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Relative Impact of the U.S. Energy Market Sentiments on Stocks and ESG Index Returns: Evidence from GCC Countries

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ABSTRACT

In this study, we provide empirical evidence on the relative impact of energy market sentiments on the stock and ESG index returns in the U.S. and Gulf Cooperation Council (GCC) economies. Specifically, we study movements in four distinct categories of energy sentiments (natural gas, crude oil, RBOB gasoline, and heating oil) displayed by professional investors and investigate their relative impact on ESG investments and stock returns in the U.S. and GCC economies. We employ the recently developed automatic time series forecasting methodology *Autometrics* to examine the postulated relationships. The results of the regression models suggest that there is a significant negative impact of stock sentiments and a positive impact of energy sentiments on the S&P 500 returns. However, in the case of the U.S. energy companies' returns, there are significantly higher effects of only energy market sentiments (mainly crude oil and RBOB gasoline). In the case of the GCC stock markets, there are significant positive impacts of crude oil sentiments and the S&P 500 of varying degrees of strength. The most significant impact of crude oil sentiments is observed in UAE and Saudi Arabia and is almost of the same magnitude as those on the U.S. energy companies' returns. These results are consistent with arguments provided in behavioral finance studies that investors prefer bigger profits over social returns during bullishness and step back from social investing when better investment opportunities are available. Also, ESG investing may be preferred during bearishness by utilitarian investors to generate abnormal returns during such lean periods.

Keywords: Asset Pricing, ESG, GCC Economies, Energy, Market Sentiments, Stock Markets
JEL Classifications: G12, G15, Q43

1. INTRODUCTION

ESG investing (socially responsible investing, impact investing, sustainable investing) is one of the hottest trends in business and almost 1/3rd of all assets under professional management are being managed using ESG criteria (Global Sustainable Fund Flows Report, Morningstar, 2020). These are strategies that consider environmental, social, and governance factors alongside traditional financial metrics to select investments. It is a term used to represent an organization's financial interests that focus mainly on sustainable and ethical impacts. The primary driver is risk mitigation and the Covid-19 pandemic has pushed environmental and societal issues higher up the risk spectrum. The executive order of President Biden (Climate-Related Financial Risk, May 20, 2021) for achieving a net-zero emissions economy by 2050, has moved ESG up the corporate priority list and is expected to further spur sustainable investments.

The academic research on ESG is fairly new and its impact on the economy, in particular, the energy sector is not well understood. Environment ("*E*" of ESG) and energy companies are the heart of this ecosystem. There exist arguments on both sides of the aisle on the likely long-term benefits and the consequences of the adoption of ESG in the energy industry. As fossil fuel producers, energy companies are among the most exposed to the energy transition which could weigh on long-term average oil prices and refining margins. On the other hand, the hypothesis is that a strong ESG proposition in energy companies has the potential to create value. However, these are merely conjectures while little empirical research is conducted to analyze the impact of ESG on the financial performance and valuations in the energy sector worldwide.

This study aims to contribute to the existing body of literature on both sustainability as well as behavioral finance by investigating the relative impact of energy sentiments on ESG investments and stock markets in the U.S. and the Gulf Cooperation Council (GCC) economies. Specifically, it provides empirical tests on the effect of professional investors' expectations on stocks and energy outlook on stock markets, energy companies' valuations, and ESG investments in the U.S. and GCC. Accordingly, it investigates the following research questions: (i) What is the relative impact of energy sentiments on the U.S. and GCC stock returns; (ii) What is the relative impact of energy sentiments on the ESG investment in the U.S. and the GCC economies? (iii) What is the relative impact of energy sentiments on the stock markets and ESG investments in the U.S. and the GCC economies? We attempt to shed light on investors' irrationality and contribute to finding answers to pertinent questions such as: What motivates investors to hold socially responsible stocks? Are arguments promoting both bigger profits and better social returns irrational? Is there hype surrounding ESG investing?

This study employs weekly data from October 2012 to June 2022 on 17 variables from proprietary databases. The energy market sentiment data is acquired from Consensus Inc. which provides professional investors' expectations on four energy-based asset classes (crude oil, natural gas, RBOB gasoline, and heating oil). In addition, the major indexes of the six GCC countries (the United Arab Emirates or, UAE, Qatar, Bahrain, Oman, Saudi Arabia, and Kuwait), the S&P 500, and the exchange-traded fund, XLE are included. Lastly, the four indexes on ESG investments in the U.S. and the Middle East are employed.

We estimate a set of regressions by using the recently developed automatic time series forecasting methodology *Autometrics* (Hendry and Doornik, 2014; Doornik and Hendry, 2015). The results suggest the impact of energy market sentiments on stock returns and ESG investments of varying degrees of strength in the U.S. and GCC markets. In the U.S., there are significant negative effects of stock sentiments and positive effects of energy sentiments on the S&P 500 while an insignificant effect of stock sentiments and a positive impact of energy sentiments on energy companies' returns. The energy sentiments have a greater effect on the oil and gas sector returns than those on S&P 500. In the GCC economies, there are positive effects of both energy market sentiments (mainly crude oil) and S&P 500 on stock markets. The impact of the energy market sentiments is higher for UAE and Saudi Arabia and is of the same magnitude as those observed in the case of the U.S. oil and gas sector. Lastly, for the ESG investments, the impact of energy market sentiments is opposite of what we observe in the case of the stock markets. Specifically, unlike the positive impact of energy sentiments on the stock market returns, the crude oil sentiments, and energy companies' returns negatively affects the ESG investments in both the U.S. and the GCC region. The magnitude of these negative impacts on ESG investments is higher for the U.S. than UAE and the GCC region.

Overall, these findings suggest that the energy market sentiments positively impact the stock markets and energy companies' returns in both U.S. and the GCC. However, the bullishness of professional investors in the energy sector seems to be bad news for ESG investments in both the U.S. and GCC region as these investments are negatively impacted by energy sentiments. These results are consistent with recent arguments provided in the behavioral finance literature that investors seem to prefer bigger profits over social returns during bullishness and step back from social investing when better investment opportunities are available. In addition, ESG investing may be preferred during bearishness by utilitarian investors to generate abnormal returns during such lean periods. These findings are also consistent with stockholder choice - investors tend to leave companies that do not meet earning expectations, especially during good times. Another point is the theory that investors buy stocks that they are knowledgeable about and that when companies invest in ESG, shareholders are not knowledgeable as to the costs and future returns of such outlays and may move to pure-play stocks.

The remainder of this paper is organized as follows: section two reviews the existing literature on ESG investments while section three presents the model, econometric methodology and data. Section four presents the econometric results and section five concludes.

2. LITERATURE REVIEW

ESG investing are strategies that consider attributes other than risk and return to select investments (Hayat and Orsagh, 2015; Statman, 2018). Environmental criteria examine how a business contributes to and performs on environmental challenges (e.g. waste, pollution, greenhouse gas emissions, deforestation, and climate change). Social criteria look at how the company treats people (e.g. human capital management, diversity and equal opportunities, work conditions, health and safety, and product misselling), while Governance criteria examine how a company is governed (e.g. executive remuneration, tax practices, and strategy, corruption and bribery, and board diversity and structure). Investors are increasingly applying these non-financial factors as part of their analysis process and companies are also including ESG measures in compensation incentives. ESG trends show COVID-19 not only increased awareness but also boosted demand for ESG investments. The assumption is that the financial performance of companies is increasingly affected by environmental and social factors.

Existing empirical studies on ESG investments have mainly focused on the investments returns and provide equivocal results (Eccles et al., 2014; Clark et al., 2015; Verheyden et al., 2016; Auer and Schuhmach, 2016; Odell and Ali, 2016; Park and Monk, 2019; Ciciretti, et al., 2017; Hoepner and Schopohl, 2018; Erragragui, 2017; Gerard, 2018; Kilic, et al., 2022). Some studies suggest that ESG investment returns are better or at least not significantly different from conventional investment returns (Derwall et al., 2005; Kempf and Osthoff, 2007; Edmans, 2011; Bauer et al., 2005; Sharma et al., 2022; Friede et al.; 2015; Memon and Tahir 2021), whereas other studies find evidence of significant ESG investment underperformance (Hong and Kacperczyk, 2009; Fabozzi et al., 2008). Investors could be attracted to socially responsible stocks when they expect risk-adjusted returns on these stocks to be higher.

Studies provide a compelling rationale to consider ESG factors in investment decisions but there are concerns that the ESG movement is getting degraded from doing good to doing well, from wants for utilitarian, expressive, and emotional benefits for others to wants for utilitarian returns for oneself (Statman, 2020; Karp, 2019; Amel-Zadeh and Serafeim, 2019). The ESG narratives are rational and the investment theme underpinning them makes perfect sense but the market excess surrounding them seems to be irrational. The weight of money-chasing returns in this area has the potential to drive prices higher in the short term. ESG is popular now but the popularity is accompanied by subversion, as its focus has shifted from expressive and emotional benefits to utilitarian benefits alone, just another way to beat the market. An over-enthusiasm over ESG issues threatens a new asset price bubble and there is a need to analyze the behavior of ESG investors and how these investments are identified.

However, it is merely conjectured that ESG investments are increasingly driven by irrational factors and there exist no empirical tests on the impact of behavioral factors on ESG investing. We might find greater clarity and reach firmer conclusions by examining the determinant of the actual observed behavior of investors instead of the idealized behavior rooted in traditional finance theories. This study contributes to the literature by investigating the role of energy market sentiments on ESG investing in the U.S. and oil and gas-based economies. Overall, the study contributes to the ongoing debate on how seriously companies and asset managers take sustainability issues such as workplace diversity and carbon emissions. It also may provide clarity on the issues of ESG disclosures, an area where regulators have started weighing in. In some cases, it may be warranted to re-examine the pitfalls in the current sustainability ratings as recommended by Zachary et al. (2022).

3. MODEL, ECONOMETRIC METHODOLOGY AND DATA

3.1. Model

The central purpose of this research is to examine the role of behavioral factors, mainly stocks and energy sentiments on the ESG investments in the U.S. and oil and gas-based economies and compare the results to its impact on the stock markets and energy companies' valuations. Overall, it investigates the extent to which the stock markets, energy companies, and ESG investment returns are driven by stocks and energy sentiments in the U.S. and the GCC. The first research question is to analyze the relative impact of four distinct categories of energy sentiments and stock sentiments on the stock markets and the energy companies' returns in the U.S. and GCC economies. Accordingly, equation (1) is formulated for the U.S. stock market returns:

$$\alpha_0 + \alpha_{1k}\sum_{k=1}^{K} Sent_{1t-k} + \alpha_{2k}\sum_{k=1}^{K} Sent_{2t-k} + \alpha_{3k}\sum_{k=1}^{K} Sent_{3t-k} + \alpha_{4k}\sum_{k=1}^{K} Sent_{4t-k} + \alpha_{5k}\sum_{k=1}^{K} Sent_{5t-k} + \varepsilon_t \quad (1)$$

The *variables* R_t measure U.S. stock market return at time *t.* The variables $Sent_1$–$Sent_5$ represent the five sentiment variables (four for energy-based assets and one for the stocks) and *k* is the lag length. Accordingly, the parameters α_1 - α_5 capture the impact of energy and stock sentiments on the U.S. stock market returns.

Similarly, equation (2) is formulated to examine the response of GCC stock markets and the U.S. energy companies' returns to energy sentiments and stock sentiments. Here, the U.S. stock market returns are also included as a control variable and the following equation is formulated:

$$R_{it} = \alpha_0 + \alpha_{1k}\sum_{k=1}^{K} Sent_{1t-k} + \alpha_{2k}\sum_{k=1}^{K} Sent_{2t-k} + \alpha_{3k}\sum_{k=1}^{K} Sent_{3t-k} + \alpha_{4k}\sum_{k=1}^{K} Sent_{4t-k} + \alpha_{5k}\sum_{k=1}^{K} Sent_{5t-k} + \alpha_{6k}\sum_{k=1}^{K} US_{6t-k} + \varepsilon_t \quad (2)$$

Here R_{it} represents the return for the i^{th} GCC stock market and the U.S. energy companies' returns. Accordingly, the parameters α_1 - α_6 capture the impact of energy and stock sentiments and U.S. stock market movements on the GCC stock market returns.

The second research question is to analyze the relative impact of energy and stock sentiments on ESG investments in the U.S. and the GCC. Accordingly, equation (3) is formulated to investigate the postulated relationship:

$$ESG_{it} = \alpha_0 + \alpha_{1k}\sum_{k=1}^{K} Sent_{1t-k} + \alpha_{2k}\sum_{k=1}^{K} Sent_{2t-k} + \alpha_{3k}\sum_{k=1}^{K} Sent_{3t-k} + \alpha_{4k}\sum_{k=1}^{K} Sent_{4t-k} + \alpha_{5k}\sum_{k=1}^{K} Sent_{5t-k} + \alpha_{6k}\sum_{k=1}^{K} US_{6t-k} + \varepsilon_t \quad (3)$$

Here ESG_{it} represents the ESG investment returns in the U.S. and the GCC. Here, the parameters α_1 - α_6 capture the impact of energy and stock sentiments on the ESG investment returns in the U.S. and the GCC.

3.2. Econometric Methodology

This study employs the more recently developed automatic time series forecasting methodology *Autometrics* (Hendry and Doornik, 2014 and Doornik and Hendry, 2015) to examine the postulated relationships. *Autometrics* (PcGive in Oxmetrics) is a computer implementation of general-to-specific modeling where the starting point is a well-specified *general unrestricted model* that captures the salient features of the dependent variable and passes all diagnostic tests. The algorithm inbuilt into *Autometrics* provides a convenient solution based on the specification of the initial model and the significance level at which the model needs to be reduced.

The chosen significance level determines the criteria for removing regressors and then *Autometrics* follows many reduction paths (not all, as there are 2^k paths for k regressors) and uses the Schwarz criterion as a tie-breaker to arrive at the most suitable model.

Automatic time series models have been discussed in Hendry (1986), Krolzig and Hendry (2001), Hendry and Krolzig (2005), Hendry and Nielsen (2007), Castle et al. (2013), and Hendry and Doornik (2014). Studies suggest that automatic modeling has statistically superior forecasting efficiency and performance in contrast to "data mining" and "garbage in, garbage out." Autometrics implemented in PcGive Oxmetrics software seeks to eliminate irrelevant variables; variables with insignificant estimated coefficients; lag-length reductions; and reducing saturation variables; nonlinearity of the principal components; and combinations of "small effects" represented by principal components (Guerard et al., 2019). This technique is more effective as it substantially reduces the regression sum of square measures relative to traditional variations on the random walk with the drift model. The adaptive averaging autoregressive model and the adaptive learning forecasts have the ability to produce the smallest root-mean-square errors and mean absolute errors.

The implementation of general-to-specific modeling from a *general unrestricted model* to a specific model is described in equations (4) – (7). If one starts with a large number of explanatory variables, say n, then the general model takes the following form:

$$y_t = \sum_{i=1}^{n} \gamma_i Z_{it} + u_t \quad (4)$$

The conditional data-generating processes are assumed to be given by the equation:

$$y_t = \sum_{i=1}^{n} \beta_j Z_{(i),t} + \varepsilon_t \quad (5)$$

Where, $\varepsilon_t \cong \text{IN}(0, \sigma_e^2)$ for any $n \leq N$

It is important to select the relevant explanatory variables where $\beta_j \neq 0$ in equation (5). Equation (4) is the general unrestricted model that can be postulated, given the availability of data and previous empirical and theoretical research. One seeks to identify all relevant variables, the relevant lag structure, and cointegrating relations, forming near orthogonal variables, Z. The general unrestricted model with s lags of all variables can then be written as follows:

$$y_t = \sum_{i=1}^{n} \sum_{j=0}^{s} \beta_{i,j} x_{i,t-j} + \sum_{i=1}^{n} \sum_{j=0}^{s} k_{i,j} z_{i,t-j} + \sum_{j=0}^{s} \theta_j y_{t-j} + \sum_{i=0}^{T} \delta_i 1_{\{i=t\}} + e_t \quad (6)$$

where, $\varepsilon_t \cong \text{IN}\ (0, \sigma_e^2)$ for any $n \leq N$

The null hypothesis of the parameter equal to zero is tested by two-tailed t-tests. Following, the orthogonal regressor case, the variables are ranked based on the values of the t-statistics (m being the lowest value of significant t-statistic). All variables with values of t-statistics lower than m are discarded. One progresses from the general unrestricted model in equation (4) to the "final" model in equation (7) by establishing that model residuals are approximately normal, homoscedastic, and independent. Such reduction in the model is achieved by tree searches of insignificant variables and the last, non-rejected model is referred to as the terminal equation. The selected model, therefore, takes the following form:

$$y_t = \sum_{(r=1)}^{m} \delta_r Z_{\{r,t\}} + n_t \quad (7)$$

where $Z_{\{r\},t}$ is a subset of the initial n variables. By omitting irrelevant variables, the selection model does not "overfit" the model and the retained variables have estimated standard errors close to those from fitting Equation (7). Following the above-described general to-specific modeling methodology of *Autometrics*, equations (1) - (3) are estimated to analyze the postulated relationships.

3.3. Data

The data spans October 2012 through June 2022 on a weekly basis for 17 variables and is acquired from three sources. The data on stock indexes for stock markets is obtained from Refinitiv Eikon. Specifically, the major stock indexes of the following countries are employed: (i) US (S&P 500); (ii) UAE (DFM index); (iii) Kuwait (Dow Jones Kuwait market index); (iv) Oman (MSCI Oman index); (vi) Qatar (MSCI Qatar index); (vii) Bahrain (Bahrain all share index); (viii) Saudi Arabia (MSCI Saudi Arabia index). In addition, the exchange-traded fund, XLE is included to capture the returns of U.S-based energy companies.

In order to measure the energy market sentiments, we employ the data used in previous studies that deal with the expectations of professional investors and analysts. Specifically, we employ the sentiment index provided by Consensus Inc. This index gives the attitudes of professional brokerage house analysts and independent advisory services on 32 asset classes. Consensus Inc. surveys these advisory services on the bullishness or bearishness of a particular asset. It compiles a sentiment index for each of these assets by dividing the number of bullish counts by the total number of opinions. This index is compiled every Friday and released during the early part of the following week. We employ sentiment data on the following four distinct categories of energy-based assets: (i) natural gas, (ii) crude oil, (iii) RBOB gasoline, and (iv) heating oil, and one additional sentiment variable for the stock market.

Lastly, the ESG investments data for the U.S. and the GCC economies are obtained from the *SPGLOBAL* and include the following ESG indexes: (i) U.S. (S&P 500 ESG index); (ii) UAE (S&P/Hawkamah ESG UAE index); (iii) MENA (S&P/Hawkamah ESG Pan Arab Index) (iv) Egypt (S&P ESG Egypt). The ESG index for the U.S. is a market-cap-weighted index that is designed to measure the performance of securities meeting sustainability criteria. The ESG indexes for UAE and MENA are the first of their kind jointly developed by S&P DJI and Hawkamah (the Institute for Corporate Governance for the MENA region), they measure the performance of the best-performing stocks in the region as measured by environmental, social and governance factors.

Table 1 reports the descriptive statistics of the data for the 16 variables included in the study. The mean return for the U.S. stock market is the highest followed by UAE, Saudi Arabia, and Bahrain both in absolute and on risk-adjusted terms. The energy ETF, XLE has generated a positive average return but is much lower compared to the stock indexes and has displayed higher volatility. The volatility of stock markets in the GCC region is also higher compared to those in the U.S.

The ESG investments in both the U.S. and UAE have outperformed the stock markets. The ESG investments in the MENA region and Egypt have also higher mean returns than other stock markets in the region. This is consistent with the fact that substantial money has flown into this new investment category in recent times both in the U.S. and internationally. Among the sentiments, the sentiments relating to the stocks are higher than those relating to energy. This is consistent with high returns observed in the U.S. stock market relative to XLE. The energy sentiments have been overall positive during the period. The sentiments related to RBOB gasoline and crude oil are somewhat higher than those relating to natural gas and heating oil.

Table 2 reports the cross-correlations of all the variables included in the study. Consistent with previous studies, S&P 500 has a high correlation with stock sentiments and low correlations with the four energy sentiments indicators. A possible reason for low correlations between energy sentiments and S&P 500 could be that the energy sector constitutes only approximately 3% of the overall U.S. stock market. On the other hand, the energy sector ETF, XLE has contrasting results as it has strong correlations with the four categories of energy sentiments and low correlations with the stock sentiment. These results are consistent with the view that industry-specific expectations have a greater impact than the overall economic outlook on an industry valuation.

Table 1: Descriptive statistics

Variable	Mean	Risk	CV	Maximum	Minimum
SP500	0.23	2.19	9.56	12.10	−14.98
XLE	0.03	4.02	122.79	18.30	−27.74
Stock	63.19	9.84	0.16	78.38	21.67
NG	43.27	15.69	0.36	76.00	20.00
Gas	52.03	16.32	0.31	82.00	16.00
Crude	51.16	16.75	0.33	80.00	15.91
Heat	49.02	16.68	0.34	81.00	17.00
UAE	0.20	3.09	15.75	13.43	−17.41
Kuwait	0.07	1.85	27.75	7.36	−13.29
Saudi	0.16	2.68	16.92	10.45	−14.84
Oman	0.03	2.12	77.70	14.48	−12.00
Qatar	0.07	2.60	37.01	8.83	−12.17
Bahrain	0.12	1.32	10.95	4.87	−11.21
SP_ESG	0.24	1.71	7.07	6.72	−11.49
UAE_ESG	0.23	2.25	9.65	7.25	−12.58
Arab_ESG	0.15	1.52	10.29	8.54	−10.63
Egypt_ESG	0.09	1.51	16.77	4.03	−7.51

The variables are S&P500 returns (SP500), energy ETF returns (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (Heat), returns on UAE stock market (UAE), Kuwait stock market (Kuwait), Saudi Arabia stock market (Saudi), Oman stock market (Oman), Qatar stock market (Qatar), Bahrain stock market (Bahrain), USA ESG index (SP_ESG), UAE ESG Index (UAE_ESG) MENA ESG index (Arab_ESG) and Egypt ESG index (Egypt_ESG). NG: Natural gas

As far as the GCC markets are concerned, we find that they are highly integrated and also dependent on the U.S. market. Specifically, these markets have high correlations among themselves and also with S&P 500. However, the correlations with the energy sentiments, in particular, crude oil sentiments are even higher than those among themselves and with S&P 500. Lastly, the correlations among the three ESG indexes (U.S., UAE, and MENA) are high with each other. The ESG index of Egypt has low correlations with other indexes. Interestingly, there exist negative correlations between energy sentiments and ESG indexes. Specifically, ESG indexes have the highest negative correlations with the sentiments related to crude oil. This is in contrast to the positive correlations observed between energy sentiments and the stock market indexes.

4. EMPIRICAL RESULTS

Before proceeding with the main results, the time-series properties of each variable are checked by performing unit root tests using the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979, 1981). Based on the consistent and asymptotically efficient *AIC* and *SIC* criteria (Diebold, 2003) and considering the loss in degrees of freedom, the appropriate number of lags is determined to be one. In the case of the ADF test, the null hypothesis of non-stationarity is rejected. The inclusion of drift/trend terms in the ADF test equations does not change these results (Dolado et al., 1990).

The first research question is to investigate the relative impact of four distinct categories of energy sentiments and stock sentiments on the U.S. and GCC stock markets and energy companies' returns. The general to specific modeling methodology of *Autometrics* with a lag length of one is estimated as per equations (1) and (2).

Tables 3 and 4 panels A and B report the estimation results for the initial (general unrestricted model) and the final (specific) model respectively for the S&P 500 and XLE returns. Panel A shows that there are significant first-order autocorrelations or, strong momentum in both cases. Consistent with previous studies there are significant negative effects of stock sentiments on the S&P 500 suggesting the contrarian nature of this sentiment indicator. However, there is a positive but weaker impact of the energy sentiments, mainly crude oil on S&P 500 returns.

Similar to the case of the S&P 500, there are significant positive effects of crude oil and RBOB gasoline sentiments in the case of XLE. The impact of crude oil sentiments is higher than those of RBOB gasoline on energy companies' returns and also higher than its effect on S&P 500 returns. Panel B of both the regressions also shows that there are significant negative effects of stock sentiments and positive impact of crude sentiments on S&P500 while positive effects of crude and RBOB gasoline sentiments on XLE returns. Also, the crude oil sentiments have a greater impact on XLE than S&P 500 returns. Overall, the results suggest that bullish expectations about crude oil seem to positively impact the energy companies' stocks and the overall market in the U.S.

Table 2: Cross-correlations

Variable	SP500	XLE	Stock	NG	Gas	Crude	Heat	DFM	Kuwait	Saudi	Oman	Qatar	Bahrain	SP_ESG	UAE_ESG	Arab_ESG	Egypt_ESG
SP500	1.00																
XLE	0.09	1.00															
Stock	0.37	0.04															
NG	0.05	0.18	0.10	1.00													
Gas	0.07	0.16	0.16	0.49	1.00												
Crude	0.06	0.17	0.16	0.56	0.96	1.00											
Heat	0.04	0.17	0.16	0.56	0.92	0.97	1.00										
UAE	0.23	0.29	0.19	0.45	0.23	0.56	0.41	1.00									
Kuwait	0.15	0.18	0.11	0.93	0.43	0.66	0.75	0.31	1.00								
Saudi	0.32	0.51	0.15	0.35	0.25	0.45	0.59	0.48	0.50	1.00							
Oman	0.28	0.48	0.09	0.39	0.62	0.58	0.58	0.49	0.37	0.48	1.00						
Qatar	0.20	0.11	0.07	0.60	0.59	0.60	0.68	0.42	0.31	0.21	0.28	1.00					
Bahrain	0.26	0.21	0.17	0.12	0.19	0.20	0.15	0.11	0.45	0.10	0.36	0.18	1.00				
SP_ESG	0.03	−0.09	0.08	−0.10	−0.09	−0.18	−0.08	−0.11	−0.03	0.05	0.03	0.00	−0.02	1.00			
UAE_ESG	0.11	0.01	0.02	−0.09	−0.13	−0.17	−0.13	−0.12	0.12	−0.06	−0.06	−0.01	0.09	0.31	1.00		
Arab_ESG	0.04	0.00	0.01	−0.15	−0.21	−0.23	−0.10	−0.07	0.05	−0.03	0.04	0.05	0.09	0.52	0.53	1.00	
Egypt_ESG	0.01	−0.02	0.02	−0.03	−0.01	−0.01	0.00	−0.04	−0.06	0.05	−0.07	0.00	−0.03	0.00	0.00	0.06	1.00

The variables are S&P500 returns (SP500), energy ETF returns (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (Crude), heating oil sentiments (heat), returns on UAE stock market (UAE), Kuwait stock market (Kuwait), Saudi Arabia stock market (Saudi), Oman stock market (Oman), Qatar stock market (Qatar), Bahrain stock market (Bahrain), USA ESG index (SP_ESG), UAE ESG Index (UAE_ESG), MENA ESG index (Arab_ESG) and Egypt ESG index (Egypt_ESG). NG: Natural gas

Table 3: Regression results for S&P 500 returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	0.1895	0.5172	0.3664
SP500_1	0.2943***	0.0359	8.2082
Stock	0.4905***	0.0282	17.3931
Stock_1	−0.4895***	0.0282	−17.3652
NG	0.0318	0.0231	1.3776
NG_1	−0.0366	0.0231	−1.5840
Gas	0.0089	0.0443	0.2007
Gas_1	−0.0294	0.0440	−0.6675
Crude	0.0826*	0.0444	1.8615
Crude_1	−0.0548	0.0440	−1.2461
Heat	−0.0220	0.0337	−0.6518
Heat_1	0.0204	0.0340	0.6015
Sigma	1.6725	RSS	1379
R^2	0.4275	*F* statistics	33.4***
Adjusted R^2	0.4147	LLH	−970.224
Panel B: Specific model			
SP500_1	−0.2895***	0.0355	−8.1559
Stock	0.4930***+	0.0276	17.8558
Stock_1	−0.4922***	0.0276	−17.8328
Crude	0.0755***	0.0253	2.9897
Crude_1	−0.0702***	0.0254	−2.7687
Sigma	1.6692	RSS	1393
LLH	−973		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are S&P500 returns (SP500), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Table 4: Regression results for XLE returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	0.4234	1.0080	0.4200
XLE_1	0.0125	0.0373	0.3351
SP500	0.1509*	0.0874	1.7260
SP500_1	1.0003	0.0740	13.5101
Stock	0.0359	0.0695	0.5173
Stock_1	−0.0628	0.0694	−0.9055
NG	0.0260*	0.0145	1.7986
NG_1	−0.0178	0.0448	−0.3977
Gas	0.0895*	0.0458	1.9543
Gas_1	−0.1110	0.0852	−1.3025
Crude	0.0910***	0.0262	3.4710
Crude_1	0.0063	0.0853	0.0741
Heat	0.0940***	0.0453	2.0768
Heat_1	−0.0577	0.0658	−0.8770
Sigma	3.2374	RSS	5146
R^2	0.3679	*F* statistics	21.99**
Adjusted R^2	0.3512	LLH	−1303
Panel B: Specific model			
SP500_1	0.9892***	0.0668	14.8033
Stock_1	−0.0298***	0.0078	−3.8401
Gas	0.2074***	0.0475	4.3628
Gas_1	−0.1746***	0.0478	−3.6508
Crude	0.1110***	0.0467	2.3753
Crude_1	0.0042	0.0877	0.0480
Sigma	3.2476	RSS	5284
LLH	−1309		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are S&P500 returns (SP500), energy ETF returns (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Tables 5-10 report the estimation results for equation (2) for the GCC stock markets. Panels A and B show that there are significant

Table 5: Regression results for UAE stock returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	0.7770	0.9313	0.8343
UAE_1	0.0698*	0.0371	1.8796
SP500	0.1834**	0.0818	2.2426
SP500_1	0.1271	0.0798	1.5919
XLE	0.0279	0.0421	0.6633
XLE_1	0.0142	0.0344	0.4142
Stock	0.0953	0.0639	1.4903
Stock_1	−0.0918	0.0638	−1.4385
NG	−0.0242	0.0412	−0.5876
NG_1	0.0462	0.0413	1.1201
Gas	0.0338	0.0790	0.4280
Gas_1	−0.0855	0.0785	−1.0887
Crude	0.1393*	0.0792	1.7585
Crude_1	−0.0986	0.0784	−1.2582
Heat	0.1166*	0.0601	1.9392
Heat_1	0.1236**	0.0605	2.0421
Sigma	2.9751	RSS	4328
R^2	0.1002	*F* statistics	3.63**
Adjusted R^2	0.0726	LLH	−1259
Panel B: Specific model			
UAE_1	0.0698	0.0371	1.8796
SP500	0.2944	0.0818	3.6008
SP500_1	0.2217	0.0798	2.7768
Crude	0.0987	0.0412	2.3956
Heat	0.0662	0.0321	2.0631
Sigma	3.0018	RSS	4528
LLH	−1270		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on UAE stock market (UAE), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Table 6: Regression results for Kuwait stock returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	0.7165	0.5612	1.2767
Kuwait_1	0.1270***	0.0450	2.8201
SP500	0.1365***	0.0487	2.8005
SP500_1	−0.0067	0.0486	−0.1372
XLE	0.0454*	0.0251	1.8072
XLE_1	−0.0027	0.0208	−0.1293
Stock	0.0407	0.0388	1.0497
Stock_1	−0.0619	0.0388	−1.5945
NG	−0.0221	0.0249	−0.8861
NG_1	0.0284	0.0250	1.1372
Gas	−0.0085	0.0479	−0.1768
Gas_1	−0.0078	0.0475	−0.1644
Crude	0.0636*	0.0358	1.7771
Crude_1	−0.0518	0.0475	−1.0898
Heat	−0.0241	0.0364	−0.6629
Heat_1	0.0379	0.0366	1.0349
Sigma	1.7999	RSS	1584
R^2	0.0761	*F* statistics	2.69**
Adjusted R^2	0.0477	LLH	−1005
Panel B: Specific model			
Kuwait_1	0.1449***	0.0437	3.3158
SP500	0.1198**	0.0484	2.4752
XLE	0.0491**	0.0201	2.4428
Crude	0.0721**	0.0311	2.3195
sigma	1.8161	RSS	1659
LLH	−1017		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on Kuwait stock market (Kuwait), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Table 7: Regression results for Saudi Arabia stock return

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	1.0334	0.9711	1.0642
Saudi_1	0.0620	0.0540	1.1481
SP500	0.1208	0.0614	1.9674
SP500_1	0.0212	0.0770	0.2753
XLE	−0.0355	0.0394	−0.9010
XLE_1	−0.0470	0.0327	−1.4373
Stock	−0.0599	0.0739	−0.8106
Stock_1	0.0290	0.0741	0.3914
NG	−0.0475	0.0486	−0.9774
NG_1	0.0418	0.0483	0.8654
Gas	−0.0749	0.1004	−0.7460
Gas_1	0.0387	0.1013	0.3820
Crude	0.0913	0.0510	1.7898
Crude_1	−0.0635	0.1095	−0.5799
Heat	0.0400	0.0893	0.4479
Heat_1	−0.0052	0.0894	−0.0582
Sigma	2.6844	RSS	2501
R^2	0.043	*F* statistics	1.04
Adjusted R^2	0.0017	LLH	−865
Panel B: Specific model			
SP500	0.1418	0.1418	0.1418
Crude	0.0987	0.0987	0.0987
Sigma	2.6898	RSS	2622
LLH	−874		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on Saudi Arabia stock market (Saudi), S&P500 (SP500), energy ETF (XLE), stock sentiments (Stock), NG sentiments (NG), gasoline sentiments (Gas), crude oil sentiments (Crude), heating oil sentiments (Heat). NG: Natural gas, SE: Standard error

Table 8: Regression results for Oman stock returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	0.1771	0.6591	−0.2686
Oman_1	0.0618	0.0450	1.3720
SP500	0.1618***	0.0573	2.8220
SP500_1	0.0633	0.0567	1.1161
XLE	−0.0085	0.0295	−0.2884
XLE_1	0.0388	0.0244	1.5934
Stock	−0.0590	0.0454	−1.2986
Stock_1	0.0519	0.0454	1.1441
NG	−0.0511*	0.0293	−1.7457
NG_1	0.0559*	0.0293	1.9062
Gas	0.0703	0.0561	1.2516
Gas_1	−0.0590	0.0558	−1.0570
Crude	0.0621*	0.0364	1.7086
Crude_1	0.0254	0.0558	0.4559
Heat	−0.0099	0.0429	−0.2310
Heat_1	0.0030	0.0432	0.0702
Sigma	2.1154	RSS	2188
R^2	0.0313	*F* statistics	1.05
Adjusted R^2	0.0016	LLH	−1087
Panel B: Specific Model			
SP500_1	0.0095*	0.0053	1.79
NG_1	0.0519*	0.0299	1.74
Gas_1	0.081***	0.0317	2.56
Crude	0.0798*	0.0459	1.74
Sigma	2.1133	RSS	2242
LLH	−1093		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on Oman stock market (Saudi), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

first-order autocorrelations suggesting strong momentum in all these markets. In addition, consistent with previous studies, there is

Table 9: Regression results for Qatar stock returns

Variable	Coefficient	SE	t
Panel A: General Unrestricted model			
Constant	0.3135	0.8118	0.3862
Qatar_1	0.0107	0.0452	0.2361
SP500	0.1051**	0.0506	2.0786
SP500_1	0.0046	0.0700	0.0661
XLE	0.0151	0.0364	0.4149
XLE_1	0.0245	0.0300	0.8160
Stock	0.0021	0.0560	0.0380
Stock_1	−0.0073	0.0560	−0.1307
NG	−0.0273	0.0361	−0.7578
NG_1	0.0357	0.0361	0.9899
Gas	0.0959	0.0691	1.3880
Gas_1	−0.1128	0.0687	−1.6418
Crude	0.0519*	0.0294	1.7646
Crude_1	0.0402	0.0686	0.5853
Heat	−0.0654	0.0526	−1.2423
Heat_1	0.0719	0.0530	1.3562
Sigma	2.605	RSS	3318
R^2	0.0257	*F* statistics	0.8594
Adjusted R^2	0.0198	LLH	−1192
Panel B: Specific Model			
SP500	0.1513**	0.0779	1.9426
Crude	0.0578**	0.0286	2.0190
Sigma	2.59	RSS	3408
LLH	−1198		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on Qatar stock market (Qatar), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Table 10: Regression results for Bahrain stock returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	−1.7173	0.3994	−4.2998
Bahrain_1	0.0395	0.0451	0.8776
SP500	0.0695	0.0340	2.0464
SP500_1	0.0558	0.0332	1.6791
XLE	0.0367	0.0174	2.1106
XLE_1	0.0024	0.0146	0.1625
Stock	0.0326	0.0268	1.2159
Stock_1	−0.0138	0.0268	−0.5145
NG	−0.0182	0.0173	−1.0535
NG_1	0.0277	0.0173	1.6011
Gas	0.0502	0.0331	1.5166
Gas_1	−0.0481	0.0329	−1.4595
Crude	0.0599	0.0333	1.7995
Crude_1	0.0159	0.0329	0.4838
Heat	0.0525	0.0253	2.0761
Heat_1	0.0461	0.0254	1.8149
Sigma	1.2487	RSS	762
R^2	0.1374	*F* statistics	5.19**
Adjusted R^2	0.1109	LLH	−821
Panel B: Specific model			
Constant	−1.8169	0.3773	−4.8156
SP500	0.0711	0.0257	2.7657
XLE	0.0563	0.0140	4.0181
Stock	0.0230	0.0058	3.9738
NG	0.0108	0.0036	2.9776
Crude	0.0388	0.0219	1.7690
Sigma	1.2547	RSS	787
LLH	−828		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on Bahrain stock market (Bahrain), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

a significant positive impact of S&P 500 returns to varying degrees of strength in all these international markets. The highest impact of the S&P 500 is on the UAE stock market followed by Saudi Arabia and Kuwait. However, unlike the case of the U.S. stock market, there is an insignificant impact of the stock sentiments on all these GCC markets. These markets seem to be mainly impacted by the U.S. stock market but not by the stock sentiments of U.S. professional investors.

As far as the energy market sentiments are concerned, the impact is significant for crude oil in all these markets. Also, the magnitude of these impacts varies by country as crude oil sentiments have a greater impact on UAE and Saudi Arabia and a relatively lower effect on Kuwait, Qatar, Oman, and Bahrain. Interestingly, the impact of the U.S. professional investors' expectations on energy has a greater impact on UAE and Saudi Arabia compared to those on the U.S.-based energy companies. In addition, we also find a significant impact on other categories of energy sentiments. For example, heating oil sentiments significantly impact XLE, and the UAE stock market while natural gas sentiments impact XLE, Oman, and Bahrain markets.

Overall, the results suggest that crude oil significantly impacts GCC markets, especially UAE and Saudi Arabia to a greater extent that U.S. energy companies' returns and the overall S&P 500.

Our next research question is to analyze the relative impact of four distinct categories of energy sentiments and stock sentiments on ESG investments in the U.S. and the GCC. Accordingly, equation (3) is estimated and the results of general unrestricted and specific models are reported in Tables 11 through 14 (panels A and B). The USA ESG index displays a significant momentum or first-order autocorrelations and also is significantly impacted by the stock market sentiments. The stock sentiments have a significant impact on both S&P 500 and S&P ESG probably due to the fact that some of the same companies are included in both these indexes. Moreover, ESG investments in the US are significantly negatively impacted by XLE and energy sentiments. This is in contrast to our earlier results of significant positive effects of energy sentiments on the S&P 500. In the case of the US ESG index, the negative impact is maximum for the crude oil sentiments followed by natural gas and energy companies returns.

The regression results for the UAE ESG index (Table 12) and MENA ESG index (Table 13) are similar in that they both display significant first-order autocorrelations. In addition, they are significantly negatively impacted by U.S. energy companies' returns and energy sentiments, mainly the crude oil sentiments. The impact of the crude oil sentiments is higher than those of XLE. In addition, the impact of crude oil sentiments on UAE ESG investments is much higher than those observed in the case of MENA ESG and the U.S ESG indexes. Lastly, in the case of the Egypt ESG index as shown in Table 14, there is only evidence of momentum and insignificant impact of all the explanatory variables. Overall, crude oil sentiments and energy stocks have negative effects on ESG investments in the U.S., UAE, and the MENA region.

Table 11: Regression results for USA ESG index return

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	2.4056***	0.5130	4.6893
SP_ESG_1	0.1489***	0.0442	3.3679
SP500	−0.0653	0.0437	−1.4965
SP500_1	−0.0380	0.0430	−0.8839
XLE	0.0203	0.0225	0.9028
XLE_1	−0.0409**	0.0186	−2.1978
Stock	0.0807*	0.0347	2.3293
Stock_1	−0.0400	0.0345	−1.1596
NG	−0.0543***	0.0224	−2.4302
NG_1	0.0123	0.0224	0.5505
Gas	−0.0793*	0.0427	−1.8572
Gas_1	−0.0656	0.0424	−1.5464
Crude	−0.0809*	0.0432	−1.8708
Crude_1	0.0757*	0.0426	1.7755
Heat	0.0070	0.0326	0.2152
Heat_1	−0.0227	0.0328	−0.6913
Sigma	1.6063	RSS	1259
R^2	0.1433	*F* statistics	5.44**
Adjusted R^2	0.117	LLH	−949
Panel B: Specific model			
XLE	−0.0303***	0.0122	−2.4719
NG	−0.0436*	0.0216	−2.0190
Crude	−0.0919*	0.0457	−2.0090
Sigma	1.6109	RSS	1297
LLH	−953		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on USA ESG index (SP_ESG), S&P500 (SP500), energy ETF (XLE), stock sentiments (Stock), NG sentiments (NG), gasoline sentiments (Gas), crude oil sentiments (Crude), heating oil sentiments (Heat). NG: Natural gas, SE: Standard error

Table 12: Regression results for UAE ESG index returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	1.1840	0.8028	1.4748
UAE_ESG_1	0.3163***	0.0528	5.9935
SP500	−0.2030**	0.0645	−3.1472
SP500_1	−0.0218	0.0619	−0.3517
XLE	−0.2089***	0.0314	−6.6648
XLE_1	0.0074	0.0261	0.2827
Stock	0.0556	0.0597	0.9307
Stock_1	−0.0402	0.0597	−0.6741
NG	0.0601	0.0380	1.5811
NG_1	−0.0557	0.0378	−1.4745
Gas	−0.0549	0.0799	−0.6867
Gas_1	0.0596	0.0805	0.7411
Crude	−0.1933**	0.0874	−2.2120
Crude_1	−0.1512*	0.0868	−1.7406
Heat	0.0945	0.0704	1.3429
Heat_1	−0.0929	0.0707	−1.3149
Sigma	2.0725	RSS	1378
R^2	0.1795	*F* statistics	2.68**
Adjusted R^2	0.1411	LLH	−716
Panel B: Specific model			
UAE_ESG_1	0.3789***	0.0639	5.9293
XLE	−0.2275***	0.0645	−3.5270
Crude	−0.1720**	0.0820	−2.0969
Sigma	2.0937	RSS	1473
LLH	−727		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on UAE ESG index (UAE_ESG), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

Table 13: Regression results for MENA ESG index returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	1.4242***	0.5051	2.8197
Arab_ESG_1	0.2891***	0.0528	5.4763
SP500	0.0159	0.0196	0.8150
SP500_1	−0.0075	0.0163	−0.4602
XLE	−0.0802*	0.0398	−2.0161
XLE_1	−0.1187***	0.0381	−3.1140
Stock	0.0620	0.0370	1.6749
Stock_1	−0.0466	0.0370	−1.2593
NG	−0.0049	0.0237	−0.2080
NG_1	0.0078	0.0236	0.3298
Gas	0.0071	0.0498	0.1416
Gas_1	−0.0193	0.0502	−0.3842
Crude	0.0562	0.0544	1.0325
Crude_1	−0.0941*	0.0542	−1.7357
Heat	−0.0346	0.0438	−0.7902
Heat_1	0.0083	0.0440	0.1894
Sigma	1.2916	RSS	535
R^2	0.1906	*F* statistics	5.03**
Adjusted R^2	0.1527	LLH	−556
Panel B: Specific model			
Arab_ESG_1	0.2891***	0.0528	5.4763
XLE	−0.0802**	0.0398	−2.0161
Crude	−0.0862*	0.0454	−1.8971
Sigma	1.3134	RSS	579
LLH	−569		

*, ** and ***Significance at 10%, 5% and 1% respectively. The variables are returns on MENA ESG index (Arab_ESG), S&P500 (SP500), energy ETF (XLE), stock sentiments (Stock), NG sentiments (NG), gasoline sentiments (Gas), crude oil sentiments (Crude), heating oil sentiments (Heat). NG: Natural gas, SE: Standard error

Table 14: Regression results for Egypt ESG index returns

Variable	Coefficient	SE	t
Panel A: General unrestricted model			
Constant	17.2771	18.4600	0.9359
Egypt_ESG_1	0.2681***	0.0539	4.9763
SP500	0.4973	1.4880	0.3342
SP500_1	2.6841	1.4190	1.8915
XLE	−0.8047	0.7321	−1.0992
XLE_1	−0.5441	0.6082	−0.8947
Stock	−0.5346	1.3800	−0.3874
Stock_1	0.3486	1.3840	0.2519
NG	0.1740	0.8893	0.1957
NG_1	−0.2818	0.8835	−0.3189
Gas	0.9880	1.8630	0.5303
Gas_1	0.0943	1.8790	0.0502
Crude	−0.0998	2.0370	−0.0490
Crude_1	−1.6935	2.0280	−0.8351
Heat	−1.0415	1.6390	−0.6354
Heat_1	1.9040	1.6470	1.1561
Sigma	1.2916	RSS	535
R^2	0.1906	*F* statistics	5.03**
Adjusted R^2	0.1527	LLH	−556
Panel B: Specific model			
Egypt_ESG_1	0.2643***	0.0527	5.0152
sigma	47.9851	RSS	771359
LLH	−1782		

*, ** and *** represent significance at 10%, 5% and 1% respectively. The variables are returns on Egypt ESG index (Egypt_ESG), S&P500 (SP500), energy ETF (XLE), stock sentiments (stock), NG sentiments (NG), gasoline sentiments (gas), crude oil sentiments (crude), heating oil sentiments (heat). NG: Natural gas, SE: Standard error

5. CONCLUSION

In this study, we provide empirical evidence on the relative impact of the energy sentiments on the stock and ESG indexes in the U.S. and GCC economies. Specifically, we study movements in four distinct categories of energy-based sentiments (natural gas, crude oil, RBOB gasoline, and heating oil) displayed by professional analysts and independent advisors and investigate their impact on ESG investments and stock returns in the U.S. and GCC economies. We employ the recently developed automatic time series forecasting methodology *Autometrics* to examine the postulated relationships. Our results suggest that there is a significant negative impact of stock market sentiments and a positive impact of energy sentiments on the S&P 500 returns. However, when we examine the U.S. energy companies' returns, there are significant effects of only energy market sentiments (mainly crude oil and RBOB gasoline) while no effect of stock market sentiments. Also, the impact of the energy market sentiments on energy companies is much higher than those on the S&P 500. Similarly, in the case of the GCC stock markets, there are significant impacts of the crude oil sentiments of varying degrees of strength with greater impact observed in UAE and Saudi Arabia. Moreover, these effects are of greater magnitude than those observed in the U.S. stock market. UAE and Saudi Arabia are affected to a greater degree than other GCC markets and even the U.S. energy companies' returns. We also find small but significant effects of heating oil and natural gas sentiments in some of the GCC stock markets.

Most importantly, there are significant effects of energy sentiments (mainly crude oil) on ESG investments in the U.S., UAE, and MENA region. However, unlike the case of stock markets, where the impact of energy sentiments was positive, its effect on ESG investments is negative in all cases. The underlying trade links with the U.S. and the economic fundamentals may explain the differences in the transmission patterns of the energy sentiments on ESG investments and stock market returns in the GCC countries. The findings can also be linked to differences in the speed of information processing by international investors.

These results are consistent with arguments provided in behavioral finance studies that investors seem to prefer bigger profits over social returns during bullishness and step back from social investing when better investment opportunities are available. Also, ESG investing may be preferred during bearishness by utilitarian investors to generate abnormal returns during such lean periods. We argue that in addition to the U.S. market movements, the U.S. energy market-based sentiment is an additional risk factor that is priced in international markets, especially ESG-based assets. The results have important implications for investors who can improve their portfolio performances by considering the stability and volatility in such risk factors as determinants of security prices, especially ESG investments.

The negative effect of the crude oil sentiments on the ESG investments in the U.S. and the GCC region suggests that good news about the energy sector may be a bad news for ESG investing in both U.S. and the GCC. Investors seem to prefer bigger profits over social returns during bullishness and step back from social investing when better investment opportunities are available. ESG investing might be preferred during bearishness either for social reasons or to generate abnormal returns during such lean periods. These findings are also consistent with stockholder choice - investors tend to leave companies that do not meet earning expectations, especially during good times.

Another point is the theory that investors buy stocks that they are knowledgeable about and that when companies invest in ESG, shareholders are not knowledgeable as to the costs and future returns of such outlays and move to pure-play stocks.

Future research on an investigation of the differences in earnings purely due to the ESG versus core business could strengthen these conclusions. In addition, an analysis of how ESG factors impact individual energy companies' returns internationally could shed more light on the relevance of sustainability in valuations.

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