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Impact of the COVID-19 Pandemic on Stock Market Volatility & Recovery: A Study of Small Cap, Mid Cap, and Large Cap Indices

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Abstract: This study explores how the COVID-19 pandemic has influenced market volatility among various market indices within the Indian stock market. By analysing weekly closing price data for the Nifty large cap 50, Nifty Midcap 50, and Nifty Small cap 50 indices, the study investigates volatility during the Pre-COVID (2018-2019), COVID (2020-2022), and Post-COVID (2022-2024) periods and tests for significant differences in volatility of the indices. In addition, the study also examines the time it took for small cap, mid cap, and large cap indices to recover to their pre-COVID average price levels after the first and second waves of COVID-19. This analysis reveals the differences in recovery time taken by different indices.

The results are expected to provide valuable insights into the behaviour of various market indices during global crises, aiding investors, policymakers, and financial institutions in managing market risks and comprehending the recovery dynamics across different stock market segments.
Keywords: COVID-19, Market Volatility, Indian Stock Market, Large-Cap Indices, Mid-Cap Indices, Small-Cap Indices, Recovery.

Introduction - The COVID-19 pandemic, which first emerged in early 2020, caused widespread disruption across global financial markets. Initially seen as a public health crisis, its far-reaching effects soon extended to economies worldwide, with the pandemic quickly becoming a major catalyst for market volatility. As countries implemented lockdowns, halted business operations, and restricted travel to curb the virus's spread, financial markets responded with significant declines in stock prices, reflecting widespread uncertainty and fear. Investors were caught off guard, leading to panic-driven decisions and the withdrawal of investments from stock markets.

In India, the stock market was no exception to these global trends. Major indices like the Nifty 50, SENSEX, and other indices experienced unprecedented levels of volatility. Volatility, a key indicator of market uncertainty, surged during the pandemic, with sharp swings in stock prices becoming a common occurrence. This research aims to study the impact of COVID-19 on the volatility and recovery of large-cap, mid-cap, and small-cap indices in India. By examining how these market segments reacted during the pandemic and their subsequent recovery time period as compared to pre-COVID period, this study seeks to provide insights into the behaviour of different types of stocks in response to unprecedented global crises. The findings will add to the literature and provide for a better understanding of the dynamics of market volatility and time taken to recover across various capitalizations, helping investors make informed decisions in future market disruptions.

Review of literature: TheCOVID-19 pandemic has been the subject of extensive research, particularly regarding its effects on stock markets and investment behaviours. Several studies have examined how markets across various countries, including India, reacted to the pandemic and how different sectors and companies were affected.

Joshi (2022) examined how COVID-19 impacted Indian stock market indices, specifically the NSE Composite and sectoral indices. The study revealed a substantial increase in market volatility across both large-cap and sectoral indices during the pandemic, highlighting the disruptive effects of the crisis on market trends. This research provides crucial insights into the Indian stock market's response to the economic uncertainty caused by the pandemic.

Challenging traditional assumptions, Shefali (2021) analysed large-cap, mid-cap, and small-cap indices during and after the COVID-19 recession. Surprisingly, large-cap indices demonstrated the highest return variability, while small-cap indices showed more consistent returns. This finding contradicts the conventional view that large-cap investments are less risky, offering valuable insights into the behaviour of different stock index segments during crisis periods.

Expanding the geographical scope, Espinosa-Méndez and Maquieira (2023) investigated herding behaviour among business groups during the pandemic in Chile. Their research revealed that, while herding behaviour was present in the Chilean stock market, it was less pronounced for firms affiliated with business groups than for standalone companies. The authors attribute this to the business groups' ability to leverage internal capital markets and shared information, thereby mitigating herding tendencies among investors. This study provides a unique perspective on how organizational structure influences investor behaviour during periods of high uncertainty.

Kumar, Bhatia, and Gupta (2021) conducted a comprehensive analysis of the sectoral impact of COVID-19 on Indian firms listed on the NSE using an event study methodology. Their findings indicated a negative response to the outbreak, with NSE-listed firms experiencing a cumulative average abnormal return (CAAR) exceeding -6% in a 10-day event window. The study categorized sectors based on their degree of impact, with financial services, metals, automobiles, and construction being highly affected, while media and pharmaceuticals were only slightly affected. Notably, larger firms experienced more significant negative impacts than smaller ones, challenging the traditional size effect phenomenon and suggesting that larger firms were more susceptible to shocks and crash risk during the pandemic. Raj (2021) conducted a comprehensive analysis of the National Stock Exchange (NSE) indices, employing multiple regression analysis and E-GARCH models. The study found that daily confirmed COVID-19 cases negatively impacted returns across the large-cap (Nifty 50), mid-cap (Nifty Next 50), and small-cap (Midcap 150, Small Cap 250) indices. Notably, the E-GARCH analysis revealed increased market volatility, with small- and mid-caps demonstrating higher sensitivity. While the lockdown period positively affected the mid-cap indices, the government's economic stimulus package showed no significant impact on stock performance during the study period.

Sowmya and Sameera (2021) further explored the risk-return dynamics of, mid-cap, small-cap and large-cap stock indices in India during the pandemic. Their analysis, covering April 2020 to March 2021, revealed that all the indices experienced higher risks than returns. The correlation analysis between NIFTY50 and these indices showed a weak positive correlation for most companies across capitalization segments. Interestingly, despite higher risk, small-cap and mid-cap companies occasionally outperformed their large-cap counterparts, suggesting potential benefits of portfolio diversification across capitalization segments in volatile market conditions.

Sharma, Kaur, and Rawat (2021) extended the research scope by comparing the volatility of sustainable indices (BSE Greenex, Carbonex) with market-capitalization-based indices (BSE Large-Cap, Mid-Cap, and Small-Cap) in India. Utilizing daily returns data from 2015 to 2021 and employing ARCH-based models, their study confirmed the significant impact of COVID-19 on stock volatility. The Asymmetric Power ARCH (APARCH) model indicated that the large-cap index experienced the highest volatility, while the Exponential GARCH (EGARCH) model highlighted significant volatility in the mid-cap index. Notably, sustainable indices, particularly Greenex, demonstrated greater resilience to pandemic-induced market fluctuations than traditional market capitalization-based indices.

Pendell and Cho (2013) analyzed the impact of foot-and-mouth disease (FMD) outbreaks on South Korean agribusiness stocks. They found that FMD outbreaks affected stock market volatility differently across industries, with smaller companies experiencing larger volatility changes. Notably, market reactions were gradual, rather than instantaneous, suggesting that investors took time to incorporate information into stock prices.

Nageri (2019) studied the persistence of volatility in the Nigerian stock market before and after the 2008-2009 financial crisis. The study revealed high volatility persistence during and after the crisis, with regulatory interventions helping stabilize market dynamics. This finding highlights the importance of government policies in mitigating the impact of financial crises on stock markets.

Topcu and Gulal (2020) investigated the effect of the COVID-19 pandemic on emerging stock markets. It was observed that the negative impacts were highest in the early phase but diminished over time, with Asian markets most affected and European emerging markets least impacted. The study emphasized the importance of timely government responses and stimulus packages in mitigating adverse effects on stock markets during crises.

Mehta and Nerlekar (2021) analysed the factors influencing stock market volatility in India during the COVID-19 pandemic, focusing on the NIFTY50 and SENSEX indices from March to May 2020. Their study revealed significant short-term volatility but concluded that the pandemic did not have a lasting impact. Key contributors to volatility include global market conditions, government policies, and investor psychology, with media coverage playing a significant role. The research also observed a shift in retail investor preferences towards small-cap funds and fundamental analysis. Despite the initial instability, the Indian stock market demonstrated resilience and recovery, highlighting its adaptability to unprecedented circumstances. This literature review highlights the complex and varied impacts of the COVID-19 pandemic on stock markets, emphasizing the need for a nuanced understanding of market behaviour during crisis events. It was therefore decided to study the performance and volatility of large-cap, mid-cap, and small-cap indices across the pre-COVID, during COVID, and post-COVID periods, as previous studies have often focused on specific indices or single periods, leaving a gap in understanding how these segments reacted and recovered over time. It is expected that these findings offer valuable insights for investors, policymakers, and researchers in developing strategies to manage risk and navigate future economic uncertainties.

Research objectives

1. **To assess the volatility** of small cap, mid cap, and large cap indices across pre-COVID, during COVID, and post-COVID periods.
2. **To analyse the recovery time** of small cap, mid cap, and large cap indices to pre-COVID levels after the first and second COVID waves.

Methodology

Data Collection: This study used weekly closing prices for three market indices: Nifty 50, Nifty Midcap 50, and Nifty Small cap 50, from January 2018* to March 2024. The data was taken from Investing.com, where it was readily available. The dataset included about 325 weekly observations per index, covering daily open, high, low, close prices, traded volumes, and turnover.

(*- Data for nifty small cap 50 was available from year 2019 onwards)

Data Analysis Techniques:

1. Weekly returns calculation: Return t = (Price t– Price [t-1]) / Price[t-1] × 100
2. Volatility measurement: Standard deviation of weekly returns over specific periods.
3. F-Test is used to compare variances of large-cap, mid-cap, and small-cap indices across periods for hypothesis interpretation.

Period Segmentation:

Pre-COVID: January 2018 to December 2019

COVID: January 2020 to March 2022

Post-COVID: April 2022 to March 2024

Tools Used: Microsoft Excel was utilized for organizing the data and performing essential calculations, such as computing weekly returns and monthly averages from closing prices. Additionally, Excel's built-in statistical functions were employed to calculate standard deviation and conduct the F-test, facilitating the analysis of volatility and comparison across different periods.

Study Hypotheses

Volatility Hypotheses:

H **1.1**: There is no significant difference in the volatility of large-cap indices (e.g., Nifty 50) across the pre-COVID, during-COVID, and post-COVID periods.

H **1.2**: There is a significant difference in the volatility of large-cap indices across these periods.

H **2.1**: There is no significant difference in the volatility of mid-cap indices (e.g., Nifty Midcap 50) across the pre-COVID, during-COVID, and post-COVID periods.

H **2.2**: There is a significant difference in the volatility of mid-cap indices across these periods.

H **3.1**: There is no significant difference in the volatility of small-cap indices (e.g., Nifty Small cap 50) across the pre-COVID, during-COVID, and post-COVID periods.

H **3.2**: There is a significant difference in the volatility of small-cap indices across these periods.

Data Analysis and Interpretation: Weekly returns are calculated from the closing prices of three indices, namely Nifty 50, Nifty Midcap 50, and Nifty Small cap 50, across three periods: pre-COVID, during COVID, and post-COVID. The standard deviation of these weekly returns was then calculated for each period to measure the volatility of each index, and an F-Test was used to interpret the hypothesis by comparing variances across the three periods.

To assess the recovery time of the large-cap, mid-cap, and small-cap indices after the COVID-19 pandemic, the study utilized the COVID-19 timeline as outlined by the **World Health Organization (WHO) and other official sources**, segmenting the pandemic into three distinct phases: Thepre-COVID period was defined as the timeframe from January 2018 to December 2019, with December 2019 specifically selected as the baseline month for average calculations. This decision was made to ensure that the data represented the last "normal" state before any global awareness of the pandemic, as news of the coronavirus outbreak had already begun circulating by January 2020. WHO had been alerted to cases of pneumonia in Wuhan, China, on 3 January 2020, making December 2019 the most reliable reference point for pre-pandemic performance of the indices.

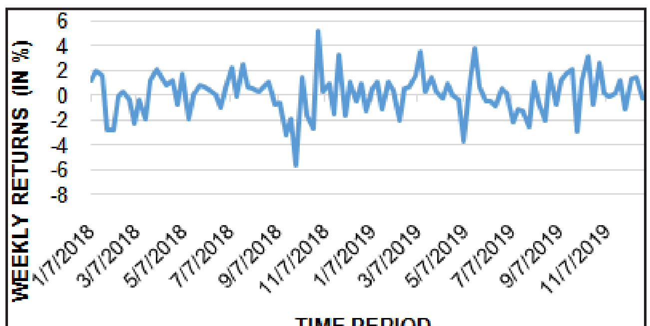

fig no. 1 weekly returns pre-COVID of large cap 50

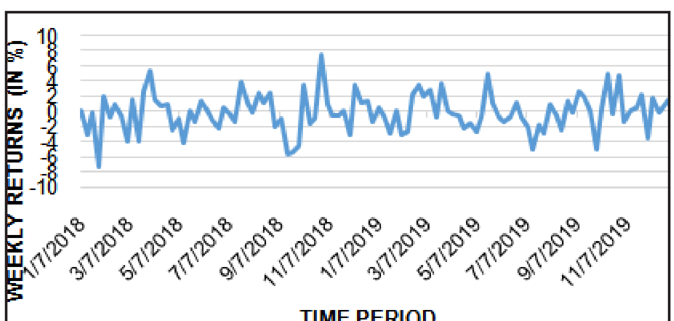

fig no. 2 weekly returns pre-COVID mid cap 50

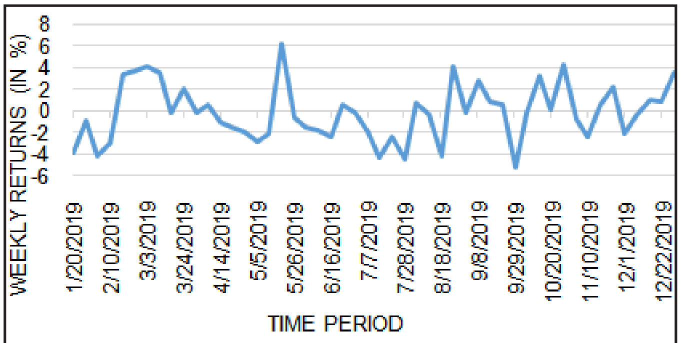

fig no. 3 weekly returns pre-COVID small cap 50

The COVID period began in January 2020, when WHO declared the outbreak a Public Health Emergency of International Concern on 30 January 2020, and lasted until May 2023, which marked the end of the emergency phase. During the first wave of the pandemic in India, several key events were considered, such as the nationwide lockdown in March 2020 and the subsequent phased reopening phases known as “Unlock.” Unlock 1.0 began on 30 May 2020, with services gradually reopening from 8 June 2020.On 1 August 2020, during Unlock 3.0, significant relaxations were introduced, allowing for broader economic and social activity. For this reason, August 2020 was chosen as the starting point for evaluating the recovery process after the first wave, and the study used the average closing prices from August onwards to assess when the indices regained their pre-COVID values.

The second wave of COVID-19 struck India in March 2021, leading to a sharp rise in cases nationwide. To establish a baseline before this surge, the average closing prices for February 2021 were used. The study then performed a comparative analysis of the recovery after the second wave, using the average closing prices of June and July 2021 As by late May 2021, the number of new cases had steadily declined, with 25 May 2021 recording 195,994 new cases its lowest daily increase since mid-April marking the beginning of the recovery process. By June-July 2021, the situation had stabilized enough to allow for reliable comparison with the pre-second wave values.

For the recovery analysis, the pre-COVID baseline was established by calculating the average closing prices for December 2019, representing the month before global awareness of the pandemic. For the first wave recovery, average closing prices were taken from August 2020 onward, coinciding with Unlock 3.0 when broader reopening began. This enabled an assessment of how long it took for the indices to return to pre-COVID values. The second wave recovery was analysed by comparing the average closing prices of February 2021 (before the second wave) with those of June and July 2021 (as case numbers began to decline). This multi-phase analysis of pre-COVID, COVID, and post-COVID periods provided a comprehensive view of the recovery timelines for the large-cap, mid-cap, and small-cap indices, identifying key insights of recovery throughout the pandemic.

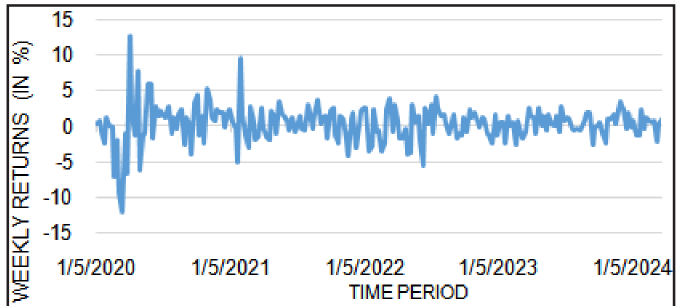

fig no. 4 weekly returns COVID & post-COVID of large cap 50

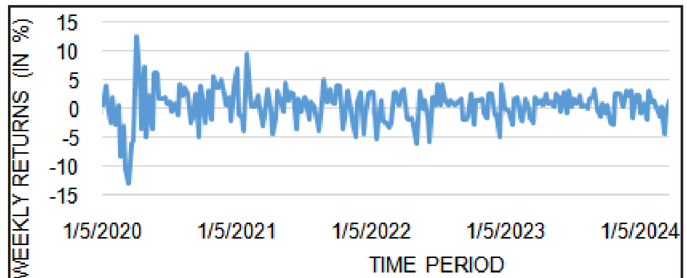

fig no. 5 weekly returns COVID & post-COVID mid cap 50

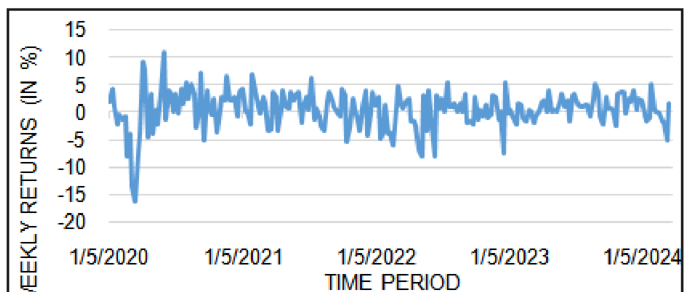

fig no. 6 weekly returns COVID & post-COVID small cap 50

Results: The volatility patterns of large-cap, mid-cap, and small-cap indices were analysed for the pre-COVID, during-COVID, and post-COVID periods. The standard deviation, a key measure of market volatility, reveals a significant surge during the COVID period across all segments, followed by a stabilization in the post-pandemic phase. An F-Test was applied to compare variances in volatility across the three periods for each index, further confirming the significance of these changes.

Table no.1-volatility comparison of large-cap index through standard deviation of weekly returns

RESULT TABLE (LARGE CAP)

Pre-COVID Volatility	**1.6957**
During-COVID Volatility	**3.2261**
Post-COVID Volatility	**1.6954**

Table no.2-F-test for variance comparison: large-cap index (pre-COVID vs. COVID)

	Change(in %) COVID	*Change(in%) PRE COVID*
Mean	0.366752137	0.155576923
Variance	10.4077066	2.875547237
Observations	117	104
df	116	103
F	3.619382937	
P(F<=f) one-tail	7.09803E-11	
F Critical two-tail	1.461370943	
P (TWO TAIL VALUE)	1.41961E-10	

The F-value (3.6194) is much larger than the F-critical value (1.4613), and the P-value is extremely small, indicating strong evidence to reject the null hypothesis. This means there is a statistically significant difference in the volatility of large-cap indices between the pre-COVID and COVID periods, with volatility being significantly higher during the COVID period.

Table no.3-F-test for variance comparison: large-cap index (COVID vs. post-COVID)

	Change(in %) COVID	*Change (in %) POST COVID*
Mean	0.366752137	0.239326923
Variance	10.4077066	2.874417989
Observations	117	104
df	116	103
F	3.620804852	
P(F<=f) one-tail	7.01356E-11	
F Critical two-tail	1.461370943	
P (TWO TAIL VALUE)	1.40271E-10	

The F-value (3.6208) is much larger than the critical value (1.4613), and the P-value is extremely small, providing strong evidence to reject the null hypothesis. This indicates a significant difference in the volatility of large-cap indices between the COVID and Post-COVID periods.

Table no.4-F-test for variance comparison: large-cap index (pre-COVID vs. post-COVID)

	Change(in %) PRE COVID	*Change (in %) POST COVID*
Mean	0.155576923	0.239326923
Variance	2.875547237	2.874417989
Observations	104	104
df	103	103
F	1.000392861	
P(F<=f) one-tail	0.499206772	
F Critical two-tail	1.474601725	
P (TWO TAIL VALUE)	0.998413543	

The F-value (1.0004) is very close to the critical value (1.4746), and the P-value is much larger than 0.05, This indicates no significant difference in the volatility of large-cap indices between the Pre-COVID and Post-COVID periods, with the variances being nearly identical (Pre-COVID: 2.8755, Post-COVID: 2.8744).

Hence we conclude that large-cap indices showed a sharp rise in volatility during COVID but quickly returned to their pre-pandemic levels post-COVID. The near-identical standard deviation values pre- and post-pandemic indicate a full recovery in market stability. The F-test results also provide evidence for this, showing no statistically significant difference in volatility between the pre- and post-COVID periods.

Table no.5-volatility comparison of mid-cap index through standard deviation of weekly returns

RESULT TABLE (MID CAP)

Pre-COVID Volatility	**2.5623**
During-COVID Volatility	**3.7419**
Post-COVID Volatility	**2.1302**

Table no.6-F-test for variance comparison: mid-cap index (pre-COVID vs. COVID)

	Change(in %) COVID	*Change(in %) PRE COVID*
Mean	0.547863248	-0.130673077
Variance	14.00161867	6.565179154
Observations	117	104
df	116	103
F	2.132709305	
P(F<=f) one-tail	5.45451E-05	
F Critical two-tail	1.461370943	
P (TWO TAIL VALUE)	0.00010909	

The F-value (2.1327) is much larger than the critical value (1.4613), and the P-value is extremely small (0.00010909), This indicates a significant difference in the volatility of mid-cap indices between the Pre-COVID and COVID periods, with volatility being much higher during the COVID period compared to the Pre-COVID period.

Table no.7-F-test for variance comparison: mid-cap index (COVID vs. post-COVID)

	Change(in %) COVID	*Change (in %) POST COVID*
Mean	0.547863248	0.491634615
Variance	14.00161867	4.537714778
Observations	117	104
df	116	103
F	3.085610127	
P(F<=f) one-tail	7.37587E-09	
F Critical two-tail	1.461370943	
P (TWO TAIL VALUE)	1.47517E-08	

The F-value (3.0856) is much larger than the critical value (1.4613), and the P-value is extremely small (1.47517E-08), This indicates a significant difference in the volatility of mid-cap indices between the COVID and Post-COVID periods, with much higher volatility during COVID compared to the Post-COVID period.

Table no.8-F-test for variance comparison: mid-cap index (pre-COVID vs. post-COVID)

	Change(in %) PRE COVID	*Change (in %) POST COVID*
Mean	-0.130673077	0.491634615
Variance	6.565179154	4.537714778
Observations	104	104
df	103	103
F	1.446802956	
P(F<=f) one-tail	0.031127595	
F Critical two-tail	1.474601725	
P (TWO TAIL VALUE)	0.06225519	

The F-value (1.4468) is slightly greater than the critical value (1.4746), and the one-tailed P-value (0.0311) is less than 0.05, allowing us to conclude there is a significant difference in mid-cap volatility between the Pre-COVID and Post-COVID periods. However, the two-tailed P-value (0.0623) slightly exceeds 0.05, meaning we would fail to reject the null hypothesis using a two-tailed test. Overall, the Pre-COVID variance was slightly higher than the Post-COVID variance, but the difference in volatility is not as pronounced as in other comparisons.

Hence we conclude that mid-cap indices experienced a significant increase in volatility during the pandemic but did not return to pre-COVID levels in the post-pandemic phase. Instead, post-COVID volatility was slightly lower than pre-pandemic, suggesting a possible structural shift in mid-cap market dynamics.

Table no.9-volatility comparison of small-cap index through standard deviation of weekly returns

RESULT TABLE (SMALL CAP)

Pre-COVID Volatility	**2.6962**
During-COVID Volatility	**4.0087**
Post-COVID Volatility	**2.6370**

Table no.10-F-test for variance comparison: small-cap index (pre-COVID vs. COVID)

	Change(in %) COVID	*Change(in %) PRE COVID*
Mean	0.536324786	-0.1238
Variance	16.07002345	7.269415878
Observations	117	50
df	116	49
F	2.210634763	
P(F<=f) one-tail	0.001131539	
F Critical two-tail	1.648618959	
P (TWO TAIL VALUE)	0.002263077	

The F-value (2.2106) is greater than the critical value (1.6486), and the P-values for both one-tail (0.0011) and two-tail (0.0023) tests are well below 0.05, this indicates a significant difference in volatility of small-cap indices between the pre-COVID and COVID periods. The variance during the COVID period was much higher than pre-COVID, reflecting the increased market volatility due to the pandemic's disruptions.

Table no.11-F-test for variance comparison: small-cap index (COVID vs. post-COVID)

	Change(in %) COVID	*Change (in %) POST COVID*
Mean	0.536324786	0.383846154
Variance	16.07002345	6.953880209
Observations	117	104
df	116	103
F	2.310943382	
P(F<=f) one-tail	9.94417E-06	
F Critical two-tail	1.461370943	
P (TWO TAIL VALUE)	1.98883E-05	

The F-value (2.3109) exceeds the critical value (1.4613), and both the one-tail and two-tail P-values are extremely small, this indicates a significant difference in volatility between the COVID and post-COVID periods for small-cap indices. The variance during COVID was much higher than post-COVID, showing difference in market volatility as the economy stabilized after the pandemic.

Table no.12-F-test for variance comparison: small-cap index (pre-COVID vs. post-COVID)

	Change(in %) PRE COVID	*Change (in %) POST COVID*
Mean	-0.1238	0.383846154
Variance	7.269415878	6.953880209
Observations	50	104
df	49	103
F	1.045375482	
P(F<=f) one-tail	0.416922059	
F Critical two-tail	1.591095229	
P (TWO TAIL VALUE)	0.833844118	

The F-value (1.0454) is smaller than the critical value (1.5910), and both the one-tail and two-tail P-values are much greater than 0.05, indicating no significant difference in the volatility of small-cap indices between the pre-COVID and post-COVID periods.

Hence we conclude that small-cap indices had the highest increase in volatility during COVID. Although post-COVID volatility was slightly lower than pre-pandemic levels, small caps remained the most volatile among the three groups.

The hypothesis testing results suggest a clear rejection of the null hypothesis (H1.1, H2.1, H3.1), which assumed no significant difference in volatility across periods. The significant increase in standard deviation during COVIDacross all indices supports the alternative hypothesis (H1.2, H2.2, H3.2), confirming that volatility significantly varied across the three periods.

While studying the recovery and time taken to recover from the crisis it was found that During the **first wave of COVID-19**, the pre-COVID average closing price for the large-cap index in December 2019 was **12,168.21**. Post-COVID, in August 2020, the average dropped to **11,349.10**, indicating a significant decline. However, by **November 2020**, the average closing price had recovered to **12,814.01**, surpassing the pre-COVID level. This indicates that the large-cap index took approximately **90 to 120 days (3 to 4**

months)to recover to its pre-COVID levels after the first wave.

During the **second wave of COVID-19**, the pre-wave average in February 2021 was **14,903.08**. Although there was a brief decline in the months that followed, by **June 2021**, the large-cap index had not only recovered but increased to **15,766.31**, and further rose to **15,808.08** in July 2021. This suggests that the large-cap index was not significantly affected by the second wave, as it quickly rebounded within **60 to 90 days (2 to 3 months).**

Table no.13- comparison of pre- and post-COVID-19 averages for large-cap index during the first and second waves

FIRST WAVE OF COVID-19 AVERAGE FOR LARGE CAP

Pre 1st Wave Of COVIDAverage For The Month Of December 2019	**12,168.21**
Post 1st Wave Of COVID Average For The Month Of August 2020	**11,349.10**
Post 1st Wave Of COVID Average For The Month Of September 2020	**11,359.15**
Post 1st Wave Of COVID Average For The Month Of October 2020	**11,812.35**
Post1st Wave OfCOVID Average For The Month Of November 2020	**12,814.01**

SECOND WAVE OF COVID-19 AVERAGE FOR LARGE CAP

Pre 2nd Wave Of COVID Average For The Month Of February 2021	**14,903.08**
Post 2nd Wave Of COVID Average For The Month Of June 2021	**15,766.31**
Post 2nd Wave Of COVIDAverage For The Month Of July 2021	**15,808.08**

Similarly, during the first wave of COVID-19, the pre-COVID average closing price for the small-cap index in December 2019 was 2,776.80. After the onset of the pandemic, the index dropped to 2,695.30 by August 2020, shortly after the first wave ended. However, by September 2020, the index had already recovered to 2,864.61, surpassing the pre-COVID level. This indicates that the small-cap index rebounded to its pre-COVID average within just one month after the first wave, demonstrating a swift recovery. In February 2021, during the second wave of COVID-19, the pre-wave average was 4,110.29. The small-cap index experienced an even sharper recovery during the second wave, reaching 4,889.85 by June 2021 and further rising to 5,221.96 by July 2021. This shows that the small-cap index not only recovered but exceeded its pre-second-wave level within 1 to 2 months.

Table no.14- comparison of pre- and post-COVID-19 averages for small-cap index during the first and second waves

FIRST WAVE OF COVID-19 AVERAGE FOR SMALL CAP

Pre 1st Wave Of COVID Average For The Month Of December 2019	**2,776.80**
Post 1st Wave Of COVID Average For The Month Of August 2020	**2,695.30**
Post 1st Wave Of COVID Average For The Month Of September 2020	**2,864.61**

SECOND WAVE OF COVID-19 AVERAGE FOR SMALL CAP

Pre 2nd Wave Of COVID Average For The Month Of February 2021	**4,110.29**
Post 2nd Wave Of COVID Average For The Month Of June 2021	**4,889.85**
Post 2nd Wave Of COVID Average For The Month Of July 2021	**5,221.96**

Also for mid-cap index in the first wave of COVID-19, the pre-COVID average closing price for the mid-cap index in December 2019 was 4,654.00. Following the pandemic's outbreak, the index dropped slightly to 4,647.25 in August 2020. However, by September 2020, the index recovered to 4,667.43, surpassing its pre-COVID level. This indicates that the mid-cap index rebounded to pre-pandemic levels within one month after the first wave, highlighting its resilience in the market during that period. In February 2021, during the second wave of COVID-19, the pre-wave average was6,817.05. The mid-cap index experienced a more significant recovery during the second wave, with the average rising to 7,467.11 by June 2021 and continuing to increase to 7,631.13 in July 2021. This shows that the mid-cap index not only recovered but exceeded its pre-second-wave average within 1 to 2 months.

Table no.15- comparison of pre- and post-COVID-19 averages for mid-cap index during the first and second waves

FIRST WAVE OF COVID-19 AVERAGE FOR MID CAP

Pre 1st Wave Of COVID Average For The Month Of December 2019	**4,654.00**
Post 1st Wave OfCOVID Average For The Month Of August 2020	**4,647.25**
Post 1st Wave Of COVID Average For The Month Of September 2020	**4,667.43**

SECOND WAVE OF COVID-19 AVERAGE FOR MID CAP

Pre 2nd Wave Of COVID Average For The Month Of February 2021	**6,817.05**
Post 2nd Wave OfCOVID Average For The Month Of June 2021	**7,467.11**
Post 2nd Wave Of COVID Average For The Month Of July 2021	**7,631.13**

This quicker recovery during the second wave across the three index suggests that market participants were better prepared and more confident to withstand and bounce back from economic shocks, compared to the first wave.

Conclusion: This study on volatility of small cap, mid cap, and large cap indices during the COVID-19 pandemic offers valuable insights into market behaviour during crises. The findings challenge traditional financial theories like the Efficient Market Hypothesis and support the Adaptive Market Hypothesis by demonstrating how market volatility and recovery can differ across segments and adapt over time. Market capitalization plays an important role in determining an index's vulnerability to external shocks and its recovery capacity. Large-cap indices experienced significant volatility but stabilized quickly post-crisis, while mid-cap indices showed a structural shift with lower post-COVID volatility. Small-cap indices remained the most volatile throughout the study period. Recovery duration varied across indices, with small-cap and mid-cap indices demonstrating faster recoveries, particularly during the second wave. These findings have important implications for investors, financial analysts, policymakers, and financial institutions. The results underscore the importance of understanding the varying behaviours of different market segments during crises for effective risk management and portfolio optimization. The observed reduction in post-COVID volatility, especially in mid-cap and small-cap indices, indicates a shift in market sentiment that could influence future investment decisions. The study highlights the significance of timely interventions to stabilize markets during crises and the need for continuous assessment of investor sentiment to guide future policy decisions and ensure more resilient financial markets. The findings provide a comprehensive framework for managing market volatility and uncertainty in future crises, emphasizing the need for tailored strategies based on market capitalization. The faster recovery observed during the second wave across all indices points to improved market resilience, likely due to better preparedness, stronger market confidence, and adaptive strategies developed during the pandemic. This research contributes significantly to our understanding of market dynamics during crisis periods, offering practical implications for risk management, investment strategies, and policy formulation. It underscores the importance of considering market capitalization when analysing market behaviour and developing resilience strategies for future economic shocks.

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