

Volatility Dynamics Between Crude Oil and South Asian Emerging Markets During COVID-19

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ARTICLE INFO	ABSTRACT
<p><i>Article History:</i> Received: 13 June, 2024 Revised: 12 Aug, 2024 Accepted: 13 Sep, 2024 Available Online: 19 Sep, 2024</p> <p>DOI: https://doi.org/10.56536/ijmres.v14i3.644</p> <hr/> <p><i>Keywords:</i></p> <p>COVID-19, oil price, Emerging markets, South Asia, BEKK-GARCH</p> <hr/> <p><i>JEL Classification:</i> C32, G15, Q41, Q43</p>	<p>The COVID-19 pandemic had profound impacts on the global economy, initially triggering a severe economic downturn due to widespread lockdowns. This outbreak generated various economic shocks, a major one being the oil price crash. A brief understanding of how this pandemic is affecting the financial markets, empirical analysis is done on three financial markets. Three stock exchange markets are selected from emerging markets in South Asia (Pakistan, China, and India). The world crude oil market is selected as a reference, to how it transmits volatility to South Asian stock markets in pandemic time. We use a bivariate BEKK-GARCH model for examining the volatility spillover from November 19, 2019, to March 31, 2021. All markets show negative coefficients with the oil market, indicating that the previous day's shocks in oil prices reduce today's stock market volatility, with significant values for India and Pakistan. China has a negative coefficient while the rest of the two markets show a positive and significant coefficient means past volatilities in the stock market decrease today's oil market volatility, likely indicating a reactive or adaptive market behavior to stock volatility. Generally, oil price changes have a significant impact on these markets, with both immediate effects (via ARCH terms) and persistent effects (via GARCH terms). The paper's key contribution is its in-depth look at how oil price volatility impacts stock markets in South Asia, particularly during the uncertainty of the COVID-19 pandemic. By highlighting these dynamic connections, it offers practical guidance for policymakers to better manage economic risks and for investors to make smarter decisions when diversifying their portfolios in today's interconnected global markets.</p>

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INTRODUCTION

World Health Organization defined a pandemic as the "global spread of new infection". It does not tell us about the scope of the pandemic, its spread to different regions and neither gives information about cases and forecasted deaths. According to WHO at the start of March, COVID-19 was classified as a pandemic and led to a worldwide public health emergency. About ten years before, in 2019 HINI virus was declared a pandemic, that affected about 26 countries. This outbreak affected every region of the world, even developed countries can't surpass this infection. COVID-19 crippled every facet of the world whether it is economic or social. This pandemic severely affects the performance of stock markets. Before COVID-19 various epidemics led to volatility in the stock market such as the SARS in 2003 epidemic (Chen et al., 2007), and the Ebola outbreak in 2015. Berche (2023) followed by swine flu and bird flu. Dynamic linkages can be defined as shock spillover or contagion among markets. Shocks do not necessarily occur in bad times they may occur during good times. Spillover of these shocks is high during the crisis period as co-movements among markets are high during the crisis compared to normal times. So, contagion can be defined as more volatility spillover after the crisis time. It is observed that bad news is severely affecting the stock market compared to good news. Risk can be defined as volatility in the financial market. Studying the volatility between markets is important from the perspective of portfolio management and hedging strategies (Kristin et al., 2002; Mubarik & Javid, 2017).

Economies are facing both demand-side and supply-side disruptions. Every sector of the financial conditions is severely hurt by this pandemic, this includes an increase in the unemployment rate, a decrease in production, a collapse of medical facilities, and fall in oil prices, and a loss of human capital due to this havoc infection. Continuous lockdown and closure of business units act as oil on burning fire. This pandemic hurt every corner of the world without discrimination of rich or poor (del Rio-Chanona et al., 2020). Although every country is facing a challenging situation in coping with the disease, the condition of poor countries as the verge of collapse. The COVID-19 pandemic has had daunting effects on South Asian economies. Both India and Pakistan are the top two countries in South Asia based on deaths and confirmed cases. COVID-19 shocks have hurt market liquidity by impacting earnings dispersion, equity risk premiums, and trade credit restrictions. The pandemic has caused greater variability in companies' earnings, leading to more uncertainty and less liquidity. Investors, looking for safer options, may pull their money out of riskier investments like stocks or require higher returns to keep such portfolios. This is evident in the Flight to liquidity Hypothesis (Apergis et al., 2023). A simultaneous decline in both oil prices and stock returns during the pandemic can largely be attributed to heightened uncertainty in the markets. This uncertainty, driven by the unprecedented global economic disruptions, likely exacerbated the negative association, as investors reacted to the unpredictable environment by reducing exposure to riskier assets, including stocks tied to fluctuating oil prices (Salisu et al., 2023).

In COVID-19, investors are drawing back their investments from the market, as they are fully informed that this pandemic will continue for an unseen period, and they can't afford enormous future losses in their investments. During COVID-19 stock prices and the oil market are showing higher volatility, as investors are behaving according to available information in the market by making unexpected decisions. This leads to connectedness with the efficient market hypothesis that states that prices in stock are correctly stated and incorporate all available facts and figures presented in the market. The efficient market hypothesis undertakes that the market is behaving efficiently, and investors are fully informed before assessing the investment ventures and managing the portfolios. According to Kaplanski and Levy (2010), the crisis in the market creates anxiety and panics the investors, which makes investors pessimistic about the future. This anxiety builds an enormous burden, that makes investors make less risky and safer investments.

Due to industrialization and globalization, energy sources play an important role in development. Crude oil is an essential energy foundation for the worldwide economic sector, essential for both industrial growth and economic progress. Its pricing is influenced by multiple elements including public crises, fluctuations in oil supply and demand, political unrest, conflicts, and natural calamities (Yan, 2012). Oil price shocks are important determinants of macroeconomic outcomes. Oil price shocks are defined as the difference between the oil price expected and what realized oil price. These oil price shocks emerge as an oil glut when there is a surplus of oil available but there is a decrease in oil demand due to some emergency such as a pandemic. These shocks can be the demand side due to economic downturn or the supply side due to supply disruptions (Hamilton, 2009). Oil-exporting nations are highly susceptible to fluctuations in oil prices due to their economies' reliance on oil exports. Changes in oil prices significantly impact these countries' overall demand, government spending, revenues, and profits (Baumeister & Kilian, 2016). Financial sector reforms should enhance the stability of South Asian markets, leading to improved efficiency and greater access to financial markets (Mumtaz & Qurat-ul-Ain, 2022).

The COVID-19 outbreak led to volatility in the stock market and more frequent market price jumps compared to other outbreaks like the flu. The pandemic leads to policy uncertainty that is directly related to economic losses and makes the stock market more unpredictable and volatile. It was observed that during the pandemic worldwide financial markets show unpredictable behavior and carry more risk (Zhang & Ji, 2020). The appreciation of oil prices during COVID-19 may also signal a rising oil demand, driven by general economic growth, increased industrial production, and easing border restrictions (Kocaarslan & Soytaş, 2019). Consequently, investors in the Karachi Stock Exchange -100 index might react favorably to oil price shocks. Stock-oriented method explains that an upward movement in stock exchange prices may draw in foreign capital, while a negative shock withdraws investment from the country, thereby increasing/decreasing demand for the local currency (Reddy & Sebastian, 2008).

The COVID-19 pandemic has negatively affected ASEAN5 stock markets, but not as severely as the global financial crisis or the taper tantrum. This shows that although the pandemic hit these economies hard, their markets have bounced back more quickly. Exchange rate fluctuations in the

ASEAN5 countries are also impacting their stock market performance (Yiu & Tsang, 2023). After COVID-19 vaccines were introduced, the volatility among regional stock markets decreased significantly. Even though extreme spillovers remained stronger than the average ones, higher vaccination rates in individual countries helped stabilize the Asia-Pacific equity markets by cutting down the risk of spillovers they sent to others. There's a clear negative link between standard spillovers and vaccination rates. Essentially, more vaccinations led to less local panic, which in turn reduced the risk of transmission between stock markets (Li et al., 2023).

Although several studies discussed the stock market performances there are very limited studies that investigated that during pandemic, the stock market and the oil market are deeply intertwined, in South Asian Emerging Economies Therefore, the present research covers this gap and conducts research in selected South Asian economies based on confirmed cases and death during COVID-19 breakout. The current study has three-fold contributions. First, this study implies checking the volatility in two stock markets. Second, this study also incorporates the part of the oil price slump and its link with stock market performances. Third, this study proposes how COVID-19 affects stock market performance. The objective of this study is to examine the impact of the pandemic COVID-19 on the South Asian stock market with the interaction of the crude oil market on daily frequency data by using BEKK- GARCH (Baba, Engle, Kraft, and Kroner Generalized Autoregressive Conditional Heteroskedasticity)

The remaining paper is organized as follows; a review of literature related to stock market performance and pandemic is reported in section 2. Section 3 describes the data and methodology. Section 4 provides results and discussion, and section 5 contains the summary and policy implementations.

LITERATURE REVIEW

The connection between oil prices and stock prices are examined through the equity pricing framework or the cash flow theory. This approach posits that an asset's worth is determined by its anticipated cash flows, which are then discounted at appropriate rate. Theoretically, there are four potential associations between oil prices and stock indices: positive, negative, time-dependent, or no relationship at all. The Efficient Market Hypothesis (EMH) posits that stock markets, efficiently and promptly reflect all accessible information in their stock prices. Ehiedu and Obi (2022) expand on this by noting that the emergence of crises or pandemics typically introduces volatility into the market. This volatility arises as investors react to new information from their surroundings.

A negative relationship is proposed on the basis that rising energy prices, such as oil prices (OP), increase production input costs for most companies, impacting their profitability and expected cash flows, and consequently, reducing the market value of their stocks. It's crucial to recognize that the nature and significance of this relationship largely depend on a country's energy status. The relationship between oil prices and equity market prices is described as asymmetric and varies over time. Le and Chang (2015) found that the influence of oil price variations on stock index vary

across oil-importing, oil-exporting, and oil-refining economies, mirroring essential economic features and time dependency. Lastly, insignificant association posits that the proportion of price energy input is too small to significantly influence oil demand or, consequently, stock prices, especially in the case of energy stocks (Tabash et al., 2022).

The COVID-19 pandemic has hit the global economy hard, bringing about unprecedented levels of risk. This has been seen in the dramatic fall in oil prices and the US stock market circuit breaker being triggered four times, causing investors to suffer significant losses in a short time. The pandemic has created more volatility in the oil and stock markets than even the 2008 global financial crisis, and its effects are still being felt (Mao et al., 2024). Along the same line, A study done by (This study done on 21 leading stock market indices including the USA, UK, Japan, Korea, and Germany, etc. to check the short-term impact of the COVID-19 pandemic on these stock markets. In this study, data was obtained for one year till the outbreak and used event study methodology. The study stated that this pandemic has a negative effect on stock markets. It was concluded that COVID-19 severely affects the Asian stock market compared to other regions and this pandemic caused more abnormal returns in Asian markets. This shows the connectedness of stock market performance with the occurrence of more COVID-19 confirmed cases. In the same line, another study done by Chen et al. (2007) on the hotel industry in Taiwan during the severe acute respiratory syndrome (SARS) outbreak in 2003. Hotel stocks show negative abnormal returns during this outbreak. It was concluded that this disease severely hurt the Taiwan economy by causing a price drop in Taiwan hotel stocks which is about 29%.

Transfer of volatility from crude oil to big stock markets is minimal, while there's significant spillover among the stock markets themselves. France, Germany and the United Kingdom are the biggest transmitters of this volatility, with France also being the largest recipient. During various crises, the stock markets in the Germany, France, Italy, and the United Kingdom are the core givers and receivers of volatility. On the other hand, Japan, India, and China mainly received volatility spillovers. This contagion is mostly due to the high financial integration among European stock markets (Guru et al., 2023). Stock markets have experienced persistent volatility, which has worsened because of the pandemic. Furthermore, the Threshold GARCH results reveal that negative news, like the pandemic, tends to affect the volatility of returns more strongly than positive news does (Khan et al., 2024).

Sarwar et al, (2020) did a study in the Asian equity market, applying various frequencies of data. Through BEKK –GARCH model it was confirmed that current volatility is mostly affected by the previous shocks and volatility in the market. Moreover, bad news has more influence on stock market return compared to good news. Stock markets are more vulnerable to bad news compared to good news; a study done by Raza et al. (2016) in emerging economies by applying nonlinear ARDL on monthly data. It was concluded that oil price variations had a negative impact on the stock market in emerging economies. only energy stocks are affected by positively positive changes in oil prices. Along the same line, Gusemi and Fattoum (2014) employed the GJR-DCC-

GARCH model to study the volatility transmission between stock markets and oil prices. The impact of oil price variation is different for oil-importing and oil-exporting countries. It was assessed that there is a direct association between oil prices and the stock market prices. It was concluded that oil is not a good choice for haven, especially during the turbulent period.

The pandemic has stirred up a lot of market uncertainty in Asian stock markets, which has weakened investor confidence and led to market volatility. The level of volatility differs across countries, depending on how severely they were impacted by the pandemic. Asian markets reacted quickly to global announcements about COVID-19, with stock returns dropping the day after news of the virus's rapid spread. This shows that news from the previous day played a role in causing market fluctuations. The study also points out that rising COVID-19 cases, falling oil prices, and exchange rate swings have all negatively affected investor sentiment and decisions about stock market investments in Asia (Mishra & Mishra, 2023). A similarly recent study was done on the Nigerian stock exchange by (Adenomon et al., 2020). They discovered that this pandemic has hurt the stock return of the Nigerian stock market. Data obtained during a pandemic and the GARCH model employed. Recent outbreaks adversely affect the economy and crippled financial institutions specifically the stock market a study done in Nigeria to check the consequences of the pandemic on the stock market, result revealed a negative impact of COVID- 19 on the stock. This study also incorporates the effect of the oil price crash on the stock market. Crude oil crash significantly affects the stock market, according to a study done by (Ozili & Arun, 2020; Akanni & Gabriel, 2020).

Now Incorporating the performance of individual stock indices from emerging Asian economies during the COVID-19 pandemic.

The Karachi Stock Exchange 100 Index (KSE-100) serves as a crucial economic barometer for Pakistan, reflecting the performance of the country's leading companies and providing a benchmark for assessing market trends. Research, including studies by Munir et al. (2024), has shown that the COVID-19 pandemic exacerbated market volatility and liquidity problems, linking these issues to an increased systemic risk in financial sectors globally. This persistent volatility in returns was primarily driven by lockdown measures, instigated by fears of the virus spreading, which introduced significant risks to the market. In the Pakistani stock exchange, negative news tends to have a more pronounced impact than positive developments, largely due to fear and other psychological factors. Our results show spillover effects from the pandemic on the exchange market, which have had detrimental effects on the country's overall economic growth. Among the various factors contributing to these negative outcomes, the most important has been the closing of business actions, which has heightened risks for the stock market and its stakeholders, as noted by (Wang et al., 2024).

Osama et al. (2020) examined how the Pakistan stock market responded to the COVID-19 pandemic. They found that a significant increase in COVID-19 cases led to a sharp decline in the KSE-100 index, dropping by 1336.03 points, or 4.68%, reaching an intraday low of 27,228.80

points. Interestingly, the products and services and utility sectors were exceptions, performing relatively well due to increased demand for home-based amenities during the pandemic. Additionally, a study by Shafi et al. (2020) employed a descriptive-analytical method to explore the impact of the pandemic on micro, small, and medium-sized enterprises (MSMEs) in Pakistan. Data collected from 184 MSMEs between April 09 and April 21, 2020, revealed that these businesses were severely affected by the pandemic-induced lockdowns, experiencing significant disruptions.

India's stock market is notably resilient and responsive to global events. The country reported its first COVID-19 case on January 30, 2020, and subsequently, the government initiated a nationwide lockdown on March 24, 2020, with the announcement marking a significant event for the market. In their study of the Indian market, Dharani et al. (2023) discovered that the daily increases in COVID-19 cases and deaths have a negative impact on stock returns. Interestingly, they noted that stock returns were positive and significantly high during the second lockdown but declined during the third and fourth lockdowns. Over the entire period studied, industries such as chemicals, technology, and food and beverages achieved higher returns, whereas banking, finance, automotive, services, and cement and construction industries saw lower returns. Despite these trends, it's noteworthy that all industry groups managed to earn positive returns during the lockdowns, with particularly strong performance in chemicals, technology, automotive, metals and mining, and food and beverages. Alam et al. (2020) studied India's stock market and show that to be highly responsive to global and local events. The study highlighted that the first COVID-19 case was recorded in India on January 30, 2020, with the national lockdown commencing on March 24, 2020, an event marked by the official lockdown announcement. The analysis revealed that during the lockdown, the market experienced significantly positive Average Abnormal Returns (AAR), suggesting that investors had anticipated the lockdown and reacted favorably. In contrast, the period leading up to the lockdown saw a negative AAR, reflecting investor panic. The findings confirm that the lockdown positively influenced stock market performance, suggesting an overall optimistic outlook among investors until conditions in India showed improvement.

Chen and Dong (2022) explored the impact of COVID-19 on China's stock market and economy, finding that outbreaks notably reduced enterprise production capacities and consumer spending expectations. This, in turn, led to a considerable decrease in GDP and the Consumer Confidence Index (CCI), contributing to economic downturns. Each new outbreak corresponded with a drop in the stock index, indicating a strong link between the epidemic's progression and market performance. The Chinese government's stringent epidemic prevention and control measures forced many businesses to halt production and other activities, exacerbating these impacts. Building on this, Apergis et al. (2023) delved deeper into the effects of the pandemic on the liquidity of China's stock market, accounting for various factors and transmission mechanisms that previous studies had not considered. Their innovative approach included both global and national COVID-19 indicators to assess the pandemic's severity, offering new perspectives on how deeply

the pandemic disrupted the Chinese stock market. The research suggests that the pandemic is likely to inflict significant economic losses across all sectors.

Based on the given literature following hypotheses can be developed

H1: There is volatility spillover from the oil market to stock indices of Asian emerging economies during COVID-19.

H2=There is a negative association between oil price and stock indices of Asian emerging economies during COVID-19.

DATA AND METHODOLOGY

In this study, we use daily data from the South Asian stock index and world crude oil prices. The data is collected from Investing.com for 16 months starting from November 19, 2019, to March 31, 2021, covering the COVID-19 period. The sample consists of South Asian Emerging Economies (Pakistan, China, and India) and crude oil market for reference. China (Shanghai Composite Index), India (BSE Sensex), Pakistan (KSE 100). The selected sample is based on the criteria of COVID-19 deep-rooted circumstances and confirmed deaths. Due to a lack of data and missing values, we consider only the top 3 COVID-19-affected countries in South Asia. For return following formula is used.

$$R_{it}=\ln(P_{it}/P_{it-1})$$

Table I: Descriptive Statistics

	India	China	Pakistan	Oil
Mean	0.008	0.004	0.005	0.001
Maximum	0.085	0.055	0.04	2.76
Minimum	-0.14	-0.08	-0.07	-5.36
Std. Dev.	.018	0.01	0.014	0.24
Skewness	-1.31	-1.23	-0.71	-2.20
Kurtosis	6.72	4.40	7.30	14.47

Descriptive statistics are displayed in Table I This shows that the Bombay Stock Exchange has a higher mean compared to the Karachi Stock Exchange and Shanghai Stock Exchange. Higher kurtosis shows that all markets are leptokurtic and are more negatively skewed, this means all markets did not follow normal distribution pattern. 0.24, showing high volatility in oil returns compared to the other three emerging markets. Among the three markets, India's return has the highest standard deviation and higher mean. In the case of the oil market, the minimum price hit - which indicates when the oil slump came due to COVID-19. Here are graphical images depicting the performance of stock indices from emerging Asian economies and the oil price index during the COVID-19 pandemic.

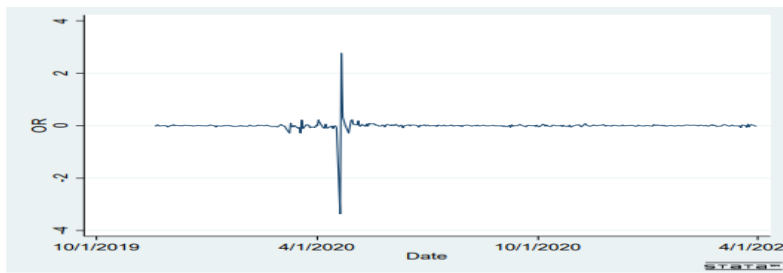


Figure 1: Crude Oil Market Index

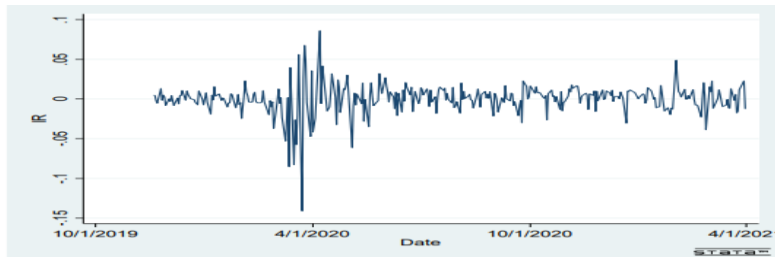


Figure 2: Bombay Stock index (India)

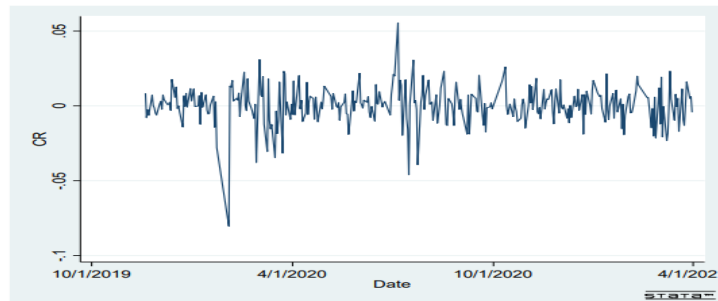


Figure 3: Shanghai Stock Index (China)

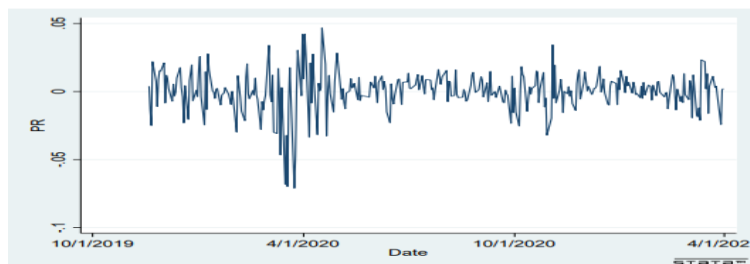


Figure 4: Karachi Stock Index (Pakistan)

BEKK-GARCH

BEKK model for the Multivariate Generalized autoregressive conditionally Heteroskedasticity GARCH (1, 1) methodology is utilized in the paper. To avoid the negative estimated variance, BEKK GARCH was introduced. This model ensures the non-negative estimated variance by incorporating the quadratic form, having a positive covariance matrix. The estimation method in BEKK GARCH is maximum likelihood. This method assumes the constant correlation among variables during time and reduces the large number of parameters that are estimated by other methods.

. Conditional return equation as

$$Z = v + e$$

$$e \sim N(0, H)$$

Conditional variance equation as

$$H_t = C'C + A'e_{t-1}e'_{t-1}A + B'H_{t-1}B$$

The equation can be expanded as

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \quad C = \begin{bmatrix} c_{11} & 0 \\ c_{21} & c_{22} \end{bmatrix}$$

C shows the constant term which is a triangular matrix having 3 parameters. Where A is a square matrix having 2*2 total 4 parameters that capture the shocks or unanticipated news on volatility (ARCH). Where B is also a square matrix 2*2 having 4 elements. This matrix shows how current volatility is affected by past volatility (GARCH). There are 11 parameters in our variance equation. This model is convenient for checking the volatility and shock transmission across the markets. Off-diagonal elements in A show shock spillover across the market, while off-diagonal elements in B matrix show volatility spillover across the markets (Varghese & Raju, 2019).

The BEKK-GARCH model is preferred because it ensures reliable, valid estimates of volatility across multiple assets by keeping the covariance matrix positive. It's great at capturing how shocks in one market can impact others, making it ideal for analyzing interconnected financial systems. While flexible enough to model complex relationships, it's still practical to use without being overly complicated. This makes it especially useful for managing portfolio risks, as it provides better estimates of how assets move together over time. Plus, it can handle asymmetry, like how markets react differently to positive and negative shocks, all while being manageable for larger datasets.

RESULT AND DISCUSSION

Table 2 BEKK-GARCH results in Matrix C, we observe the constant term. C (1,1) measures the baseline volatility for each market. For all three markets, the coefficients are positive and statistically significant. C(2,1) measures the negative impacts of oil on the stock markets and is highly significant for China and India, which suggests that changes in oil prices may have the effect of suppressing volatility or returns in these two markets. The coefficient is also negative and significant for Pakistan, indicating a similar effect for Pakistan but slightly weaker. The C (2,2) coefficients are positive for all markets, but only significant for China, suggesting there is some baseline persistence of volatility in China that is related to its past.

Table II: BEKK-GARCH Results

	Oil-India	Oil-China	Oil-Pakistan
C(1,1)	0.241*** (3.89)	0.241** (2.81)	0.129** (2.17)
C(2,1)	-0.001*** (-8.90)	-0.0003*** (-39.50)	-0.001** (-2.22)
C(2,2)	0.01 (1.07)	0.012** (4.45)	0.005 (1.09)
A(1,1)	0.100** (2.89)	0.100* (2.00)	0.387*** (3.78)
A(2,1)	0.120*** (6.99)	-0.003* (-1.99)	0.001* (1.88)
A(1,2)	-0.020*** (-4.89)	-0.020** (-2.09)	-0.001** (-2.00)
A(2,2)	0.100** (2.89)	-0.021** (-2.57)	0.017*** (24.5)
B(1,1)	0.900** (2.09)	-0.900** (-2.30)	0.670*** (9.09)
B(2,1)	-0.02 (-0.09)	-0.051** (-2.89)	0.005** (2.56)
B(1,2)	0.010* (1.10)	0.100 (0.30)	-0.071* (-1.89)

B(2,2)	-0.073*	0.900**	0.072***
	(-1.90)	(38.5)	(5.90)

Note: In the crude oil market, A(1,1) represents the ARCH effect coefficient, while A(2,2) corresponds to the ARCH effect coefficient for stock markets. B(1,1) and B(2,2) are the GARCH effect coefficients for the oil market and Asian economies' stock markets, respectively. The coefficients A(1,2) and A(2,1) illustrate the shock transmission from the oil market to Asian economies and from Asian stock markets to the oil market, respectively. Furthermore, B(1,2) and B(2,1) indicate the volatility spillovers from oil to Asian economies and from the stock markets of Asian economies to oil, respectively. The corresponding t-values are provided in parentheses.

In Table II, C(1,1), C(1,2) and C(2,2) are represents the constants in the variance equation in the oil-Asian stock markets during COVID-19. C(1,1), 0.241 is constant in models 1 and 2 but lesser in model 3 that is 0.129. Matrix A shows ARCH effects. This is an indication that today's market volatility has positive significant responses to yesterday's shocks in all markets. This indicates that past shocks significantly up today's volatility. Sign of A (2,1) indicates today's stock market volatility concerning how past volatilities in oil. It is significant and positive in India, almost negligible in China, while positive for Pakistan; it implies that a different level of sensitivity toward oil price shocks is exhibited. All markets have negative coefficients, which show that yesterday's shocks in oil prices reduced today's stock market volatility, with significant values for India and Pakistan. $0.120 > 0.001 > -0.003$. Volatility from oil to stock market is higher in India that is 0.120 and lower in China that is -0.03. Sign of A (2, 2) shows that the coefficient is significant in India and Pakistan, and negative in China, which means that the past volatilities in the stock market reduce today's oil market volatility, likely indicating a reactive or adaptive market behavior to stock volatility. Similarly, 0.1 higher past volatility in India compared to other markets China has lowest with -0.021 units.

Matric B shows the GARCH effects. B (1,1), Measures the persistence of volatility from one period to the next. High positive values, particularly for India and Pakistan, suggest a strong persistence of volatility that is 0.67 and 0.90. The negative value for China indicates a potential mean-reversion in volatility. B (1,2) and B (2,1), Show cross-market effects of past volatilities on current conditions. Negative coefficients for China and Pakistan indicate a tendency for increasing volatility in the oil price to reduce volatility in the stock market (, while positive coefficients in Pakistan suggest the opposite. B (2,2), coefficients indicate how past volatility in one market impacts current volatility in another. Significant positive values for China and Pakistan indicate strong persistence or amplification of volatilities. 0.90 in China and 0.072 is in Pakistan. India has the lowest value that is -0.073.

CONCLUSION AND POLICY IMPLICATION

The current paper emphasizes on performance of the South Asian stock market and the World crude oil market during COVID-19. This study reveals how COVID-19 affects the financial markets. This paper examines the influence of oil price fluctuations and volatility spillovers on the stock indices of Asian emerging economies during the COVID-19 pandemic. By employing bivariate BEKK GARCH results, it is evident that there is volatility and shock transmission from the oil price index market to the stock index. This phenomenon is more prominent during Pandemic. During the pandemic, results show that there are more cases of lagged shock transmission from the current oil market to stock exchange of Asian countries. Generally, oil price variations have important impact on these markets, with both immediate effects (via ARCH terms) and persistent effects (via GARCH terms). India and Pakistan tend to exhibit strong persistence in volatility, indicating that market conditions can be highly influenced by past volatilities. China shows both mean-reverting behavior and strong persistence depending on the parameter, suggesting a more complex and potentially more regulated market environment.

This study will be helpful for the investor to reexamine the investment risk in foreign markets. During COVID-19, the economic situation accelerates the negative spillover across different markets. For policymakers, to reduce the negative consequences of this volatility and shocks, these economies should introduce financial derivatives that decrease risk and increase gain during the crisis by providing hedges during turbulent periods. Moreover, strengthens economic and financial ties among interconnected economies to better handle oil price fluctuations. This can be achieved through coordinated economic policies, regional trade agreements, and enhanced financial cooperation. Make financial institutions more resilient by using the study's findings to inform stress tests and risk management practices. These institutions need to be ready for both the immediate and long-term impacts of oil price changes. Create dedicated teams to monitor the impact of oil price changes on stock markets, especially during crises like COVID-19. This continuous analysis will support better policy decisions and timely interventions.

This paper differs from previous studies by incorporating South Asian stock markets, which are not included in earlier research. Additionally, it focuses on countries with the highest reported death rates, analyzing data from a time frame that coincides with the peak of the COVID-19 pandemic when stock markets are most significantly impacted.

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