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AN ANALYSIS OF THE INDIAN ECONOMY DURING THE THREE COVID-19 PANDEMIC WAVES

Hasnan BABER [1]✉, Muneer SHAIK [2], Himani GUPTA [3]

[1] *Department of Management, Strategy and Entrepreneurship, School of Business Administration, American University of Sharjah, PO Box 26666, Sharjah, United Arab Emirates*
[2] *School of Management, Mahindra University, Hyderabad, India*
[3] *Jagannath International Management School, New Delhi, India*

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Abstract. The objective of the study was to examine the effects of the COVID-19 pandemic on India's economy. The analysis focused on several economic metrics, including stock market prices, the rupee's value in relation to the US dollar, economic activity, the unemployment rate, and the rate of inflation. Contrary to popular belief, the results demonstrate that during the first wave (25 March 2020 to 16 September 2020), the increasing number of cases had a beneficial influence on economic activity and a negative impact on the unemployment rate. The second wave, which lasted from 15 March 2021 to 17 July 2021, was considerably stronger and demonstrated how confirmed instances had a significant detrimental impact on inflation rates and stock values. Contrary to expectations, the third wave (December 28, 2021, to January 30, 2022) was found to be less intense. Overall, the report shows how the pandemic affected India's economy during each of the three waves and notes that there have been encouraging signs of recovery during the return to normalcy phase. The government, scholars, policymakers, and economists will find this study useful in understanding how the COVID-19 Pandemic affected the Indian economy and in coming up with ideas for future risk mitigation measures.

Keywords: economy, India, COVID-19, stock market, currency, unemployment.

JEL Classification: G1, E3, E6.

✉Corresponding author. E-mail: ***hbaber@aus.edu***

1. Introduction

The COVID-19 pandemic has emerged as one of the most significant global challenges, impacting nations across the world in unprecedented ways. As the virus has swept through various regions, its multifaceted repercussions on economies have been profound, leading to disruptions in trade, finance, and employment. This research endeavors to provide a comprehensive analysis of an emerging Indian economy during the three distinct waves of the COVID-19 pandemic, unraveling the intricate dynamics that have shaped its trajectory.

Contagious illnesses have plagued humanity for millennia, from the 1918 "Spanish flu" to the coronavirus of 2019. Their negative influence goes beyond demography or human health but also to economic growth in developing countries like India (Brainerd & Siegler, 2003; Keogh-Brown & Smith, 2008). The COVID-19 epidemic has caused havoc in the global economy (Gupta & Gupta, 2023). Due to its high infection rates, fatality, and incubation time,

the primary preventative strategies are to manage social distance and isolation, which renders many business operations unfeasible (Mou, 2020). It causes tremendous costs to individuals, societies, healthcare systems, the stock market, foreign exchange, inflation, employment, and other economic activity (Price-Haywood et al., 2020).

When the World Health Organization (WHO) revealed a coronavirus-related respiratory tract infection epidemic in Wuhan, China, on January 9, 2020, almost nothing was known about this novel infectious illness. Because precautionary measures, SARS-CoV-2 PCR antibody testing, and targeted medicines were restricted, the first wave of widespread worldwide illness occurred. There have been many waves of coronavirus infections in many nations. Statistics from the 2020 pandemic demonstrate that features differed across waves (Iftimie et al., 2021). During the second and following waves, reliable testing became more commonly accessible, monitoring became more efficient, and experimental medicines were being investigated, among other things, allowing healthcare practitioners to better treat the infection and achieve positive health outcomes. The percentage of local clusters was less in the third wave compared to the second wave, but personal contact transmission and unidentified pathways of transmission were greater (Seong et al., 2021). As a result, many nations and health agencies, along with the WHO, have been aggressively training individuals to adopt preventative steps to stop the transmission of the infection, which also include lockdown efforts (Farooq et al., 2021; Godman et al., 2020).

The first wave of the COVID-19 outbreak in India, in particular, occurred in late January 2020 and continued for around eight to nine months. Throughout that period, the country reported 11 million cases and 0.157 million fatalities, with a spike after 15th September 2020. The first wave was comparatively moderate in comparison to the second wave, which began after 10th February 2021 and expanded more rapidly throughout the nation. The emergence of more contagious Alpha and Delta variants was a major factor for this second wave. This increase occurred shortly after the vaccine deployment, which began on January 16, 2021, with the reopening of public places, followed by enormous crowds and disregard for personal protective measures. The third wave of the COVID-19 epidemic in India, caused by the extremely contagious Omicron variant, was expected to peak considerably sooner than expected. The third wave began in January 2022 and concluded in February 2022.

Statistical evidence demonstrates that the nature of the virus's impacts differs between the different time periods. Differences in the stock market, foreign exchange, inflation, employment, and other economic activities have been documented, but the comparative features of the three waves are still mostly unknown. The objective of this research is to investigate the economic factors affected by three different waves of the pandemic COVID-19. Stock market prices, the rupee's value versus the dollar, economic activity, the unemployment rate, and the inflation rate were used as variables in a dataset ranging from 1 February 2020 to 31 January 2022.

The importance of understanding the economic implications of the pandemic cannot be overstated. Specifically focusing on India, a country with a diverse and dynamic economic landscape, the impact of the pandemic has been multifaceted (Singh et al., 2022). During the initial wave, the stringent lockdown measures imposed to curb the spread of the virus led to disruptions in supply chains, hampering industrial production and contributing to a contrac-

tion in GDP by 24.4% in the second quarter of 2020 (Reserve Bank of India, 2021). Subsequent waves introduced further complexities, revealing the resilience and adaptability of the Indian economy in the face of such adversity. This research aims to contribute to the existing literature by offering an in-depth analysis of the nuanced economic responses to each pandemic wave in India. By scrutinizing key economic indicators such as GDP growth, unemployment rates, and trade patterns, we seek to provide insights into the effectiveness of policy interventions and identify areas for future resilience building.

Several studies have examined the global economic impact of the COVID-19 pandemic, but a focused analysis of India's experience throughout the three waves is vital for crafting targeted policy recommendations (Albu et al., 2020; Padhan & Prabheesh, 2021). Until yet, only a few research have taken into account all three COVID-19 waves. To the best of my knowledge, no research has employed stock market prices, the rupee's value vs the dollar, economic activity, the unemployment rate, and the rate of inflation as factors in their study in the Indian context. As a result, this study tried to give investment and offsetting opportunities by applying a wide range of statistical techniques and procedures, such as descriptive statistics, regression analysis, and one-way ANOVA with the Games-Howell post hoc test. It strengthens the study and sets it apart from earlier research. By delving into the unique challenges and opportunities presented by each pandemic wave, our findings aim to inform policymakers, researchers, and stakeholders, fostering a more resilient and adaptive economic landscape in the post-pandemic era.

The remainder of the research is structured as follows. In the next part, we will review prior studies on the COVID-19 pandemic and its different waves. The third part examines the various ways used to detect and compare the effect of three COVID-19 waves on parameters. Section 4 discusses the analytical section, while Section 5 concludes the study.

2. Literature review

The COVID-19 pandemic has upset the world's financial markets (Singh et al., 2022). According to the study of Aggarwal et al. (2022), the Indian stock market does not accurately reflect the real economy during the pandemic. The Indian market is negatively impacted by COVID-19, but this effect only lasts for a brief period during the Pre-lockdown window. The findings suggest that investor concern had an impact on returns during the Pre-lockdown window. However, during the Lockdown phase, all sector returns dramatically improved, indicating that investors are hopeful about the future growth of the economy after the COVID-19 pandemic ends and the entire economy resumes its usual pace.

Bhagawan and Kumar (2022) indicate that the announcement of the lockdown had a substantial influence on sectoral indices, whilst the release of the stimulus package had a minimal impact and the 1st COVID-19 case had no impact. The pandemic had a large adverse overall effect on the indices for banks, financial services, and real estate while having a favourable influence on the indices for pharmaceuticals and fast-moving consumer goods. The media index indicated that the epidemic had little to no impact. Using co-integration and the VECM model, Bhama (2022) concludes that the COVID-19 waves and the disruptions brought on by lockdown announcements, confirmed cases, and a surge in fatalities have severely impacted

the Indian economy and increased exchange rate volatility. Due to corporations being better prepared than in the first wave, the stock market collapse was marginally better during the second wave.

According to Jain (2021), the firms' betas rose during COVID-19's first wave (2020), but not during the 2nd wave of COVID (2021). In contrast to the energy businesses, the increase is also more noticeable in the infrastructure, consumer goods, information technology, and insurance sectors. According to the findings of the (Wickramasinghe & Naranpanawa, 2023) study, most of the NSE sectors accomplished fine and saw inconsistent returns in the 21 days after the declaration. This demonstrates that investors had faith that the market's unusual condition was to blame for the impact rather than a flaw or underlying issues with these industries.

According to the study by Prusty et al. (2021), stakeholders have a favourable opinion of the government of India's different monetary and fiscal stimulus efforts for bringing the Indian economy out of the COVID-19 pandemic's downturn. Naik and Haldankar (2021) inspected the influence of COVID-19's 1st wave on GST and discovered that collection of revenue drastically decreased in the months following the announcement of the lockdown. In addition, the study finds that smaller states, as opposed to larger states, have a greater effect on revenue collection and distribution pre and post-lockdown period.

Using a logit-probability model, Bhandari et al. (2021) found that, compared to the analysis done immediately after the lockdown's announcement, company sentiment six months ahead of forecast significantly decreased during the lockdown. Additionally, tiny businesses have a much more detrimental impact than bigger businesses. The analysis discovers that the fall in domestic sales had a greater negative impact on business confidence than the supply-side squeeze. Additionally, businesses used mitigation strategies including ceasing to pay trained personnel and using an untrained labour force. In both an optimistic and pessimistic approach based on the capacity utilisation ratio method, the analysis by Behera et al. (2023) predicts that the COVID-19 pandemic affected the demand and supply, as well as a drop in employment levels.

According to Deshpande (2022), who used the Difference-in-Difference method and examined data from a national-level panel dataset, the employment gap between men and women shrank during the 1st month (April 2020) of the nationwide lockdown not because additional women entered the workforce but rather because fewer men participated in it. The gender gap had returned to its December 2019 levels by December 2020. The work by Padmakumar et al. (2022) demonstrates that the relaxation of lockdowns was shown to have a steady increase in mobility as well as the COVID-19 confirmed cases by using publically accessible activity-based mobility datasets and dynamic regression models. According to the study, travel limitations are shown to be effective in preventing the spread of pandemics through human influence.

Haq and Medhekar (2022) emphasized damaging effects of COVID-19 on the economy, employment, marketing, and peace in the specialised spiritual tourism sector. According to a study by Alpesh and Parmar (2020), the COVID-19 pandemic's nationwide lockdown limitations have had a significant negative impact on agriculture and related industries. The lockdown restrictions have a favourable effect on the unpredictability of BSE Sensex returns, according to Singh et al. (2022) investigation into the 1st wave of COVID-19. Additionally, coin-

tegration tests show a long-term association between the last price of the BSE Sensex and the number of daily confirmed instances.

Previous studies have shown the effect of COVID-19 pandemic on different sectors of the economy. Clemente-Suarez et al. (2021) discussed the impact of the pandemic on social, and health sectors of the economy. The study by Debata et al. (2020) discusses the effect of pandemic on people, economy, and environment by analyzing the industrial sectors like tourism, aviation, agriculture, hotels, construction, textile, gems, FMCG, manufacturing, and startups of the Indian economy. Wickramasinghe and Naranpanawa (2023) discusses the measures to boost the tourism post COVID-19 due to its negative impact during the pandemic period. The study by Blustein et al. (2020) discussed how unemployed during the pandemic period evoked grief in the lives of the people. Wickramasinghe and Naranpanawa (2023) tests the accuracy and predictability of two term structure models using both yields-only and factor-augmented specifications focusing on the recent COVID-19 crisis. The study investigates the inflation-unemployment dynamics during the recession and COVID-19 pandemic and compare the outcomes in India, and UK and observed that both the outbreaks have similar effect. Using wavelet power spectrum analysis, Shaik et al. (2023) investigated how geopolitical risk impact stocks, oil, and gold returns during global financial crisis, the COVID-19 pandemic, and the Russian-Ukraine war periods.

Ashraf (2020) studied the stock markets response to the COVID-19 pandemic using data from confirmed cases and deaths and stock market returns from 64 countries. Furthermore, the study by Deb et al. (2022) examines the economic effects of COVID-19 containment measures using daily global data on containment measures, infections, and economic activity indicators, such as Nitrogen Dioxide (NO2) emissions, international and domestic flights, energy consumption, maritime trade, and mobility indices. Janiak et al. (2021) studies the impact of sanitary protocols aimed at reducing the contagion by COVID-19 during the production and consumption of goods and services. Hossain (2021) examines the effect of the COVID-19 on consumers, service providers, firms and regulatory bodies in sharing economy.

In this paper, unlike previous studies, we evaluate the three COVID-19 pandemic waves on the Indian economy and business. Also, the study employs macroeconomic variables like stock market prices, exchange rate, unemployment rate, inflation rate, and economic activities to comprehend the influence of the COVID-19 pandemic. This study will be helpful to the government, researchers, policymakers and economists to realize the consequence of the COVID-19 pandemic on the Indian economy to propose strategies to mitigate the risk in future.

3. Data and methodology

The data was divided into four parts. The first wave of the COVID-19 pandemic started on 25 March 2020 and lasted till 16 September 2020. This was the longest wave among the three that the country has seen and also the longest lockdown in history. Even the lockdown in this wave had different phases. The highest restrictions were in the lockdown period from 25 March 2020 to 14 April 2020, during which people were not allowed to move out of their homes or places of stay. The lowest restrictions were in the period from 18 May 2020 to 31 May 2020 during which people were allowed to move and restaurants were allowed to

operate kitchens for home delivery of food items. Although the cases were detected before 25 March 2020 however, it was under control and the administration was monitoring the situation. The restrictions were lifted eventually and the peak of the wave was witnessed on 16 September 2020 with 93,198 cases per day. The second wave started from 15 March 2021 with 23,577 cases per day till 17 July 2021 with 38,406 cases per day. The delta variant was prominent during this wave and the intensity of the lockdown was not as severe as compared to wave one to safeguard the economy. The peak was seen 8 May 2021 with a booming 3,91,232 cases. The states that were affected heavily were Maharashtra, Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Andhra Pradesh, Delhi, Uttar Pradesh, and West Bengal. Kar et al. (2021) stated that farmer protests against the farm laws and elections in several states have made this wave more spiked. The third wave was less intense as against the expectation. The lower severity of the omicron variant and the well-managed vaccination drive in the country kept this wave short. Although we are still witnessing a downward trend the peak is already evident. The much anticipated third wave started on 28 December 2021 with 7200 cases per day and peaked on 20 Jan 2021 with 3,21,157 cases per day. The number of cases was calculated by 7-day rolling average method to reduce the backlog effect and the data was taken from "our world in data" (Our World in Data, n.d.).

The data on the stock market related to the opening price (OP), closing price (CP), lowest price (LP), and highest price (HP) of the listed industrial stocks were obtained from BSE SENSEX as analyzed by Baber and Tripati Rao (2021). The data of currency values against the dollar was retrieved from Yahoo Finance. Both data were retrieved for the period from 1st February 2020 to 31 January 2022. In the estimations, we take the natural logarithm of each price data to reduce the observed skewness in the distribution of stock price data. On the days the stock market and foreign exchange market were closed, the values of the last working day were used for the measurement as suggested by Baber and Tripati Rao (2021). The Purchasing Managers' Index (PMI) was also extracted for this given period. The PMI is an indicator of the prevailing direction of economic trends in the manufacturing and service sectors. It is derived from monthly surveys of private-sector companies. The PMI can be used as a proxy for the level of general economic/business activities.

We have also included the unemployment rate variable to check on the effect of the COVID-19 pandemic waves in India. Due to the pandemic, joblessness over the entire Asian continent is racing to 15 percent in 2020 and Indian being on the top may anticipate a horrible joblessness pace of 23.5 percent followed by Bangladesh at 12.5 percent (Lai et al., 2021). The unemployed are people who are of working age but without work or available for work, or have to take specific steps to find work. In addition to the unemployment rate, the Inflation rate during this time was also retrieved (Trading Economics, n.d.).

The period of two years of the pandemic was calibrated in the following way: Wave 1: 25 March 2020 – 14 February 2021 is consigned a value "1", Wave 2: 15 March 2021 – 17 July 2021 is consigned a value "2", Wave 3: 28 December 2021 – 31 January 2022 is consigned a value "3", and time period which can be treated as "period of normalcy" during the pandemic e.g. 1 February 2020 – 24 March 2020, 15 February 2021 – 14 March 2021 and 18 July 2021 – 27 December 2021 is consigned a value "0". Finally, we have constructed a bivariate model for empirical estimation using ordinary least square regressions as the following:

$$SP_i, IN_i, EA_i, UE_i, \text{ and } IF_i, = C + CC_i + CD_i,$$

where: C – Constant; CC – confirmed new cases; CD – confirmed new deaths; *SP* – the log vector of stock market variables: *OP* (open price), *CP* (close price), *LP* (low price), and *HP* (high price); *EA* – level of general economic activities; *IN* – the log vector of rupee value against the dollar: INR/USD; *UE* – level of the unemployment rate; *IF* – level of Inflation rate; *i* – day of the week.

The main aim of the study is to examine and compare the differences in stock prices, rupee valuation, unemployment rate, and inflation rate during the three waves. We have used descriptive statistics, regression analysis, and one-way ANOVA with the Games-Howell post hoc test to understand the differences during the three pandemic waves. The data was collected and compiled in Microsoft Excel, and then SPSS software was used to run the regression model.

4. Results and discussion

The results of the influence of COVID-19 cases and deaths are shown in Table 1. Before we discuss the influence of COVID-19 wave-1 on the economic parameters, we need to know that confirmed cases during this wave increased over the period; however, the government unlocked the economic activities after a few restrictions in the beginning. The government had a trade-off between economic activities and lockdown to immobilize the community transfer and they preferred economic activities as the situation was going bizarre. The number of deaths declined for the first wave, so we may see a reverse trend of confirmed cases and deaths on the selected factors. In the Wave-1 confirmed cases have a strong positive influence on the stock market prices. As the cases were rising the stock market prices were also going up after a sudden dip in the prices until 25 March 2020. As the lockdown started on 25 March 2020 people were stuck in the home and stock market prices have steadily gone up and touched 51,835 high on 09 February 2021 in the first wave. However, the number of death cases hurt the stock market prices. As the number of deaths declined over time after hitting the peak deaths of 2003 on 6 June 2020, the stock prices were gaining new highs. This trend has been seen in all four prices of the stock market in the first wave.

In wave one, the value of the rupee against the dollar has seen a sharp decrease and as the cases of infection were increasing the value of the rupee has declined. On the other hand, the deaths were going down after some time and the rupee was yet to recover and even worsen with time so there is a positive association between confirmed deaths and rupee value against the dollar. The economic activities embodied by the Purchasing Managers' Index (PMI) have also seen a positive impact on growing cases and a negative impact on deaths. The reason can be unlocked of economic activities after some months. The economic activities were on the rise after the first and second lockdowns so were the cases but the government preferred to keep the engine of the economy going with the pandemic. The rise in the unemployment rate is no surprise during the pandemic, however, the situation in India was terrible as daily wager labor were unable to find jobs during the lockdown. The situation was so grave that labourers travelled from one state to another on foot. There were about 100 million internal migrant workers in India, and most of them are daily-wage labourers who have travelled out from

different states like Uttar Pradesh, and Bihar, to other states in search of unskilled or semi-skilled jobs (Jesline et al., 2021). These migrant labourers were stuck in the lockdown with no employment and no money, facing a major economic setback, besides being away from their families (Mishra & Sayeed, 2020). The death numbers didn't influence the unemployment rate of the country. The inflation rate has seen an insignificant influence on confirmed cases but a positive influence on deaths, which implies that inflation was decreasing in the latter part of the wave. The values of R^2 and F-change were moderate in both cases of infection and death.

The second wave of the pandemic has been the worst among all three. Although the wave lasted for 125 days approximately it was the deadliest of all and has recorded a total of 1,97,20,726 confirmed cases and 2,47,510 deaths. The highest number of cases recorded during this wave was 4,14,188 on 6-May 2020 and the highest number of deaths was 4529 on 18 May 2020. The number of confirmed cases had a severe negative effect on the stock prices. All four stock prices have witnessed a negative relationship with the growing cases of infection. However, there is a positive affected of confirmed deaths on the stock prices. This opposite effect has been seen in the first wave also. However, this time it was stronger. The high R^2 and F-change values explain the variance in the stock prices to the cases of infection and deaths. In contrast to the first wave, rupee values have been seen gaining value over the increase in the number of confirmed cases and the negative impact of the deaths. A similar impact has been witnessed by economic activities. The unemployment rate has been seen changed by the influence of cases but a positive influence has been seen by the deaths. The inflation rate has seen a dip with the growing number of cases as there is a negative relationship but also has seen a reverse trend concerning the confirmed deaths. The R^2 value of rupee value, economic activities, unemployment rate and inflation rate are 0.153, 0.520, 0.737 and 0.483. This signifies the amount of change in economic activities, unemployment rate and inflation rate values were well explained by the rise in deaths and cases.

The third wave is the shortest and the effects are yet to be over. This wave was much anticipated and didn't last long with mild effects. Similar to the first wave the confirmed cases had a positive influence on the open and high prices at a 5% level of significance. The low and close prices didn't see any influence on the confirmed number of cases. The number of deaths had a negative impact on all stock market prices although the number of deaths during this period was the lowest 15,000 among all waves. The rupee value has no evidence of influence from confirmed cases but there is a positive influence of deaths. On the contrary, economic activities have witnessed a negative impact of the number of cases and no significant influence on deaths. This implies that with the rise in confirmed cases, economic activities slowed down.

The normalcy period is estimated to be around 246 days. These were days when confirmed cases were low and the death rate was under control. There were almost no curbs on the movement and social gatherings. The hospitals were also witnessing less stress in designated COVID-19 wards and people were not much refereeing on the hospitalization. The stock prices have shown the same positive influence of cases and deaths unlike the waves, which showed the opposite effect. As the cases were steadily going up and down during this period, the stock prices were following this trend too. Economic activities, unemployment rate, and inflation rate have seen a negative effect of cases which is a sign of recovery from the pandemic waves.

Table 1. Regression analysis

			Open	High	Low	Close	INR	PMI	Unemployment rate	Inflation rate
Wave 1#	Confirmed cases smoothed	β	**0.913*** **	**0.913**	**0.917**	**0.91**	**–1.293**	**0.977**	**–0.6**	*0.131*
		t-value	7.163	7.162	7.203	7.134	–11.873	9.117	–5.362	1.082
	Confirmed Deaths	β	**–0.788**	**–0.795**	**–0.778**	**–0.779**	**0.869**	**–0.408**	*0.022*	**0.346**
		t-value	–6.179	–6.232	–6.115	–6.112	7.981	–3.805	0.195	2.857
		R^2	0.139	0.138	0.141	0.138	0.372	0.392	0.337	0.22
		F Change	**26.075**	**25.958**	**26.628**	**25.967**	**95.807**	**104.38**	**82.177**	**45.824**
		N	327	327	327	327	327	327	327	327
Wave 2#	Confirmed cases smoothed	β	**–1.431**	**–1.454**	**–1.438**	**–1.458**	**0.68**	**1.003**	*–0.018*	**–0.993**
		t-value	–15.351	–16.232	–15.249	–16.168	4.531	8.87	–0.213	–8.459
	Confirmed Deaths	β	**0.993**	**1.001**	**1.039**	**1.024**	**–0.664**	**–1.289**	**0.873**	**1.245**
		t-value	10.65	11.169	11.016	11.353	–4.423	–11.392	10.432	10.609
		R^2	0.674	0.699	0.666	0.695	0.153	0.52	0.737	0.483
		F Change	**124.922**	**140.356**	**120.638**	**137.651**	**10.965**	**65.452**	169.511	56.472
		N	125	125	125	125	125	125	125	125
Wave 3#	Confirmed cases smoothed	β	**0.427****	**0.399****	*0.236*	*0.301*	*–0.276*	**–0.587**		
		t-value	2.18	2.042	1.191	1.555	–1.519	–3.151		
	Confirmed Deaths	β	**–0.524****	**–0.544**	**–0.508****	**–0.568**	**0.669**	*0.133*		
		t-value	**–2.674****	–2.785	–2.556	–2.932	3.679	0.711		
		R^2	0.194	0.2	0.173	0.213	0.307	0.271		
		F Change	**3.86****	**4.005****	3.34	4.319	**7.08****	**5.949****		
		N	35	35	35	35	35	35	35	35
Normalcy	Confirmed cases smoothed	β	**0.435**	**0.436**	**0.447**	**0.441**	*0.057*	**–0.235**	**–0.275**	**–0.524**
		t-value	7.463	7.496	7.712	7.727	0.872	–3.439	–4.047	–8.816
	Confirmed Deaths	β	**0.218**	**0.218**	**0.212**	**0.213**	**0.336**	**0.219**	*0.018*	*–0.03*
		t-value	3.748	3.754	3.657	3.672	5.12	3.206	0.265	–0.498
		R^2	0.315	0.317	0.323	0.324	0.132	0.061	0.072	0.288
		F Change	**55.937**	**56.339**	**57.91**	**58.215**	18.474	**7.839**	**9.378**	**49.165**
		N	246	246	246	246	246	246	246	246
Pandemic	Confirmed cases smoothed	β	**0.274*** **	**0.277**	**0.268**	**0.274**	*–0.006*	**0.219**		
		t-value	4.577	4.638	4.491	4.579	*–0.098*	3.632		
	Confirmed Deaths	β	–0.1	*–0.105*	*–0.091*	*–0.098*	–0.108	–0.118		
		t-value	–1.676	–1.762	–1.518	–1.642	*–1.773*	–1.951		
		R^2	0.041	0.042	0.042	0.042	0.013	0.021		
		F Change	**15.711*** **	**15.797**	**15.811**	**15.918**	**4.661****	**7.788**		
		N	733	733	733	733	733	733	733	733

Note: Italic – non-significant, ** significant at 1%, *** significant at 5%;
#Wave 1: 25 March 2020 – 14 February 2021, Peak – 16 September, 2020 (93,198);
#Wave 2: 15 March 2021 (23,577) – 17 July 2021 (38406), Peak 8 May, 2021 (391,232);
#Wave 3: 28 December (7200) – Ongoing (31-jan-238619), Peak 20 Jan, 2022 (321157).

The empirical results of the whole pandemic will show that confirmed cases had a positive impact on the stock prices, which is surprising but as people were stuck at home or lost their job, investment in the stock market was a good option while being at home and earning. The results also signify that deaths did not influence stock prices. The R^2 values are also very low which signifies that overall variance in stock prices is unlikely to be explained by the change in confirmed cases and deaths. The value of the rupee has seen the insignificant influence of the pandemic and changes in oil prices, international trade, and volume of remittance may have impacted the change in rupee value. Although the economic activities have witnessed the positive impact of confirmed cases but the low R^2 value is asking to explore other factors that lead to the change in it.

Table 2 shows the one-way ANOVA with the Games-Howell post hoc test to check the difference among the economic factors in different phases of the pandemic. As the value of $p < 0.05$, the results show significant differences in all economic factors-stock prices, currency value, economic activities, unemployment rate, and inflation rate during the three waves and in-between periods of normalcy. The Games-Howell method is applicable in cases where the equivalence of variance assumption is violated. It is a t-test using Welch's degree of freedom. This method is known to maintain the present significance level even when the size of the sample is different. This method can be applied when the number of samples is six or more (Lee & Lee, 2018). The Games–Howell test showed statistically significant differences ($P < 0.05$), in open, high, low, and close stock prices in all three waves and normalcy. There was also a significant difference ($P < 0.05$) in rupee value between waves one and two, one and normalcy, two and three and three and normalcy. However, there was no significant difference between normalcy and wave two, and wave one and three in rupee value. PMI and the unemployment rate have seen statistically significant differences ($P < 0.05$) in all three waves and normalcy. The inflation rate also has statistically significant differences ($P < 0.05$) in the three waves and normalcy except the waves two and three.

4.1. Theoretical implications

Using employment rate, inflation rate, stock price, currency value, and economic activity as the study context, the current paper adds to the COVID-19 literature by emphasizing theoretical implications as follows: During COVID-19, there was a surge in turbulence as well as connectivity in stock prices, marking a period of financial instability. Investors may be inclined to adjust their portfolios to changes in the economy, which may cause stock values to fluctuate. According to the efficient market concept, stock values during epidemic waves represent every available detail, especially projections concerning the state of the economy going forward. Second, theoretically, variables like inflation, interest rates, and economic growth all affect the value of currencies. Nonetheless, investor mood, the country's imbalanced export and import, or governmental actions may have contributed to currency value changes during the COVID-19 waves. Thirdly, during the COVID-19 outbreak, the government implemented certain economic measures, including lockdowns and supply chain interruptions, which resulted in lower production and consumption. But not every economic sector is affected in the same way. While some people are impacted by the economic downturn, others have been able to adapt to changing customer preferences and the digital revolution.

Fourthly, during different waves of COVID-19, unemployment rates tend to rise due to layoffs and business closures. Finally, changes in customer demand or monetary and fiscal policies implemented by the government may have an impact on the rate of inflation during distinct COVID-19 waves.

Table 2. Games–Howell test

			Sum of Squares	df	Mean Square	F	Sig.	Games-Howell Post hoc test
Open * Wave	Between Groups	(Combined)	34518326057.900	3	11506108685.967	263.205	.000	W0-W1-W2-W3 (SD)
	Within Groups		31868553365.777	729	43715436.716			
	Total		66386879423.677	732				
High * Wave	Between Groups	(Combined)	34578349410.808	3	11526116470.269	271.001	.000	W0-W1-W2-W3 (SD)
	Within Groups		31005600305.549	729	42531687.662			
	Total		65583949716.357	732				
Low * Wave	Between Groups	(Combined)	34075465239.581	3	11358488413.194	253.322	.000	W0-W1-W2-W3 (SD)
	Within Groups		32687018734.120	729	44838160.129			
	Total		66762483973.701	732				
Close * Wave	Between Groups	(Combined)	34250291218.174	3	11416763739.392	262.020	.000	W0-W1-W2-W3 (SD)
	Within Groups		31764076437.580	729	43572121.314			
	Total		66014367655.755	732				
USD/INR * Wave	Between Groups	(Combined)	78.928	3	26.309	22.680	.000	W0-W1:W0-W3: W1-W2: W2-W3 (SD)
	Within Groups		845.645	729	1.160			
	Total		924.573	732				
PMI * Wave	Between Groups	(Combined)	4776.522	3	1592.174	30.228	.000	W0-W1-W2-W3 (SD)
	Within Groups		38397.567	729	52.672			
	Total		43174.089	732				
Unemployment rate * Wave	Between Groups	(Combined)	1193.941	3	397.980	23.115	.000	W0-W1-W2-W3 (SD)
	Within Groups		12017.663	698	17.217			
	Total		13211.604	701				
inflation rate * Wave	Between Groups	(Combined)	144.057	3	48.019	55.066	.000	W0-W1:W0-W2:W0-W3: W1-W2: W1-W3 (SD)
	Within Groups		608.670	698	0.872			
	Total		752.726	701				

4.2. Practical implications

Stakeholders can make well-informed decisions to navigate these difficult times with the assistance of the practical implications (Elkhwesky et al., 2023). Our findings offer traders, investors, and policymakers valuable insights. First, there has been an increase in market volatility as a result of numerous crises that occasionally arise. As a result, investors ought to diversify their investment choices and use strategies for risk management. In an unpredictable financial environment, investors might keep a careful eye on business results and trends in the economy. Secondly, companies and investors ought to keep a careful eye on the movements of the foreign exchange markets and use hedging strategies to control risk associated with currencies. Businesses operating internationally should modify their pricing strategies to account for fluctuations in foreign exchange markets. Thirdly, given the evolving demands of their clientele and the mounting focus on digital integration, an increasing number of companies ought to consider instituting flexible work arrangements. Authorities can implement fiscal stimulus measures to help the economy recover and mitigate the effects of a decrease in activity. Fourth, the government ought to intervene, provide unemployment insurance, and support efforts for job relocation to support affected workers. Businesses should also spend on staff training to help them adjust to the ever-changing market conditions. Lastly, the necessary monetary and fiscal measures should be put in place by the government to control inflationary pressures and promote economic recovery. The amount of money that individuals and businesses spend and invest can be influenced by inflation expectations, which can have an impact on their purchasing power and investment returns.

5. Conclusions

The COVID-19 pandemic's severe health crisis has had an unprecedented effect on the global economy. Despite having its beginnings in China, the first case slowly spread around the world. In this study, we examined the impact of the COVID-19 pandemic on the fastest-growing economy in the world – India – and made an effort to comprehend how the three distinct waves of this pandemic affected macroeconomic indicators such as stock market prices, the value of the dollar, the rate of inflation, the unemployment rate, and economic activity.

The study employs descriptive statistics, regression analysis, and one-way ANOVA with the Games-Howell post hoc test, and compares the first, second, and third waves of the COVID-19 pandemic in India. The analysis concludes that the second wave has had the most impact. During the second wave, the verified COVID-19 instances have a significant negative impact on stock prices and inflation rates. It's interesting to note that the first wave of COVID-19 has a favourable impact on Indian economic activity but a negative impact on the unemployment rate, according to the study. Despite the rise in the number of verified cases and the detrimental effects of the deaths, the value of the rupee has been seen to grow during the second wave. The report also notes that during the era of normalcy, the Indian economy showed encouraging signs of recovery. According to the results of the Games-Howell post hoc test, the macroeconomic factors that were taken into account in this study had substantial changes between the three COVID-19 pandemic waves as well as during the recovery period. The study reveals

intriguing dynamics, such as the first wave having a favorable impact on economic activity but a negative effect on the unemployment rate. Additionally, the report highlights the resilience of the Indian economy, as evidenced by the growth of the rupee during the second wave.

Overall, the study contributes to the literature by comprehensively analyzing the impact of the COVID-19 pandemic on the Indian economy across its three waves. To the best of our knowledge, this is the first study to assess how various pandemic waves have affected India's economic status. To give a comprehensive picture of the Indian economy, future research should take into account more economic factors. The government, academics, decision-makers, and economists will benefit from this study's understanding of the COVID-19 pandemic's impact on the Indian economy and its recommendations for future risk-mitigation measures. India's economic resilience post-pandemic can be further explored in the future.

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