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Examining the Impact of Oil Prices on the Gulf Stock Exchange: A System GMM Approach

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Abstract- Oil is a critical macroeconomic component of the global economy. This is hardly surprising, given that the global crude oil market is the largest commodity. Oil price swings may reflect or even foretell changes in the political and economic stability of oil-exporting and oil-importing countries. This study examined the impact of oil prices on Gulf country stock markets using data from 2010 to 2020. The study applied the System Generalized Method of Moment estimation approach. The results indicate that stock markets are sensitive to oil prices and that their impact is positive. Similarly, economic activities and interest rates show a positive impact on stock prices. However, the stock market price index is insensitive to inflation. Furthermore, the stock market index depends on its own lag. This study recommends that Gulf Cooperation Council countries diversify their economies for financial stability, rather than relying solely on natural resources.

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I. Introduction

Oil is an essential resource in the global economy. Therefore, fluctuating oil prices significantly affect the economy. Oil is a crucial macroeconomic component that causes unstable economic conditions and affects the stability of the global financial system based on its high volatility. The volatility of oil prices impacts both countries that export oil and those that import it. As stated by Wong and Massah (2018), the Gulf Cooperation Council (GCC) involves some of the world's biggest oil-exporting nations, controls the world's largest known oil reserves.

Economic stability depends on oil prices and numerous studies have noted changes in oil prices as crucial sources of economic volatility (theoretically and empirically) and as a model of global shocks that are likely to affect many economies simultaneously (Amin, 2015; Blanchard and Gali, 2008). The typical supply-side effect, where higher oil prices increase production costs and reduce the availability of primary productive inputs, can be used to explain the relationship between oil prices and economic activity. High oil prices slow down the pace of activity development and reduce productivity. Also, rising oil prices may impact the economy through demand-side channels by reducing household purchasing power and delaying consumption expenditures.

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Oil is one of the most significant macroeconomic factors affecting the global economy. Unsurprisingly, the global market for crude oil is the largest market for commodities. The fact that variations in oil prices may reflect or even predict changes in international stability make them even more intriguing than their direct impact on economic activity (Leigh, Wolfers, and Zitzewitz, 2003). This means that variations in oil prices may affect consumption and production differently and serve as an economic proxy for shifting risk aversion. It is widely known that an increase in oil demand without an equivalent increase in supply would drive up oil prices. The effect of higher oil prices on consumers and producers is similar to that of an inflation tax; as higher prices reduce the amount of disposable income that consumers have left over to spend on other goods and services and increase the costs of non-oil-producing companies, but in the absence of fully passing these costs to consumers, profits and dividends would be reduced, which are crucial factors in stock price movement. Additionally, the Organization of the Petroleum Exporting Countries (OPEC), institutional agreements, and the dynamism of the futures market all have an impact on oil prices (Sadorsky, 2009). The unexpected changes in any of these variables may increase oil price volatility and the corresponding risk. The oil price volatility raises uncertainty, which can also have a negative impact on investment.

The performance of any nation's economy is reflected in the global stock market. For example, a decline in stock prices may result in widespread economic disruption on a worldwide scale by lowering household income and making investors more frugal with their spending as a result of their financial losses in the stock market. Furthermore, when facing decreasing stock prices, investors find it challenging to increase investment by issuing new shares (Fornell et al., 2006).

The expansion of an economy is reflected in stock price fluctuations. A country's economic activity grows when stock prices rise. Conversely, when stock prices fall, a country's economic activity declines. This demonstrates that macroeconomic factors significantly impact both stock price rise and drop. Accordingly, a firm's future market activity can be predicted based on market prices (Ilahi, Ali and Jamil, 2015). Macroeconomic factors are significant because they impact stock market performance, hence investors

consider these macroeconomic factors when valuing stocks. The primary indicator that is used to assess a nation's economic condition over time or in comparison to other nations is real GDP per capita (Bergh, 2009).In previous studies, exchange rates, inflation rates, and interest rates have been employed as indicators of macroeconomic factors; which have a strong impact on the stock market; to evaluate stock market returns (Novriyani, 2021).

Recent increase in oil prices have reignited interest in the relationships between oil prices, financial markets, and the economy (e.g., Herrera and Pesavento, 2009). It is commonly agreed that rapid fluctuations in oil prices affect both macroeconomic policies and economic activity. The link between oil price factors, economic indicators, and stock market returns in net oil-exporting countries has received little attention in the empirical literature (Elsayed, Naifar, and Nasreen, 2021). Studies on the stock market and how it affects macroeconomic variables (interest rates and inflation) have been conducted for many years, as well as the macroeconomic events are generally thought to exert a certain amount of pressure on stock markets (Büyüksalvarci and Abdioglu, 2010).

In fact, analyzing the connection between macroeconomic factors (inflation, interest rate, and GDP) and stock returns is extremely important for an economy. As policy makers should decide which variables to manage and control to foster an environment that supports successful investments. Therefore, an in-depth analysis of the relationships between stock returns and macroeconomic factors is necessary. It is essential to identify the long-term relationships and causal links between markets and key macroeconomic factors to ascertain their actual status, to provide potential investors with a consistent regulatory framework when markets are volatile, and to assist information flows from one market to another across the globe in an unprecedented manner.

This study examined the impact of inflation, interest rate, GDP, and oil prices on the stock exchange indices of GCC countries. The main contribution of this study is the clarification of our understanding regarding the relationships between energy and economic activities. We attempt to highlight regime-dependent correlations between oil price volatility and GCC stock market performance. The remainder of this paper is organized as follows. Our research methodology is presented in Section 2. Section 3 discusses the data and variables considered in this study. Section 4 presents and discusses the results of our analysis. Finally, Section 5 concludes this paper.

II. Research Methodology

Panel data techniques were used to examine the impact of oil prices on stock exchange indices in GCC countries. Panel data are cross-sectional data that are stacked chronologically and include both temporal and country-specific information. In recent years, panel data has become a significant component of econometrics. Its benefits include the following. First, panel data can reflect data information at the time level and can effectively reflect the time relevance of sample data, unlike cross-sectional data that only contains spatial dimensions. Second, panel data can simulate time series data more effectively than time series models. Third, panel data represent both time and location. These data do not simply contain sums, but instead reflect the intersections of different items to reflect individual variations in the dynamic evolution of the data, which reduces estimate bias by eliminating individual differences. Cross-sectional and time series data features are included to increase the sample size and strengthen estimation. Therefore, we constructed a model using panel data for our analysis (Cao et al., 2020). The general dynamic panel model is defined as follows:

$$SP_{it} = \alpha_i + \beta_1 SP_{i.t-1} + \beta_2 Oil_{it} + \beta_3 Inf_{it} + \beta_4 Int_{it} + \beta_5 GDP_{it} + \varepsilon_{it} \quad (1)$$

where *SP* is the stock price index, which acts as the dependent variable, *Oil* is the crude oil price, *Inf* is the inflation rate, Int is the interest rate, *GDP* represents government activities, *αi is* an unobservable random variable representing individual heterogeneity, and *εit* is a random disturbance term.

The preceding period's dependent variable (*SPi.t − 1)* is introduced into the equation as an independent variable based on the dynamic panel data, which increases the model's realism by incorporating aspects that were not considered in the original model. However, the random disturbance term and explanatory variable can be connected. A dynamic panel data model can obtain accurate and unbiased parameter estimates to address the above-mentioned issues and prevent distortions caused by biased parameters. Heteroscedasticity, autocorrelation, and individual effects are prevalent in dynamic panel data models. In general, two techniques are used to assess these features. One way to increase accuracy is to adjust the estimator derived from the general static model by reducing its estimation error. The generalized moment estimation (GMM) approach directly estimates a model. Many academics have been interested in GMM because it can provide many consistent estimates simultaneously. As a result, the system GMM model estimation approach was selected for this study. Blundell and Bond (1995), and Arellano and Boverover (1995) also adopted this estimation technique. To increase the effectiveness of parameter estimation, it

combines the differential GMM and horizontal GMM estimation approaches. We established the general form of the system GMM shown below for deriving explanations quickly. All variables were converted using a logarithmic scale (Barro and McCleary, 2003) to eliminate any potential heteroscedasticity (i.e., uneven distribution of the variance) and translate the regression coefficients into elasticity measurements.

$$lSP_{it} = \alpha_i + \beta_1 lSP_{i.t-1} + \beta_2 lOil_{it} + \beta_3 Inf_{it} + \beta_4 lint_{it} + \beta_5 lGDP_{it} + \varepsilon_{it} \quad (2)$$

III. Data and Variable Descriptions

a) Stock Market Index

The stock exchange market is a critical economic entity that heavily influences and predicts the success of an economy. The government, investors, and all stakeholders are concerned about the characteristics and conditions of a stock market. It is widely acknowledged that in rising economies such as those of Gulf countries, under a general equilibrium, the stock market must play a significant role in the efficient collection and distribution of capital. It must fulfill at least two fundamental requirements: assisting industrialization through the mobilization of savings, collection of investment funds, and maturity transition, and fostering an environment that facilitates the effective and safe performance of the duties as mentioned earlier. The existing relationships between stock prices and macroeconomic factors such as GDP, oil prices, industrial production, and consumption are jointly significant. The relationship between macroeconomic factors is unilateral or in one direction i.e., from inflation to stock price and from stock price to the interest rate (Wasseja, 2015). The values of particular shares are used to calculate a stock market index that serves as a gauge of the size of a specific stock market sector. This technique is used by investors to describe the market and contrast returns on different investments. We considered the average stock exchange price index as a dependent variable, and data on the average stock exchange of all GCC countries from 2010 to 2020 were obtained from Investing.com.

b) Crude Oil Prices

It is intriguing to examine how oil prices affect GCC stock markets. First, because they are significant oil suppliers in the global energy market, fluctuations in oil prices are likely to impact the stock markets of GCC countries. Second, markets in the GCC are separated from those in industrialized and other growing nations, so they are excessively susceptible to regional political developments. A closer examination of the effects of implied oil volatility on the GCC stock markets is warranted for several reasons. From the perspective of investors or portfolio managers, selecting appropriate investment strategies, such as asset allocation and diversification, heavily depends on how stock markets respond to fluctuations in oil prices. From the perspective of economists and decision-makers, a precise assessment of the relationship between the volatility of oil prices and stock market returns can form the foundation for effective policy creation, planning, and implementation (Alqahtani, Klein, and Khalid, 2019). We considered the average annual oil prices as an independent variable, and the oil price data were obtained from Bloomberg.

c) Inflation

Inflation is defined as an ongoing increase in the cost of goods and services over a certain period. Every nation aims for sustainable economic growth since it is considered as a major indicator of future economic conditions (Feldkircher and Siklos, 2019; Oikawa and Ueda, 2015). Any uncertainty introduced by changes in inflation rates is a sign that policy decisions are unreasonable, which becomes challenging to conduct and monitor monetary policy analysis over time (Szafranek, 2019). Therefore, precise inflation rate forecasts are essential to monetary policy. Though inflation reduces purchasing power, it is important in the economic world, particularly for stock exchange (Gidigbi, Babarinde, and Lawan, 2018). We considered inflation as an independent variable, and the data were obtained from the international financial statistics (https://data.imf.org).

d) Gross Domestic Product

The monetary market worth of all finished goods and services generated in a nation over a year, excluding net foreign income, is known as the GDP. The primary indicator used to assess a nation's economic condition over time or in comparison to other nations is often real GDP per capita (Bergh, 2009). In this study, GDP was considered as a proxy for economic activities, and GDP data were obtained from the World Bank (https://databank.worldbank.org).

e) Interest Rate

The cost of borrowing is represented by the interest rate, which is also used to reduce the future cash flows of financial assets. Stock prices fall due to an increase in interest rates because the required rate of return on investments increases. The decisions of monetary authorities heavily impact stock prices, and changes in interest rates provide investors with either positive or negative news (Lobo, 2000). A sudden increase in inflation has a detrimental effect on stock market performance. Investors view rising inflation as a lousy sign because it indicates poor national economic conditions. As a result, investors became cautious

about investing in stock markets. If the inflation rate falls, it indicates that the economy is performing well and attracts investors to the stock market (Okechukwu et al., 2019). We considered the interest rate as an independent variable, and data on interest rates were obtained from the International Financial Statistics ((https://data.imf.org).

IV. Results and Discussion

Initially, the study calculated the descriptive statistics as presented in Table 1. The results reveal that stock prices of Oman, Saudi Arabia, and Qatar have large standard deviations, which indicate high stock price volatility in the market. Thus, investments in these markets are risky based on fluctuations in stock prices. The results in Table 1 show that the UAE stock price has the lowest standard deviation, indicating that stock prices are less volatile market and that investment in this market is less risky than the other financial markets. The standard deviation of oil prices is the same for all Gulf countries because all of these countries are oil-exporting countries with huge oil resources. Saudi Arabia and Kuwait have high volatility in inflation rates compared to other countries. Increased volatility in the inflation rate indicates an uneven increase in prices. Unevenly growing prices in an inflationary environment inevitably lower the purchasing power of some consumers. This depreciation of real income is the single most significant cost of inflation. Over time, inflation can also affect the purchasing power of both suppliers and consumers, who pay and receive fixed interest rates. Oman has a high-interest rate standard deviation. The fluctuation in interest rates on loans and savings over time is referred to as interest rate volatility. Fluctuating interest rates influence businesses since they affect borrowing costs and investment account earnings.

As shown in Table 1, the GDP standard deviation indicates growth rate volatility. GDP volatility is relatively low for all countries because they are economically stable. A volatile economy is likely to grow relatively slowly (Bartak, Jałbo ński, and Jastrzębska, 2021).

Table 1: Descriptive Statistics

	Mean	Minimum	Maximum	S.D.
UAE				
Stock Price	352.92	210.86	512.54	79.11
Oil Price	69.47	39.68	97.98	22.92
Inflation	1.14	−2.08	4.07	4.07
Interest rate	2.95	2.63	3.23	0.21
GDP (Million)	373397.60	289787.33	422215.04	37196.92
Bahrain				
Stock Price	1312.36	1110.03	1471.78	123.92
Oil Price	69.47	39.68	97.98	22.92
Inflation	1.55	−2.32	3.30	3.30
Interest rate	2.47	2.08	2.72	0.23
GDP (Million)	32828.09	25713.27	38652.57	3801.80
Oman				
Stock Price	5549.57	3667.35	6980.07	1056.34
Oil Price	69.47	39.68	97.98	22.92
Inflation	1.38	−0.90	4.04	4.04
Interest rate	2.99	2.30	3.69	0.46
GDP (Million)	81888.12	64993.50	92699.09	8757.60
Saudi Arabia				
Stock Price	7531.18	6326.89	9615.36	1042.95
Oil Price	69.47	39.68	97.98	22.92
Inflation	2.37	−2.09	5.83	5.83
Interest rate	2.87	2.59	3.26	0.19
GDP (Million)	700528.79	528207.33	792966.84	76396.88
Qatar				
Stock Price	9720.03	7381.48	12645.48	1470.96
Oil Price	69.47	39.68	97.98	22.92
Inflation	0.87	−2.54	3.35	3.35
Interest rate	2.71	2.17	3.30	0.36
GDP (Million)	169397.47	125122.31	206224.60	24062.81
Kuwait				
Stock Price	6317.68	5369.99	7442.66	672.84
Oil Price	69.47	39.68	97.98	22.92
Inflation	2.78	0.54	4.84	4.84
Interest rate	2.71	2.37	3.06	0.27
GDP (Million)	136853.12	105960.23	174161.14	25814.33

Table 2: Impact of Oil Prices on Stock Exchange Indexes

	Coefficient	T-Stats	Prob
C	45.39998	3.684613	0.0006
Log (Stock Prices.L1)	0.379957	2.243677	0.0294
Log (GDP)	0.565660	3.299402	0.0018
Log (Interest rate)	0.929667	1.771869	0.0826
Inflation	−0.000162	−0.011080	0.9912
Log (Oil Prices)	0.721926	1.721147	0.0915
R-squared	0.979519		
Adjusted R-squared	0.975340		
Prob (J-statistic)	0.235663		

Table 2 presents the results of our empirical model. The GDP, interest rate, oil price, and stock price lag are positively associated with the stock exchange index and are statistically significant at the 10% level. Inflation has no significant impact on the GCC stock exchange index at the 10% significance level (Mgammal, 2012). The GCC stock exchange index is positively associated with oil prices (Arouri and Rault, 2012).Since GCC nations produce and export a significant amount of oil; oil price shocks may impact their stock markets. The results of this study should be of interest to researchers, policymakers, and market participants. As OPEC policymakers, the majority of GCC nations should monitor how changes in the price of oil affect their economies and stock markets. A strong correlation between oil prices and stock markets can aid investors in developing effective long-term portfolio investment strategies. GDP has a significant impact on the stock exchange indices of GCC countries. Therefore, diversifying economies by raising the non-oil sector's share of GDP should be a top priority for policymakers in GCC nations. Regarding to Fayyad and Daly (2011), diversification is essential as oil shocks significantly influence the GDP and stock market returns of GCC countries.

The R-squared value in Table 2 is 97.9%, indicating that our model is highly suitable and appropriate. A variant of R-squared that has been changed to account for the number of predictors in the model is known as the adjusted R-squared. The adjusted R-squared value is a more accurate measure than R-squared. When an additional term enhances the model, more compared to prediction by chance, the adjusted R-squared increases. When a predictor improves the model less than anticipated, it decreases. Up to a point, the adjusted R-squared value increases, after which it falls. Additionally, R-squared rises sharply with every independent variable added. A value of 97% indicates that the variation in the stock exchange index is 97%, as explained by the independent variables.

The performance of a dichotomous diagnostic test was captured using Youden's J-statistic, which is a single statistic. Its extension to the multiclass case, called informedness, calculates the likelihood that a decision will be made based on sufficient information. The value of the J-statistic is 23%, indicating that the corresponding instruments are valid.

V. Conclusion

This study examined the impact of oil prices on Gulf countries' stock markets by using data from 2010 to 2020 and adopting the system GMM approach. The results indicate that the target stock markets are sensitive to oil prices and that high prices have a positive impact. Moreover, this study reveals that log stock prices, log GDP, log interest rate, and log oil prices are positively associated with the stock exchange index, whereas inflation is negatively associated with the stock exchange index.

It is intriguing to examine how oil prices affect the stock markets in these countries for several reasons. First, GCC countries are significant oil suppliers in the global energy market, hence, fluctuations in oil prices are likely to impact their stock markets. Second, the markets in the GCC countries are divided from those in industrialized and other growing nations and are excessively susceptible to regional political developments. Finally, GCC markets offer significant potential for diversifying international portfolios. It may be helpful for regulators that oversee stock markets to research how oil price shocks affect the GCC stock market returns to assist investors in making important investment decisions. These factors encouraged this study to consider that the GCC countries are of enormous importance.

Based on our findings, it is recommended that GCC countries diversify their economies to reach financial stability rather than relying solely on natural resources.

Since the scope of this study is limited to GCC countries, and the period of data is from 2010 to 2020. Future researchers can implement this study to other countries and expand the data period.

Future researchers could focus on several directions. First, the study can be implemented to other countries and expand the data period. Second, it is reasonable to assume that the long-term relationships between oil prices and stock markets in GCC nations

differ depending on the type of economy. Third, it would be helpful to conduct a sector analysis of these long-term relationships, and to examine the asymmetric responses of sector indices to changes in oil prices. Finally, as we demonstrated that oil prices and stock returns in GCC nations have a co-integrating relationship, which implies a causal relationship between the two variables, it would be interesting to analyze the short- and long-term causal relationships between oil prices and stock markets in GCC nations, as well as the speed of adjustment toward long-term equilibrium.

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