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Article

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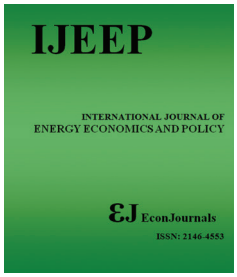
International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Babu, Manivannan/Lourdesraj, A. Antony et. al. (2022). Effect of COVID-19 pandemic on NSE Nifty energy index. In: International Journal of Energy Economics and Policy 12 (4), S. 141 - 145. https://econjournals.com/index.php/ijeep/article/download/13171/6829/30751. doi:10.32479/ijeep.13171.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2022, 12(4), 141-145.

Effect of COVID-19 Pandemic on NSE Nifty Energy Index

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Received: 18 March 2022 **Accepted:** 11 June 2022 **DOI:** https://doi.org/10.32479/ijeep.13171

ABSTRACT

The research intends to assess the efficiency of NSE Energy Index-listed firms throughout the COVID-19 before and post pandemic phases, which run from 2019 to 2021. The primary goal of this article was to examine the price movement of corporations in the petroleum, gas, and electricity sectors by employing statistical methods such as descriptive statistics, ADF, and the GARCH (1,1) model, during the period of study. When comparing the post-COVID-19 pandemic era to the pre-COVID-19 pandemic period, certain firms experienced excessive volatility. The energy market's investor sentiment was significantly higher on the tail events, suggesting that anxious investors raced to put options and paid an exorbitant premium to shield them against unprecedented danger in the energy market.

Keywords: COVID-19, NIFTY Energy, GARCH (1,1)
JEL Classifications: B26; F44; G15; Q43

1. INTRODUCTION

The study examined the impact of COVID-19 on the energy sector stock market price movement, particularly in the Indian context. According to the Ministry of New and Renewable Energy's vision, statement, India has the potential to produce novel and renewable energy techniques, methods, equipment, components, subsystems, commodities, and services that fulfil worldwide requirements, norms, and performance characteristics in order to make the country a net foreign exchange earner in the sector and to deploy such indigenously designed or produced goods and services in support of the national goal of energy security. According to the National Institution for Transforming India Aayog, the government could deliver high-quality policy support to all stakeholders in order to make India more energy secure. Its goal is to increase investment in order to develop an efficient, sustainable, and clean energy system. It uses aggressive measures to reduce energy imports, ensure an alternate energy source and improve domestic supply. It aims to improve energy infrastructure and address cross-sectoral concerns. The policy framework has been designed to ensure that energy is delivered through efficient markets, thereby improving India's competitiveness and spurring economic progress. Kazemilari et al. (2017) the renewable energy sector has grown rapidly in recent years. Sinha (2015) during the period 2008-2014, the Indian financial market experienced highs and lows, with the SENSEX reaching a high in April 2014, after reaching a low in March 2009. The globe was in the grip of an economic crisis in 2008, and India created its first commercial energy trading system, the India Energy Exchange.

Utility trading has had a huge influence on Indian growth patterns by allowing firms to get electricity at a cheaper cost than previously. The increase of the SENSEX, following the financial crisis, was obvious due to the growth of Indian firms and the movement of utility costs as well as the currency rate. The volatility of the currency rate, crude oil, and gas prices had a substantial influence on developing-country financial markets. Ahmad et al. (2018) found that clean energy stocks appeared to be very volatile, making a correct understanding of how to hedge their risks critical for getting portfolio

diversification advantages and the stability of clean energy stock investments. Investments in clean energy stocks produced positive environmental and social outcomes, which may help ensure a certain degree of sustainability. But clean energy shares appeared to be very volatile, making it difficult to manage their risks, critical for getting portfolio diversification advantages. According to SEBI press reports, the financial markets were particularly turbulent in March 2020. As a result of market uncertainty and the associated concern of a financial crisis caused by the COVID-19 pandemic problem, SEBI introduced remedial measures on both the BSE and the NSE, such as an adequate risk management framework. Anxiety and misunderstanding of investing could influence investors. Trypolska et al. (2021) The COVID-19 outbreak has exposed the present global energy system's flaws, its reliance on fossil fuels and massive energy access issues, which have a detrimental impact on health care facilities, water distribution, communication, and other important services. While the energy business has suffered greatly as a result of the crisis, the renewable energy sector has been reported to be more robust. Investing in the energy transition would aid the economy's recovery, create a varied range of new jobs, strengthen the health sector, and prevent the climate crisis.

Public money and assistance are critical for encouraging private investment and it should be used wisely for recovery and improvement through good investment regulation and financing (IRENA). Based on the Business Standard report, Pillay claims that a large reduction in electricity usage was reported, ranging from 20% to 40%. In contrast, this downward tendency began to reverse in May 2020. According to the Economic Times, in March and April, India's electricity consumption fell by 9.24% and 22.75%, respectively, but this decline slowed to 14.16% in May. The volatility spillover between major Asian oil exporting and importing countries, as well as stock markets and crude oil returns, were investigated (Ashfaq et al., 2019). The model was chosen from a set of multivariate GARCH models. Shirodkar and Guntur (2021) analysed the influence of Stock Futures on India's underlying Energy Sector Stocks using the AR (1)-GARCH (1,1) model, with structural breakdowns. Despite the fact that the impacts of derivatives trading on cash market volatility were experimentally explored in two ways: by examining Cash Market Volatilities during the Pre- and Post-Derivatives trading periods, the study's findings from a restricted sample of Energy sector shares were mixed. However, the great majority of energy sector shares showed signs of a drop in unconditional volatility. According to the study's findings, Stock futures trading were not always linked to the volatility of the underlying Energy sector companies. By analysing the earlier studies, a gap was identified in the Indian energy sector stock price volatility movement, during in the pre and post COVID-19 pandemic periods. Hence, present study to investigate the effect of COVID-19 on NSE NIFTY Energy Index listed companies, during the study period. For the purpose of achieving objectives two hypothesis namely NH01: There is no stationarity of daily prices of NSE NIFTY Energy Index listed companies during the pre and post COVID-19 pandemic period, and, NH02: There is no significant volatility in daily returns of NSEs NIFTY Energy Index listed companies, during the pre and post COVID-19 pandemic periods was developed and tested.

2. METHODOLOGY

According to a WHO press release, China reported a cluster of COVID-2019 cases in Wuhan, Hubei Province, on December 31, 2019, and a novel coronavirus was eventually detected. The study examined stock price movement during the pre and post COVID-19 periods. The NSE NIFTY Energy Index is comprised of 10 firms, of which eight were chosen for the research based on data availability. The NSE's official website was used to collect the daily closing prices of sample firms from 2018 to 2019 (24 months for the pre-COVID-19 pandemic period) and 2020-2021. (24 months for the post-COVID-19 pandemic period).

2.1. Assessment of ADF Test

The ADF test estimates the following regression to determine if a time series is stationary or not:

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_t \Delta y_{t-1} + ... + \delta_p \Delta y_{t-p} + \in_t \quad (1)$$

Δ *1st operator*
α *Constant term*
β *Time trend*
p *Lag term*
ϵ_t *Error term*

The null hypothesis examined non-stationary data. The null hypothesis was rejected for this test because the P<0.05.

2.2. Assessment of GARCH (1,1) Model

The following equation was used to estimate stock price volatility:

$$\sigma_t^2 = \omega + \alpha \in_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (2)$$

σ_t^2 *Conditional volatility*
ω *Constant term*
$\in_{t-1}^2$ *ARCH effect term*

σ_{t-1}^2 *GARCH effect term*
α *and* β *Coefficients term.*

3. RESULTS AND DISCUSSION

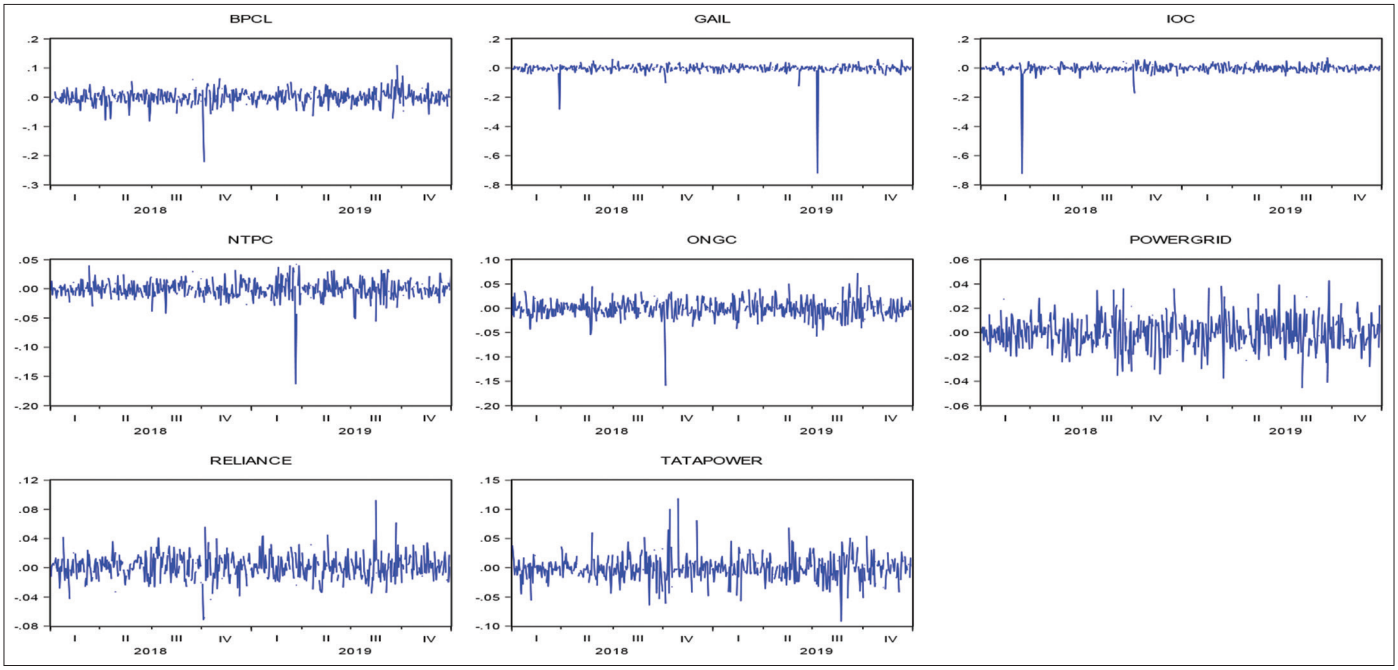
Table 1 and Figures 1 and 2, discusses the results of descriptive statistics, in the nifty energy sector during the pre and post COVID-19 pandemic periods. The highest mean was recorded by Reliance Industries Ltd and the highest standard deviation was reported by GAIL (India) Ltd during 2018 and 2019. The lowest mean value was recorded by Bharat Petroleum Corporation Ltd, during both pre and post COVID-19 pandemic periods. In the case of skewness, five companies were negatively skewed while three companies were positively skewed, during 2018 and 2019. The highest mean was recorded by NTPC Ltd

Table 1: Results of descriptive statistics analysis for the pre and post COVID-19 pandemic period in nifty energy index

COMPANIES	BPCL	GAIL	IOC	NTPC	ONGC	POWERGRID	RELIANCE	TATAPOWER
Statistics	**2018-2019 (for the pre-COVID-19 pandemic period)**							
Mean	−0.000106	−0.002887	−0.002301	−0.000808	−0.000847	−0.000105	0.001012	−0.001026
Median	0.000295	0.001148	0.000308	−0.000743	−0.001389	−0.000263	0.000519	−0.001220
Maximum	0.110091	0.062767	0.073434	0.040930	0.072152	0.042658	0.092521	0.118911
Minimum	−0.221710	−0.719645	−0.721257	−0.162797	−0.159045	−0.045672	−0.071227	−0.091567
Std. Dev.	0.026003	0.039849	0.039562	0.015748	0.018742	0.013063	0.016789	0.021463
Skewness	−1.466333	−12.62840	−12.42709	−2.220645	−1.075262	0.106186	0.239440	0.519259
Kurtosis	15.05418	219.3177	224.1753	25.53398	13.20957	3.777836	5.764824	6.930306
Jarque-Bera	3148.614	970364.8	1013429.	10791.88	2227.094	13.30059	161.0803	338.0909
Statistics	**2020-2021 (for the pre-COVID-19 pandemic period)**							
Mean	−0.000486	0.000130	−0.000237	8.79E-05	0.000201	0.000143	0.000895	0.002727
Median	−0.001340	0.000161	−0.000799	−0.000607	0.001600	−0.000726	0.001597	0.001474
Maximum	0.142725	0.152090	0.068392	0.075158	0.169822	0.066384	0.137307	0.144866
Minimum	−0.165568	−0.123948	−0.115096	−0.089594	−0.180526	−0.309398	−0.141032	−0.121392
Std. Dev.	0.026437	0.025569	0.020261	0.020959	0.029599	0.024570	0.023761	0.030000
Skewness	−0.602777	0.119328	−0.512764	−0.035746	−0.442480	−4.076640	−0.017500	0.105831
Kurtosis	12.10504	7.096998	6.440958	4.966919	11.87979	53.45171	11.71344	6.100201
Jarque-Bera	1757.400	350.8822	268.5812	80.70586	1659.038	54413.55	1581.775	201.1676

Source: Computed in E-views 7

Figure 1: Line graph - Daily share price returns of NSE nifty energy index listed companies for the pre-COVID-19 pandemic period.

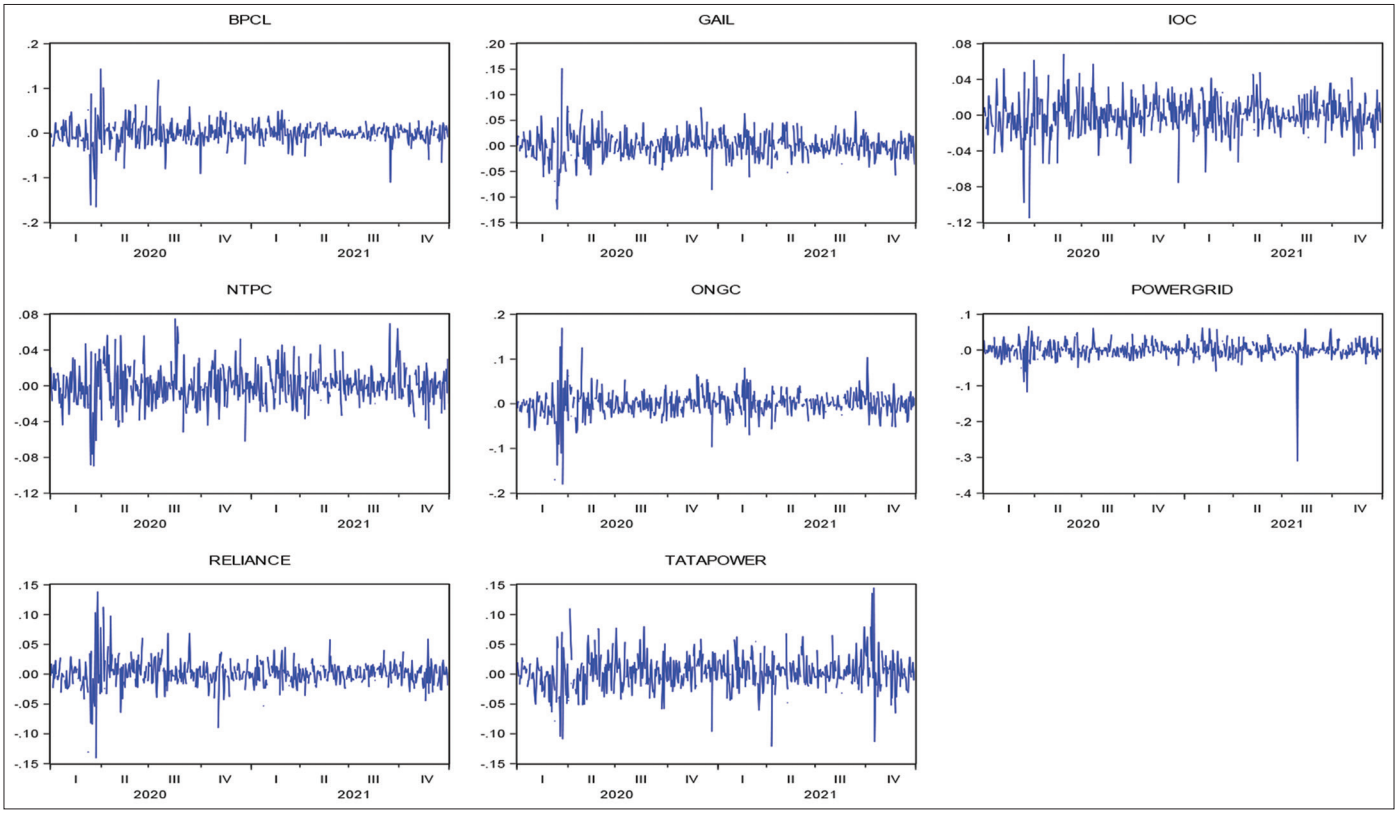


Source: Computed in E-views 7

and the highest standard deviation was displayed by Tata Power Co. Ltd during 2018 and 2019. In the case of skewness, sex companies were negatively skewed, while two companies were positively skewed during 2020 and 2021. All the companies were leptokurtic in nature. Jarque-Bera test results indicated normal distribution for all the sample companies during the study period.

Results of GARCH (1,1) for NSE Nifty Energy Index selected companies, during the pre and post COVID-19 pandemic periods, are displayed in Tables 2 and 3. Throughout the research period, Oil and Natural Gas Corporation Ltd recorded relatively low volatility in its stock price during the years 2018 and 2019. But the volatility of Tata Power Co. Ltd stock price was quite high in 2018 and 2019. NTPC Ltd exhibited relatively little volatility in its stock price over the study period, in the NIFTY Energy index between 2020 and 2021. But the Power Grid Corporation of India Ltd stock price had witnessed unusually significant volatility in 2020 and 2021. During the pre and post COVID-19 pandemic periods in the NIFTY Energy index, Oil and Natural Gas Corporation Ltd had reported the lowest stock price volatility of any company, during the period 2018 and 2019. During the pre and post COVID-19 pandemic phases in the NIFTY Energy index, Power Grid Corporation of India Ltd

Figure 2: Line graph - Daily share price returns of NSE nifty energy index listed companies for the post-COVID-19 pandemic period.



Source: Computed in E-views 7

Table 2: Results of GARCH (1,1) model and results of augmented dickey fuller test pre COVID-19 pandemic period in nifty energy index

GARCH (1,1) Models			Augmented Dickey Fuller test	
Variable			Test critical values	
RESID (−1) ^2 (α=ARCH effect)			1% level	−3.443469
GARCH (−1) (β=GARCH effect)			5% level	−2.867219
			10% level	−2.569857
			Prob	0.0000
Company	**Coefficient**	**α+β**	**t-Statistic**	
BPCL (Bharat Petroleum Corporation Ltd.)	0.312552	0.570964	−19.80168	
	0.258412			
GAIL (GAIL (India) Ltd.)	−0.004628	0.580608	−21.45149	
	0.585236			
IOC (Indian Oil Corporation Ltd.)	0.153366	0.880218	−20.61804	
	0.726852			
NTPC (NTPC Ltd.)	0.167298	0.930494	−22.33227	
	0.763196			
ONGC (Oil and Natural Gas Corporation Ltd.)	0.340423	0.472936	−21.04595	
	0.132513			
POWERGRID (Power Grid Corporation of India Ltd.)	0.114432	0.718552	−15.82763	
	0.604120			
RELIANCE (Reliance Industries Ltd.)	0.150112	0.806876	−20.40543	
	0.656764			
TATAPOWER (Tata Power Co. Ltd.)	0.052373	0.96474	−22.01349	
	0.912371			

had experienced the most volatility in its stock price, among all firms, in the period 2020 and 2021. Observing the pre and post COVID-19 pandemic periods in the NIFTY Energy index, the majority of the sample firms reported little volatility in their stock prices in 2018 and 2019. But the majority of the chosen companies showed considerable volatility in their stock values, in 2020 and 2021. As a result, the study rejected the null hypothesis NH02: "*There is no significant volatility in daily*

Table 3: Results of GARCH (1,1) model and results of augmented dickey fuller test post COVID-19 pandemic period in nifty energy index

GARCH (1,1) Models			Augmented Dickey Fuller test	
Variable			Test critical values	
RESID (−1) ^2 (α=ARCH effect)			1% level	−3.443228
GARCH (−1) (β=GARCH effect)			5% level	−2.867112
			10% level	−2.569800
			Prob	0.0000
Company	**Coefficient**	**α+β**	**t-Statistic**	
BPCL (Bharat Petroleum Corporation Ltd.)	0.185437	0.91941	−23.33891	
	0.733973			
GAIL (GAIL (India) Ltd.)	0.066884	0.964647	−20.82896	
	0.897763			
IOC (Indian Oil Corporation Ltd.)	0.064067	0.959503	−22.06578	
	0.895436			
NTPC (NTPC Ltd.)	0.069294	0.90396	−21.66021	
	0.834666			
ONGC (Oil and Natural Gas Corporation Ltd.)	0.098068	0.959464	−9.077286	
	0.861396			
POWERGRID (Power Grid Corporation of India Ltd.)	−0.005461	0.977117	−23.35243	
	0.982578			
RELIANCE (Reliance Industries Ltd.)	0.131572	0.939397	−24.53716	
	0.807825			
TATAPOWER (Tata Power Co. Ltd.)	0.089981	0.904768	−21.91250	
	0.814787			

returns of NSE NIFTY Energy Index listed companies the pre and post COVID-19 pandemic period."

4. CONCLUSION

The study examined the stock price movement of selected companies in the NIFTY Energy index, during the pre and post COVID-19 pandemic periods. The majority of sample companies, during the period 2018 and 2019 had experienced low volatility in their stock prices, with Oil and Natural Gas Corporation Ltd, recording very low volatility followed by Bharat Petroleum Corporation Ltd and GAIL (India) Ltd. The majority of sample companies, during the period 2020 and 2021, had reported high volatility in their stock prices. Power Grid Corporation of India Ltd. had reported the highest volatility in its stock price, among all the companies, during the period 2020 and 2021. At the same time, during the post-COVID-19 periods of 2020 and 2021, the majority of sample companies, experienced very high volatility in their stock prices. At the same time, during the pre-COVID-19 periods of 2018 and 2019, the majority of sample companies, experienced very low volatility in their stock prices. The NSE NIFTY Energy index sample companies were highly influenced by the stock price volatility during the post-COVID-19 pandemic compared to the pre-COVID-19 pandemic period. In short, COVID-19 had exercised significant impact on the NSE NIFTY Energy index.

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