Investigating the Impact of the First and Second Waves of the COVID - 19 Pandemic on the Indian Stock and Commodity Markets : An ARDL Analysis of Gold, Oil, and Stock Market Prices

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Abstract

COVID - 19 and its consequential impact on the economic fundamentals are highly discussed topics among the researchers. However, there is a literature void in the context of the Indian commodity and financial markets. To bridge this gap, the current study tried to investigate the influence of COVID -19 on the Indian commodity and financial markets by taking the data of the National Stock Exchange of India representing financial markets and the gold prices & oil prices representing commodity markets. The data were segregated into three-time lines, that is, whole period (April 1, 2020 – April 10, 2021), first wave (June 6 – September 30, 2020), and second-wave (February 2 – April 10, 2021) and to investigate the above relationship, the autoregressive distribution lag (ARDL) approach was employed. The findings suggested that during the whole period of the study and the first wave, coronavirus spread had a significant negative influence on the oil prices and the stock market. However, the impact was significant and positive for gold prices. The Wald test also confirmed a long-run cointegration among the variables in both periods of the study. In the context of the second wave, the study contradicted the above findings and concluded that during the second wave, the spread of COVID-19 cases had a positive impact on oil prices and stock markets; whereas, there was a negative impact on the gold prices. The findings highlighted the issue of uncertainty of pandemic, symmetry, demand theory and also highlighted the inverse relationship of gold and equity instruments, which will help in making appropriate policy-oriented decisions.

Keywords : **pandemic, COVID-19, financial markets, commodity markets, ARDL**

JEL Classification Codes : CO1, G11, G12, F32

Paper Submission Date : April 15, 2021 ; Paper sent back for Revision : November 15, 2021 ; Paper Acceptance Date : November 28, 2021 ; Paper Published Online : December 15, 2021

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DOI : https://doi.org/10.17010/ijf/2021/v15i12/167306

The financial and commodities markets are often subject to price variations due to some rare economic conditions (Sharif et al., 2020). In addition to the economic conditions, natural phenomena like pandemics also create volatilities in the commodity and financial markets (Ahmed et al., 2021). The novel coronavirus is an example of a pandemic, which has created havoc in the international financial and commodity markets. This novel coronavirus is also termed COVID-19, which started spreading at the end of December 2020. The first novel coronavirus case was registered in China on January 3, 2020, and on January 30, 2020, the World Health Organization (WHO) released its global alert (World Health Organization, 2020a), and on March 30, 2020, WHO declared it a pandemic (World Health Organization, 2020b). Initially, wearing a face mask and social distancing were suggested as the procedures to control the spread of COVID-19 infection (WHO, 2020a). Later on, due to an increase in the cases globally, most of the countries started enforcing lockdowns. These lockdowns worldwide affected both the economic, psychological, and social well-being of individuals and firms.

Previous literature has advocated that unexpected events like terrorist attacks, natural calamities, and pandemics severely negatively influenced the countries' financial and economic structure (Nippani & Washer, 2004). Such events create panic among individuals in addition to disturbing the supply and demand chain of goods, money, and labor (Kollias et al., 2011). For example, in the United States, the stock market observed a circuit breaker four times in 10 days in March because of the uncertainties caused by this virus. Further, the other international stock markets also witnessed a sudden fall due to the coronavirus spread (Wang, 2020). The commodity markets recorded unexpected volatilities, as did the stock market performance. The oil prices fell to negative in April 2020 for the first time due to low market demand. In addition to the oil prices, gold prices also witnessed unexpected movements, from the lowest in March 2020 to the highest in May 2020 (Broadstock & Zhang, 2019). The previous literature indicated that investors contemplated financial ratios as the parameter for making investment choices in stock and commodity markets (Kanojia & Malhotra, 2021). However, sometimes, due to unforeseen events like pandemics, financial information turns out to be superfluous in evaluating the market responses (Dumontier & Raffournier, 2002). This uncertainty in the financial market encouraged us to investigate the influence of COVID-19 on the Indian stock market & commodity markets.

In Kerala, the first COVID-19 case was reported in January 2020. According to the Health Ministry of India, on November 20, 2021, India confirmed 34,499,925 cases of COVID-19; whereas, active cases were 124,868, and the total death toll was 465,349. Since March 2020, the Indian government has put into effect five lockdowns; the first three were rigorous and complete lockdowns; whereas, the other two were more flexible. These lockdowns during the first wave of coronavirus helped in controlling the spread of the pandemic. However, these stringent lockdowns also impacted the Indian economic structure. To revive the economic growth, at the end of November 2020, the Indian government partially uplifted the COVID-19 induced restrictions. The Indian government, together with the government of other countries, successfully launched the COVID-19 vaccine to fight the spread of the novel coronavirus. In India, after reaching the peak of coronavirus infection in September 2020, the cases started subsiding. However, due to the lack of self-restriction and mutation in the virus, globally, the COVID-19 infections again started showing an upward trend.

Thus, considering the variation in infection, the Health Ministry of India has categorized the spread of novel coronavirus into different waves. The first wave was from June 06 – September 30, 2020, and the second wave started from February 2, 2021, onwards. Since the onset of this pandemic globally, most countries have witnessed severe turbulence in their financial and commodity markets, and India is no exception. The sluggish economic growth in India during the first wave of COVID-19 and the uncertainties of the second wave encouraged us to evaluate and compare the direct influence of COVID-19 cases on India's financial and commodity markets during both the waves of coronavirus spread.

The reason for including India is justified in the following ways. First, India is one of the most populated countries in the world after China, thus more susceptible to the pandemic (Syed & Tripathi, 2020). Second, India is

one of the emerging economies of the world, and it has sufficient investment and market opportunities, and therefore, the economic impact of COVID-19 will be much severe in India compared to other countries. Third, due to the market potential, the repercussion of lockdown-induced slow demand will be more threatful to India's economic and financial fundamentals. Fourth, in comparison to population growth, the health care infrastructure is not so adequate in India. Thus, the chances of uncertainties and infection are high, thereby negatively impacting foreign and domestic investments. Last, during the second wave, India again witnessed a tremendous rise in infections. Hence, studying the financial and market reactions during this time will bring insightful findings.

To fulfill the objectives, we performed the study based on three coronavirus timelines: the whole period from April 1, 2020 – April 10, 2021 ; the first phase from June 6 – September 30, 2020, and the second phase from February 2, 2021 – April 10, 2021. We employed autoregressive distribution lag (ARDL) methods to compare and analyze the influence of COVID-19 cases on India's financial and commodity markets. The findings suggest that coronavirus-induced infections had a significant and negative influence on the Indian stock market and oil prices during the whole period and the first phase of the study; whereas, the impact was positive in terms of gold prices. The findings also suggest that the influence subdued in the second phase of coronavirus infection, which witnessed a positive impact on oil and stock prices; whereas, there was a negative effect on the gold prices.

This study adds to the extant literature in the following aspects. In the backdrop of economic and financial consequences, COVID-19 has become an emerging topic for researchers to explore. However, as per our knowledge, there is no such conclusive study regarding the impact of COVID-19 in India that has segregated the performance of the financial and commodity markets into three phases, thus providing an appropriate literature gap. The other reasons that justify the novelty and contribution to the previous literature are as follows: First, the present study empirically investigates the current effects of COVID-19 on the Indian commodity and financial markets by conducting a comparative analysis between the two phases of coronavirus infection. Second, this study includes the two most essential commodities (gold and oil), together with the stock market index, which is not discussed comprehensively in previous studies. Last, this study evaluates the symmetric responses by employing the ARDL estimation technique, thus providing more robust and conclusive findings.

Theoretical Background and Literature Review

This section highlights the details of extant literature available on the relationship between pandemics and the financial and commodity markets. Further, this section also discusses the theoretical framework of the study.

There are scant studies that have discussed the influence of COVID-19 infection on the financial and commodity markets. Singh et al. (2020) examined the effect of COVID - 19 on the stock market performance of G20 countries using event-based analysis. The findings advocated that there was a significant relationship between coronavirus spread and abnormal returns. The study also suggested similar findings for both developed and developing countries. Naseem et al. (2021) investigated the US prices and stock market volatility and reported volatility in the US stock market's performance. The timing of the break in the United States's stock market performance matched with the coronavirus outbreak, which confirmed an affiliation between COVID-19 spread and stock market volatility. Mirza et al. (2020) performed a similar study on the impact of COVID-19 and the performance of stock markets. The study focused on the precariousness of the European funds during the coronavirus pandemic outbreak. The study highlighted that investment funds exhibited jittery performance in all the major sectors as the pandemic progressed, excluding the social fund sector. Liu et al. (2020) also performed a related study by investigating the relationship of COVID-19 with 27 prominent stock markets and concluded that COVID-19 negatively affected the performance of all 27 stock markets. Other empirical studies that reported comparable relationships are Papadamou et al. (2020) and Del Giudice and Paltrinieri (2017).

A pandemic is often related to the consequences of low demand and consumption levels. Chaudhary et al.

(2020) presented a comprehensive summary of the impact of COVID-19 on the Indian economy. The study highlighted that low demand and consumption levels affected the following sectors of India, namely aviation; oil; micro, small, and medium industries; and travel & tourism. Similar findings were reported by Siu and Wong (2004), who performed a study on the relationship between domestic demand and the SARS epidemic in Hong Kong. The study highlighted that in Hong Kong, the epidemic led to low demand for domestic and international goods. Chen et al. (2021) evaluated the consumption pattern during the coronavirus outbreak in 214 cities of China and concluded that most cities witnessed a fall in the consumption pattern, with the highest fall being witnessed in the epicenter Wuhan (70%). Albulescu (2020) investigated the volatility of oil demand and financial markets in the U.S. during the COVID-19 outbreak using the ARDL estimation technique and concluded that with the rise in the cases in the United States, oil demand witnessed a falling trend.

Similarly, Shruthi and Ramani (2021) explored the volatility transmission during the crisis by using impulsive response and variance causality test. They concluded that during the pandemic outbreak, volatility in the oil market was high compared to the food market. Other studies concluded similar results (Fornaro & Wolf, 2020 ; Mzoughi et al., 2020).

A review of extant literature motivated us to investigate how COVID-19 and related lockdown have influenced the oil and gold prices followed by the financial market volatility of the Indian stock market. The background of the study is driven by the assumption of investment decisions under the uncertainty theory (Mao, 1969), which advocated that investors start indiscriminate selling to prevent any future or unexpected losses during uncertainty. COVID-19 has also generated a sense of fear and insecurity among the investors. Since the start of the corona outbreak, all kinds of economic and business activities have been at a standstill. People are not sure about the robustness of vaccines and are also in fear of witnessing the sudden rise in positive cases, especially in India. This uncertainty precedes hasty selling and investment decisions, which motivated us to examine the relationship between COVID-19 cases and their impact on the commodity and financial markets based on the principle of uncertainty theory.

Likewise, this paper also derives its rationale from the demand theory. Demand theory argues that price and demand are interconnected, and a change in one variable significantly influences the other. The coronavirus-induced lockdown has resulted in sluggish growth among industries. This slow demand has further resulted in lower profits and productivity (Narender & Kumar, 2021). Hence, these outcomes further encouraged us to measure the influence of lockdown and novel coronavirus on the gold and oil prices based on the demand theory. Based on the above explanations and literature gap, the following hypotheses are devised:

- **H_1 :** COVID -19 has a negative influence on the stock market performance.
- **H_2 :** COVID -19 has a negative influence on the oil prices.
- **H_3 :** COVID -19 has a negative influence on the gold prices.

Data Analysis and Methodology

To estimate the above relationship, we included the daily closing prices of gold, oil, and the stock market, borrowed from India's NSE index and the Multi Commodity Exchange (MCX). Data of COVID-19 infections were retrieved from the World Bank indicators. This present study is divided into three subsections; the first part estimates the financial and commodity markets' volatility in the Indian financial market for the whole period ranging from April 1, 2020 – April 10, 2021. In the second part, we evaluated the above relationship covering the first wave of the COVID - 19 infection, and in the last part, we covered the second wave of coronavirus infection and its impact on the Indian financial and commodity markets. Table 1 shows the detailed timeline of the study.

Table 1. ***Timeline of the Study***

Phase of the Study	Timeline
First Phase	April 1, 2020 – April 10, 2021
Second Phase (First Wave)	June 6, 2020 – September 30, 2020
Third Phase (Second Wave)	February 2, 2021 – April 10, 2021

Note. *The categorization of the first and second waves is done following the guidelines issued by the Ministry of Health, GOI.

The current study has employed the linear auto-regressive distribution lag estimation technique proposed by Pesaran et al. (2001). The ARDL method offers comprehensive results in the case of mixed integrated variables, that is, $I(0)$ and $I(1)$ or when the sample size is small. This estimation technique also considers hidden cointegration, as reported by Meo et al. (2018). Before applying the ARDL method, the only precondition is that none of the variables should be $I(2)$ level of integration. To confirm the above condition, we employed the Augmented Dickey-Fuller unit root test (ADF) on our sample data, as this test provides robust estimates (Syed & Tripathi, 2020). The nonlinear autoregressive distribution lag (NARDL) is an estimation technique that is an augmentation of the ARDL model; thus, we have used the basic form of the linear ARDL method:

$$\Delta y_t = \alpha_o + \sum_{i=1}^{s-1} b_i \Delta y_{t-i} + \sum_{i=1}^{r-1} c_i \Delta x^{t-i} + p y_{t-1} + \theta x_{t-1} + e_{t-1} \quad (1)$$

In the above equation x_t represents the vector of regressors, y_t shows the dependent variable, α_o is intercept b_i, c_i show the short-run coefficients, s highlights restricted lags, Δ highlights differencing, and e_t denotes error term.

We use the upper and lower bound values to confirm and check the cointegration under the ARDL model. Here, we check the null hypothesis of no cointegration against the alternative hypothesis of cointegration. The lower bound value assumes that the variables are integrated at levels; whereas, the upper bound considers that the variables are integrated at first difference. The ADF test results confirm that in our study, we have mixed integrated variables, therefore, we can use both the upper and lower bound values. The value of the F-test is used to test the null and alternative hypotheses. The ARDL technique assumes that all the variables are exogenous and dependent and have a symmetric response. It means they only affect either directly or indirectly, but they don't affect both sides. The equations show the models which we have used in our empirical analysis.

$$\Delta LnSTK_t = \alpha_0 + \sum_{i=1}^{p-1} b_i \Delta LnSTK_{t-1} + \sum_{i=1}^{q1} c_{1,i} \Delta LnCOV_{t-1} + \rho LnCOV_{t-1} + \theta_1 LnSTK_{t-1} + e_t \quad (2)$$

$$\Delta LnGold_t = \alpha_0 + \sum_{i=1}^{p-1} b_i \Delta LnGOLD_{t-1} + \sum_{i=1}^{q2} c_{2,i} \Delta LnCOV_{t-1} + \rho LnCOV_{t-1} + \theta_2 LnGOLD_{t-1} + e_t \quad (3)$$

$$\Delta LnOIL_t = \alpha_0 + \sum_{i=1}^{p-1} b_i \Delta LnOIL_{t-1} + \sum_{i=1}^{q3} c_{3,i} \Delta LnCOV_{t-1} + \rho LnCOV_{t-1} + \theta_3 LnOIL_{t-1} + e_t \quad (4)$$

In the above equations, *STK* shows closing stock price per day of NIFTY 50 index, *GOLD* indicates gold prices per day in ounce, *OIL* represents oil prices per day, and *COV* represents COVID -19 infection per day. All the variables are in their natural log form.

Analysis and Results

First, we have examined the Indian financial commodity market's volatility by studying the NSE index's

descriptive statistics and gold and oil prices. Table 2 shows the descriptive analysis of the variables by segregating them into the whole period, first wave, and second wave.

The descriptive statistics show that the gold prices had the maximum value (154901.9) during the first wave of COVID-19; whereas, the lowest value of gold prices was in the second wave (136060.5). The average of gold prices (128006.1) was also the lowest in the second wave. In terms of stock and oil prices, the results of the descriptive statistics show that during the second wave, oil prices (69.95) and stock prices (15314.7) were maximum compared to the first wave. Similarly, the mean of oil (63.94) and stock prices (14879.09) was also maximum during the second wave compared to the first wave. With reference to standard deviation, the standard deviation of stock (246.43) and oil prices (3.22) were also minimum during the second wave compared to the first wave of coronavirus infection. The results of descriptive analysis conclude that the uncertainty and the effect of COVID-19 infection on the commodity and financial markets in India were much severe during the first wave of COVID-19 in comparison to the second wave of COVID-19.

After analyzing the descriptive statistics, we proceed with investigating the long-run relationship among the variables. Before proceeding with the ARDL estimation, it is mandatory to check the level of integration among the variables. It is a condition that none of the variables has to be a second-order of integration *I*(2) to apply the ARDL estimation technique. Therefore, we have employed the ADF test to estimate the level of integration among the variables. Table 3 depicts the results of the ADF estimation technique, which confirms that we have a mixed level of integration among the variables, and none of the variables is integrated at second order.

The results (Table 3) confirm that except oil, which is integrated at a level, all the other variables are of the first level of integration. After confirming with the unit root test, we further proceed with the long-run ARDL estimation using the equations 1 – 4. Using four lags, the linear models are estimated, and the Akaike information criteria (AIC) is used to check the suitable lag. The model which describes the lowest AIC value is chosen from the equations 1 – 4. The results of each phase are presented and discussed below.

Table 2. ***Descriptive Statistics***

	Gold Prices (Indian Rupee per ounce)			Oil Prices (per Barrel)			NSE Index India		
	Whole Period	First Wave	Second Wave	Whole Period	First Wave	Second Wave	Whole Period	First Wave	Second Wave
Mean	133796.5	135044.5	128006.1	43.7	39.77	63.94	11919.1	11286.7	14879.09
Maximum	154901.9	154901.9	136060.5	69.9	55.98	69.95	15314.7	14644.7	15314.7
Minimum	110494.3	110494.3	123574.6	9.12	9.12	56.52	7610.2	7610.2	14281.2
Std. Dev	7929.74	8562.24	3616.01	13.00	10.23	3.22	2081.9	1723.369	246.43

Table 3. ***Augmented Dickey-Fuller Test***

Variables	Whole Period		First Wave		Second Wave	
	p - value Level	*p* - value First Difference	*p* - value Level	*p* - value First Difference	*p* - value Level	*p* - value First Difference
LnCOV	.14	.01**	.35	.01**	.52	.00*
LnSTK	.83	.00*	.52	.00**	.82	.01*
LnGOLD	.28	.00**	.29	.03*	.15	.00*
LnOIL	.04*	.00*	.04	.00*	.84	.00**

Note. *,** denote 1% and 5% levels of significance.

Table 4 shows the long-run results of ARDL estimation covering the first phase, that is, the whole period from April 1, 2020 – April 10, 2021. The ARDL estimation highlights that COVID-19 infection has a short-run and long-run negative impact on the NSE stock index and oil prices. However, in the long-run, the influence of COVID-19 on gold prices is positive. The negative effect on the stock index and oil prices is because globally, the coronavirus-induced lockdown stopped all sorts of business and production activities. Most industries like tourism, construction, shipping, transportation, aviation, and automobiles were affected by this virus, which resulted in sluggish demand (Mohania & Mainrai, 2020). Thus, it affected the stock portfolio of these industries along with allied industries. The interrelation with the global market also significantly affected the Indian commodity and financial markets. The restriction on international flights and travel & tourism also affected the oil demand, and slow market demand resulted in oil price reduction. However, in the context of gold prices, the novel coronavirus positively influenced gold prices. The plausible reason is that although gold does not produce any economic value on its own, it is an efficient investment option in times of uncertainty and disturbance.

The conversion value of gold is much higher compared to other financial instruments. Previous studies also highlighted that gold and equity instruments had a bidirectional relationship — with the rise in equity, gold prices fell, and vice versa. The ECM value is .002, which confirms that the model corrects itself at .02% annually. To confirm the model specification, we have also included LM and RESET tests. The value of the LM and RESET tests in Table 3 confirms the model fitness and stability. The value of the WALD test also confirms cointegration among the variables. It means that the variables have a long-run relationship. Further, the *R* square value of .72 also substantiates the model's stability and reliability.

Based on the above results, we can confirm that during the whole period, the coronavirus had a negative impact on the financial and commodity markets of India ; whereas, its impact was positive on the gold prices. Hence, we can accept hypotheses H_1 and H_2 and reject hypothesis H_3. Furthermore, to investigate how this relationship changes during the first and second waves of the coronavirus infection, we have evaluated the above relationship

Table 4. *Whole Period ARDL Results*

Section A : Short-run Variables		**Lags**		
	0	**1**	**2**	**3**
Δ in *STK*, Δ in *OIL*, Δ in *Gold*				
Δ in COV_{STK}	–.13(–3.17)**			
Δ in COV_{GOLD}			–.12(–0.25)*	
Δ in COV_{OIL}	–.14(2.56)*			
Section B : Long-run				
Ln COV_{STK}	Ln COV_{GOLD}	Ln COV_{OIL}	*C*	
–.14(–1.21)*	1.32(1.154***)	–.23(–2.26*)	6.43(.23)	
Section C : Diagnostics				
ECM_{t-1}	Wald (Joint Sig)	Adj. R^2	RESET	LM
–.02(0.04***)	5.09***(Bound)	.72	9.04	4.6

Note. * The table covers the results of ARDL analysis focusing on the whole sample from April 1, 2020 – April 10, 2021. Δ in *STK*, Δ in *OIL*, Δ in *Gold* show dependent variables' stock prices, gold prices, and oil prices. Δ in COV_{STK}, Δ in COV_{GOLD}, Δ in COV_{OIL} represent the impact of the COVID infection on stock prices, gold prices, and oil prices. The *t* - values are in bracket, and the only values which are significant are shown in the table.

*,**,*** denote the level of significance at 10%, 5%, and 1% , respectively. The ECM and WALD are used to check cointegration, and for model specification, R^2, RESET, and LM are calculated.

Table 5. *First Phase ARDL Results*

Section A : Short-run Variables		**Lags**		
	0	**1**	**2**	**3**
Δ in *STK*, Δ in *OIL*, Δ in *Gold*				
Δ in COV_{STK}	–.32(–2.52)**			
Δ in COV_{GOLD}			.16(1.45)**	
Δ in COV_{OIL}	–.14(1.10)*			
Section B : Long-run				
Ln COV_{STK}	Ln COV_{GOLD}	Ln COV_{OIL}	*C*	
–.13(–1.15)**	2.13(1.87***)	–.29(–1.43*)	5.23(.93)	
Section C : Diagnostics				
ECM_{t-1}	Wald (Joint Sig)	Adj. R^2	RESET	LM
–.05(0.02***)	6.15***(Bound)	.64	9.12	4.5

Note. * The table depicts the results of ARDL analysis covering the first wave from June 6, 2020 – September 30, 2020. Δ in *STK*, Δ in *OIL*, Δ in *Gold* show the dependent variables' stock prices, gold prices, and oil prices. Δ in COV_{STK}, Δ in COV_{GOLD}, Δ in COV_{OIL} represent the impact of the COVID infection on stock prices, gold prices, and oil prices. The *t* - values are in bracket, and the only values which are significant are shown in the table.

*,**,*** denote the level of significance at 10%, 5%, and 1% , respectively. To check cointegration, the ECM and WALD tests are used, and for model specification, R^2, RESET, and LM are calculated.

Table 6. *Second Phase ARDL Results*

Section A : Short-run Variables		**Lags**		
	0	**1**	**2**	**3**
Δ in *STK*, Δ in *OIL*, Δ in *Gold*				
Δ in COV_{STK}	.23(1.05)			
Δ in COV_{GOLD}			–.12(–1.39)**	
Δ in COV_{OIL}	.18(1.06)			
Section B : Long-run				
Ln COV_{STK}	Ln COV_{GOLD}	Ln COV_{OIL}	*C*	
.12(0.19)**	–2.12(–0.90)*	.56(.13)*	4.13(.04)	
Section C : Diagnostics				
ECM_{t-1}	Wald (Joint Sig)	Adj. R^2	RESET	LM
–.08(0.01***)	6.13***(Bound)	.54	10.08	4.7

Note. * The table presents the results of ARDL analysis focusing on the second wave from February 2, 2021 – April 10, 2021. Δ in *STK*, Δ in *OIL*, Δ in *Gold* show the dependent variables' stock prices, gold prices, and oil prices. Δ in COV_{STK}, Δ in COV_{GOLD}, Δ in COV_{OIL} represent the impact of the COVID infection on stock prices, gold prices, and oil prices. The *t*- values are in bracket, and only the significant values are shown in the table.

*,**,*** denote the level of significance at 10%, 5%, and 1%, respectively. To check cointegration, the ECM and WALD are used, and for model specification, R^2, RESET, and LM are calculated.

by segregating the time periods separately into the first and second waves. Table 5 and Table 6 show the results for both periods of the study.

The results of Table 5 reveal that during the first wave of coronavirus spread, both in the short-run and long-run, the COVID caseload negatively impacts the stock market and oil prices in India. However, it has a positive impact on gold prices. These results collaborate with the findings of the whole period. The reason for such a relationship is due to the uncertainties associated with the lockdown. During the first wave of corona spread in India, the Indian government implemented five lockdowns — two were stringent, and the last three were less strict. Due to the severity of corona spread and uncertainties of lockdown, most Indian private organizations started downsizing their workforce, which created economic instability. Closure of businesses and lack of effective demand aggravated investors' fears, resulting in herd selling and the falling of the stock market index.

Similarly, due to the restriction in transportation and travel globally, during the first wave of corona infection, oil demand witnessed a downfall, which resulted in a fall in oil prices. Previous studies have suggested that gold prices and equity investments move in the opposite direction. Hence, with the fall in stock market returns, investors resorted to buying gold, as gold is considered the safest form of investment. Based on the empirical results, we can accept the hypotheses H_1 and H_2 and reject hypothesis H_3. The findings also support the empirical theory of uncertainty and risk. The diagnostic results of the first wave of estimation also substantiate the model's stability, and the WALD test confirms cointegration among the variables. The findings of the second wave of coronavirus analysis are contradictory with the results of the whole period and those of the first wave. Table 6 show that in the short-run, during the second wave of COVID-19 spread, stock market, oil, and gold prices are insignificant to the spread of the COVID-19 infection.

However, in the long - run, the stock market and oil prices share a positive association with COVID spread; whereas, gold has an inverse association with the spread of coronavirus infection. This is because, after the first wave of COVID-19, people became more adaptive to the situation. In India, meanwhile, the vaccination process had also started, which instilled confidence among the investors. To book maximum profit and mitigate the previous losses, both the industries and individuals started working more efficiently and productively. During the second wave of coronavirus infection, to revive the sluggish economic growth, the Indian government also implemented partial lockdown and not complete lockdown except for night curfew in a few states. All these reasons cumulatively created a positive impact on the commodity and financial markets of India. However, we can see that in the long - run, the value of the coefficient is too small, which poses apprehensions that may be if the cases did not reduce, then the condition could have become worse for the Indian economy. The diagnostic value also confirms the stability and viability of the ARDL model. Therefore, based on the findings, we can reject hypotheses H_1 and H_2 and accept hypothesis H_3.

Summary and Conclusion

The current study tries to measure the influence of COVID - 19 on the Indian financial and commodity markets by segregating the coronavirus spread into three categories: the whole period, the first wave of COVID-19 spread, and the second wave of COVID-19 spread. The ARDL estimation technique is used for the empirical analysis, as this model provides robust results in the case of mixed integrated variables and small sample size data. Based on the results of the empirical investigation, we can conclude that during the whole period of the study, the novel coronavirus has a negative influence on the Indian stock market and oil prices. However, the influence is positive for the gold prices during the whole period of the study. When we segregated the data into the first wave and second wave, the results conclude that during the first wave of coronavirus spread, the results are in accordance with the findings of the whole period of the study. However, in the case of the second wave, the findings are contradictory, and the study concludes that during the second wave, the influence of COVID-19 spread is positive for oil and stock markets, and it has a negative impact on gold prices.

The corona-induced lockdown severely impacted the investment capabilities of the investors, together with creating a feeling of panic and apprehension due to the uncertain future. Job retrenchments, closure of businesses, and halt in the production activities affected the efficiency and profitability of most of the sectors of the Indian economy like tourism, real estate, automobile, aviation, etc. The lower profitability and lack of adequate demand, together with the uncertainty of corona, resulted in herd selling, which created a sudden downfall in the financial market during the whole and first phase of the lockdown. During the second wave of COVID-19 spread, people became adaptive to this virus and started adjusting with the infection of COVID-19, and therefore, the financial markets became more stable despite the rise in the cases. The mass vaccination process which started in India also inculcated confidence among the investors.

When we analyze the results of the commodity markets for the whole period and the first wave in terms of oil and gold prices, we can conclude that the results are contradictory as COVID-19 has created a significant and negative impact on the oil prices. The incessant lockdown led to a fall in oil demand compared to the supply. Hence, based on the results, we can infer that the findings corroborate with the theoretical background of demand theory; whereas, in the case of gold prices, the impact of COVID-19 is positive. The probable justification is that although gold does not produce any economic value on its own, it is an efficient option for investment during uncertainties and economic turmoils. Thus, we can infer that gold is a safer instrument to invest during pandemics and uncertainty. The above results also support the findings of Dutta et al. (2020). The findings during the second wave of corona spread are quite contradictory for the commodity markets compared to the first wave as the oil prices rose; whereas, the prices of gold fell. During the second wave, the people became more aware of corona infection, and the uncertainty reduced. The Indian government did not implement any total lockdown, and to meet out the previous losses, most of the organizations worked tirelessly, which resulted in increased oil demand, and therefore, oil prices showed an upward trend. In addition, the vaccination process and control of the death rate also created a positive influence on the investors. Investors were more inclined toward investing in the stock markets, and thus, the gold prices fell worldwide.

We provide the following suggestions based on the findings of the study. The study depicts that uncertainty and fear of pandemics are the main determinants that create a negative influence on the financial and commodity markets of India. Therefore, it is required that in case of such pandemics, the governments should make adequate efforts to remove the uncertainties in the long run by information dissemination. The study also suggests that during a pandemic and economic crisis, gold is the preferred investment choice. Thus, from the viewpoint of the investors, it is recommended that they should invest more in gold at the onset of any uncertain event, and as the situation improves, they should switch to equity instruments. During this pandemic, we witnessed a mass job loss and economic downfall. Therefore, the government should take steps towards providing economic security to individuals by creating a pandemic fund, which can be used in such uncertain events. Lockdowns also created difficulties for individuals and firms in terms of production loss, food, and shelter. Thus, it is suggested that adequately planned and phase-wise lockdowns should be enforced compared to sudden lockdowns. Last, in terms of health infrastructure and psychological uncertainties, it is suggested that the government should also invest in health care. Proper investment is also required in the domain of counselors and psychiatrists to deal with the psychological impact of pandemics.

Managerial and Theoretical Implications

The current study is one of a kind that investigates the influence of COVID-19 on the financial and commodity markets of India by segregating the data into three timelines, that is, the whole period, the first wave, and the second wave of COVID-19 spread. The findings expose the vulnerability of the financial and commodity markets to pandemics and suggest empirical findings for investment industries. The results highlight how the stock market

performs during uncertain events and how the performance reduces as information symmetry increases. The current study also advises how an investor should switch to alternative investment options during pandemics. In addition, the study also highlights the significance of uncertainty and risk in investment decisions. Besides, the study also provides a theoretical argument for the demand theory and economic uncertainty economic theory.

Limitations of the Study and Scope for Further Research

In addition to the above benefits, the current study also encompasses a few limitations. First, we have included only two commodities in the present study, although numerous commodities have been severely affected by the COVID-19 spread. Secondly, the time period of the study is also limited, which also poses a limitation of the study. However, these limitations also serve as a direction for future research.

Authors' Contribution

Dr. Aamir Aijaz Syed conceived the idea and developed the quantitative framework for conducting this research. Dr. Ravindra Tripathi verified the econometric model and helped in conceptualizing the work. Dr. Jyoti Dewan helped in writing the review of literature. The same was further transcripted and converted into this complete research paper with the efforts of all the authors.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgement

The authors received no financial support for the research, authorship, and/or for the publication of this article.

References

Ahmed, F., Syed, A. A., Kamal, M. A., Nieves López-García, M., Ramos-Requena, J. P., & Gupta, S. (2021). Assessing the impact of COVID-19 pandemic on the stock and commodity markets performance and sustainability: A comparative analysis of South Asian countries. *Sustainability, 13*(10), 5669. https://doi.org/10.3390/su13105669

Albulescu, C. (2020). *Coronavirus and financial volatility: 40 days of fasting and fear* (02501814). https://arxiv.org/abs/2003.04005

Broadstock, D. C., & Zhang, D. (2019). Social-media and intraday stock returns: The pricing power of sentiment. *Finance Research Letters*, *30,* 116 – 123. https://doi.org/10.1016/j.frl.2019.03.030

Chaudhary, M., Sodani, P. R., & Das, S. (2020). Effect of COVID-19 on economy in India: Some reflections for policy and programme. *Journal of Health Management*, *22*(2), 169–180. https://doi.org/10.1177/0972063420935541

Chen, H., Qian, W., & Wen, Q. (2021). The impact of the COVID-19 pandemic on consumption: Learning from high frequency transaction data. *AEA Papers and Proceedings, 111,* 307–311. https://doi.org/10.1257/pandp.20211003

Del Giudice, A., & Paltrinieri, A. (2017). The impact of the Arab Spring and the Ebola outbreak on African equity mutual fund investor decisions. *Research in International Business and Finance*, *41*, 600 – 612. https://doi.org/10.1016/j.ribaf.2017.05.004

Dumontier, P., & Raffournier, B. (2002). Accounting and capital markets: A survey of the European evidence. *European Accounting Review*, *11*(1), 119–151. https://doi.org/10.1080/09638180220124761

Dutta, A., Das, D., Jana, R. K., & Vo, X. V. (2020). COVID-19 and oil market crash: Revisiting the safe haven property of gold and Bitcoin. *Resources Policy, 69*, 101816. https://doi.org/10.1016/j.resourpol.2020.101816

Fornaro, L., & Wolf, M. (2020). *Covid-19 Coronavirus and macroeconomic policy* (BSE Working Paper No. 1168). Barcelona Graduate School of Economics. https://bse.eu/research/working-papers/covid-19-coronavirus-and-macroeconomic-policy

Kanojia, S., & Malhotra, D. (2021). A case study of stock market bubbles in the Indian stock market. *Indian Journal of Finance, 15*(2), 22 – 48. https://doi.org/10.17010/ijf/2021/v15i2/157638

Kollias, C., Manou, E., Papadamou, S., & Stagiannis, A. (2011). Stock markets and terrorist attacks: Comparative evidence from a large and a small capitalization market. *European Journal of Political Economy*, *27*(1), S64–S77. https://doi.org/10.1016/j.ejpoleco.2011.05.002

Liu, H. Y., Manzoor, A., Wang, C. Y., Zhang, L., & Manzoor, Z. (2020). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health*, *17*(8), 2800. https://doi.org/10.3390/ijerph17082800

Mao, J. C. (1969). *Quantitative analysis of financial decisions*. Macmillan.

Meo, M. S., Chowdhury, M. A., Shaikh, G. M., Ali, M., & Masood Sheikh, S. (2018). Asymmetric impact of oil prices, exchange rate, and inflation on tourism demand in Pakistan: New evidence from nonlinear ARDL. *Asia Pacific Journal of Tourism Research, 23*(4), 408–422. https://doi.org/10.1080/10941665.2018.1445652

Mirza, N., Naqvi, B., Rahat, B., & Rizvi, S. K. (2020). Price reaction, volatility timing and funds' performance during Covid-19. *Finance Research Letters*, *36,* 101657. https://doi.org/10.1016/j.frl.2020.101657

Mohania, S., & Mainrai, G. (2020). The COVID-19 pandemic and its impact on the banking industry - A case of National Bank Ltd. *Indian Journal of Finance, 14*(8 – 9), 80–89. https://doi.org/10.17010/ijf/2020/v14i8-9/154950

Mzoughi, H., Urom, C., Uddin, G. S., & Guesmi, K. (2020). The effects of COVID-19 pandemic on oil prices, CO_2 emissions and the stock market: Evidence from a VAR model. *SSRN Electronic Journal.* https://dx.doi.org/10.2139/ssrn.3587906

Narender, M., & Kumar, A. A. (2021). IndiGo - In the times of pandemic. *Indian Journal of Finance, 15(2),* 62 – 70. https://doi.org/10.17010/ijf/2021/v15i2/157640

Naseem, S., Mohsin, M., Hui, W., Liyan, G., & Penglai, K. (2021). The investor psychology and stock market behavior during the initial era of COVID-19: A study of China, Japan, and the United States. *Frontiers in Psychology,* 12, 626934. https://doi.org/10.3389/fpsyg.2021.626934

Nippani, S., & Washer, K. M. (2004). SARS: A non-event for affected countries' stock markets? *Applied Financial Economics*, *14*(15), 1105 – 1110. https://doi.org/10.1080/0960310042000310579

Papadamou, S., Fassas, A., Kenourgios, D., & Dimitriou, D. (2020). *Direct and indirect effects of COVID-19 pandemic on implied stock market volatility: Evidence from panel data analysis* (MPRA Paper 100020). University Library of Munich, Germany. https://mpra.ub.uni-muenchen.de/id/eprint/100020

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289 – 326. https://doi.org/10.1002/jae.616

Sharif, A., Aloui, C., & Yarovaya, L. (2020). COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet-based approach. *International Review of Financial Analysis*, 70(C), 101496. https://dx.doi.org/10.1016%2Fj.irfa.2020.101496

Shruthi, M. S., & Ramani, D. (2021). Statistical analysis of impact of COVID 19 on India commodity markets. *Materials Today: Proceedings, 37*(2), 2306 – 2311. https://doi.org/10.1016/j.matpr.2020.07.729

Singh, B., Dhall, R., Narang, S., & Rawat, S. (2020). The outbreak of COVID-19 and stock market responses: An event study and panel data analysis for G-20 countries. *Global Business Review,* 1–26. https://doi.org/10.1177%2F0972150920957274

Siu, A., & Wong, Y. R. (2004). Economic impact of SARS: The case of Hong Kong. *Asian Economic Papers*, *3*(1), 62 – 83. https://doi.org/10.1162/1535351041747996

Syed, A. A., & Tripathi, R. (2019). Non-performing loans in BRICS nations: Determinants and macroeconomic impact. *Indian Journal of Finance, 13*(2), 22 – 35. http://doi.org/10.17010/ijf/2019/v13i2/141684

Syed, A. A., & Tripathi, R. (2020). Macroeconomic vulnerabilities and its effect on nonperforming loans in Indian commercial banks. *Indian Journal of Finance, 14*(2), 34 – 49. https://doi.org/10.17010/ijf/2020/v14i2/150555

Wang, Y. (2020). MeiguChixuBaodie de BinggenZaiNaer *[What is the root cause of the continued collapse of US stocks]*. Shanghai Zhengquan Bao [Shanghai Security News] http://news.cnstock.com/news,bwkx-202003-4507256.htm

World Health Organization. (2020a, January 30). *COVID - 19: Public health emergency of international concern declared*. https://www.who.int/docs/default-source/coronaviruse/transcripts/ihr- emergency-committee-for-pneumonia-due-to-the-novel-coronavirus-2019-ncov-press-brief-ing-transcript-30012020.pdf?sfvrsn=c9463ac1_2

World Health Organization. (2020b, March 11). *WHO characterizes COVID-19 as a pandemic*. https://www.who.int/docs/default-source/coronaviruse/transcripts/who-audio-emer-gencies-coronavirus-press-conference-full-and-final-11mar2020.pdf?sfvrsn=cb432bb3_2

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