Ushus-Journal of Business Management
2023, Vol. 22, No. 1, *1-17*
ISSN 0975-3311 | https://doi.org/10.12725/ujbm.62.1

Indian Financial Systems and Stock-Markets During COVID 19- Shape Off Post Covid Through AI and Other Digital Tools

Thogaram Umasankar* & P. K. Asthana†

Abstract

Apart from the loss of precious lives, COVID-19 pandemic caused setbacks to all the developmental works, progress of the economy of all countries with serious repercussions on financial systems and stock markets. Most economies, including Indian stock markets since recovered from the shock, showing robustness due to stringent regulatory framework, started rebuilding, from the vertical fall. India as a nation had sufficient leeway to respond to the crisis and market instability, due to its inner strength. In this theoretical study of the reaction of stock markets, also of expansionary monetary policies during pandemic, the resurgence of financial system and recovery of Indian stock markets, with extreme adoption of Digital tools like AI for Algo trading. Secondary research methods have been adopted, for analyzing conceptual approaches of regulatory frameworks of the Securities market, Central bank, amid volatility, to draw conclusions. The stock market data (NSE) is subjected to VaR test. The Study finds that country has responded quickly to the outbreak of the crisis by easing capital and liquidity requirements or at least refraining from the previously planned tightening. At the same time, the authors noticed that loan-based

* Amity University, Raipur, Chathisgarh, India; Email: umasankar66@gmail.com

† Amity University, Raipur, Chathisgarh, India; Email: pkasthana@rpr.amity.edu

measures and minimum reserve requirements were rarely relaxed and risk weights were not changed at all. Digital tools like Algo trading, AI based advisory gained prominence. The impact of novel coronavirus (COVID-19) pandemic on financial system and the stock markets in India, is significant. But Monetary policy, liquidity operations and aid packages that were offered by the Government have minimized the impact to a large extent and brought the financial systems back onto the rail.

Keywords: Corona Virus, Financial Markets, Stock market, Algo trade

1. Introduction

The corona virus or COVID -19 categorized as a pandemic has spread throughout the world, affecting all sectors including economic sectors and financial markets. Governments all over the world have initiated many precautionary measures, like restrictions on travel, curfews and closure of borders, work from home conditions, to slow down the pace of the spread. While the main idea was to prevent the virus from spreading further, these actions obviously affected the economy of those countries as a whole. In fact, the pandemic brought entire economic activity, across the globe, to an unexpected halt during its outbreak (Xu, 2022). Undoubtedly, the pandemic happened to be a turning point for a few sectors. Pandemic is also happened to be a turning point for the development of the entire economies, as well as changing the economic realities more than the previous crisis. Like all other major events that significantly affect stock market performance, the COVID outbreak has also significantly affected the financial markets, stock market investment and other business environments (Abdullah M. Al- Awadhi, 2020).

1.1 The Events that Unfolded

Central bankers follow the country's monetary policy strategy, based on macroeconomic developments consisting of a broad-based economic analysis of that country, financial markets on the global front and monetary analysis. During Covid pandemic global economy and financial markets have come under severe stress. Due to strict quarantine and lockdown policies, economic activity came to a grinding halt (Baek et al,. 2020). Soon, certain sectors have

chosen alternative routes and started working with a limited workforce, 'work from home' etc. However, one important significance of behavioural change is the adoption of digital transformation of financial systems, during covid. In fact, digital transformation has emerged as a strategic perspective of financial systems (Ogrean Claudia & Herciu Mihael, 2021). Events that unfolded during Covid in the year 2020.

2. Financial Systems

Financial systems in India are a network of financial institutions wherein first comes the Reserve Bank of India, which is also central bank. Further consists of various Commercial banks, Cooperative Societies, Rural banks. The financial markets are basically Money markets, and also the Stock markets. Dealing bythese entitites involves variety of financial instruments, which usally range from deposits in the banks, to tradable instruments like Bonds, stocks or shares of the companies listed. The services of these instruments are engaged in the provisioning loan and credit facilities and also involves activities related to money transmission. Hence, all these financial institutions and markets occupy very significant positions in the country's economy in the form of intermediaries. In such forms, these intermediaries channelise the funds through savings, to borrowers and investors. They do the reconciliation of various requirements of savers and borrowers, which facilitates a higher level of investments and also the savings in the economy.

2.1 Liquidity Management‡

RBI had taken an unconventional approach during Covid19 in 2020, to give stimulus and keep liquidity alive. Such Unconventional monetary policy tools or UMPTs very significantly differ from already existing conventional instruments as policy actions, because of the rationale involved and the channels and the scale of operations.

2.1.1 Targeted Long-Term Repo Operations (LTROs)[1]

The Reserve Bank of India undertook unconventional initiatives, such as long-term repo operations (LTROs). These were introduced

‡ RBI Governor's Seventh Bi-monthly Monetary Policy Statement on 27 Mar 2020

in order to facilitate easy and better monetary transmission and support credit offtake. LTROs ensured liquidity to sectors experiencing liquidity stress. As redemption pressures intensified, due to the large quantum of sell-off in the Bond, Forex and Domestic equity, the liquidity premia have surged on financial instruments such as commercial paper, corporate bonds and debentures. To ease the pressure, the RBI announced long-term repo operations (LTROs) which has maintained the liquidity, eased financial stress considerably, and smoothened the credit flow, thus facilitated the proper eased financial stress considerably, and smoothened the credit flow, thus facilitated the proper functioning of financial markets. The RBI injected INR 2500 billion (USD 33.02 billion) through LTROs, by Apr 2020. These instruments are usually used as inter alia, for working capital access has also been tightened due to a slowdown in bank credits, causing pressure on

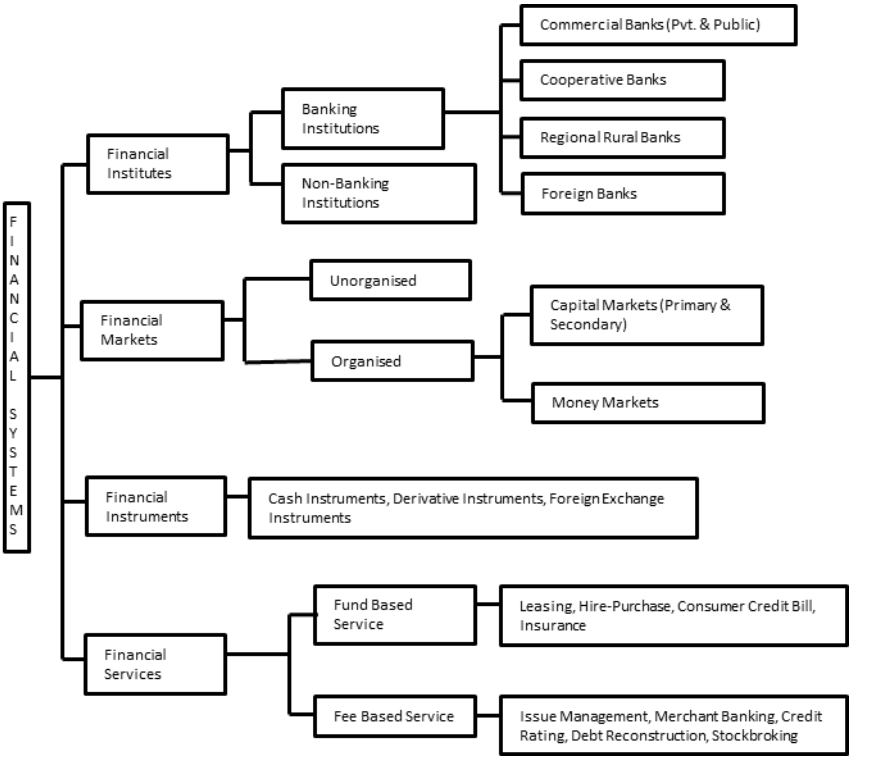


Figure 1: Financial systems

cash flows. To ease the pressure on the economic activity and keep on cash flows, the Reserve Bank of India had considered the term repos which are up to three years tenor, and are of 1,00,000 crores at a floating rate. The RBI has linked, these with the repo rates. The banks have deployed in non-convertible debentures, commercial paper, and investment grade corporate bonds. The first TLTRO auction was held on 27 Mar 2020 (Radeef Chundakkadan & Subash Sasidharan., 2022).

2.1.2 Cash Reserve Ratio

Reserve Bank of India had initiated that, cash reserve ratio (CRR), to be reduced to 3%, on 100 basis points for all banks. This CRR reduction is of net demand and time liabilities (NDTL) for one year duration, and 28 Mar 2020 as the effective date. This CRR reduction also facilitated liquidity of approx ₹ 1.37 lakh crores, across the banking system, in proportion to constituents' liabilities, instead of SLRs excess holdings. Maintaining of minimum CRR balance of 90% on daily basis has also been reduced to 80% due to staff constraints due to social distancing and lockdown. Furthermore, under the same considerations, effective from 28 March 2020, the minimum CRR balance requirement is reduced to 80% from the original 90%.

2.1.3 Marginal Standing Facility

Liquidity stress was occurring in phases due to the high volatility. RBI had increased the limit of borrowing, to 3 % from 2 % from the banks for overnight borrowing. All these 3 measures of TLTRO, CRR and MSF have injected total liquidity of ₹ 3.74 lakh crore into the system.

2.2 Loan Moratorium

A moratorium is considered as a temporary suspension accorded. It will continue that way, till govt or authorities consider lifting the suspension, or a solution has been found for the problems those led to the moratorium or problems have been resolved. Imposing of such moratoriums can be made by the government, or by a business organisation, or even by the regulators. RBI has come out with a policy that all lenders have to give minimum three months of moratorium on all term loans, those are outstanding as on 1 March 2020. This policy issued

has been made applicable to all Commercial Banks including Regional Rural banks, and also to all Small Finance banks, Co-Operative Banks,to All India Financial Institutions and NBFCs. The NBFCs includes Housing Finance and Microfinance institutes also. Further, the Reserve Bank of India (RBI) also came out with another policy of a six-month moratorium. This policy is for a period between 01 March 2020, to 31 August 2020, covering all loan-equated monthly installments (EMIs) to lessen the troubles faced by borrowers due to the COVID-19 pandemic (Meera Mehta &, Rishab Kaul, 2020)[i]

2.3 Deferment of Interest on Working Capital Facilities

RBI has issued another policy related to Working Capital Facilities. All such lendings sanctioned as either as cash credit or overdraft by lending institutions have been issued with a policy, to allow a deferment of paying interest for three-month period. Again this policy of deferring working capital facility covers all such outstanding loans, as of 01 March, 2020 as the effective date. The accumulated interest for the period will be paid by the borrower after the expiry of the deferment period. Further, the policy also indicated that these facilities will not result in an asset classification downgrade.

3. Stock Markets During Covid

3.1 Stock-Markets World-Wide During Covid

Times of fear and anxiety are ripe for rumours and misinformation and knowledge and wisdom are the right antidotes. Stock markets worldwide had a roller coaster ride during the pandemic with many up – lower swings, with VIX reaching to peak exhibiting extreme fear, anxiety and rumours. The VIX of the Indian Nifty measured 83.6%, the VHSI of China measured 64.8% and the VXJ of Japan measured 60.67% (Vera-Valdes & J. Eduardo 2021), (Muhammad Sadiq et al,. 2021). During early 2020, the economy was rising and stock markets were showing favourable conditions with trades of BSE hitting a peak of 42273, and the NSE of 12362. The Indian stock market is a vital constituent of the Indian financial system. India is one of the emerging economies. The stock market showing impressive growth is an indicator of the positivity of the

Indian economy just before Covid. Investors' optimism results in discounting earnings volatility, but, investors' pessimism causes an increase in earnings volatility, resulting in a deviation of stock prices from their intrinsic value (Werner FM De Bondt& Richard H Thaer, 1987). The Stock markets were highly volatile during pandemics often spreading the risks caused by events due to asymmetric information flow, and negative externalities. Investors' optimism led to volatility due to pessimism surrounded (Yashraj Varma et al., 2021).

3.2 Returns in Stockmarket (Specific to NSE)2

The widespread swings, display the psychology of investors during the pandemic and focus on the irrationality of investors. The irrationality of the investors under extreme fear and anxiety resulted in losses for world stock markets in trillions of dollars. On 12 Mar 2020, NSE had 822 points and the BSE Sensex had 2991 points which is 10% in the lower circuit, thereby triggering the lower circuit breaker. The trading was halted for 45 minutes. Again, on 13 Mar 2020, nifty had plunged by 966 points ie 10.07%, and Sensex by 9.43% by 3090 points and again triggered a circuit breaker. The Bombay Stock Exchange Sensex index dropped by 13.2 percent on 23 March 2020, as the lockdown was announced. It was the steepest fall since 28 Apr 1991, which happened due to the Harshad Mehta Scam, for BSE Sensex. The NSE fell by the same day by 8.67%. To check the volatility, in the month of Mar 2020, the closing price of 11175.05 on 28 Feb 2022 is taken as time t − 1, and the closing price on 23 Mar 2022, of 7583.6, the lowest close price due to the lockdown announcement is taken as time t. The rate of return: Rt = ((Pt – Pt-1) / Pt)-1 is ((7583.6-11175.05)/11175.05)-1, is -32.1% negative returns on the day of lockdown.

3.3 Value at Risk (VaR)

The usage of VaR is basically to determine the risk exposure level of a portfolio or an investment or stock level, to decide the extent of potential losses. VaR or Value at Risk is the maximum loss that is not to be exceeded, for a taken time period at a decided confidence level ie, at a given probability level. VaR is also termed as a statistical measure of the riskiness, of the chosen financial investment and analyses the loss that may happen at a certain level

of confidence due to exposure to market risk over a specific time frame (Chen R & Yu L., 2013). Hence, the VaR makes an attempt to gauge the volatility or the risk of change in the rate of return due to unexpected changes in prices (Kushagra Goel & Sunny Oswal., 2019). There are two key elements in VaR, one is a fixed period of time and the second one is confidence level.

The fixed period of time is the period for assessing the risk and the confidence level is the probability of loss occurrence at 95% or 99% confidence. There are various methods used to compute the VaR. Historical method, Variance- Covariance method and simulation method are the various types available to calculate VaR. The VaR for nifty returns from Sep 2019 to Sep 2020 is calculated under these methods.

3.4 VaR Through Historical Data Method

The rate of returns from 01 Sep 2019 to 30 Sep 2020 has been calculated with the rate of return: Rt = ((Pt – Pt-1) / Pt)-1 formula. The percentile function of Excel clearly calculates the 'k'th percentile of the data set under consideration. The NSE data is tested for VaR with 95% and 99% confidence levels. A frequency table has been prepared, from the data arranged in historical distribution. The result is as under:

Table 1: Frequency Table of Nifty

Returns	**Frequency**
-10%	1
-9%	0
-8%	1
-7%	1
-6%	0
-5%	2
-4%	3
-3%	3
-2%	11

Returns	Frequency
-1%	18
0%	83
1%	94
2%	31
3%	9
4%	6
5%	1
6%	2
7%	1
8%	1
9%	0
10%	0

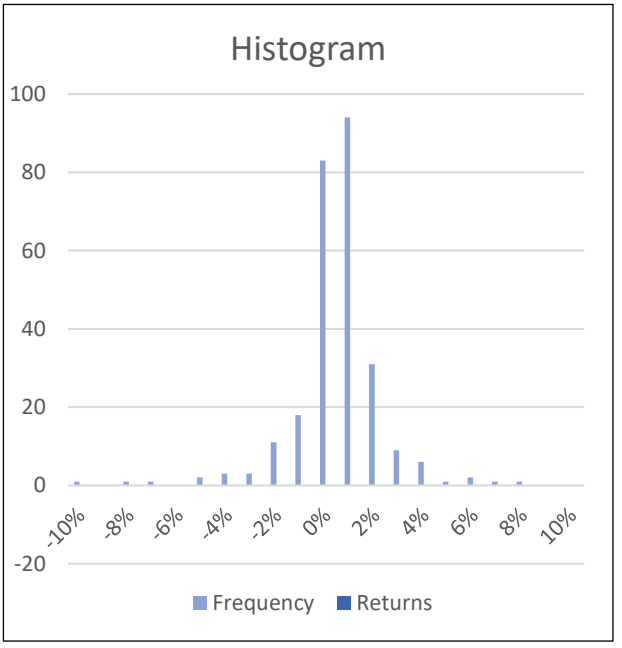


Figure 2

Table 2

Subject	Values
P' at 95% confidence level	5.00%
VaR at 95% confidence level	-2.51%
P' at 99% confidence level	1.00%
VaR at 99% confidence level	-6.36%

VaR Based on Normal Distribution Method:

VaR can be calculated, not only by using historic method but by using different other techniques as well. As a function of mean and variance, VAR is calculated, of the returns series, and assuming it as normal distribution, achieved under parametric method. This method is also known as the variance-covariance method. Under this variance-covariance method, VaR is calculated as a function of the mean and variance of the returns series, assuming normal distribution (Ulku Koroglu & Yasemin Erisoglu ., 2021). To calculate the VaR under this method, the data NSE from Sep 2019 to Sep 2020 is used. The mean of the rate of return of the NSE index data from the given data is 0.03% and the standard deviation is 1.92%. VaR is calculated for 95% and 99% confidence levels. The 'Norminverse probability' function is used to calculate the inverse of the normal cumulative distribution. The Norm inverse function in excel is used to calculate the VaR for Confidence level of 95% and 99% as under:

The formula VaR = Value x Standard deviation x probability.

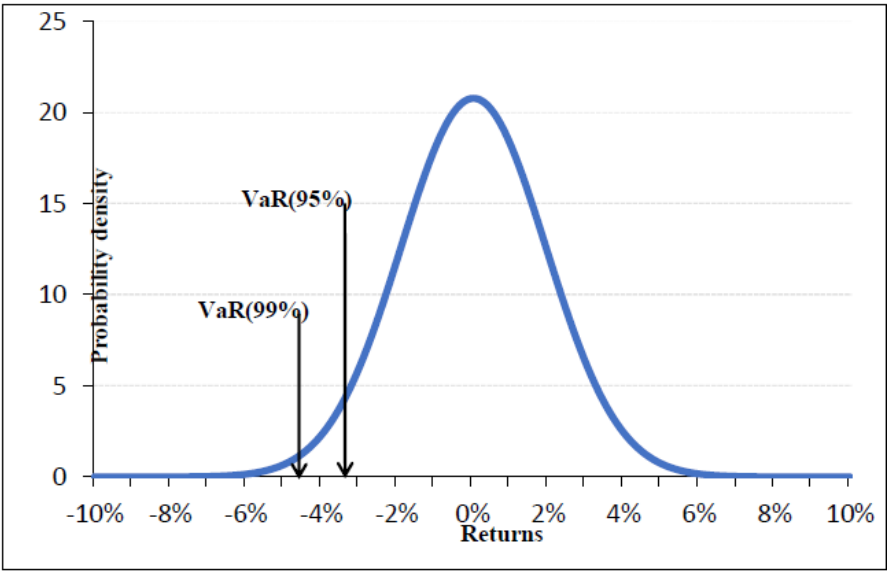
= μ x σ x P(A) or use =NORMINV(μ,σ,P(A)) in excel.

= Norminv(P as 5% for Confidence level of 95 and P as 1% for 99% Confidence Level, Mean, Standard deviation), where in Mean = 0.03% and Standard Deviation = 1.92%. The result is, for 95 % Confidence level, the VaR is -3.12% and for 99% the VaR is -4.43%.

3.5 Monte Carlo Simulations

Simulation models are a set of assumptions. These assumptions are mainly concerned about the relationship among existing model components. A simulation run for a given model is termed as a sample from all available infinite populations of possible results for a given model. Once the simulation model is built, one can select the number of trials that can be established. Statistical methods are now used to validate simulation models and associated design simulation experiments. The NSE Data of Sep 2019 to Sep 2020 is used to calculate the VaR.

Figure 3: Bell curve to plot 5% and 1% probability



Simulations were created with normal distribution function in excel for values ranging from -10% to 10%. The probability density is made with excel with function =NORMDIST (simulation value, Mean, Standard deviation).

PART - II

Shape off in Post Covid era through AI and other digital tools

4. Post-Covid Era –Increase of Digital Footprint in Stock Markets

Covid had triggered a severe economic downturn to the world economy, but bounced back subsequently as people got used to social distancing, precautions to be observed and the development of vaccinations. The stimulus measures announced by the Government of India, started giving yield, though the recovery is with spikes and kinks, also plagued by many uncertainties (secretariat, 2022). The digital systems came as rescuer and proved to be a lifeline for many organisations, including stock markets, as physical contact has been kept to a minimum. Stock traders, both HNIs (High Networth Investors) and retailers have embraced the digital trading method to the existing old trading system of visiting the traders' place. Covid has given a glimpse of what being digital truly means. It is not only about convenient apps, but also about having a solution chain that ran deep across various processes, and technology. As the pandemic pushed the workforce of the offices, to work from home, a sharp increase has been higher spending on digital services and enhanced similar investments by corporates on hardware as well, as the economy recovered due to stimulus offered by the Govt (Ding Ding et al., 2020).

4.1 Changed Market Strategy of Financial Services

Many financial technologies (FinTech) have emerged to be used by financial services, offering a variety of solutions to their customers to enhance their customer base. The new developments paved way for the new technologies and started presenting a variety of new services like investment, risk management, payments and savings. Financial institutions made technological investments to make technological changes in their digital platforms, ensured remote access, and established alternative communication channels, and security to ensure the continuity of their services (Sendur, 2022). The broking services have brought in theme-based investment strategy into stock trading. The broking services introduced packages like sector-based basket trading, Market capitalisation-

based basket trading etc. They have brought in SIP mode into stock investment also.

4.2 Artificial Intelligence, it's Usage in Stock Trading in Post Covid Era

Artificial intelligence or AI is a buzz word and has provided an altogether new dimension and fresh approach to the area of finance management through its implementation. Especially, AI role in the prediction of price movement in financial markets is comparatively better in accuracy, thus promising more favourable results in forecasting of move of stock markets. Algorithmic Models have been developed for accurate usage of certain techniques of Machine Learning (ML) methods by modelling risk, forecasting returns, and construction of the portfolio based on predicted mode (Gagan Deep Sharma et al., 2020). The number of DEMAT accounts were estimated to be around 4.09 crore during pre-pandemic time ie March 2020. However, the DEMAT count has increased to 10 crore3, by September 2022. As told by Chandra, such high growth stands as a testament that the people participation in the equity market has grown exponentially (Chandra., 2022). The experts opine that Artificial Intelligence tools are real game changers for the stock traders. These are helpful for the novices, experts as Do-it-yourself (DIY) investors.

4.2.1 Do-it-yourself (DIY) investors. These investors invest the money by themselves, through online trading. However, the biggest challenge faced by these Do-it-yourself (DIY) investors, to choose right stocks with right quality and create a strong portfolio. Such investors started using AI tools to pick up quality stocks, to strengthen their portfolios.

4.2.2 Algo-trading: The increase in demand for the reduction of transaction costs has paved way for use of algorithms in stock - trading, like any other services. All financial sector institutes whether broking houses, investment funds or stock traders are using algorithmic based stock selections to trade at a lightning speed.

4.3 Robo advisory

The COVID pandemic has resulted in reduced close interaction between human beings and increased financial volatility. Such a situation creates stress on the human mind and influences consumers' perception towards automated robo-advisor, to manage their financial planning. The concept of Robo advisories, powered by Artificial Intelligence (AI) has gained popularity, through online basis. In the finance sector and retail traders, very significantly, due to the automated and very inexpensive approach of portfolio management (Li Yin Gan & Mohammad Tariqul Islam Khan., 2021). Main reasons for the rise in Robo advisory:

4.3.1 No Emotions: The robo-advisory platforms make their decision, based on real-time statistics, unfazed by any kind of emotions or short-term occurrences. Hence, this eliminates poor decision making due to illogical behaviour, or spontaneous decisions taken for buy or sell, being critical during times of uncertainty.

4.3.2 Quick Re-evaluations: The portfolio once set needs to be evaluated periodically and rebalanced with changing socio, political, and economic conditions. Robo advisory, based on hard facts and news than emotions, will ensure tactical intervention. With the changing economic and market conditions, the portfolios are reevaluated and rebalanced. The volatility effect on the investments gets mitigated through digital portfolio managers, by means of tactical interventions, as they have added the human touch to robo-advisory.

4.3.3 Assess correct risk profile and make portfolio: Different products like high, medium or low-risk products, are offered by the robo-advisory platforms. These products depend upon the risk levels, with long-term horizon. In fact, a noteworthy feature of robo-advisory observed during the pandemic, is its long-term horizon (Victor Tiberius et al., 2022).

5. Conclusion

The world witnessed unrecoverable loss due to the pandemic outbreak, which shuddered the entire world's economy. The impact of the crisis is reflected in the stock market, worldwide. Indian stock

markets too witnessed volatility, but the various economic packages have ensured the recovery of the stock market. The NSE closed on 30 Sep 2019 at 11474 and the NSE on 30 Sep 202 is 11247 with a rate of return of -1.9% only from -32% of return on lockdown on 23 Mar 2020, is evident that the economy is in a recovery path. Digital financial solutions came into existence, post Covid era. These products have started challenging traditional wealth and asset management products, investment ideas and related advice, post-retirement solutions and planning, products related to tax harvesting, etc. These digital solutions are based on big data analysis, algorithms based on such real-time data, machine learning, and other technologies, minimising the necessity of human intervention.

5. References

Abdullah M. Al-Awadhi, K. A.-A. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. Journal of Behavioral and Experimental Finance, 27((1)), 1-5. https://doi.org/10.1016/j.jbef.2020.100326

Baek Seungho, S. K. (2020). COVID-19 and stock market volatility: An industry level analysis. Finance Research Letters, 37((1)), 1-10. https://doi.org/10.1016/j.frl.2020.101748

Chandra, S. (2022, Oct 27). How are AI tools helping DIY investors? The Economic Times, p. 1. https://economictimes.indiatimes.com/markets/stocks/news/how-are-ai-tools-helping-diyinvestors/articleshow/95116196.cms

Chen R, Y. L. (2013). A novel nonlinear value-at-risk method for modeling risk of option portfolio with multivariate mixture of normal distributions. Economic Modelling, 35((1)), 796-804.

Ding Ding, C. G. (2020). Building stock market resilience through digital transformation: using Google trends to analyze the impact of COVID-19 pandemic. Frontiers of Business Research in China, 14((21)), 1-21. https://doi.org/10.1186/s11782-020-00089-z

Gagan Deep Sharma, B. E. (2020). Sailing through the COVID-19 Crisis by Using AI for Financial Market Predictions.

Mathematical Problems in Engineering, 1((1)), 1-11. https://doi.org/10.1155/2020/1479507

Kushagra Goel, S. O. (2019). Value at Risk Models in Indian Markets: A Predictive Ability Evaluation Study. Theoretical Economics Letters, 9((8)). https://doi:10.4236/tel.2019.98177

Li Yin Gan, M. T. (2021). Understanding consumer's adoption of financial robo-advisors at the outbreak of the COVID-19 crisis in Malaysia. Financial Planning Review, 4((9)), 1127-1145. https://DOI:10.1002/cfp2.1127

Meera Mehta, R. K. (2020). Loan Moratorium 2020 - Its impact on Indian Banks. Australian Finance & Banking Review, 4((2)), 1-14. doi:10.46281/afbr.v4i2.919

Muhammad Sadiq, C.-C. H. (2021). COVID-19 fear and volatility index movements: empirical insights from ASEAN stock markets. Environmental Science PollutionResearch international, 28, 67167–67184. DOI: 10.1007/s11356-021-15064-1

Ogrean Claudia, H. M. (2021, Dec). Digital transformation as a stra--tegic shift - A bibliometric analysis. STUDIES IN BUSINESS A--ND ECONOMICS, 16((3)), 136-151. https://doi.org/10.2478/s--be-2021-0050.

Radeef Chundakkadan, S. S. (2022). Monetary Policy Announceme--nt and Stock Returns: Evidence From Long-Term Repo Operat--ions in India. Asian economic Letters, 3((2)), 1-7. https://doi.--org/10.46557/001c.27117

Secretariat, U. (2022). Recovering from COVID-19 in an increasingly digital economy: Implications for sustainable development. United Nations Trade and Development Board.

Sendur, Y. (2022). The Covid-19 Pandemic and Digitalization inFinancial Markets. Istanbul Journal of Economics, 72((2)), 1025-1038. https://doi.org/10.26650/ISTJECON2022-1127590

Ulku Koroglu, Y. E. (2021). Value at risk for risk management with normal-logDagum mixture distribution. Journal of Statistics & Management Systems, 24((7)), 1489-1501. https://doi:10.1080/0-9720510.2020.1826630

Vera-Valdes, J. E. (2021, Apr). The persistence of financial volatility after COVID-19. Finance Research Letters, 44, 1-9. https://doi.org/10.1016/j.frl.2021.102056

Victor Tiberius, R. G. (2022). Forecasting the future of robo advisory: A three-stage Delphi study on economic, technological, and societal implications. Technological Forecasting and Social Change, 182((1)), 1-12. https://doi.org/10.1016/j.techfore.2022.121824

Werner FM De Bondt, R. H. (1987). Further Evidence On Investor Overreaction and Stock Market Seasonality. The journal of finance, 42((3)), 557-581. https://doi.org/10.1111/j.1540-6261.1987.tb04569.x

Xu, D. (2022). Canadian Stock Market Volatility under COVID-19. International Review of Economics and Finance, 77(1), 1-11. https://doi:10.1016/j.iref.2021.09.015

Yashraj Varma, R. V. (2021). Short-Term Impact of COVID-19 on In--dian Stock Market. Journal of Risk and Financial Management, 14((11)), 558-572. https://doi.org/10.3390/jrfm14110558