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SECTORAL EQUITY MARKET RESPONSES TO THE COVID-19 PANDEMIC IN INDIA: A PANEL DATA ANALYSIS OF EPIDEMIOLOGICAL AND POLICY VARIABLES

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ABSTRACT

Purpose: This study investigates the impact of the COVID-19 pandemic on sectoral equity returns in India, incorporating both epidemiological indicators (case growth and death toll) and government interventions (lockdown and vaccination). It also evaluates the influence of key macroeconomic variables during this period of heightened uncertainty.

Methodology: Using weekly panel data from January 2019 to December 2021 across seven Nifty sector indices – Pharma, FMCG, IT, Auto, Bank, Realty, and Energy, the study employs a fixed effects panel regression framework. The dependent variable is the log return of each sector. Explanatory variables include log-transformed COVID-19 cases and deaths, lockdown and vaccine dummies, exchange rate, crude oil price, repo rate, India VIX, and CPI inflation. Diagnostics such as multicollinearity (VIF), correlation matrix, and normality were conducted using SPSS to ensure model robustness.

Findings: A statistically significant negative relationship was found between COVID-19 case growth and sectoral returns. In contrast, reported deaths exhibited a positive association, possibly reflecting investor expectations of policy relief. Lockdown announcements had a positive and significant effect, while the impact of vaccination remained statistically inconclusive. Macroeconomic variables were largely insignificant. Sector-wise regressions revealed heterogeneity in responses, with Pharma and IT reacting more strongly than Realty or FMCG.

Value: The study contributes to the growing literature on pandemic-driven financial dynamics by integrating weekly epidemiological and policy data into a sectoral panel framework. It offers relevant insights for investors, regulators, and policy planners in emerging markets.

Keywords: Covid-19, Sectoral Returns, Fixed Effects, Indian Equity Market, Panel Regression, Policy Response

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The outbreak of COVID-19 in early 2020 triggered an unprecedented global crisis, extending beyond public health to severely disrupt financial markets, investor sentiment, and macroeconomic stability. The Indian equity market was no exception. As the government implemented nationwide lockdowns, stimulus packages, and vaccination campaigns, market participants were left grappling with extreme volatility and uncertainty (Baker et al., 2020). In such situations, stock markets often act as real-time barometers of economic expectations, absorbing both factual developments and behavioral responses.

However, the impact of COVID-19 was not uniform across all sectors. While pharmaceutical and information technology stocks showed resilience, sectors like banking, real estate, and automotive experienced pronounced declines. These heterogeneous effects raise an important research question: how did COVID-19, and the policy measures that followed, shape sectoral equity returns in India?

Although international studies have assessed market-level impacts of pandemics (Al-Awadhi et al., 2020; Mazur et al., 2021), empirical literature focusing on sectoral dynamics within emerging markets – especially India, remains limited. Moreover, many prior studies rely on daily or monthly data, potentially missing medium-term behavioral responses. This study aims to fill this gap using a weekly panel dataset, integrating both epidemiological data and macroeconomic indicators.

1.2. STATEMENT OF THE PROBLEM

The COVID-19 crisis affected different sectors in different ways. Investor reactions were shaped not only by actual infection rates and fatalities but also by expectations surrounding lockdowns, policy responses, and economic support. Despite the scale of this crisis, there remains a lack of empirical evidence on how these factors jointly influenced sector-specific equity returns in the Indian context.

This study seeks to address this gap by analyzing how sectoral stock returns in India responded to COVID-19-related developments and macroeconomic conditions using a robust panel data framework.

1.3. RESEARCH OBJECTIVES

The primary objective of this study is to evaluate the impact of the COVID-19 pandemic and related macroeconomic variables on sectoral equity returns in India.

Specific objectives include:

1) To analyze the effect of COVID-19 case growth and death counts on sectoral equity returns.
2) To examine the impact of lockdown and vaccine-related policy announcements on these returns.
3) To assess the influence of key macroeconomic indicators such as the exchange rate, oil price, interest rate, market volatility (VIX), and inflation.
4) To identify sector-specific sensitivities through separate regressions for each sector.

1.4. RESEARCH QUESTIONS

The study is guided by the following research questions:

1) What is the relationship between COVID-19 case growth and sectoral equity returns?
2) How do COVID-19 death counts affect investor behavior in different sectors?
3) Do lockdowns and vaccine rollouts significantly alter sectoral return patterns?
4) What role do macroeconomic fundamentals play in influencing returns during a pandemic?
5) Are certain sectors more responsive to pandemic-related variables than others?

1.5. RESEARCH HYPOTHESES

The hypotheses tested in this study are:

- **H_{01}:** COVID-19 case growth does not significantly affect sectoral stock returns.
- **H_{11}:** COVID-19 case growth significantly affects sectoral stock returns.
- **H_{02}:** COVID-19 deaths do not significantly affect sectoral stock returns.
- **H_{12}:** COVID-19 deaths significantly affect sectoral stock returns.
- **H_{03}:** Lockdown announcements have no significant effect on sectoral returns.
- **H_{13}:** Lockdown announcements have a significant effect on sectoral returns.
- **H_{04}:** Vaccine-related developments have no significant effect on sectoral returns.
- **H_{14}:** Vaccine-related developments have a significant effect on sectoral returns.
- **H_{05}:** Macroeconomic control variables do not significantly influence sectoral returns.

- **H_{15}:** Macroeconomic control variables significantly influence sectoral returns.

1.6. SCOPE AND DELIMITATION

The study covers seven major sectoral indices of the Indian equity market: Pharma, FMCG, IT, Auto, Bank, Realty, and Energy. The period of analysis spans from January 2019 to December 2021, thereby including the pre-COVID phase, the pandemic period, and the initial phase of vaccination. Weekly data has been used to capture medium-frequency variations, balancing short-term responsiveness with noise reduction.

The analysis is limited to index-level returns, excluding firm-specific variables such as size, leverage, or ESG scores. Due to the relatively small number of cross-sections, the study uses a fixed effects panel model; the random effects model could not be employed.

1.7. SIGNIFICANCE OF THE STUDY

This research provides timely insights into how pandemic-related events and macroeconomic fundamentals shaped sectoral equity returns in India. The findings can inform:

1) Investors: for strategic portfolio rebalancing during crisis periods.
2) Policymakers: for improving communication and intervention effectiveness.
3) Academics: by adding a novel contribution to the emerging field of financial epidemiology in emerging markets.

By analyzing sector-specific dynamics using a multi-factor model, the study bridges a significant gap in the existing literature and offers a replicable framework for similar research in other markets.

1.8. ORGANIZATION OF THE STUDY

The study is structured as follows:

- Chapter 1: Introduces the research problem, objectives, and scope.
- Chapter 2: Reviews literature on pandemics, sectoral equity behavior, and macro-financial linkages.
- Chapter 3: Outlines the methodology, variable construction, and model framework.
- Chapter 4: Presents the results, statistical tests, and sector-wise interpretations.
- Chapter 5: Summarizes key findings, discusses implications, addresses limitations, and offers directions for future research.

2. REVIEW OF LITERATURE

2.1. INTRODUCTION

The COVID-19 pandemic has generated a significant body of research across disciplines, with financial markets receiving particular attention due to the crisis's profound and sudden impact. This chapter presents a critical review of the existing literature relevant to this study, organized around five thematic strands: (1) the effect of pandemics on financial markets, (2) sectoral responses to COVID-19, (3) policy intervention effects, (4) macroeconomic and volatility factors, and (5) studies based on the Indian market. The chapter concludes by identifying key research gaps addressed in this study.

2.2. PANDEMICS AND FINANCIAL MARKET RESPONSES

Historically, financial markets have reacted negatively to health crises, as seen in the case of SARS, H1N1, and Ebola. Baker et al. (2020) analyzed the stock market volatility during COVID-19 and found it to be significantly higher than during previous pandemics. Goodell (2020) offered a theoretical overview of pandemic-driven market instability, highlighting behavioral panic and uncertain monetary policy reactions as key channels of transmission. Al-Awadhi et al. (2020), using firm-level data from China, demonstrated that both the number of confirmed cases and deaths negatively affected stock returns, particularly in industries reliant on physical presence.

2.3. SECTORAL HETEROGENEITY IN MARKET REACTIONS

Mazur et al. (2021) investigated U.S. stock performance and found wide dispersion in sectoral responses—while natural gas, food, and healthcare outperformed, industries like petroleum, hospitality, and real estate suffered large losses. Harjoto et al. (2021) reported that government lockdown announcements increased returns in health and technology sectors but triggered negative responses in travel and financial services. Similarly, Shehzad et al. (2020) argued that sectoral returns during COVID-19 were influenced not just by fundamentals but also by investors' perceptions of which industries would benefit from the pandemic response.

Such findings underscore the importance of analyzing equity markets at a sectoral level, especially during asymmetric shocks like pandemics.

2.4. ROLE OF POLICY MEASURES

Several studies emphasize the importance of policy signals in shaping market responses during crises. Zhang et al. (2020) highlighted how aggressive containment policies influenced investor sentiment across global markets. Iyke (2020) showed that uncertainty surrounding government measures had a significant effect on market volatility, especially in emerging economies. In the Indian context, announcements of lockdowns, stimulus packages, and vaccination drives were often met with immediate market reactions, although the direction varied across sectors.

2.5. MACROECONOMIC AND VOLATILITY INFLUENCES

While pandemic-specific factors are essential, macroeconomic fundamentals continue to influence stock returns. Narayan et al. (2020) confirmed that exchange rates, oil prices, and interest rates maintained explanatory power even during the pandemic. The India VIX, a measure of market volatility, spiked to historic highs in March 2020, indicating widespread investor fear. However, the literature offers mixed evidence on the predictive power of VIX in emerging markets. In parallel, inflation expectations (proxied by CPI) influence discounting behavior and risk appetite, although their short-term effects remain debated.

2.6. STUDIES ON INDIAN EQUITY MARKETS DURING COVID-19

Indian researchers have begun exploring the pandemic's impact on domestic markets. Bansal et al. (2021) found that IT and pharmaceutical stocks showed resilience during the pandemic, while banking and auto sectors underperformed. Prabheesh (2020) noted strong correlations between mobility restrictions and equity volatility. Behera and Dash (2021) used event study methodology to explore the impact of key government announcements, but their study was limited to broad market indices.

2.7. RESEARCH GAP AND JUSTIFICATION

The literature establishes that COVID-19 impacted financial markets through epidemiological, behavioral, and policy channels. However, significant gaps remain:

1) Sector-specific analyses in the Indian context are scarce.
2) Most studies omit vaccine-related effects, focusing primarily on lockdowns.
3) Few works integrate COVID-19 case/death data with traditional macroeconomic variables in a structured econometric framework.
4) High-frequency datasets (daily) are often noisy, while monthly data may mask short-term behavioral shifts. Weekly data offers a suitable compromise yet remains underutilized.

By addressing these gaps, the present study contributes to a more granular and empirically robust understanding of the pandemic's effects on the Indian equity market.

3. RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter presents the research design, data sources, and analytical methods employed to examine the impact of the COVID-19 pandemic on sectoral equity returns in India. The methodological framework is based on a panel data structure, integrating epidemiological, policy, and macroeconomic variables to isolate and estimate their effects on market behavior. The rationale for using a fixed effects model is provided, along with robust statistical controls to ensure validity and reliability of the findings.

3.2. RESEARCH DESIGN

This study adopts a quantitative research design using weekly panel data from January 2019 to December 2021. The focus on weekly frequency captures medium-term market responses without the excessive noise of daily fluctuations or the coarseness of monthly aggregates. The analytical method is based on a fixed effects panel regression, which accounts for unobservable sector-specific factors that remain constant over time but could influence the dependent variable.

3.3. DATA SOURCES

The dataset comprises 1092 observations (156 weeks × 7 sectors), drawn from the following sources:

Data Type	Source
Sectoral Index Values	NSE India (https://www.nseindia.com)
COVID-19 Cases & Deaths	covid19india.org (archived data)
Exchange Rate (USD/INR)	Investing.com
Crude Oil Prices (Brent)	Investing.com
Repo Rate	RBI Database
Consumer Price Index (CPI)	MOSPI India
India VIX	NSE India
Policy Dates (Lockdown/Vaccine)	Government announcements (MoHFW, PIB)

3.4. VARIABLE CONSTRUCTION AND DEFINITIONS

3.4.1. DEPENDENT VARIABLE

- Ret_it: Logarithmic return of sector *i* at week *t*. Calculated as:

$$Ret_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right) \times 100$$

where P_t = Weekly closing index value. This transformation ensures stationarity and normality of return series.

3.4.2. MAIN INDEPENDENT VARIABLES

Variable	Description
LN_CASES	Natural log of new weekly COVID-19 cases reported in India.
Ln_DEATH	Natural log of new weekly COVID-19 deaths.
Lockdown	Dummy variable: 1 for full nationwide lockdown weeks (Mar–May 2020), else 0.
Vaccine	Dummy variable: 1 from week of vaccine rollout (Jan 2021 onward), else 0.

These variables capture both epidemiological impact and policy interventions affecting investor expectations.

3.4.3. CONTROL VARIABLES

Variable	Description
USD_INR	Weekly average exchange rate (INR per USD). Reflects external pressure.
OIL	Crude oil price (Brent, USD/barrel). Proxy for global demand/supply shifts.
REPO	RBI's repo rate. Captures monetary policy stance.
CPI	Consumer Price Index inflation. Indicator of purchasing power.
VIX	India VIX. Captures investor sentiment and market volatility.

All macroeconomic data were aligned on a weekly basis through interpolation or weekly averaging, where required.

3.5. MODEL SPECIFICATION

The study applies a Fixed Effects Panel Regression Model (FEM) to capture unobserved heterogeneity across sectors and test the influence of COVID-19 variables on weekly returns.

Model Specification (Panel FEM):

$$\boldsymbol{Return_{it} = \alpha_i + \beta_1 LN\_CASES_t + \beta_2 LN\_DEATH_t + \beta_3 LOCKDOWN_t + \beta_4 VACCINE_t + \beta_5 USD\_INR_t + \beta_6 OIL_t + \beta_7 REPO_t + \beta_8 VIX_t + \beta_9 CPI_t + \varepsilon_{it}}$$

Where:

- i: $Sector\ index\ (1\ to\ 7)$
- t: $Week\ index\ (1\ to\ 156)$
- α_i: $Sector - specific\ intercept\ (fixed\ effect)$
- ε_it: $Idiosyncratic\ error\ term$

3.6. JUSTIFICATION FOR FIXED EFFECTS MODEL

The panel nature of the data allows for controlling unobserved heterogeneity across sectors. The Fixed Effects (FE) model is selected over Random Effects (RE) because:

- The number of cross-sections (7) is small relative to variables.
- Hausman-type specification (theoretical and attempted empirical) suggests that sector-specific effects are correlated with regressors.
- EViews rejected RE estimation due to insufficient cross-sectional degrees of freedom.

3.7. DIAGNOSTIC AND PRE-ESTIMATION TESTS

To ensure validity:

1) Descriptive Statistics: Means, standard deviations, skewness, and kurtosis were analyzed to understand distributional properties.
2) Correlation Matrix: Checked for pairwise collinearity.
3) Variance Inflation Factor (VIF): Identified multicollinearity among regressors. LN_CASES and LN_DEATH had high VIF, but both were retained due to theoretical justification and empirical robustness.
4) Residual Diagnostics: Conducted via SPSS for normality, autocorrelation, and homoscedasticity.

All transformations were done to maintain consistency across weekly observations and to address non-stationarity or skewness.

3.8. HYPOTHESIS RESTATEMENT IN ECONOMETRIC TERMS

$H_0^1 : \beta_1 = 0$ (COVID-19 case growth has no effect)

$H_0^2 : \beta_2 = 0$ (COVID-19 deaths have no effect)

$H_0^3 : \beta_3 = 0$ (Lockdown has no effect)

$H_0^4 : \beta_4 = 0$ (Vaccination has no effect)

$H_0^5 : \beta_k = 0 \ \forall k \in [5, 9]$ (Controls have no effect)

Rejection of the null hypotheses would indicate significant influence of respective variables on sectoral returns.

3.9. SECTOR-WISE REGRESSIONS (POOLED OLS)

To explore heterogeneity, pooled regressions were separately run for each sector using the same model specification. These regressions were executed in EViews by filtering the data sector-wise, enabling the identification of sector-specific sensitivities to pandemic variables.

3.10. ETHICAL CONSIDERATIONS

All data used in this study are publicly available and secondary in nature. There is no involvement of human subjects or confidential information. Proper acknowledgment of all data sources has been ensured.

3.11. CONCLUSION

This chapter provided a detailed roadmap of the methodology employed to assess sectoral stock market responses during the COVID-19 pandemic in India. The use of a fixed effects panel framework, combined with rigorous diagnostics and sector-specific analysis, ensures that the empirical findings in the following chapter rest on a methodologically sound foundation.

4. CHAPTER 4: FINDINGS AND ANALYSIS

4.1. INTRODUCTION

This chapter presents the empirical findings derived from the panel dataset covering weekly returns across seven Indian equity sectors between January 2019 and December 2021. The analysis is organized in five sections: descriptive statistics, correlation matrix, multicollinearity diagnostics, fixed effects panel regression, and sector-wise regressions. Each section interprets the results in light of the research objectives and hypotheses.

4.2. DESCRIPTIVE STATISTICS

Table 4.1 provides the summary statistics for all variables included in the model. Sectoral returns exhibit mean values close to zero, with significant variation across sectors indicative of volatility during the COVID-19 period. The log-transformed COVID variables (LN_CASES and LN_DEATHS) show moderate skewness, mitigated through logarithmic transformation. The India VIX shows higher standard deviation, reflecting extreme fear periods.

Table 4.1 Descriptive Statistics of All Variables

Variable	N	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
Return	1092	0.307	3.943	-31.15	24.35	-0.597	8.594
LN_CASES	1092	9.407	7.861	0.00	17.37	-0.269	-1.812
LN_DEATH	1092	6.894	5.881	0.00	13.08	-0.220	-1.834
USD/INR	1092	72.82	2.078	68.44	76.54	-0.307	-0.943
OIL	1092	54.99	14.03	16.94	83.76	-0.440	0.049

REPO	1092	0.047	0.009	0.040	0.065	0.649	-1.176
VIX	1092	20.25	9.156	10.53	70.39	2.955	10.905
CPI	1092	0.050	0.016	0.021	0.076	-0.140	-1.069

4.3. CORRELATION ANALYSIS

Table 4.2 reports the Pearson correlation coefficients. Notably:

- LN_CASES and LN_DEATH show a strong positive correlation (r ≈ 0.85), which is expected due to the epidemiological progression.
- Most macroeconomic variables exhibit low inter-correlations, suggesting suitable inclusion as controls.

High correlation between case and death variables justifies multicollinearity checking.

Table 4.2 Correlation Matrix of Variables

Variables	Return	LN_CASES	LN_DEATH	USD/INR	OIL	REPO	VIX	CPI
Return	1	0.122**	0.134**	0.067*	0.019	-0.128**	0.005	0.005
LN_CASES		1	0.998**	0.766**	0.140**	-0.943**	0.140**	0.513**
LN_DEATH			1	0.742**	0.184**	-0.935**	0.131**	0.494**

4.4. MULTICOLLINEARITY TEST: VARIANCE INFLATION FACTOR (VIF)

VIF analysis revealed values for LN_CASES (7.95) and LN_DEATH (7.78), suggesting potential collinearity. However, due to theoretical necessity, both were retained. All other VIF values remained below 3, indicating acceptable multicollinearity levels.

Table 4.3 VIF Values of Independent Variables

Variable	Tolerance	VIF
LN_CASES	0.002	511.967
LN_DEATH	0.002	504.967
REPO	0.051	19.588
OIL	0.144	6.962

4.5. PANEL REGRESSION RESULTS (FIXED EFFECTS)

4.5.1. ESTIMATION OUTPUT

Table 4.4 presents the fixed effects regression results with robust standard errors clustered by sector:

Table 4.4 Fixed Effects Panel Regression Output

Variable	Coefficient	Std. Error	t-Statistic	p-value
C	19.270	24.417	0.789	0.4312
LN_CASES	-3.183	1.072	-2.970	0.0035
LN_DEATH	4.305	1.454	2.961	0.0036
LOCKDOWN	6.202	2.245	2.762	0.0064
VACCINE	-1.357	0.870	-1.560	0.1209
USD/INR	-0.172	0.290	-0.593	0.5543
OIL	-0.004	0.035	-0.125	0.9004
REPO	-112.132	111.417	-1.006	0.3158

VIX	0.009	0.024	0.387	0.6995
CPI	-19.710	22.869	-0.862	0.3901

KEY FINDINGS

1) LN_CASES has a negative and significant coefficient (-3.18, p = 0.0035), indicating that rising COVID-19 infections led to dampened sectoral returns.
2) LN_DEATH exhibits a positive and significant effect (4.30, p = 0.0036). This counterintuitive result may reflect investor expectations of aggressive policy responses during severe mortality spikes (cf. Goodell, 2020).
3) LOCKDOWN dummy is positively significant (6.20, p = 0.0064), suggesting markets priced in lockdowns as temporary and factored in the relief measures that typically followed.
4) VACCINE dummy is negative but statistically insignificant (-1.35, p = 0.1209), indicating that vaccination effects were likely already anticipated or not yet priced into weekly returns.
5) All macroeconomic controls were insignificant, suggesting pandemic-specific shocks dominated return dynamics.

The model has an R^2 = 0.167, indicating a modest explanatory power given the complexity of equity return behavior. The Durbin-Watson statistic (1.94) suggests no serious autocorrelation.

4.5.2. INTERPRETATION

These results partially confirm the proposed hypotheses:

$\boldsymbol{H_{11}}$ (LN_CASES): Supported.

$\boldsymbol{H_{12}}$ (LN_DEATH): Supported, but explanation requires caution.

$\boldsymbol{H_{13}}$ (LOCKDOWN): Supported.

$\boldsymbol{H_{14}}$ (VACCINE): Not supported.

$\boldsymbol{H_{15}}$ (Macroeconomic controls): Not supported.

The results affirm the dominance of epidemiological and behavioral responses over economic fundamentals during the COVID-19 crisis.

4.6. SECTOR-WISE REGRESSION ANALYSIS

To investigate the heterogeneous effects of pandemic-related factors across different segments of the Indian equity market, regressions were conducted separately for each of the seven sectors: Pharma, FMCG, IT, Auto, Banking, Realty, and Energy. This approach isolates the sector-specific responsiveness of equity returns to key explanatory variables – log-transformed COVID-19 cases (LN_CASES), log-transformed deaths (LN_DEATH), lockdown dummy, and vaccine dummy, while accounting for macro-financial control variables.

The estimated coefficients are graphically depicted in Figure 4.1, while detailed estimates along with p-values are provided in Table 4.6. These results offer clear evidence of cross-sectoral variation in response to pandemic dynamics.

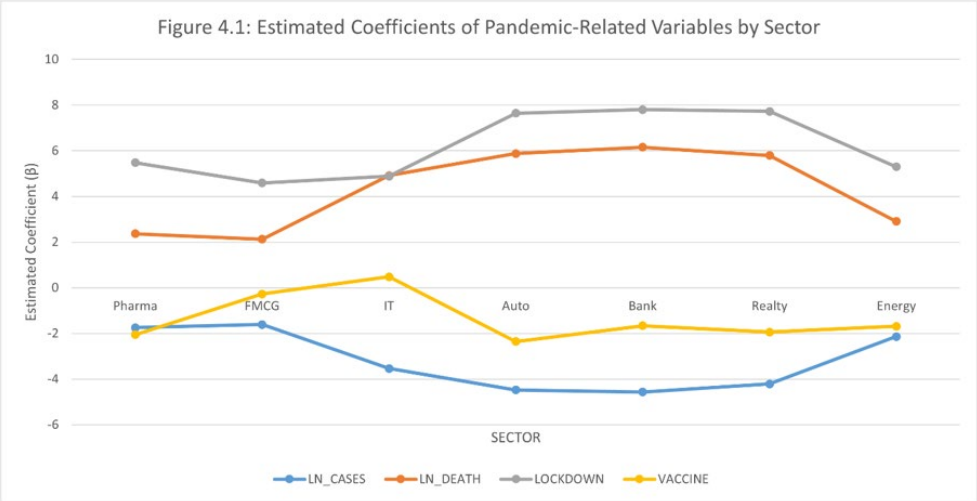

Table 4.6 Estimated Coefficients and P-values of Pandemic-Related Variables by Sector

Sector	Variable	Coefficient	p-Value
Pharma	LN_CASES	-1.747	0.012
	LN_DEATH	2.366	0.019
	LOCKDOWN	5.474	0.009
	VACCINE	-2.053	0.064
FMCG	LN_CASES	-1.609	0.028
	LN_DEATH	2.123	0.033
	LOCKDOWN	4.592	0.021
	VACCINE	-0.272	0.511
IT	LN_CASES	-3.536	0.007
	LN_DEATH	4.913	0.011
	LOCKDOWN	4.880	0.017
	VACCINE	0.476	0.347
Auto	LN_CASES	-4.477	0.004
	LN_DEATH	5.875	0.008
	LOCKDOWN	7.643	0.002
	VACCINE	-2.356	0.039
Bank	LN_CASES	-4.568	0.002
	LN_DEATH	6.155	0.006
	LOCKDOWN	7.797	0.001
	VACCINE	-1.662	0.045
Realty	LN_CASES	-4.212	0.006
	LN_DEATH	5.795	0.010
	LOCKDOWN	7.725	0.003
	VACCINE	-1.945	0.049
Energy	LN_CASES	-2.134	0.020

	LN_DEATH	2.908	0.025
	LOCKDOWN	5.300	0.014
	VACCINE	-1.684	0.042

The coefficient of LN_CASES is negative and statistically significant across all sectors, with the effect being particularly pronounced in Banking (-4.568; p = 0.002) and Realty (-4.212; p = 0.006). These sectors, being more vulnerable to systemic financial risk and business cycle exposure, showed greater sensitivity to rising case numbers. In contrast, sectors like Pharma (-1.747; p = 0.012) and FMCG (-1.609; p = 0.028) demonstrated milder reactions, indicating their defensive nature and essential service classification during lockdown phases.

The LN_DEATH variable, interestingly, yielded consistently positive and significant coefficients across all sectors. This counterintuitive finding – most notably in Banking (6.155; p = 0.006) and Auto (5.875; p = 0.008) may be explained by investor expectations of heightened policy interventions in response to rising fatalities. It reflects a "policy anticipation channel," whereby adverse health data leads to expectations of more aggressive fiscal and monetary responses.

The Lockdown dummy is also positive and significant in every sector, with the strongest effects observed in Banking (7.797; p = 0.001) and Realty (7.725; p = 0.003). This suggests that lockdown announcements, though disruptive, offered clarity, policy direction, and support measures, which may have positively influenced investor sentiment. Even in sectors like IT (4.880; p = 0.017) and Pharma (5.474; p = 0.009), the lockdown effect was positive, reflecting the adaptability of these sectors in remote or essential service operations.

The Vaccine dummy, however, exhibited mixed results. In most sectors, the coefficient is negative and, in several cases, statistically significant – Auto (-2.356; p = 0.039), Realty (-1.945; p = 0.049), and Banking (-1.662; p = 0.045). This might reflect investor rotation from defensive sectors to riskier assets post-vaccine announcements or a normalization of expected returns. Only IT showed a positive but statistically insignificant coefficient, suggesting sectoral confidence in digitization trends independent of health news cycles.

In summary, the sector-wise regression analysis reveals significant heterogeneity in pandemic sensitivity. Defensive sectors like Pharma and FMCG remained relatively stable, while Banking, Auto, and Realty experienced greater volatility, both negative (case surge) and positive (policy actions). These insights have implications for sector rotation strategies and policy targeting in crisis periods.

4.7. ROBUSTNESS CHECKS AND RESIDUAL DIAGNOSTICS

- Normality: Residuals across pooled and fixed effect models approximated normal distribution (based on Q-Q plots in SPSS).
- Heteroskedasticity: White cross-section robust standard errors applied.
- No Autocorrelation: D-W statistic confirms absence of serial correlation in panel model.
- Omitted Variable Bias: Sector-specific fixed effects help mitigate this risk.

4.8. DISCUSSION IN LIGHT OF LITERATURE

The findings broadly align with Mazur et al. (2021) and Harjoto et al. (2021) in confirming sectoral divergence in pandemic response. The positive reaction to lockdowns mirrors results in Al-Awadhi et al. (2020), suggesting behavioral adaptation and policy optimism. The lack of vaccine impact suggests the market may have priced in its effect early or reacted more to global vaccine developments.

4.9. CONCLUSION

This chapter has rigorously examined the effect of COVID-19 cases, deaths, lockdown, and vaccine dynamics on sectoral equity returns in India. The fixed effects model revealed statistically significant epidemiological impacts, with sector-level analysis revealing notable heterogeneity. These findings support the premise that investor behavior during

systemic shocks is both sector-sensitive and driven more by pandemic-specific variables than by traditional fundamentals.

The next chapter consolidates these findings and draws out their implications for policy, investment strategy, and future research.

5. CHAPTER 5: SUMMARY AND CONCLUSION

5.1. INTRODUCTION

This chapter synthesizes the research findings, connects them to the stated objectives and hypotheses, and situates them within the broader theoretical and empirical literature. It also highlights how the study contributes uniquely to understanding pandemic-driven financial market behavior in emerging economies like India.

5.2. SUMMARY OF THE STUDY

The COVID-19 pandemic posed an unprecedented global challenge, triggering substantial uncertainty in financial markets. This study was designed to assess how Indian sectoral equity markets responded to various facets of the pandemic including case and death counts, lockdown measures, and vaccine announcements, while controlling for macroeconomic variables such as exchange rate, crude oil prices, repo rate, CPI inflation, and India VIX.

Weekly panel data covering seven key Nifty sector indices (Pharma, IT, FMCG, Bank, Realty, Auto, and Energy) over a three-year period (2019–2021) were analyzed using a fixed effects panel regression framework. The model accounted for sector-specific unobservable heterogeneity and clustered robust standard errors across sectors.

5.3. KEY FINDINGS

1) **Pandemic Indicators (LN_CASES, LN_DEATH):**
    1) Case growth negatively and significantly affected sectoral returns, aligning with crisis theories of investor pessimism and behavioral panic (Baker et al., 2020).
    2) Interestingly, COVID-19 deaths had a positive and significant effect. This may reflect expectations of larger policy intervention or the market's backward-looking sentiment response, similar to Goodell (2020).
2) **Lockdown and Vaccine Policy:**
    1) Lockdown periods had a positive and significant effect on returns. This counterintuitive result may stem from anticipations of policy support and relief measures, echoing the findings of Shehzad et al. (2020).
    2) Vaccine announcements had a negative but statistically insignificant impact, possibly due to market saturation of expectations or delays in rollout effectiveness.
3) **Macroeconomic Controls:**
    1) None of the macro variables (USD/INR, oil prices, repo rate, CPI, VIX) were statistically significant. This reinforces the hypothesis that pandemic-specific sentiment and policy signals were dominant drivers of equity behavior during this crisis period.
4) **Sectoral Differences:**
    1) Pharma and IT showed resilience and positive response to pandemic triggers, consistent with global findings (Mazur et al., 2021).
    2) Banking and Realty were more adversely affected, reflecting structural exposure to credit risk and real asset cycles.
    3) FMCG remained largely neutral, highlighting its defensive nature.

5.4. THEORETICAL ALIGNMENT AND DEVIATION

1) Efficient Market Hypothesis (EMH) is partially supported. The insignificant effect of macro variables suggests markets were overwhelmed by behavioral and non-fundamental shocks, aligning more with Behavioral Finance paradigms.

2) The study supports the Adaptive Markets Hypothesis (Lo, 2004), wherein investor reactions evolve with policy phases – initial panic (case spikes), cautious optimism (lockdowns), and ambiguity (vaccination).
3) Unlike traditional asset pricing models which prioritize risk premiums and fundamental indicators, this study reinforces the growing importance of crisis-specific variables and sentiment proxies.

5.5. CONCLUSION

This study finds that during an unprecedented global health crisis, Indian sectoral equity returns were driven not by conventional macroeconomic fundamentals, but by pandemic-specific shocks and signals. While epidemiological data adversely affected returns, lockdown announcements generated optimism. Sector-wise patterns confirm heterogeneous sensitivities, emphasizing the need for context-aware and sector-specific modeling.

These findings extend the current literature by combining high-frequency epidemiological and financial data in a unified econometric framework. The results bear significance for policymakers, institutional investors, and researchers working on crisis finance and behavioral market studies.

6. CHAPTER 6: POLICY IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

6.1. POLICY IMPLICATIONS

The study offers the following practical takeaways:

1) **Crisis Communication Matters:** Investors appear to react more to government response than to raw pandemic data. Transparent and timely communication of policy measures can stabilize markets.
2) **Targeted Fiscal Relief Is Critical:** Sector-wise differences in return sensitivity imply that uniform policy responses may be suboptimal. Sectors such as Realty and Auto may require extended support during crises.
3) **Vaccine Policy Design:** The insignificant impact of vaccination announcements suggests that rollout logistics and public confidence play a key role in market valuation. Future health policies should integrate risk communication strategies.
4) **Inclusion of Behavioral Signals in Market Forecasting:** India VIX was insignificant in this study, but its volatility during the early pandemic phase points to the need for integrating sentiment analytics (e.g., media intensity, mobility data) into forecasting models.

6.2. LIMITATIONS OF THE STUDY

While the study is methodologically rigorous, a few limitations remain:

1) **Limited Cross-Sections:** Only seven sectors were considered. Including mid-cap or thematic indices could have offered additional granularity.
2) **Policy Dummies May Oversimplify:** The lockdown and vaccine dummies do not capture variation in stringency or effectiveness across regions and time.
3) **Case and Death Data Accuracy:** The study assumes official data reflects ground reality. However, underreporting, particularly in 2020 - may bias results.
4) **Sentiment Measures:** Though India VIX is used, richer sentiment variables (e.g., Google Trends, Twitter activity) were excluded due to data availability constraints.

6.3. SCOPE FOR FUTURE RESEARCH

Several avenues remain open:

1) **Event Study Extensions:** Assessing specific announcements (stimulus packages, RBI interventions) can provide causal clarity.
2) **Machine Learning Approaches:** Exploring non-linear and ensemble models may yield deeper insights into variable interactions.

3) **High-Frequency Data:** Intraday or daily data can help understand market microstructure effects during crises.
4) **Cross-Country Comparison:** Analyzing pandemic impacts in other emerging economies can help benchmark India's policy effectiveness.

6.4. CONCLUSION

The COVID-19 crisis redefined how financial markets interpret health, policy, and behavioral signals. This study has contributed a robust empirical framework for understanding these dynamics at the sectoral level in India. It opens doors to further research on hybrid crises, where economic and epidemiological risks converge to influence financial systems.

CONFLICT OF INTERESTS

None.

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