International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2021, 11(2), 56-66.

Macroeconomic Determinants of Stock Market Returns in the Gulf Cooperation Council

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Received: 11 January 2021 **Accepted:** 01 March 2021 **DOI:** https://doi.org/10.32479/ijefi.11189

ABSTRACT

This study investigates the impact of certain macroeconomic determinants on stock market returns in the Gulf Cooperation Council (GCC). Those macroeconomic factors are: interest rates, oil prices, exchange rates, and money supply. Those factors were empirically studied and investigated to have an impact on stock market returns in many countries. This paper also attempts to capture that impact of those macroeconomic factors on the stock market, using a panel set of data by implying several tests on the data, which include unit root tests, cointegration test, and error correction model (ECM). The empirical results support previous studies that suggest the high reliance of governments and stock markets in the GCC on macroeconomic determinants, specifically oil prices, while other determinants were found to have less effect on stock market returns than oil prices. The findings of the study will presumably enable investors and stakeholders in making better investment decisions, in addition to assisting policy-makers in enhancing the efficiency of stock markets and better regulating them.

Keywords: Stock Market, Oil Prices, Interest Rates, Exchange Rates, Money Supply (M2)
JEL Classifications: Q41, E02, G1, N95

1. INTRODUCTION

This study investigates the impact of four macroeconomic determinants on stock market returns in the Gulf Cooperation Council (GCC). Specifically, interest rates, exchange rates, money supply (M2), and oil prices. Aiming to augment the limited body of existing research on the correlation between the stock price and the oil market, the results of this study can be used to aid in the success of economic diversification programs in GCC countries such as Saudi Arabia and the United Arab Emirates (Ross, 2017). Unlike the bulk of published research on the subject, which tends to analyze the topic from a global perspective, this study specifically targets the stock market in the GCC and how it is affected by the oil prices across the region.

Many researchers have analyzed the impact of oil on the stock market, especially in the GCC. This is a result from the fact that a majority of the six countries relies heavily on oil, which is the most significant contributor to their GDPs and government revenues (Ready, 2018). A 2013 research study conducted by Antonakakis and Filis found that the stock markets in both oil producing and importing countries were affected by fluctuations in oil prices. That being said, another paper (Miller and Ratti, 2009) on the relationship between crude oil prices and global stock market performances during the period between 1971 and 2008 found that the correlation between oil prices and the stock market varies with time, and it is not consistent.

The GCC Countries trade bloc is a leading oil producer in the world. The block consists of six countries, which include the Kingdom of Saudi Arabia, Qatar, Bahrain, Oman, the United Arab Emirates, and Kuwait. According to Organization of the Petroleum Exporting Countries (2019) statistics, the region produces close to one-fourth of the world's total oil production. In 2016, the region was producing 18.4 million barrels per day, with KSA leading with 7.2 million barrels per day. However, the high productivity in regards to oil means that the six countries rely heavily on the product. The oil sector is connected to other industries in the country, either directly or indirectly (Amadeo, 2021). The same case applies to the stock market, where a drop in the oil prices is likely to trigger a drop in the stock returns and vice versa. In addition to oil prices, literature shows that other macroeconomic factors such as interest rates, exchange rates, and money supply (M2) may also have an impact on stock market returns.

However, this paper will first review of the existing literature, where various published studies will be analyzed. It will then employ panel data—which uses the Error Correction Model (ECM) as a benchmark–collected monthly over the period between 1995 and 2018. Ultimately, the findings of the study indicate that oil prices and other macroeconomic determinants have a significant impact on stock prices. This paper contributes in the existing literature in the GCC region by providing an understanding of stock markets from a macroeconomic perspective, which is shown to support previous studies on the same subject in the GCC, such as of Alenezi et al., (2020).

2. LITERATURE REVIEW

This section discusses literature associated with each of the four determinants to be examined in this paper–oil prices, money supply, interest rates, and exchange rates–and their respective impacts on stock market returns as discussed in the literature. The macroeconomic determinants of stock market returns are not limited to the four determinants to be discussed in this paper, but due to the lack of data and the monthly frequency of observations, some variables were dropped such as CPI and technological advancement. However, determinants in this chapter will be discussed separately, because most previous studies focused mainly on only one or two determinants, except few studies such as of Sahin (2014).

An early study conducted by King (1966) finds that 50% of stock returns are explained by macroeconomic factors. In his factor analysis approach, he studies stock behaviors and market and industry factors associated with their returns. He finds that approximately 50 and 10% of stock returns are explained by market and industry factors respectively, which are indirectly related to macroeconomic factors. Those macroeconomic factors include the determinants that will be reviewed.

2.1. Oil Prices

Over the years, many studies and researches have explored the impact of oil prices on market returns. While some researchers have found a negative correlation between growth in oil prices and stock market returns in some countries, others have found that increasing oil prices impact markets positively. One of the factors to consider when attempting to measure the effect of oil price fluctuations on markets is the role that oil plays in both sectors of the economy: private and public. For instance, in Kuwait, oil contributes to almost half of the GDP, while it contributes to almost 90% of its government income (Central Intelligence Agency, 2021). Such contribution to a nation's economy and income would eventually lead to a certain degree of economic and financial reliance on oil.

Antonkakis and Filis (2013) examine the impact of changing oil prices on stock market. The research considered indices of five stock markets - in the US, UK, Germany, Canada, and Norway - from 1988 to 2011. The main finding of the study was that the correlation between stock market returns and oil prices varies over time in both oil exporting (Canada and Norway) and oil-importing (US, UK, Germany) countries. The research concludes that price shocks in aggregate demand of oil have had a negative effect on stock market returns in oil-importing countries, while no such correlation has been found in oil-exporting countries that were examined in the study.

Miller and Ratti (2009) investigated the relationship between crude oil prices and global stock market performances over the period 1971-2008. This study also found that oil-stock market correlation varies over time and is not consistent. Negative correlation between oil price and stock market returns was found broadly, stronger and clearer in Organization for Economic Co-operation and development (OECD) countries, yet the model does not explain why stronger correlation was found particularly in OECD countries.

A paper examining the impact of oil price shocks on the US stock market finds that non-U.S. oil production is statistically irrelevant to fluctuations in stock markets, while U.S. oil production has a huge influence on the market (Kang et al., 2016). Technological advancement and innovation have lead to lower oil production costs, allowing aggregate oil supply to increase and lowering oil prices. Another study that analyzes U.S. stock market return against shocks in global crude oil price partially contradicts the previous study. It finds that U.S. stock market response depends on the cause of crude oil price shocks (Ahmadi et al., 2016). A positive global demand shock results in price appreciation in stock market for 10 months and a steep decline in the following period. However, oil price fluctuation was found to have different impact on various industries, and metal and oil industries were less affected by demand shocks than other industries. As mentioned at the beginning of this chapter, such findings cannot be included in this paper due to the lack of data in the region. This finding supports Kilian and Park's (2009) claim that only 22% of the variation in the U.S. stock market returns are explained by price shock in international oil market in the period between 1975 and 2006, where monthly set of data was used to analyze the oil-stock relationship. More recent research takes a similar approach to that of Kilian and Park's study, using daily frequency to estimate the correlation between oil prices and stock market returns (Conrad et al., 2014). The results of the 2014 study also confirms the conclusions reached by Kilian and Park (2009) – specifically, that using simple regression to estimate correlation between stock market returns and oil price changes could be misleading, as other macroeconomic factors must also be taken into account.

China is one of the world's largest oil consuming countries, ranked 3rd after the United States and the European Union (EU) (BP Statistical Review, 2018). According to Bénassy-Quéré *et al*. (2007), "China's incremental oil demand accounted for one-fourth of world demand over 1995-2004, and one-third in 2004." China's high demand for oil is explained, amongst many other factors, by its average GDP growth of 9.4% over the same period (The World Bank, 2019). It is important to understand how stock markets behave in oil importing countries, such as China, in contrast to oil exporting countries, to draw better understanding of the relevance of oil prices in determining stock market returns, in addition to understanding the direction of the impact of oil prices on stock market returns, if it exists. Lin et al., (2010) claim that they are among the first researchers to analyze the oil-stock relationship in Greater China, which includes Hong Kong, Macau, and Taiwan. They provide an empirical analysis of Greater China's stock markets against shocks in oil prices from 1997 to 2008. The research's main focus is to distinguish oil price shocks from other macroeconomic shocks in order to estimate the portion of stock price changes that are due to oil price shocks. In Taiwan, stock market reaction was completely similar to that of the U.S., due to its closeness with world economy and capital mobility constraint. Hong Kong's stock market was found to respond positively during all three oil price shocks examined in the study. Capital mobility is almost perfect in Hong Kong, which encourages the belief that capital will continue to flow during oil price increase periods, but it is totally a different case in China. It was found that only global supply shock has an impact on stock market returns in China, and no significant global demand shocks have no impact on stock returns.

Sahin (2014) studies the impact of oil prices on Turkish stock returns between 1987 and 2014 among other factors that influence stock returns, such as interest rates, exchange rates, income growth, and money supply. Turkey is a net importer, and oil price increases were found to have a negative impact on stock market return, as they increased the cost of production. Other factors were also found to have an impact on stock returns, most noticeably regarding exchange rates, as they affect the cost of importing goods, increasing the cost of production.

The majority of literature suggests that oil price influence on stock market return varies under different circumstances. A lot of factors play a role in determining the market reaction to oil price movements over time. Findings from some studies contradict with others due to many factors such as trade regulations and the balance of oil net exports/imports.

2.2. Money Supply (M2)

Celebi and Honig (2019) study the impact of macroeconomic variables on the German Stock Market over the period between 1991 and 2018. Their study includes all three measures of money supply: M1, M2, and M3, all of which have significant impact on stock market returns. M2 and M3 showed negative impact on stock returns in a crisis period, while M1 showed positive impact during the same period. M1 has also shown some significant impact in post-crisis periods, but the direction of the impact could not be determined. However, the study provides empirical evidence of the significant impact of money supply on German Stock Market returns, regardless of the direction of the impact.

Širůček (2012) attempts to find a relationship between money supply (M2) and stock returns in the United States, using the Dow Jones Industrial Average (DJIA) as a benchmark. The study uses monthly data from 1967 to 2011, totaling 530 observations, and it confirms the hypothesis that money supply has an influence on stock returns, although higher correlations occur when a period of 6 months delay for effect is applied. Sirucek expands the study to investigate the relationship between money supply and stock market bubbles, such as subprime and dot-com bubbles. He finds an empirical evidence of a positive correlation between money supply and stock returns, as their growth rates were comparable in all three market bubbles examined in the study.

Pícha (2017) studies the impact of money supply on U.S. stock market indices over the period between 1952 and 2015, which is relatively a long period of time. The study uses three variables as proxies of money supply: deposits and currency, value of equities in the U.S. households' portfolios, and value of treasuries in the U.S. households' portfolios. The benchmark index was the S&P 500 index because it widely reflects the status of the U.S. stock markets, as the index includes companies of different sizes and from different industries. The main finding of the study was that all long-run historical increases in any of the three independent variables are followed by an increase in S&P 500. For short-run measures, deposits and currency variable shows the highest speed of adjustment, with a lag period of only 6 months.

2.3. Interest Rates

Fang and Bessler (2017) use a prequential approach to study whether interest rates can help in forecasting stock returns in China. The study uses a log of daily stock returns from the Shanghai Stock Exchange Composite Index and three-month interest rates over the period from 2013 to 2015. The study shows that interest rates help in forecasting stock returns in China, which also confirm the findings of Fang et al., (2016) that interest rates have a significant effect on stock returns.

Alam and Uddin (2009) investigate the impact of interest rates on stock market returns for fifteen developed and developing countries. Using monthly data for the period January 1988 to March 2003, the study also attempts to determine whether any of these countries violates the very basic assumption of Efficient Market Hypothesis, centered on the randomness of stock returns. The study finds that all fifteen markets violate this assumption, but also does not reject the empirical evidence collected from most studies in the literature suggesting that interest rates have a negative impact on stock returns and vice versa. However, except for one country, the Philippines, of fifteen countries total, all countries show at least one form of significant negative relationship between interest rates and stock returns.

Gan et al., (2006) examine the impact of seven macroeconomic factors on stock returns in New Zeeland over the period between 1990 and 2003. Those seven macroeconomic variables include long-term interest rates and short-term interest rates, amongst others. The study shows that both interest rate measures have shown more significant and consistent impact on stock market returns over the examination period than other variables such as exchange rate and inflation rate index (CPI).

Naïmy (2007) study the impact of oil prices, gold prices, and US interest rates on four GCC stock markets over the year 2005: Kuwait, Saudi Arabia, Oman, and United Arab Emirates. The findings of the study provide many interesting remarks. First, stock markets of Kuwait and KSA were found to have perfect positive correlation, which is partially explained by the similarity of nature in these two countries in economic and financial structure. According to the paper, interests rates have positive relationship with stock prices, while oil price impact was not found to have a significant impact on stock market returns, which contradicts the findings of this study. This contradiction can be explained by the difference in the sample periods, frequency of the data, and the examination period. Also, Naïmy (2007) uses U.S. interests rate rather local interests rates used in this paper, which may have an impact on the outcome of the model.

2.4. Exchange Rates

The relationship between exchange rates and stock market returns remains one of the most disputed topics in the literature. Results and findings vary in this regard depending on the model utilized, the industries examined, and the regions used in the studies. Aydemir and Demirhan (2009) investigate the relationship between exchange rates and stock market returns of selected indices in Turkey, over the period from 23 February 2001 to 11 January 2008. They find a casual bi-directional relationship between exchange rates and stock market returns. While financial and industrial sectors have negative correlation with interest rates, the study finds positive correlation between technology indices and exchange rates.

Using daily closing prices of indices, Nieh and Lee (2001) search for a relationship between foreign exchange rates and stock prices in G-7 countries over the period between October 1, 1993 and February 15, 1996. The study finds no long-term correlation between these two variables. Although the study finds minimal evidence for a short-term correlation in a few G-7 countries, no such evidence was found the United States, which might be due to the dissimilarity of economies and regulations in each country examined.

Suriani et al., (2015) study the impact of exchange rates on the stock market of Pakistan, over the period 2004-2009. Findings of the study suggest no evidence or interaction between exchange rates and stock prices, and the authors claim that it is due to the lack of accountability and efficiency in the Pakistani stock market, and also because of some unethical practices by brokers that dominates the market in Pakistan.

3. DATA AND METHODOLOGY

3.1. Data

Data used in this research consists of collecting historical annual interest rates and money supply (M2) from each local central bank in the GCC, while data for stock market indices and crude oil prices were obtained by Boursa Kuwait, Saudi Stock Exchange, Bourse Bahrain, Qatar Stock Exchange, Abu Dhabi Securities Exchange, Dubai Financial Market, and Muscat Securities exchange as they were provided to subscribers to *Bloomberg*'s Database. For values that are provided in local currencies, average exchange rate was used for conversion, which is also provided by the central bank of each country. The data set ranges from January 1995 to December 2018, with a total of 1728 periods. Due to the lack of data in some countries, the number of observations decreased to a total of 947.

All market sectors will be taken into consideration as they are represented in the given index of member countries in the GCC. The research accounts for other factors that are shown in the literature to have an impact on stock returns, such as interest rate changes, money supply, exchange rates, and oil prices. Variables included in the model are equity market index, equity market return, money supply, M2 growth, interest rate, average oil price, oil price returns, and exchange rate of given currency versus US dollar. Variable descriptions are provided in Table 4.1 and main descriptive statistics are provided in Appendix A.

3.1.1. Descriptive analysis

The variable descriptions are given in Table 4.1. As shown during the examined period, the average equity market return is about 1.4%, with the minimum average of 0.2% for Bahrain, and maximum average of 6.9% for UAE. The average money growth rate is about 0.9%, with the minimum average of 0.6% for Kuwait, and maximum average of 1.2% for Qatar. The highest average interest rate was observed in Qatar at 4.8%, while the lowest was in the UAE at 1.3%. Oil price returns followed the same path in all the examined countries, with an average rate of 0.8%, which varied in the given period within the range of −27.1-22.5%. On average, the exchange rate in the given countries is about 2.019 units per 1 US dollar.

The most widespread equity market index over time was observed in Kuwait, the smallest one in Bahrain. In the distribution of equity market returns for UAE there is one big outlier, which was observed because of a big jump in equity market index from 345.62 to 4127.33 in November 2006. In general, the average equity market index started to increase sharply after 2005-2006. The most widespread M2 over time was observed in Saudi Arabia and the smallest was observed in Oman, again, the average value of which started to increase significantly after 2005-2006. Interest rates among the countries over the examined periods mainly have similar dispersion, oil prices, as was mentioned earlier have similar paths, which started to increase after 2005-2006. Finally, exchange rates were mainly fixed over time in all the countries.

3.2. Methodology

Considering the panel data nature of the examined sample on the determinants of stock market returns in the GCC countries, with long monthly time series starting from January 1995 to December 2018, and check the stationarity of the examined variables with a Fisher-type (Choi, 2001) panel data unit root test, and for the existence of a long-term relationship among the variables through three different tests, a Kao test (1999), Pedroni test (1999; 2004), and Westerlund test (2005), after which employing ECM. The outcome of the first two tests determines the robustness and validity of the ECM model results.

Table 4.1: Variables description

Variable	Description
Eq	Equity market index
RetEq	Equity market returns
M2	Money supply
gM2	M2 growth
Int	Interest rate
Oil	Average oil price
RetOil	Oil price returns
Ex	Exchange rate of giving currency versus US dollar

3.2.1. Unit root tests

The mean reverting nature of the examined sample is tested through the Fisher-type panel data unit root test, which performs a unit-root test on each cross-sectional unit of the panel data, after which the p-values are combined to check the stationarity of the panel series. Consistency of each individual test is obtained by assuming large time series (T→∞). The test implements either Augmented Dickey and Fuller (1979) or Phillips and Perron (1988) unit-root tests on each panel.

Both tests are implemented under the null hypothesis that all panels contain a unit root, and the alternative hypothesis is that at least one panel is stationary. ADF estimates a linear model with least squares estimator where the first difference of the series at time t is regressed on the level at time t-1, augmented with lag terms of the dependent variable (Eq. 1). Then the stationarity is checked based on the significance of the level term. PP test statistics are a generalization of the Dickey-Fuller test, without augmenting by lag terms, using the Newey and West (1987) heteroskedasticity and autocorrelation robust standard errors (Eq. 2).

$$\Delta X_{i,t} = \alpha_0 + \rho X_{i,t-1} + \delta T + \sum_{m=1}^{P} \alpha_m \Delta X_{i,t-m} + \varepsilon_{i,t} \quad (1)$$

$$\Delta X_{i,t} = \alpha_0 + \rho X_{i,t-1} + \delta T + u_{i,t} \quad (2)$$

Where $X_{i,t-1}$ and $\Delta X_{i,t}$ are the level and the first difference of the tested variable at time t–1 and t, T is a time trend, $\sum_{m=1}^{P} \alpha_m \Delta X_{i,t-m}$ are corresponding lag terms up to order P, and $\varepsilon_{i,t}$ is the error term. ρ is the coefficient of interest, and testing the hypothesis ρ=0 is equivalent to testing that $X_{i,t}$ follows a unit root process. Hamilton (1994) discusses four different cases for implementation of unit-root tests, from which to employ test specification with and without time trends. The latter is equivalent testing equations (1) and (2) with the restriction that δ = 0.

Finally, Choi (2001) suggests four different methods to combine the P-values from the panel-specific unit-root tests; particularly, inverse χ^2, modification of inverse χ^2, inverse-normal, and inverse-logit transformation of P-values are applied.

3.2.2. Cointegration

The co-integration test is applied for variables that are integrated of order one, I(1), and are stationary after the first difference. This means that in levels the examined series is a nonstationary process whose first two moments may vary over time. The existence of cointegration proposes that the variables share a common long-term relationship and their linear combination follows a mean reverting process (Engle and Granger, 1987).

The existence of panel cointegration between the variables is to be tested through three different tests, the Kao test (1999), Pedroni test (1999; 2004), and Westerlund test (2005), which are applicable for a sample with many observations on each of many individual units. In all the tests the null hypothesis is that there is no cointegration between the examined variables. The alternative hypothesis of the Kao and the Pedroni tests is that, in all panels, the variables are cointegrated. In the Westerlund test, the alternative hypothesis is that the variables are cointegrated in some of the panels. All the three tests combine statistics computed for each individual in the panel, provide high power, and allow unbalanced panels. The tests require large samples in both cross sectional and time series dimensions.

In all the tests, initially the following panel data specification is estimated

$$y_{i,t} = x'_{i,t}\beta_i + z'_{i,t}\gamma_i + \varepsilon_{i,t} \quad (3)$$

Where both the dependent variable, $y_{i,t}$, and the independent covariates, $x_{i,t}$, follow I(1) processes, $z_{i,t}$ is matrix of deterministic terms that control for panel-specific effects and linear time trends, ε_{it} is the error term.

Then stationarity unit root tests are applied to the predicted residuals from (Eq. 3), estimated with and ordinary least squares approach. All the tests employ Dickey-Fuller t-test, Augmented Dickey-Fuller t-tests, and Phillips–Perron t-tests to check the stationarity of the linear combination of the examined non-stationary series.

3.2.3. ECM

If the existence of cointegration is validated, an ECM can be applied (Engle and Granger, 1987). ECM is the framework for testing and estimating the equilibrium relationship between non-stationary variables and the short-term dynamic behavior of these variables around the long-run equilibrium path. The ECM model links the long-run equilibrium relationship between the nonstationary variables implied by cointegration with the short-run dynamic adjustment mechanism that describes how the variables react to out of long-run equilibrium movements.

An ECM model with cointegrated variables can be presented with the following functional form:

$$\Delta y_{i,t} = c + \alpha\left(y_{i,t-1} - \beta x_{i,t-1}\right) + \sum_{j=1}^{p} \phi_j \Delta y_{i,t-j} + + \sum_{j=1}^{p} \gamma_j \Delta x_{i,t-j} + \varepsilon_{it} \quad (4)$$

Where parameter β captures the long-run equilibrium relationship between the discussed variables, α, also called factor loading, is a measure of the speed of adjustment, or how strongly *y* is affected by equilibrium errors. *p* is the lag order of the AR process in *y* and *x*, ϕ_j and γ_j parameters are the short-run multipliers. Variable descriptions are provided in Table 4.2.

The ECM is well-defined if $\alpha < 0$, which is needed to return the variables back to equilibrium after a deviation. On the other hand, $\alpha > -1$ to prevent overshooting with oscillations.

4. EMPIRICAL RESULTS

4.1. Unit root tests

The results of Fisher-type unit-root test, under the null hypothesis that all panels contain unit roots, are summarized in the Appendix B. As presented in Appendix B, for all the cases the results mainly fail to reject the null hypothesis for level tests, and reject for growths, returns, or first differences. Therefore, the conclusion is that the examined variables follow I(1) processes.

The table reports four different methods for combining the p-values from the panel-specific unit-root tests: inverse χ^2, inverse-normal, inverse-logit transformation, modified of inverse χ^2. Except for M2 and interest rates, for all the cases deterministic trends from the test are excluded. For equity market index and exchange rates, some of the test specifications in a linear case suggest rejecting the null, but based on overall results, the results suggests that these variables as I(1) processes.

4.2. Cointegration Tests Results

The results of the Kao (1999), Pedroni (1999; 2004), and Westerlund (2005) tests for cointegration are reported in Table 4.3.

Table 4.2: Summarized results of augmented Dickey-Fuller test for unit root

Test	Eq		RetEq	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	19.07	0.09	423.03	0.00
	M2		gM2	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	7.65	0.81	432.52	0.00
	Int		d (Int)	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	18.64	0.10	432.52	0.00
	Oil		RetOil	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	7.92	0.79	432.52	0.00
	Ex		d (Ex)	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	16.85	0.16	288.35	0.00

Table 4.3: Cointegration test results

Kao test for cointegration	Statistics	P-value
Modified Dickey-Fuller t	−4.02	0.00
Dickey-Fuller t	−2.44	0.01
Augmented Dickey-Fuller t	−2.38	0.01
Unadjusted modified Dickey Fuller t	−4.27	0.00
Unadjusted Dickey-Fuller t	−2.51	0.01
Pedroni test for cointegration	**Statistics**	**P-value**
Modified Phillips-Perron t	−1.77	0.04
Phillips-Perron t	−0.28	0.39
Augmented Dickey-Fuller t	1.72	0.04
Westerlund test for cointegration	**Statistics**	**P-value**
Variance ratio	-1.90	0.03

In all the tests the null hypothesis is no cointegration, with the alternative that all panels are cointegrated. The results reveal that the results mainly reject the null hypothesis and should conclude that there is panel cointegration between the examined variables. The existence of cointegration suggests that the variables share a common long-term relationship and their linear combination follows a mean reverting process.

The table reports the results of Dickey-Fuller t-tests, Augmented Dickey-Fuller t tests, Phillips–Perron t-tests, and modified versions of these tests to check the stationarity of the linear combination of the examined non-stationary series. Variance-ratio statistic for panel cointegration is computed using the alternative hypothesis that some of the panels are cointegrated. The AR parameter for Dickey–Fuller (DF) regressions is panel specific for the regression used in this option.

4.3. ECM Model

Under the existence of cointegration between the examined variables—which means that they do not follow stationary processes, but that their linear combination does ECM is utilized to estimate long-run and short-run interrelationships between the variables. In the ECM model, the short-run dynamics of the variables in the system are influenced by the deviation from long-run equilibrium. The ECM specification for our model can be presented as:

$$\Delta Eq_{i,t} = \alpha_i \left(Eq_{i,t-1} - \theta_i^{'} X_{i,t} \right) + \sum_{j=1}^{p} \rho_j \Delta Eq_{i,t-j} + \sum_{j=1}^{p} \beta_j^{'} \Delta X_{i,t-j} + \int_{i,t}$$

Where α is the error-correcting speed of adjustment term and is expected to have significant negative impact–otherwise there would be no evidence for a long-run relationship– θ_i are the parameters of long-run relationships between the variables, ρ_j, and β_j are short-run effects. The results of the estimated panel ECM are summarized in Table 4.4. From the results:

- There is a long-run relationships between oil prices, interest rates, money growth rates, and equity market index, 1% point increase in oil prices increases equity market index by 0.239% points; 1% point increase in interest rates increases equity market index by 0.287% points; 1% point increase in M2 increases equity market index by 0.289% points. The positive impact of interest rates and oil prices can be explained by price transmission in financial markets
- Error correction coefficient α is only significant for Bahrain, Qatar, and Saudi Arabia, and in these cases has negative value, which indicates that in these countries there is a long-run relationships between the examined variables, and any distortion from the equilibrium is adjusted correspondingly by about 4.3, 5.9, and 14.1% in each period
- Short-run effects are significant for oil price changes, with the estimated coefficient in the range of 0.115-0.435, and also for some cases of interest rate changes and M2 changes. For Kuwait and Saudi Arabia, it was also possible to estimate the short-run effects of exchange rate, with negative and significant impact for Kuwait
- Empirical results show UAE and Oman's stock markets are more vulnerable to fluctuations in oil prices than other

Table 4.4: Panel ECM model results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Long-run relationships	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
α_i		−0.0429***	0.000668	−0.0233	−0.0594**	−0.141***	−0.0189
		(0.0115)	(0.00105)	(0.0263)	(0.0241)	(0.0427)	(0.0171)
$\Delta\ln(Oil_{it})$		0.118***	0.115**	0.238***	0.308***	0.202***	0.435***
		(0.0273)	(0.0468)	(0.0552)	(0.0628)	(0.0610)	(0.0754)
$\Delta\ln(Int_{it})$		0.00772	0.115	−0.0798	0.604***	0.514***	0.226**
		(0.0243)	(0.0768)	(0.0500)	(0.215)	(0.122)	(0.0979)
$\Delta\ln(M2_{it})$		0.274**	−0.0544	−0.137	0.154	0.710**	0.343
		(0.135)	(0.220)	(0.167)	(0.164)	(0.353)	(0.427)
$\Delta\ln(Ex_{it})$			−1.610**			−50.87	
			(0.767)			(57.04)	
$\ln(Oil_{it-1})$	0.239***						
	(0.0873)						
$\ln(Int_{it-1})$	0.287***						
	(0.0660)						
$\ln(M2_{it-1})$	0.289***						
	(0.100)						
$\ln(Ex_{it-1})$	−396.7						
	(598.7)						
Constant		−16.46	0.329**	−8.680	30.76	74.93	9.859
		(25.78)	(0.129)	(16.56)	(48.45)	(108.4)	(17.21)
Observations	941	941	941	941	941	941	941

Standard errors in parentheses. ***P < 0.01, **P < 0.05, *P < 0.1. All the variables are under logs

GCC countries, with estimated 0.435 and 0.308 estimated coefficients respectively. Stock exchanges in other countries, such as Saudi Arabia and Qatar, were found to be more vulnerable to other indicators such as interest rates, with 0.514 and 0.604 positive coefficients respectively

- Exchange rates of given currency vs. US dollar have negative and significant impact on Kuwait stock market only, which is explained by the fact that all currencies of GCC countries are pegged to the US dollar.

5. CONCLUSION AND POLICY IMPLICATIONS

Interest rates, exchange rates, money supply, and oil prices have been a significant factor in determining stock markets' returns as proven by the literature. The primary purpose of this research is to investigate the impact of four specific macroeconomic determinants on stock market returns in the GCC countries. The study employed the panel data model, which analyzed the monthly data published between 1995 and 2018. The ECM was also used as a benchmark in the study. Moreover, the primary objective of the study is to assist the GCC governments in the implementation of diversification programs, which they plan to achieve shortly. The programs involve shifting their countries from over-reliance on oil to developing other economic sectors. The study also aims to assist stakeholders in the stock market to understand the effect of oil prices on their investments. Additionally, the findings of the study will presumably enable investors and stakeholders in making better investment decisions, in addition to assisting policy-makers in enhancing the efficiency of stock markets and better regulating them.

The findings of earlier studies indicate that stock prices in oil producing and importing countries were both affected by oil prices. For instance, in the case of GCC countries, which are oil exporting nations, a drop in oil prices leads to a decline in the stock market and vice versa. Also, empirical results shows that in al of the GCC countries, oil has the largest impact amongst macroeconomic factors on stock market returns. The same also holds true in the oil importing countries, where a fluctuation in oil prices variously affects the stock market because other critical economic sectors such as transportation rely on oil, meaning that a problem in the oil sector forces investors to spend a lot of money on the products, reducing the amount of savings, and further affecting the rate of investment. However, as demonstrated in the study's literature review, the correlation of stock market returns and oil prices varies over time in both oil exporting and oil-importing countries, and further investigation is necessary to measure the change in correlation between factors over time. The empirical results of the study also show positive correlation between interest rates and stock market returns in Qatar, Saudi Arabia, and UAE, which is contrary to what the finance literature suggests. This phenomenon could be explained by price transmission in financial markets, and needs to be investigated to confirm, deny, or explain the findings of this study.

The model used in this study did not include a delay factor to estimate the price adjustment period of each independent variable, and applying a delay factor could explain some of the results. Moreover, empirical findings of the study show significant impact of exchange rates on stock market returns in Kuwait, which can be explained by the fact that Kuwaiti Dinar is the only GCC currency that is not pegged to the U.S. dollar (Central Bank of Kuwait, 2019). This finding needs further attention as the fluctuation of Kuwaiti Dinar could also affect other factors including the country GDP, since oil prices are set in U.S. dollar and Kuwait's economy relies heavily on oil exports.

Finally, the sample used in this paper is limited to oil exporting countries and economies with governments that rely heavily on oil, which may not generally reflect the impact of oil prices on other stock exchanges of different economy. Stock analyst and investors need to pay attention to the differences in nature and structure of economies before making an investment decision, and also keep into account that conclusions that are drawn from previous studies on different countries may not be applicable to the case of GCC.

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APPENDIXES

Appendix A: Main descriptive statistics

Var.	Mean	Median	Max	Min	Sd.	Sk.	Kurt.	N
Bahrain								
Eq	1571.0	1421.0	2881.0	1010.0	480.8	1.175	3.346	192
RetEq	0.002	0.001	0.097	−0.122	0.034	−0.167	4.406	191
M2	14287.0	10937.0	28844.0	3515.0	9030.0	0.281	1.448	288
gM2	0.008	0.005	0.323	−0.249	0.030	2.042	59.780	287
Int	0.015	0.008	0.050	0.005	0.015	1.454	3.726	156
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	0.376	0.376	0.376	0.376	0.000	−1.874	4.581	288
Kuwait								
Eq	6900.0	6543.0	15456.0	1600.0	2905.0	0.644	3.692	211
RetEq	0.007	0.010	0.203	−0.277	0.057	−0.651	7.610	210
M2	66601.0	54823.0	127112.0	23225.0	38235.0	0.241	1.389	288
gM2	0.006	0.006	0.083	−0.047	0.017	0.833	5.755	287
Int	0.037	0.030	0.073	0.020	0.016	0.710	2.062	229
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	0.294	0.299	0.308	0.265	0.011	−0.739	2.610	288
Oman								
Eq	5676.0	5726.0	11555.0	1941.0	1637.0	0.606	5.351	191
RetEq	0.005	0.006	0.313	−0.269	0.058	−0.023	10.580	189
M2	6581.0	5717.0	14253.0	1181.0	4558.0	0.394	1.647	240
gM2	0.010	0.008	0.110	−0.106	0.037	0.149	3.042	239
Int	0.016	0.015	0.050	0.010	0.007	1.406	7.025	124
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	0.385	0.385	0.385	0.385	0.000	.	.	288
Qatar								
Eq	8881.0	8745.0	13728.0	3646.0	2145.0	−0.039	2.678	183
RetEq	0.009	0.005	0.296	−0.256	0.080	0.058	4.801	182
M2	55676.0	27409.0	165751.0	5116.0	55328.0	0.680	1.868	288
gM2	0.012	0.009	0.254	−0.097	0.031	2.075	16.590	287
Int	0.048	0.050	0.059	0.015	0.008	−1.683	6.712	178
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	3.640	3.640	3.640	3.640	0.000	1.000	1.000	288
Saudi Arabia								
Eq	7391.0	7125.0	11112.0	4385.0	1353.0	0.540	3.029	144
RetEq	0.003	0.004	0.196	−0.258	0.067	−0.258	4.744	143
M2	197549.0	143324.0	441858.0	46911.0	140948.0	0.567	1.783	288
gM2	0.008	0.006	0.107	−0.035	0.015	1.348	9.039	287
Int	0.035	0.025	0.070	0.015	0.018	0.435	1.474	288
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	3.750	3.750	3.754	3.745	0.001	−3.121	12.120	288
UAE								
Eq	2877.0	2956.0	5960.0	345.6	1357.0	0.242	2.275	153
RetEq	0.069	−0.008	10.940	−0.332	0.892	12.02	147.10	152
M2	150217.0	109501.0	357544.0	19955.0	118187.0	0.402	1.623	288
gM2	0.011	0.009	0.192	−0.139	0.029	1.046	18.460	287
Int	0.013	0.010	0.048	0.010	0.006	2.887	13.120	134
Oil	53.450	47.760	132.800	10.410	31.860	0.513	2.055	288
RetOil	0.008	0.017	0.225	−0.271	0.083	−0.508	3.720	287
Ex	3.672	3.672	3.672	3.671	0.000	−2.317	6.367	288
Total								
Eq	5560.0	5778.0	15456.0	345.6	3164.0	0.333	2.507	1074
RetEq	0.014	0.004	10.940	−0.332	0.341	30.850	988.900	1067
M2	83968.0	32640.0	441858.0	1181.0	106851.0	1.762	5.360	1680
gM2	0.009	0.007	0.323	−0.249	0.028	1.377	25.260	1674
Int	0.030	0.023	0.073	0.005	0.019	0.430	1.853	1109
Oil	53.450	47.760	132.800	10.410	31.810	0.513	2.055	1728
RetOil	0.008	0.017	0.225	−0.271	0.082	−0.508	3.720	1722
Ex	2.019	2.012	3.754	0.265	1.669	0.000	1.003	1728

Appendix B: Augmented Dickey-Fuller test for unit root

	Eq		RetEq	
	Statistics	P-value	Statistics	P-value
Inverse Chi-squared	19.07	0.09	423.03	0.00
Inverse normal	−1.73	0.04	−19.66	0.00
Inverse logit t	−1.66	0.05	−48.35	0.00
Modified inv. Chi-squared	1.44	0.07	83.90	0.00
	M2		**gM2**	
	Statistics	**P-value**	**Statistics**	**P-value**
Inverse Chi-squared	7.65	0.81	432.52	0.00
Inverse normal	0.21	0.58	−19.90	0.00
Inverse logit t	0.19	0.57	−49.43	0.00
Modified inv. Chi-squared	−0.89	0.81	85.84	0.00
	Int		**d (Int)**	
	Statistics	**P-value**	**Statistics**	**P-value**
Inverse Chi-squared	18.64	0.10	432.52	0.00
Inverse normal	1.09	0.86	−19.90	0.00
Inverse logit t	0.80	0.78	−49.43	0.00
Modified inv. Chi-squared	1.36	0.09	85.84	0.00
	Oil		**RetOil**	
	Statistics	**P-value**	**Statistics**	**P-value**
Inverse Chi-squared	7.92	0.79	432.52	0.00
Inverse normal	0.10	0.54	−19.90	0.00
Inverse logit t	0.09	0.54	−49.43	0.00
Modified inv. Chi-squared	−0.83	0.80	85.84	0.00
	Ex		**d (Ex)**	
	Statistics	**P-value**	**Statistics**	**P-value**
Inverse Chi-squared	16.85	0.16	288.35	0.00
Inverse normal	−2.12	0.02	−16.25	0.00
Inverse logit t	−2.11	0.02	−40.64	0.00