil prices and stock markets.

The varied reactions of stock exchange indices to oil price shocks, both positive and negative, highlight the importance of considering asymmetries in the oil-stock nexus (Mehta et al., 2022). Positive oil price shocks do not have the same impact as negative oil price shocks on the stock market, emphasizing the need to account for these asymmetrical effects. Prabheesh et al. (2021) and Polat (2020) have also observed a significant correlation between stock market performance and oil prices. Equities have demonstrated a tendency to move in tandem with the rise in global oil prices, catching many off-guard, especially in oil-importing countries like Bangladesh, India, Pakistan, and Sri Lanka, among others (Kilian and Park, 2009; Silvapulle et al., 2017). As Bernanke (2017) points out, the price of oil and the stock market exhibit responses to shifts in a shared set of fundamental characteristics.

Other studies have demonstrated that various financial institutions and investors view the oil market as an alternative investment avenue to traditional stock market assets. This perception stems from its potential to generate profitability, owing to its low correlation with conventional asset classes and its role as a hedge against inflationary risks (Kat and Oomen, 2006; Silvennoinen and Thorp, 2013). However, some authors have raised questions about this hypothesis, as they suggest that the oil market and stock markets have become increasingly intertwined. This integration is attributed to the growing financialization of the oil market, driven by the greater involvement of speculative hedge funds in oil trading (Silvennoinen and Thorp, 2013; Tang and Xiong, 2012; Buyuksahin and Robe, 2011; Hamilton and Wu, 2012; Sadorsky, 2014).

Many researchers posit that the influence of oil price fluctuations on stock market returns is indirect, as it can be transmitted through various macroeconomic variables. This view is based on the significance of oil as a vital commodity, where an increase in oil prices leads to higher production costs, resulting in elevated prices and subsequently lower consumer demand and spending (Hamilton, 1996; Huang et al., 1996; Arouri and Nguyen, 2010). The reduced consumption may then lead to a decline in production, potentially leading to a decrease in employment (Lardic and Mignon, 2006).

Numerous empirical studies have explored the dynamic interaction between stock market indices and oil prices. For instance, Sadorsky (1999) investigated the asymmetric impact of oil price shocks and volatility on the US economy and stock market returns (S&P 500) using VAR and GARCH models. The findings indicated that positive oil shocks negatively affect real equity returns, revealing asymmetric effects of oil price volatility shocks on the economy.

Furthermore, Malik and Hammoudeh (2007) utilized the BEKK-GARCH model to analyze the transmission of shocks and volatility between WTI oil prices, the American stock market, and the stock markets of GCC countries from February 14, 1994 to December 25, 2001. They found that the stock markets of the GCC group were influenced by the volatility of the oil market.

Bouri (2015) used the causality-in-variance methodology to document risk spillover effects between Jordanian stock market returns and global oil prices. The analysis focused on both the pre and post-2008 financial crisis periods. The pre-crisis period showed no spillovers between stock returns and global oil price shifts, whereas the post-crisis period revealed one-way risk spillover effects from oil price changes towards stock market returns (Liu et al., 2018; Ma et al., 2021b)."

Recently, Morema and Bonga-Bonga (2020) examined the effects of oil and gold market fluctuations on the South African stock market, with a specific focus on various sectors. Daily data from stock market indices, Brent oil prices, and gold prices were utilized for their analysis. The researchers employed a VAR-ADCC-GARCH model to explore the relationships. Their findings revealed that the industrial and resource sector indices were particularly susceptible to past shocks in oil price volatility, while the financial sector appeared to be relatively insulated from such shocks. Additionally, their research indicated a unidirectional transmission of volatility, flowing from the commodity market (oil and gold) to the South African equity markets.

In addition, some studies underscore the importance of considering nonlinear approaches to uncover complex relationships and asymmetries in the oil-market nexus. De Jesus et al. (2020) studied the long-run dynamics between stock and oil prices, utilizing the Rafailidis and Katrakilidis (2014) approach, which accounts for structural breaks in the relationship between these variables within a Dynamic Ordinary Least Squares model. The outcomes of their study revealed intriguing insights when employing nonlinear methodologies, where cointegration and asymmetry were identified. For oil-exporting countries, a positive long-term relationship emerged between oil and stock prices, indicating the prevalence of the wealth effect in these economies. Conversely, oil-importing countries with developed economies exhibited a negative signal, signifying the prominence of the business cost channel in influencing the stock-oil relationship within these nations. Interestingly, for oil-importing countries with emerging economies, a positive sign was observed in the long-term relationship, likely attributable to the influence of the economic cycle. The combination of these findings underscores the complexity of the relationship between oil prices and stock market behavior, emphasizing the need for a comprehensive understanding of the underlying factors that drive these interactions. In their study, Okpezune et al. (2023) examined how oil prices relate to stock market performance in Africa, employing the Vector Error Correction Model. Their findings indicate a positive influence of oil price fluctuations on stock market performance in oil-importing countries. However, for oil-trading countries, the impacts vary among the nations studied. The research establishes that oil price fluctuations had a heterogeneous effect on both large and small stock markets.

3. DATA AND PRELIMINARY ANALYSIS

In this article, we empirically investigate the dynamic causal relationships between oil prices and stock market indices in two oil-importing countries, Tunisia and Egypt, and one oil-exporting country, Oman. The data used in our study are sourced from reputable platforms, namely www.investing.com and www.eia.gov. The selection of Brent as the oil price reference is justified by its significance, accounting for around 65% of global oil production and serving as the benchmark for oil produced in Europe, Africa, and the Middle East.

The exploration of the relationship between oil prices and stock market indices in developing countries has been relatively limited, primarily due to the smaller size of their economies and the less robust nature of their stock markets in terms of transaction volumes and market capitalization. However, it is crucial to note that the MENA region, being a developing area, encompasses both oil-importing and oil-exporting countries. Notably, the oil-producing countries within this region, as members of OPEC+, wield significant influence over oil prices. Consequently, investigating the dynamic causality between oil prices and stock markets in the selected countries within the MENA region becomes an essential undertaking to better comprehend the implications of this relationship.

Figure 1 depicts the price evolution of Brent oil, EGX30, TUNINDEX, and MSX30 stock market indices from January 01, 2008 to February 02, 2022. Notably, the chart reveals significant fluctuations, particularly during periods of economic turmoil, such as the European sovereign debt crises and the Covid-19 pandemic. Specifically, when the European sovereign debt crises occurred, all prices experienced a decline. Furthermore, the figure highlights the fluctuations in oil and stock prices since 2011, each exhibiting varying degrees of intensity during the European sovereign debt crises and the Covid-19 pandemic.

Table 1 (Panel A) presents the summary statistics for Brent oil price and stock market indices. Among the variables, (BRENT) exhibits the highest volatility, with a standard deviation of 26.553%, while TUNINDEX displays the least volatility, having a standard deviation of 1.3339%. Additionally, MSX30 shows the highest level of excess kurtosis, suggesting that extreme changes occur more frequently in its stock price. Moving on to Panel B, the null hypothesis of the presence of unit roots is rejected when employing the ADF and PP tests on both the level and first difference of the data.

4. EMPIRICAL METHODOLOGY

4.1. Bootstrap Full-sample Causality Test

In our study, we utilize the bootstrap rolling window Granger causality test, which was proposed and introduced by Balcilar et al. (2010). This analytical approach has been widely recognized and employed in various research works, including those by Su et al. (2021), Sun et al. (2021), and Minlah et al. (2021).

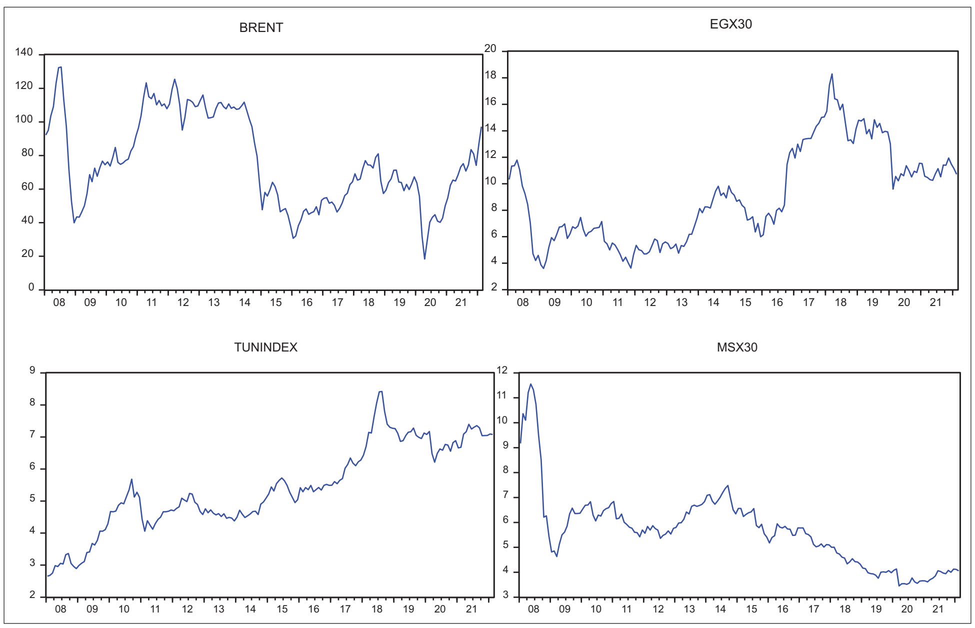
To examine the causality between the fluctuations of oil prices and the stock market indices in the studied countries, we adopt the Granger

Table 1: Descriptive statistics and unit root tests

	BRENT	MSX30	EGX30	TUNINDEX
Panel A: Descriptive statistics				
Mean	76.357	5.6651	9.1050	5.4002
Maximum	132.72	11.554	18.295	8.4184
Minimum	18.380	3.4482	3.5975	2.6554
SD	26.553	1.5266	3.5661	1.3339
Skewness	0.2195	1.3393	0.4231	0.0374
Excess Kurtosis	1.9176	6.2066	2.0922	2.3044
Jarque-Bera	9.6639***	123.65***	10.910***	13.466***
Probability	0.0079	0.0000	0.0042	0.0000
Panel B: Unit root test				
ADF-test				
Level	−2.6519	−2.1685	−1.3276	−1.6596
Probability	0.0848	0.2187	0.6162	0.4499
First difference	−8.0366***	−10.458***	−12.176***	−10.942***
Probability	0.0000	0.0000	0.0000	0.0000
PP-test				
Level	−1.9669	−2.4732	−1.5384	−1.7051
Probability	0.3013	0.1239	0.5118	0.4269
First difference	−7.4467***	−10.744***	−12.271***	−10.937***
Probability	0.0000	0.0000	0.0000	0.0000

***Significance at 1%. SD: Standard deviation

Figure 1: Oil and stock prices behavior over times



non-causality test introduced by Engle and Granger (1987) based on the bivariate VAR model. This approach is widely used in the literature to determine whether the information related to one variable improves the prediction of another variable and vice versa. However, it is important to note that the classic statistics of the Granger causality test, including the Wald test, the likelihood ratio (LR) test, and the Lagrange multiplier (LM) test, do not have a standard asymptotic distribution when the series are I(1) or non-stationary at the level.

The empirical estimation of the VAR model through the Granger causality test poses challenges due to the rolling window sub-samples. To overcome this issue, we adopt Toda and Yamamoto's (1995) modified Wald test for the bivariate VAR model. Standard Granger causality tests are unsuitable for small samples and may yield non-asymptotic critical values. To address this limitation, we employ the residual-based (RB) bootstrap method introduced by Shukur and Mantalos (2004). According to Shukur and Mantalos (2000), the small sample modified-LR tests exhibit better power and size properties, even in small samples. Hence, we utilize the RB-based modified-LR method to examine the causal relationship between stock indices and oil prices in both oil-importing and oil-exporting countries.

The bivariate VAR model is represented by the following equation:

$$y_0 = \varnothing_0 + \varnothing_1 y_{t-1} + ... + \varnothing_p y_{t-p} + \mu_t, t = 1, 2, ...T \quad (1)$$

Where $(\varepsilon_{1t}, \varepsilon_{2t})'$ is the white noise process with zero mean and covariance matrix. the optimal lag is determined by referring to the SBIC information criterion.

$y_t = (OP_t, SP_t)'$ where, OP is the BRENT oil price and SP is the stock prices for the countries. using two sub-vectors, equation (1) is written as follow:

$$\begin{Bmatrix} OP_t \\ SP_t \end{Bmatrix} = \begin{Bmatrix} \varnothing_{10} \\ \varnothing_{20} \end{Bmatrix} + \begin{Bmatrix} \varnothing_{11}(L)\varnothing_{12}(L) \\ \varnothing_{21}(L)\varnothing_{22}(L) \end{Bmatrix} \begin{Bmatrix} OP_t \\ SP_t \end{Bmatrix} + \begin{Bmatrix} \mu_{1t} \\ \mu_{2t} \end{Bmatrix} \tag{2}$$

Where $\varnothing_{ij}(L) = \sum_{k=1}^{p} \varnothing_{ij,k} L^k$ and the lag operator (L) is expressed as follow: $L^k x_t = x_{t-k}$

Referring to equation (2), when $\varnothing_{12,k} = 0$, the oil price does not cause the stock market indices in the Granger sense. In addition, when $\varnothing_{12,k} = 0$, the stock market indices does not cause the oil price in the Granger sense.

4.2. Parameter Stability Tests

In the empirical literature, it has been suggested that the VAR model parameters may indicate instability when the full sample data show evidence of structural changes (Su et al., 2019). Balcilar and Ozdemir (2013) argue that a high number of observations in the sample can lead to structural mutations occurring in the component variables, thereby causing instability in the interaction between the two variables throughout the sample period.

To address the issue of parameter instability, we conduct stability tests on the short-term parameters, namely Sup-F, Exp-F, and Mean-F, as proposed by Andrews (1993) and Andrews and Ploberger (1994). Additionally, we evaluate the stability Lc test of the long term, as suggested by Nyblom (1989) and Hansen (1992). The aim is to assess the time-varying nature of the parameters and identify potential structural changes. If the parameters are found to be time-varying, it indicates the need to employ sub-sample tests to investigate the Granger causal relationship between oil and stock prices.

4.3. Bootstrap Sub-sample Rolling-window Causality Test

If the assumption of parameter instability is not accepted, Balcilar et al. (2010) propose dividing the entire time series into subsamples using a sliding window approach. This method, as emphasized by Wang et al. (2020), considers the varying nature of the causal relationship between the variables and accounts for potential instability arising from structural changes. To explore the causal relationship between the variables within the subsamples, we conduct the modified RB-based LR test. By analyzing the bootstrap P-values and LR statistics for the T-1 subsamples, we can identify temporal variations in the causal relationship between the two series.

5. EMPIRICAL RESULTS

5.1. Causality Analysis: Full-sample

After conducting stationarity tests, we confirmed that all variables exhibit stationarity in first difference (I[1]). To investigate the causal link between the oil price (BRENT) and the stock market indices of oil-importing countries, namely Egypt and Tunisia (EGX30 and TUNINDEX), and the oil-exporting country, Oman (MSX30), we employed the bivariate VAR model. The optimal lag order of 1 was determined based on the SBIC information criterion.

For our analysis, a rolling window approach with a window size of 24 observations was chosen. The results of the modified LR tests based on the RB method, as well as the stability tests of the parameters and rolling window causality tests, were interpreted for each country in the sample.

The outcomes of the RB-based modified-LR tests are presented in Table 2. For Oman, we observed bidirectional causality at the 1% and 5% significance levels between BRENT and MSX30. This result contradicts the findings of Lee et al. (2012), who reported the absence of causality between oil and stock markets among the G7 countries. However, the results revealed unidirectional causality between oil price and stock prices in Egypt and the absence of causality in Tunisia.

To investigate the presence of structural changes and assess the stability of the VAR system parameters, we conducted Sup-F, Ave-F, Exp-F, and Lc tests. The results of these parameter stability tests are presented in Table 3. For Oman, the Sup-F and Exp-F statistics indicate strong evidence of a sudden structural change in both the oil price equations and the stock market index (MSX30), as well as in the VAR system, at a significance level of 1%. However, the Ave-F statistic suggests no significant structural change in the VAR system. Furthermore, the Lc test shows that the parameters in the VAR system follow a random walk process with high confidence at the 1% level.

Similar empirical findings are observed for Egypt, where the Sup-F and Exp-F statistics also point to the presence of a sudden structural change in the equations and the VAR system at a significance

Table 2: Full sample granger causality tests: Bootstrap LR test

Test	Pair (BRENT-MSX30)			
	H_0: Brent does not granger cause MSX30		H_0: MSX30 does not granger cause BRENT	
	Statistics	P	Statistics	P
Bootsrap LR-test	14.0618***	0.0100	7.8105**	0.0300
Test	**Pair (BRENT-EGX30)**			
	H_0: Brent does not granger cause EGX30		**H_0: EGX30 does not granger cause BRENT**	
	Statistics	**P**	**Statistics**	**P**
Bootsrap LR-Test	5.0152	0.1300	6.7642*	0.0800
Test	**Pair (BRENT-TUNINDEX)**			
	H_0: Brent does not granger cause TUNINDEX		**H_0: TUNINDEX does not granger cause BRENT**	
	Statistics	**P**	**Statistics**	**P**
Bootsrap LR-test	0.3611	0.8300	2.3643	0.2700

*** and **Significance at 1% and 5%. P-values are calculated using 1000 bootstrap repetitions. LR: Likelihood ratio

Table 3: Parameters stability tests

			Oman			
	Brent equation		**MSX30 equation**		**VAR system**	
	Statistics	**P**	**Statistics**	**P**	**Statistics**	**P**
Sup-F	73.0527***	0.0000	23.7027***	0.0025	8.9000***	0.0000
Ave-F	9.9564***	0.0000	6.7625*	0.0824	9.8531	1.0000
Exp-F	31.7440***	0.0000	7.1743***	0.0074	4.4021***	0.0050
Lc					13.1853***	0.0000
			Tunisia			
	Brent equation		**Tunindex equation**		**VAR system**	
	Statistics	**P**	**Statistics**	**P**	**Statistics**	**P**
Sup-F	23.2224***	0.0030	34.9087***	0.0000	8.4711***	0.0000
Ave-F	5.0721	0.2314	7.1782*	0.0630	13.5596	1.0000
Exp-F	7.6450***	0.0047	12.6869***	0.0002	4.1877***	0.0000
Lc					9.5291***	0.0000
			Egypt			
	Brent equation		**EGX30 equation**		**VAR system**	
	Statistics	**P**	**Statistics**	**P**	**Statistics**	**P**
Sup-F	24.0218***	0.0021	32.4114***	0.0000	9.3951***	0.0000
Ave-F	9.4578**	0.0134	12.0272***	0.0002	0.5066	1.0000
Exp-F	8.8016***	0.0015	12.7869***	0.0000	4.6497***	0.0000
Lc					9.7012***	0.0000

***, **, and *Significance at the 1%, 5%, and 10% levels, respectively. P-values are calculated using 1000 bootstrap repetitions. VAR: Vector autoregressive

level of 1%. However, the Ave-F statistic indicates no significant structural change in the oil price equation.

Lastly, for Tunisia, the results show the existence of a sudden structural change in both the VAR system and the two equations. The Lc test confirms that the parameters in the VAR system follow a random walk process with strong evidence at the 1% level, emphasizing the importance of considering the potential volatility and unpredictability in the oil-importing countries.

5.2. Time-varying Causality Analysis

Overall, the empirical findings reveal a dynamic and time-varying causal relationship between oil prices and stock market indices in both oil-exporting and oil-importing countries. To investigate this relationship, we employ the subsample bootstrap rolling-window Granger causality method with a rolling window of 24 months.

Figures 2-4 provide insights into the causal link between oil prices and stock market indices, as well as the direction and magnitude of their impact. For Oman, Figure 2 demonstrates that the null hypothesis of no Granger causality between BRENT and the stock index (MSX30) is rejected at a significance level of 10% when the bootstrap probability values (P-values) fall below the horizontal dotted green line. Notably, we observe periods of causality rejection, such as 2010M01-2010M05, 2015M03-2015M07, 2016M07-2016M10, 2017M08-2017M08, 2021M09-2021M10, and 2022M02. Similarly, when examining the impact of MSX30 on BRENT, we find causality rejection in periods such as 2010M04-2010M12, 2011M05-2012M11, 2012M11-2013M03, 2015M05-2015M12, 2017M05-2017M07, and 2021M08-2022M2. These periods correspond to significant events such as the sovereign debt crisis, oil crisis for MENA countries, the Covid-19 pandemic, and the ongoing Russian war, which have significantly influenced financial markets and oil prices.

5.2.1. Case of Oman

By focusing on Egypt, the analysis of the causal relationship between BRENT and EGX30, as depicted in Figure 3, reveals periods of causality rejection, including 2010M01-2010M11, 2016M06-2016M12, 2017M07-2017M10, 2018M06-2021M02, and 2021M11-2021M01. Conversely, the absence of causality is observed for the impact of EGX30 on BRENT during the following periods: 2011M06-2012M02 and 2015M10-2016M01.

5.2.2. Case of Egypt

Moving on to Tunisia, causality is absent in the following periods: 2010M06-2010M08, 2017M04-2018M04, and 2019M01-2019M05 (impact of BRENT on TUNINDEX) and 2010M06-2010M09, 2015M02-2015M08, 2019M02-2020M02, and 2021M01-2021M12 (impact of TUNINDEX on BRENT). These findings indicate that the causal relationship between oil and stock markets is not constant but rather time-varying.

5.2.3. Case of Tunisia

These findings indicate that the causal relationship between oil and stock markets is not constant but rather time-varying. In addition, these figures reveal the sign of the bidirectional causality expressed by the bootstrap estimate of the sliding coefficient, representing the impact of one variable on the other (oil price on stock prices and vice versa). Notably, the effect of each variable on the other fluctuates over time, and the sign changes from one period to another. For Oman, an oil-exporting country, we observe that the effect of BRENT on MSX30 is negative during periods like 2011M01-2013 and 2017M06-2020M01. On the other hand, this effect turns positive during periods such as 2010M04-2010M12, 2013M01-2013M04, 2014M08-2017M06, and 2020M01-2022M02. Additionally, the effect of MSX30 on BRENT is predominantly negative during times of the sovereign debt crisis and the Covid-19 pandemic.

Figure 2: Rolling window estimation results for relation between MSX30 and BRENT

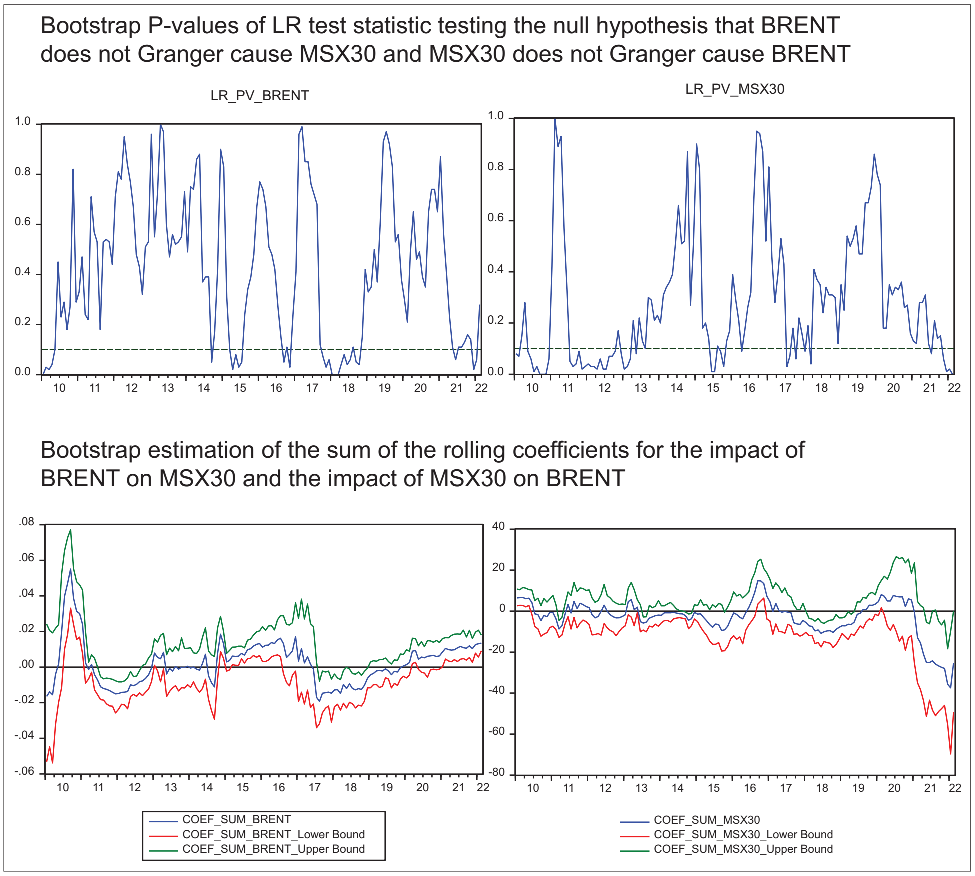


Figure 3: Rolling window estimation results for relation between EGX30 and BRENT

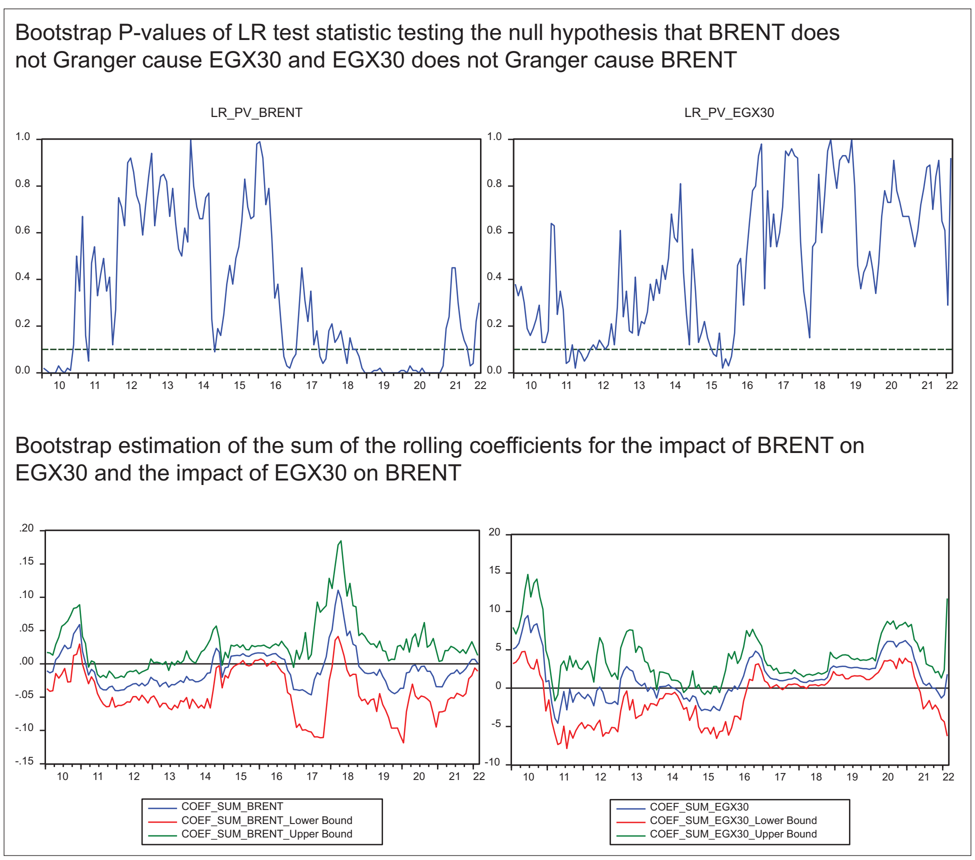
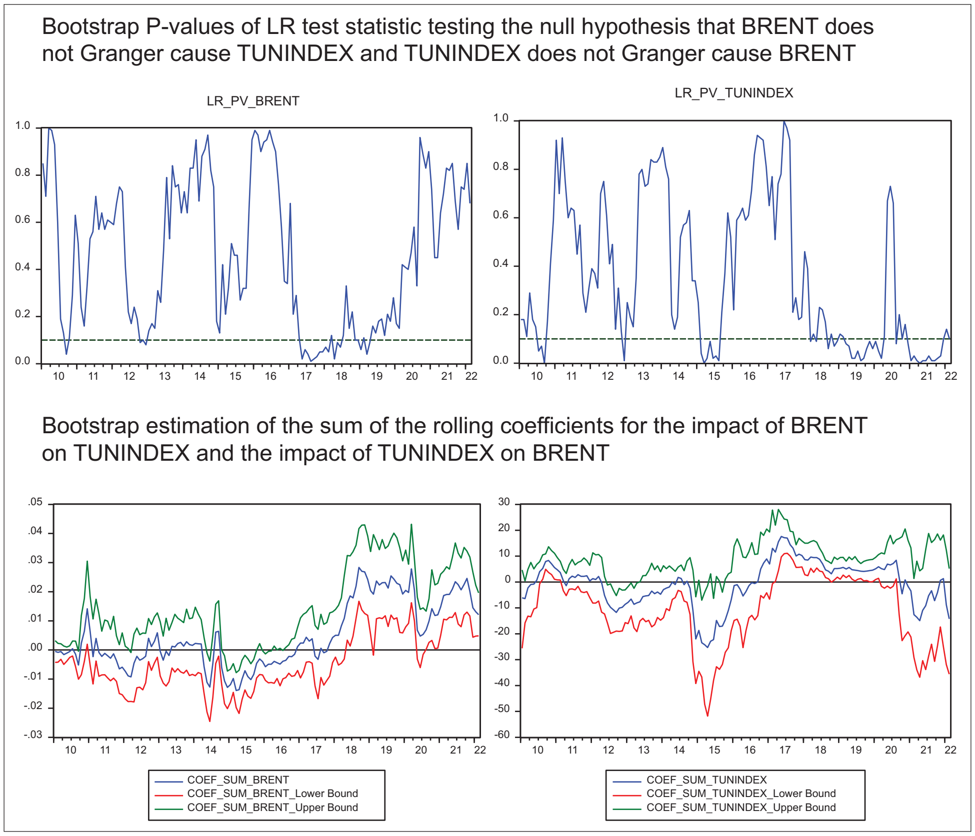


Figure 4: Rolling window estimation results for relation between TUNINDEX and BRENT



These same empirical findings hold for oil-importing countries, namely Egypt and Tunisia. The impact of the shock is destabilizing, and we observe alternating movements during different periods, indicating the time-varying nature of the causal relationship between oil prices and stock market indices in these countries. These results emphasize the importance of considering the dynamic and evolving nature of the oil-stock nexus in different economic scenarios and market conditions.

6. CONCLUSION

The main objective of this study was to investigate the causal relationship between oil prices and stock market indices in selected countries within the MENA region. The countries analyzed included Egypt and Tunisia as oil-importing nations, and Oman as an oil-exporting country. To achieve this goal, we adopted an empirical approach based on a bivariate VAR model and utilized a rolling-window bootstrap causality test. This methodology allowed us to examine the time-varying dependence between oil prices and stock market returns, considering the dynamic nature of these interactions.

Our results revealed a time-varying relationship between oil prices and stock market indices, with periods of both unidirectional and bidirectional causality. In oil-exporting countries like Oman, we observed a bidirectional causal relationship, while in oil-importing countries like Egypt and Tunisia, the causality was either unidirectional or absent.

On the one hand, the presence of bidirectional causality between oil prices and Oman's stock market indicates a close interdependence between these two variables. This means that fluctuations in oil prices can influence Oman's stock market and vice versa. Policymakers in this country need to be aware of this close relationship and consider oil price fluctuations in their risk management and strategic planning.

On the other hand, the results showing unidirectional causality between oil prices and stock prices in Egypt suggest that variations in oil prices can influence the Egyptian stock market. However, no significant causality was observed in Tunisia, indicating that other factors may play a more dominant role in the fluctuations of the stock market in this country. Furthermore, the identification of a random walk in the parameters of the VAR system for oil-importing countries (Egypt and Tunisia) highlights the complexity of interactions between oil prices and stock market indices in these economies. This indicates that these countries may be particularly sensitive to economic shocks and oil price fluctuations, necessitating a cautious approach in economic decision-making.

The results of this investigation carry significant implications for both market participants and policymakers, underscoring the need to consider specific economic dynamics and market contexts when examining the relationship between oil prices and the stock market. Moreover, these findings emphasize the importance of taking into account the economic and political particularities of each country when analyzing the link between oil prices and stock market performance. Investors must be vigilant about fluctuations in oil prices and their potential impact on the stock markets of relevant countries. These results also offer valuable insights for investment diversification strategies. International investors can leverage this information to adjust their portfolios and factor in the stock markets' sensitivity to changes in oil prices in the studied nations. Policymakers should also take these results into account when formulating economic and financial policies. Periods of unidirectional causality between oil and stocks in oil-importing countries may require specific measures to mitigate the adverse effects of oil shocks on the economy and stock market. Furthermore, the results underscore the importance of closely monitoring economic and geopolitical events that could influence oil prices and stock markets. Periods of changing causality may be linked to events such as economic crises, geopolitical conflicts, and oil shocks, making it essential to understand these dynamics for better risk and opportunity management. In conclusion, our research contributes to a better understanding of the complex relationship between oil prices and stock market indices in countries within the MENA region, highlighting the time-varying nature of this relationship over time.

REFERENCES

An, L., Jin, X., Ren, X. (2014), Are the macroeconomic effects of oil price shock symmetric?: A factor-augmented vector autoregressive approach. Energy Economics, 45, 217-228.

Andrews, W. (1993), Tests for parameter instability and structural change with unknown change point. Journal of the Econometric Society, 61(4), 821-856.

Andrews, W., Ploberger, W. (1994), Optimal tests when a nuisance parameter is present only under the alternative. Journal of the Econometric Society, 62(6), 1383-1414.

Arouri, M.E.H., Nguyen, D.K. (2010), Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade. Energy Policy, 38, 4528-4539.

Assaf, A. (2016), MENA stock market volatility persistence: Evidence before and after the financial crisis of 2008. Research in International Business and Finance, 36, 222-240.

Balcilar, M., Ozdemir, Z.A. (2013), The export-output growth nexus in Japan: A bootstrap rolling window approach. Empirical Economics, 44(2), 639-660.

Balcilar, M., Ozdemir, Z.A., Arslanturk, Y. (2010), Economic growth and energy consumption causal Nexus viewed through a bootstrap rolling window. Energy Economics, 32(6), 1398-1410.

Bashar, Z. (2006), Wild Oil Prices, but Brave Stock Markets! The Case of Gulf Co-operation Council (GCC) Stock Markets. Middle East Economic Association Conference, Dubai.

Benbachir, S., Harit, S., Chraibi, A. (2022), Impact of oil price shocks on MENA countries stock markets: Event study methodology. Review of Middle East Economics and Finance, 18(1), 1-27.

Bouri, E. (2015), Return and volatility linkages between oil prices and the Lebanese stock market in crisis periods. Energy, 89(C), 365-371.

Buyuksahin, B., Robe, M.A. (2011), Does "Paper Oil" Matter? Energy Markets' Financialization and Equity-commodity Co-movements. Working Paper. United States: The American University.

Chkili, W. (2022), The links between gold, oil prices and Islamic stock markets in a regime switching environment. Eurasian Economic Review, 12(1), 169-186.

Cifter, A., Akay, G.H., Doğan, F.İ. (2021), Oil prices and stock returns in the MENA countries: A firm-level data analysis. Emerging Markets Finance and Trade, 57(15), 4350-4360.

Cologni, A., Manera, M. (2008), Oil prices, inflation and interest rates in a structural cointegrated VAR model for the G-7 countries. Energy Economics, 30, 856-888.

Da Silva Souza, R., Mattos, L.B. (2023), Macroeconomic effects of oil price shocks on an emerging market economy. Economic Change and Restructuring, 56(2), 803-824.

De Jesus, D.P., Bezerra, B.F.L.S., da Nóbrega Besarria, C. (2020), The non-linear relationship between oil prices and stock prices: Evidence from oil-importing and oil-exporting countries. Research in International Business and Finance, 54, 101229.

Engle, R.F., Granger, C.W.J. (1987), Co-integration and error correction: Representation, estimation, and testing. Econometrica, 55, 251-276.

Hamilton, J.D. (1996), This is what happened to the oil price-macroeconomy relationship. Journal of Monetary Economics, 38, 215-220.

Hamilton, J.D., Wu, J.C. (2012), Risk Premia in Crude Oil Futures Prices. Working Paper. United States: University of California at San Diego.

Hansen, E. (1992), Test for parameter instability in regressions with I(1) processes. Journal of Business and Economic Statistics, 10, 321-336.

Huang, D.R., Masulis, R.W., Stoll, H. (1996), Energy shocks and financial markets. Journal of Futures Markets, 16(1), 1-27.

Jones, C.M., Kaul, G. (1996), Oil and the stock markets. Journal of Finance, 51(2), 463-491.

Jones, D.W., Leiby, P.N. (1996), The macroeconomic impacts of oil price shocks: A review of literature and issues. Oak Ridge National Laboratory, 25(2), 1-32.

Jones, D.W., Leiby, P.N., Paik, I.K. (2004), Oil price shocks and the macroeconomy: What has been learned since 1996. The Energy Journal, 25(2), 1-32.

Kat, H., Oomen, R. (2006), What Every Investor Should Know About Commodities, Part I: Univariate Return Analysis (Working Paper No. 29). Available from: https://www.cfapubs.org/doi/pdf/10.2469/dig.v37.n3.4774

Kilian L. (2008), Exogenous oil supply shocks: How big are they and how much do they matter for the US economy? Review of Economics and Statistics, 90, 216-240.

Kilian, L., Park, C. (2009), The impact of oil price shocks on the US stock market. International Economic Review, 50(4), 1267-1287.

Lardic, S., Mignon, V. (2006), Oil prices and economic activity: An asymmetric cointegration approach. Energy Economics, 34, 3910-3915.

Lardic, S., Mignon, V. (2006), The impact of oil prices on GDP in European countries: An empirical investigation based on asymmetric cointegration. Energy Policy, 34(18), 3910-3915.

Lardic, S., Mignon, V. (2008), Oil prices and economic activity: An asymmetric cointegration approach. Energy Economics, 30(3), 847-855.

Lee, B.J., Yang, C.W., Huang, B.N. (2012), Oil price movements and stock markets revisited: A case of sector stock price indexes in the G-7 countries. Energy Economics, 34(5), 1284-1300.

Lescaroux, F., Mignon, V. (2008), On the influence of oil prices on economic activity and other macroeconomic and financial variables. OPEC Energy Review, 32(4), 343-380.

Liu, B., Ma, B., Bashir, M.F. (2018), Mechanism Design of Multi-attribute Reverse Auction on Margin Bid. Paper Presented at the 2018 4th International Conference on Education Technology, Management and Humanities Science (ETMHS 2018).

Ma, B., Zhang, Y., Qin, Y., Bashir, M.F. (2021b), Optimal insurance contract design with "no-claim bonus and coverage upper bound" under moral hazard. Expert Systems with Applications, 178, 115050.

Malik, F., Hammoudeh, S. (2007), Shock and volatility transmission in the oil, US and Gulf equity markets. International Review of Economics and Finance, 16(3), 357-368.

Mehta, A.M., Qamruzzaman, M.D., Serfraz, A. (2022), The effects of finance and knowledge on entrepreneurship development: An empirical study from Bangladesh. Journal of Asian Finance, Economics and Business, 9(2), 409-418.

Mensi, W., Al-Yahyaee, K.H., Vo, X.V., Kang, S.H. (2021), Modeling the frequency dynamics of spillovers and connectedness between crude oil and MENA stock markets with portfolio implications. Economic Analysis and Policy, 71, 397-419.

Miller, J., Ratti, R. (2009), Crude oil and stock markets: Stability, instability, and bubbles. Energy Economics, 31, 559-568.

Minlah, M.K., Zhang, X. (2021), Testing for the existence of the environmental Kuznets curve (EKC) for CO_2 emissions in Ghana: Evidence from the bootstrap rolling window granger causality test. Environmental Science and Pollution Research International, 28(2), 2119-2131.

Morema, K., Bonga-Bonga, L. (2020), The impact of oil and gold price fluctuations on the South African equity market: Volatility spillovers and financial policy implications. Resources Policy, 68, 101740.

Nyblom, J. (1989), Testing for the constancy of parameters over time. Journal of the American Statistical Association, 84, 223-230.

Okpezune, C.C., Seraj, M., Ozdeser, H. (2023), The effect of oil price shocks on stock market performance in selected African countries. OPEC Energy Review, https://doi.org/10.1111/opec.12288

Polat, O. (2020), Time-varying propagations between oil market shocks and a stock market: Evidence from Turkey. Borsa Istanbul Review, 20(3), 236-243.

Prabheesh, K.P., Padhan, R., Garg, B. (2021), COVID-19 and the oil price stock market Nexus-evidence from net oil-importing countries. Energy Research Letters, 1(1), 1-4.

Rafailidis, P., Katrakilidis, C. (2014), The relationship between oil prices and stock prices: A nonlinear asymmetric cointegration approach. Applied Financial Economics, 24(12), 793-800.

Sadorsky, P. (1999), Oil price shocks and stock market activity. Energy Economics, 21, 449-469.

Sadorsky, P. (2014), Modelling volatility and correlations between emerging market stock prices and the prices of copper, oil and wheat. Energy Economics, 43, 72-78.

Shukur, G., Mantalos, P. (2000), A simple investigation of the Granger-causality test in integratedcointegrated VAR systems. Journal of Applied Statistics, 27(8), 1021-1031.

Shukur, G., Mantalos, P. (2004), Size and power of the RESET test as applied to systems of equations: A bootstrap approach. Journal of Modern Applied Statistical Methods, 3(2), 370-385.

Silvapulle, P., Smyth, R., Zhang, X., Fenech, J.P. (2017), Nonparametric panel data model for crude oil and stock market prices in net oil importing countries. Energy Economics, 67, 255-267.

Silvennoinen, A., Thorp, S. (2013), Financialization, crisis and commodity correlation dynamics. Journal of International Financial Markets, Institutions and Money, 24, 42-65.

Su, C.W., Wang, X.Q., Tao, R., Oana-Ramona, L. (2019), Do oil prices drive agricultural commodity prices? Further evidence in a global bio-energy context. Energy, 172, 691-701.

Su, Y., Cherian, J., Sial, M.S., Badulescu, A., Thu, P.A., Badulescu, D., Samad, S. (2021), Does tourism affect economic growth of China? A panel Granger causality approach. Sustainability, 13(3), 1349.

Sun, X., Chenggang, Y., Khan, A., Hussain, J., Bano, S. (2021), The role of tourism, and natural resources in the energy-pollution-growth nexus: An analysis of belt and road initiative countries. Journal of Environmental Planning and Management, 64(6), 999-1020.

Tang, K., Xiong, W. (2012), Index investment and financialization of commodities. Financial Analyst Journal, 68, 54-74.

Toda, H.Y., Yamamoto, T. (1995), Statistical inference in vector autoregressions with possibly integrated processes. Journal of Econometrics, 66(1-2), 225-250.

Togonidze, S., Kočenda, E. (2022), Macroeconomic responses of emerging market economies to oil price shocks: An analysis by region and resource profile. Economic Systems, 46(3), 100988.

Wang, L., Chang, H.L., Sari, A., Sowah, J.K., Cai, X.Y. (2020a), Resources or development first: An interesting question for a developing country. Resources Policy, 68, 101714.