

Technical Indicators of Major Healthcare Companies: A Comprehensive Analysis

Rohit Mehta¹, Sofia Khan², Ashutosh Kumar Singh³

¹Research Scholar, Department of Business Economics, VBS Purvanchal University, Jaunpur, India

²Assistant Professor, Department of Management, School of Management Sciences, Varanasi, India

³Assistant Professor, Department of Business Economics, VBS Purvanchal University, Jaunpur, India

Abstract

This research aims to provide a comprehensive analysis of major healthcare stocks along with the nifty health care index within the healthcare sector. Employing technical indicators such as the Moving Average Convergence Divergence (MACD), Rate of Change (ROC) and Relative Strength Index (RSI) we conduct a detailed trend analysis to identify historical patterns and potential turning points in stock prices. Furthermore, advanced time series forecasting models and predictive analytics are utilized to forecast future share prices for the selected three companies, offering valuable insights for investors and market participants.

In addition, we investigate the relationship between the stock prices of Apollo Hospital, Fortis Healthcare & Narayana Hrudra and the Nifty Healthcare Index. This analysis sheds light on how individual stock prices are influenced by broader sectoral performance. We also explore the impact of MACD, ROC, and RSI technical indicators on the prices of all healthcare stocks through rigorous statistical analysis. Our findings provide healthcare sector stakeholders with a deeper understanding of stock behaviour, potential future movements, correlations with market indices and risk assessment.

The results of this study enhance the decision-making process for investors and market participants in the healthcare sector. By examining historical trends, forecasting price dynamics, assessing sectoral correlations, evaluating technical indicator effects and risk measurement, this research contributes to a more comprehensive view of these stocks and their positioning within the healthcare industry.

Keywords: Healthcare Services Stocks, Moving Average Convergence Divergence (MACD), Rate of Change (ROC), Relative Strength Index (RSI), Apollo Hospital Stock, Fortis Healthcare Stock, Narayana Hrudra Stock, Nifty Healthcare Index

Introduction

Historical Background of the Healthcare Services Sector in India

The healthcare service sector in India has a rich and evolving history that spans centuries. India has a long tradition of healthcare dating back to ancient times. Ayurveda, one of the world's oldest holistic healing systems, originated in India around 5,000 years ago. It emphasized natural remedies and lifestyle practices to promote health. During British colonial rule in India, modern Western medicine and healthcare practices were introduced. This period saw the establishment of medical colleges and hospitals influenced by Western medicine. After gaining independence in 1947, India's healthcare system underwent significant

Corresponding Author: Rohit Mehta, Research Scholar, Department of Business Economics, VBS Purvanchal University, Jaunpur, India, E-mail: rohit2mehta@gmail.com

How to cite this article: Mehta, R.; Khan, S.; Singh, A.K., (2023). Technical Indicators of Major Healthcare Companies: A Comprehensive Analysis. *Purushartha*, 16(1), 122-141.

Source of support: Nil

Conflict of interest: None

changes. The government recognized the need for accessible and affordable healthcare and embarked on a journey to expand healthcare infrastructure and services. India's Five-Year Plans, initiated in the 1950s, laid the foundation for healthcare development. The plans focused on building primary healthcare facilities, training healthcare professionals and improving public health.

India formulated its first National Health Policy in 1983, emphasizing the need for comprehensive

primary healthcare services. Subsequent policies and revisions have continued to address the evolving healthcare needs of the population. The healthcare sector in India has seen remarkable growth in both the public and private sectors. Public healthcare includes government-funded facilities, while the private sector comprises a vast network of hospitals, clinics and healthcare providers. India has emerged as a prominent destination for medical tourism. Patients from around the world seek high-quality and cost-effective medical treatments in India, boosting the healthcare service sector. India has embraced healthcare technology, with the adoption of electronic health records, telemedicine and digital health solutions. These innovations have improved healthcare access and delivery. While India has made significant strides in healthcare, challenges such as healthcare disparities, disease burden and infrastructure gaps persist. Initiatives like Ayushman Bharat, launched in 2018, aim to address these challenges and increase healthcare access. The COVID-19 pandemic highlighted the resilience of India's healthcare system, as healthcare workers and facilities worked tirelessly to manage the crisis. It also underscored the need for increased healthcare preparedness and infrastructure.

The healthcare service sector in India continues to evolve and expand to meet the diverse healthcare needs of its population. With a growing focus on preventive care, health equity and technological advancements, India's healthcare sector is poised for further development in the coming years.

Healthcare Service Sector and Stock Performances

The healthcare service sector in India has gained prominence in the stock market due to its significant growth and development over the years. The healthcare service sector in India has a history of consistent growth driven by factors like rising healthcare needs, a growing population and

increased healthcare spending (Nollet & Beaulieu, 2003). This growth trajectory has contributed to the sector's attractiveness to investors. India's healthcare service sector comprises a mix of public and private players. Public healthcare includes government-funded hospitals and clinics, while the private sector encompasses a wide range of hospitals, healthcare chains and specialized clinics. India has established itself as a global hub for medical tourism, attracting patients from around the world. World-class medical facilities, highly skilled healthcare professionals and cost-effective treatments have fuelled this trend, making healthcare stocks associated with medical tourism particularly appealing to investors. India has adopted cutting-edge healthcare technologies and practices, enhancing patient care and treatment outcomes. The integration of telemedicine, electronic health records and digital health solutions has played a role in the growth of healthcare stocks. The Indian government has launched initiatives like Ayushman Bharat, aimed at improving healthcare access and affordability for millions. Such policies have a direct impact on healthcare service providers' revenues and consequently, their stock performance. Prominent healthcare companies, such as Apollo Hospitals, Fortis Healthcare and Narayana Hrudra, have been publicly listed and their stock performance is closely watched by investors. The financial health and expansion strategies of these companies significantly influence their stock prices. While the sector has exhibited consistent growth, it faces challenges such as regulatory changes, competition and healthcare disparities. Investors assess the ability of healthcare companies to navigate these challenges while capitalizing on growth opportunities. Investor sentiment in the healthcare service sector is influenced not only by financial performance but also by broader factors like demographic trends, government policies and global health dynamics, especially during health crises like the COVID-19 pandemic. In brief, the healthcare service sector in India has witnessed

substantial growth, attracting investors looking to capitalize on the sector's expansion, technological advancements and medical tourism opportunities. However, it is essential to consider both the potential for growth and the sector-specific challenges when evaluating the stock performance of healthcare companies in India.

Background and Significance

The healthcare sector, a pivotal component of the global economy, has been marked by on-going evolution and transformation. Within this dynamic landscape, individual healthcare companies' stock performances play a crucial role, attracting considerable attention from investors and financial analysts. This study delves into the intricate dynamics of three prominent entities within the healthcare sector: Apollo Hospital, Fortis Healthcare and Narayana Hrudra. These three leading players in the Indian healthcare industry have experienced fluctuations in their stock prices over the last five years, spanning from April 2018 to March 2023. These price movements, influenced by a multitude of factors, including market sentiment, economic conditions and company-specific developments, are of great interest to investors and stakeholders (Hoffmann & Shefrin, 2014; Shiva et al., 2020). Understanding the historical trends, forecasting potential price shifts, evaluating the impact of technical indicators (Chong et al., 2011; Fang et al., 2014; Nor et al., 2014) on these stocks and risk assessment can provide valuable insights for investment decisions.

Objectives of the Study

The objectives of this study are:

Trend Analysis:

We aim to conduct an exhaustive analysis of historical trends in Apollo Hospital, Fortis

Healthcare and Narayana Hrudra stock prices. Employing technical indicators such as the Moving Average Convergence Divergence (MACD), Rate of Change (ROC) and Relative Strength Index (RSI) the objective is to identify patterns and potential turning points in stock prices over the last five years, spanning from April 2018 to March 2023.

Price Forecasting:

Through advanced time series forecasting models and predictive analytics (Agrawal et al., 2019; Rout & Muppidi, 2019), we endeavour to forecast the future share prices of Apollo Hospital, Fortis Healthcare and Narayana Hrudra stocks to make predictions for the upcoming year starting from April 2023 to March 2024, assisting investors and market participants in their decision-making processes.

Sectoral Relationship:

We explore the interplay between the stock prices of Apollo Hospital, Fortis Healthcare & Narayana Hrudra and the Nifty Healthcare Index, a broader representation of the healthcare sector's performance. This analysis reveals correlations and dependencies between individual stock prices and sectoral health, shedding light on the influence of sectoral performance on individual healthcare companies.

Technical Indicator Impact:

Additionally, we investigate the influence of MACD, ROC and RSI technical indicators on the stock prices of all healthcare companies. Rigorous statistical analysis is employed to discern whether these indicators exert statistically significant effects on price dynamics over the specified study period.

Risk Assessment:

In addition to forecasting stock prices, this study endeavours to estimate the returns of selected healthcare and services stocks in comparison to the Nifty Healthcare Index returns. This comparative analysis aims to measure both diversifiable and non-diversifiable risks, providing stakeholders with insights into the risk-return profile of these stocks.

This study's significance lies in its potential to provide healthcare sector stakeholders with a more comprehensive understanding of stock behaviour, forecasts of future movements, correlations with market indices, the impact of technical indicators and risk measurement. These insights are crucial in navigating the complex landscape of healthcare investments and finance, especially considering the dynamic period under examination from April 2018 to March 2023.

Methods*Data Collection*

Source Population: The source population for this study comprises historical daily stock price data for Apollo Hospital, Fortis Healthcare & Narayana Hrudra and Nifty Healthcare Index price, spanning a defined time period. Additionally, the values of technical indicators (MACD, ROC & RSI) and relevant market indices were collected.

Selection Criteria: The selection criteria for study data were based on the availability of historical stock price data for Apollo Hospital, Fortis Healthcare & Narayana Hrudra based on highest market capitalization during the chosen time frame. Although Max Healthcare was the second highest service company but due to non-availability of data, it is excluded from the study. Data from reputable financial sources, stock exchange and databases were utilized.

Data Preparation

Cleaning and Pre-processing: Raw data underwent rigorous cleaning and pre-processing. This involved handling missing values, removing duplicates and converting data into a consistent format. Stock prices were adjusted for splits and dividends to ensure data accuracy.

Feature Engineering:

Technical indicators (MACD, ROC & RSI) were computed from the raw stock price data using standard formulas.

Trend Analysis*Technical Indicators:*

The Moving Average Convergence Divergence (MACD), Rate of Change (ROC) and Relative Strength Index (RSI), were employed for trend analysis. These indicators were calculated using specific mathematical formulas.

Visualization: Trends in Apollo Hospital, Fortis Healthcare and Narayana Hrudra stock prices were visualized using line charts and technical indicator signals were plotted to identify trend reversals and potential turning points.

Price Forecasting*Time Series Forecasting:*

Time series forecasting models, such as Winters' Additive model, Simple Seasonal and ARIMA model were employed to predict future stock prices for Apollo Hospital, Fortis Healthcare and Narayana Hrudra respectively. These models were trained on historical data.

Model Evaluation: The forecasting models were evaluated using statistical metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE) and Root Mean Squared Error (RMSE) to assess their accuracy.

Technical Indicator Impact

Correlation Analysis:

To evaluate the impact of technical indicators (MACD, ROC & RSI) on their respective stock prices of Apollo Hospital, Fortis Healthcare and Narayana Hrudra, Pearson's correlation coefficient was calculated. This analysis measured the degree and direction of the correlation.

Sectoral Relationship

Correlation Analysis:

To study the relationship between Apollo Hospital, Fortis Healthcare & Narayana Hrudra stock prices and the Nifty Healthcare Index, Pearson's correlation coefficient was calculated. This analysis measured the degree and direction of the correlation.

Risk Measurement

Diversifiable and Non-Diversifiable Risk:

The returns of selected healthcare and services stocks against the Nifty Healthcare Index returns will be compared to measure diversifiable (company-specific) and non-diversifiable (market-related) risks. This analysis will contribute to a comprehensive risk assessment.

Statistical Methods

Statistical Software:

All statistical analyses were performed using the

Statistical Package for the Social Sciences (SPSS) and Microsoft Excel.

These detailed methods enabled the comprehensive analysis of Apollo Hospital, Fortis Healthcare & Narayana Hrudra stocks, including trend analysis, price forecasting, sectoral relationship examination, the assessment of technical indicator impact and risk measurement. The steps were executed meticulously to ensure data integrity and the reproducibility of results by other researchers with access to the original data.

Data Analysis and Interpretation

Abbreviation for Word or Phrase used in Data Analysis:

AHR - Apollo Hospital Return

FHR - Fortis Healthcare Return

NHR – Narayana Hrudra Return

NHCIR - Nifty Healthcare Index Return

CP_AH - Closing Price of Apollo Hospital Stock

CP_FA - Closing Price of Fortis Health Care Stock

CP_NH - Closing Price of Narayana Hrudra Stock

Nifty_HC_Index- Nifty Healthcare Index Closing Price

MACD_AH - Moving Average Convergence Divergence of Apollo Hospital Stock

MACD_FH - Moving Average Convergence Divergence of Fortis Healthcare Stock

MACD_NH - Moving Average Convergence Divergence of Narayana Hrudra Stock

ROC_AH - Rate of Change of Apollo Hospital Stock

ROC_FH - Rate of Change of Fortis Healthcare Stock

ROC_NH - Rate of Change of Narayana Hrudra Stock

RSI_AH- Relative Strength Index of Apollo Hospital Stock

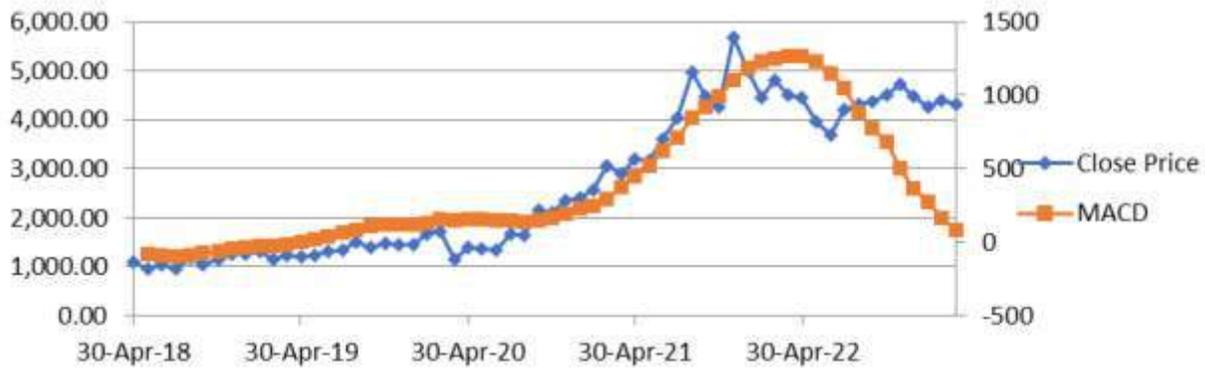
RSI_FH- Relative Strength Index of Fortis Healthcare Stock

RSI_NH- Relative Strength Index of Narayana

Hruda Stock

Problem 1: To identify the trend patterns and potential reversals in selected stock prices over the last five years, spanning from April 2018 to March 2023.

Figure 1: Moving Average Convergence Divergence of Apollo Hospital Stock



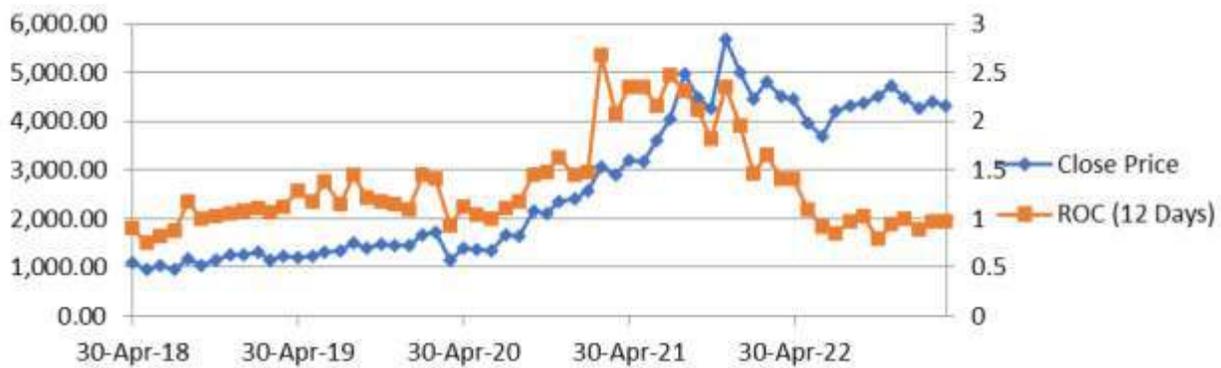
source: <https://www.nseindia.com> and authors compilation

Interpretation:

A tremendous upside was observed between the phases October 2020 to March 2022 where MACD

started moving upside above zero mark line. After March, 2023 the MACD started moving downside towards zero mark line which depicts a clear picture of bearish trend.

Figure 2: Rate of Change of Apollo Hospital Stock



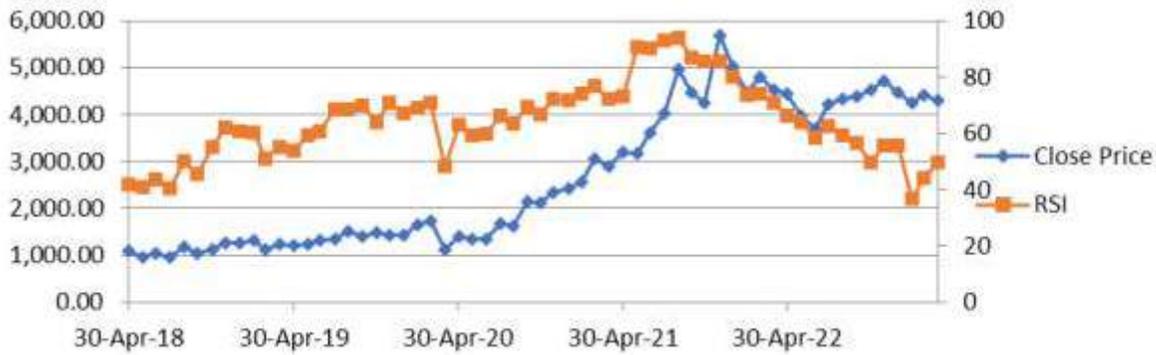
source: <https://www.nseindia.com> and authors compilation

Interpretation:

On several occasions it can be observed that ROC after touching its peak took a reversal on the chart making a high of 2.68 in February 2021. Stock

surged upside till November 2021. Irrespective of ROC making a clear signal of bearish market, stock price did not support the ROC movement. Stability was found in the stock price when ROC reached a mark line of 1.

Figure 3: Relative Strength Index of Apollo Hospital Stock



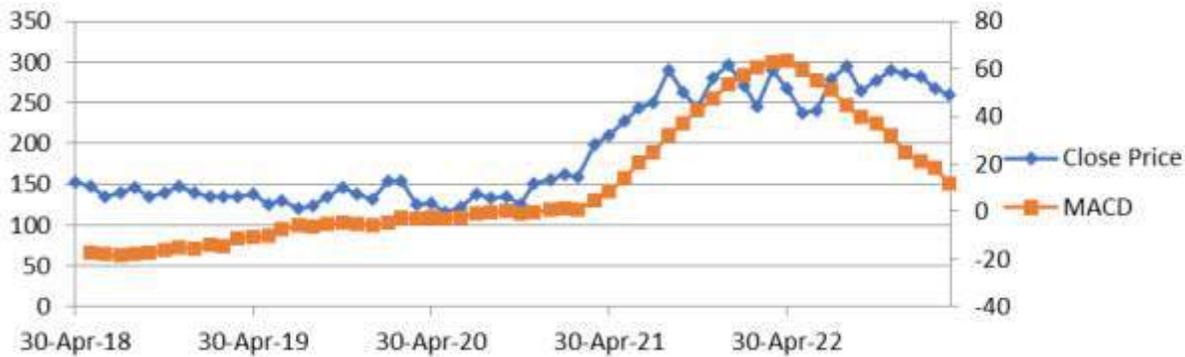
source: <https://www.nseindia.com> and authors compilation

Interpretation:

A constant growth has been observed in the RSI levels of Apollo hospital through the five-year

phase of the stock with having a trend reversal in the August 2021 where RSI touched a level of 94 and started correcting.

Figure 4: Moving Average Convergence Divergence of Fortis Healthcare Stock



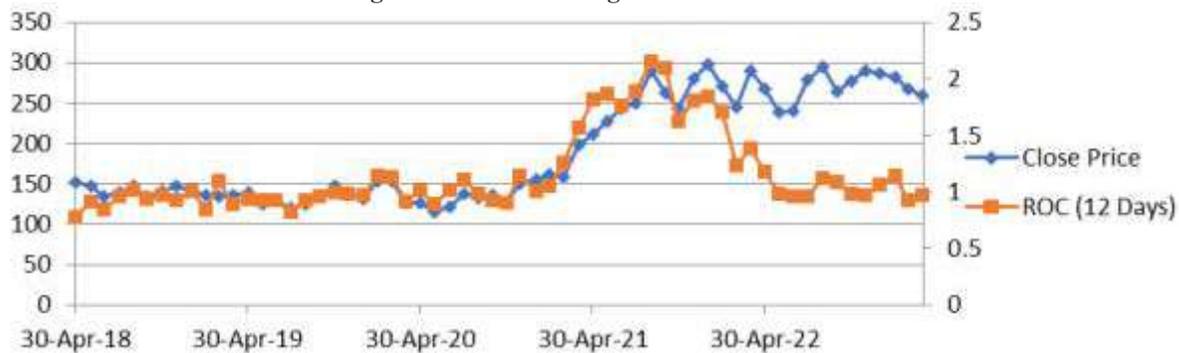
source: <https://www.nseindia.com> and authors compilation

Interpretation:

A tremendous upside was observed between the phases January 2021 to March 2022 where MACD started moving upside above zero mark line. After

March, 2023 the MACD started moving downside towards zero mark line which depicts a clear picture of bearish trend.

Figure 5: Rate of Change of Fortis Healthcare Stock



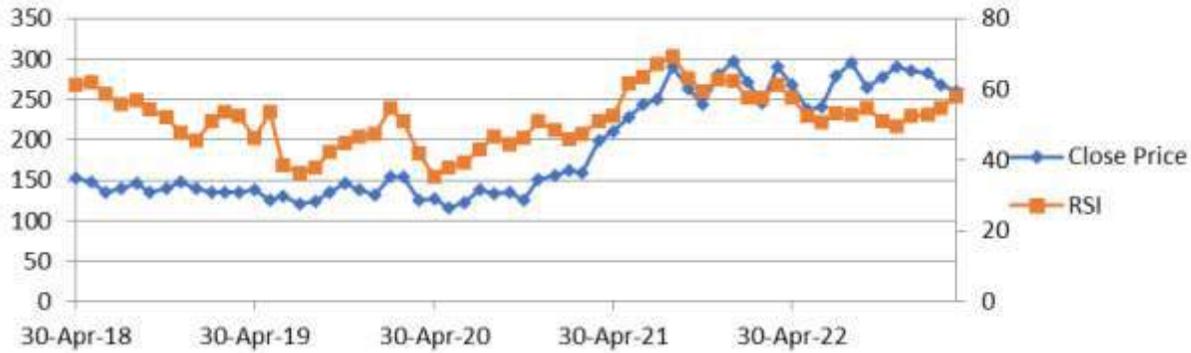
source: <https://www.nseindia.com> and authors compilation

Interpretation:

Initially the stock prices were moving in tandem with the ROC line. Around December 2020 it started an upside and it was clearly seen from the

ROC mark line. After touching 2.14 ROC level in August 2021 the ROC started declining giving a clear trend reversal signal, but the stock prices did not correct and remained in a range bound between 250-300 stating a clear support at 250 level.

Figure 6: Relative Strength Index of Fortis Healthcare Stock



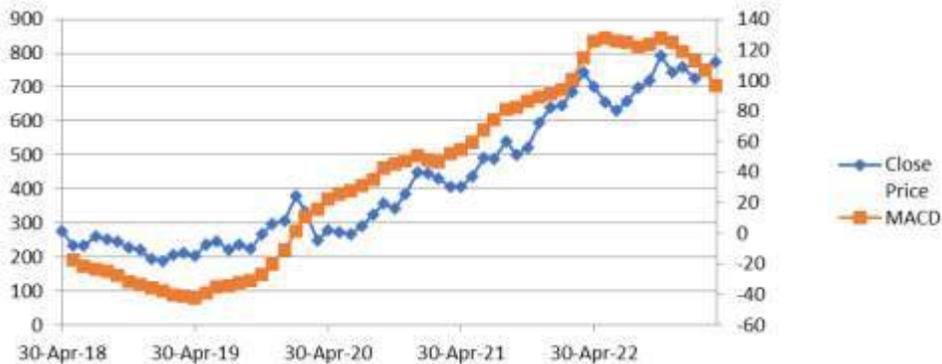
source: <https://www.nseindia.com> and authors compilation

Interpretation:

A constant growth has been observed in the Fortis shares through the five-year phase of the stock. The

RSI level levels remained range bound between crucial levels of 70 on upward side & 30 on lower-level side.

Figure 7: Moving Average Convergence Divergence of Narayana Hrudra Stock



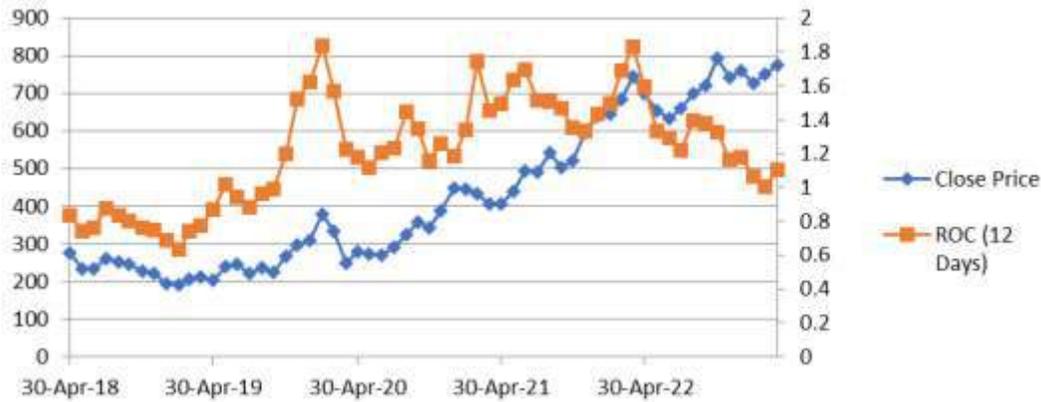
source: <https://www.nseindia.com> and authors compilation

Interpretation:

A consistent growth has been observed since

March 2020 and it seems the growth will continue in the near future.

Figure 8: Rate of Change of Narayana Hrudra Stock



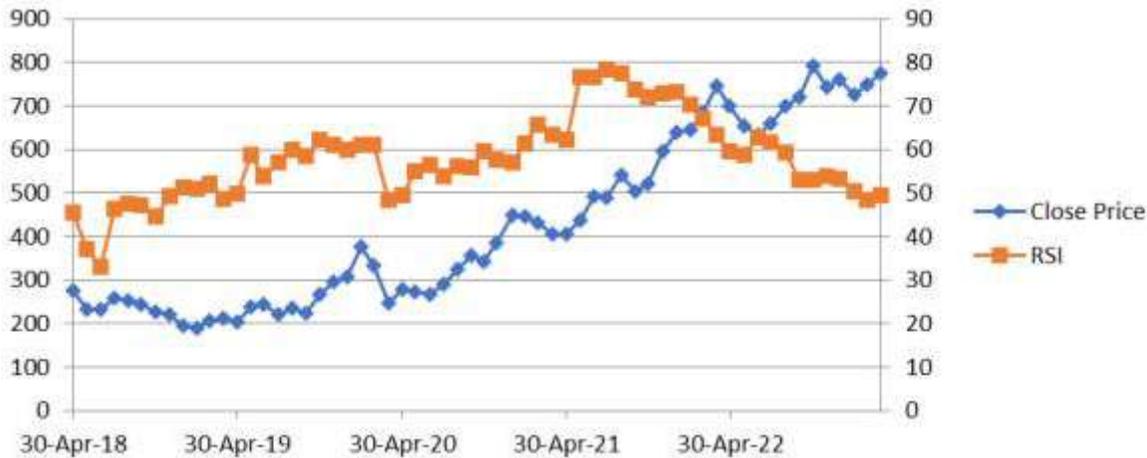
source: <https://www.nseindia.com> and authors compilation

Interpretation:

On several occasions it can be observed that ROC after touching its peak took a reversal on the chart

making a high of 1.83 in January 2021 but it did not have a considerable effect on the price of the share. Stock prices are consistently growing irrespective of ROC coming down towards mark line 1.

Figure 9: Relative Strength Index of Narayana Hrudra Stock



source: <https://www.nseindia.com> and authors compilation

Interpretation:

A constant growth has been observed in the RSI levels of Narayana Hrudra hospital through the five-year phase of the stock with having a trend reversal in the July 2021 where RSI touched a level of 78 and started correcting. But again, there were no

significant changes in the prices of the Narayana Hrudra stock.

Problem 2: To forecast the future share prices of Apollo Hospital, Fortis Healthcare and Narayana Hrudra stocks to make predictions for the upcoming year starting from April 2023 to March 2024.

Apollo Hospital Stock:

Table 1: Model Description

			Model Type
Model ID	CP_AH	Model_1	Winters' Additive

source: authors compilation

Model Summary

Table 2: Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile							
					5	10	25	50	75	90	95	
Stationary R-squared	.587	.	.587	.587	.587	.587	.587	.587	.587	.587	.587	.587
R-squared	.963	.	.963	.963	.963	.963	.963	.963	.963	.963	.963	.963
RMSE	288.945	.	288.945	288.945	288.945	288.945	288.945	288.945	288.945	288.945	288.945	288.945
MAPE	9.631	.	9.631	9.631	9.631	9.631	9.631	9.631	9.631	9.631	9.631	9.631
MaxAPE	34.457	.	34.457	34.457	34.457	34.457	34.457	34.457	34.457	34.457	34.457	34.457
MAE	214.375	.	214.375	214.375	214.375	214.375	214.375	214.375	214.375	214.375	214.375	214.375
MaxAE	972.360	.	972.360	972.360	972.360	972.360	972.360	972.360	972.360	972.360	972.360	972.360
Normalized BIC	11.537	.	11.537	11.537	11.537	11.537	11.537	11.537	11.537	11.537	11.537	11.537

source: authors compilation

Table 3: Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
CP_AH-Model_1	0	.587	22.357	15	.099	0

source: authors compilation

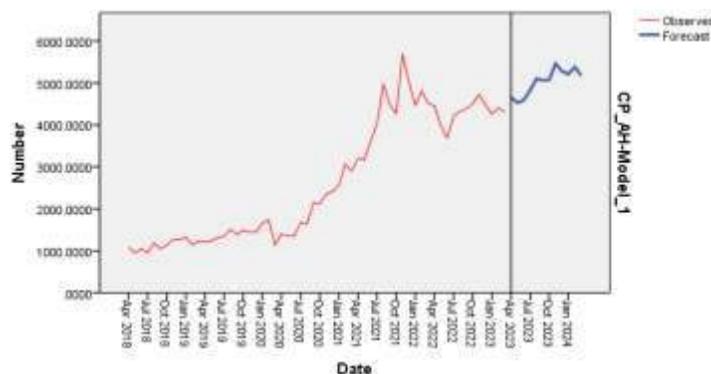
Table 4: Forecast

Model		Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024
CP_AH-Model_1	Forecast	4662.9888	4527.3810	4587.3294	4825.9152	5100.5236	5063.2305	5074.1573	5458.9143	5282.2432	5209.6220	5381.6827	5169.3395
	UCL	5241.5919	5260.0896	5447.3648	5797.0897	6171.7005	6226.1502	6322.3833	6787.2513	6686.3858	6685.9286	6927.0223	6780.9841
	LCL	4084.3857	3794.6723	3727.2939	3854.7408	4029.3468	3900.3108	3825.9313	4130.5773	3878.1006	3733.3154	3836.3430	3557.6950

For each model, forecasts start after the last non-missing in the range of the requested estimation period and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

source: authors compilation

Figure 10: Forecast Closing Price for Apollo Hospital Stock



source: authors compilation

Interpretation:

Applying Winters' Method with additive seasonality for forecasting the future prices of Apollo Hospital for the period of April 2023 to March 2024 has been shown in Table No. 4. The

stock will continue the growth trend in the future and will close around 5200 mark approximately in the March end 2024. As the variation is seen constant in the past year Winters' Additive model is considered for predicting of the future prices of the stock.

Fortis Healthcare Stock:

Table 5: Model Description

			Model Type
Model ID	CP_AH	Model_1	Simple Seasonal

source: authors compilation

Model Summary

Table 6: Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile							
					5	10	25	50	75	90	95	
Stationary R-squared	.460	.	.460	.460	.460	.460	.460	.460	.460	.460	.460	.460
R-squared	.937	.	.937	.937	.937	.937	.937	.937	.937	.937	.937	.937
RMSE	16.396	.	16.396	16.396	16.396	16.396	16.396	16.396	16.396	16.396	16.396	16.396
MAPE	7.091	.	7.091	7.091	7.091	7.091	7.091	7.091	7.091	7.091	7.091	7.091
MaxAPE	27.461	.	27.461	27.461	27.461	27.461	27.461	27.461	27.461	27.461	27.461	27.461
MAE	12.850	.	12.850	12.850	12.850	12.850	12.850	12.850	12.850	12.850	12.850	12.850
MaxAE	37.277	.	37.277	37.277	37.277	37.277	37.277	37.277	37.277	37.277	37.277	37.277
Normalized BIC	5.731	.	5.731	5.731	5.731	5.731	5.731	5.731	5.731	5.731	5.731	5.731

source: authors compilation

Table 7: Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
			Stationary R-squared	Statistics	DF	
CP_FA-Model_1	0	.460	27.020	16	.041	0

source: authors compilation

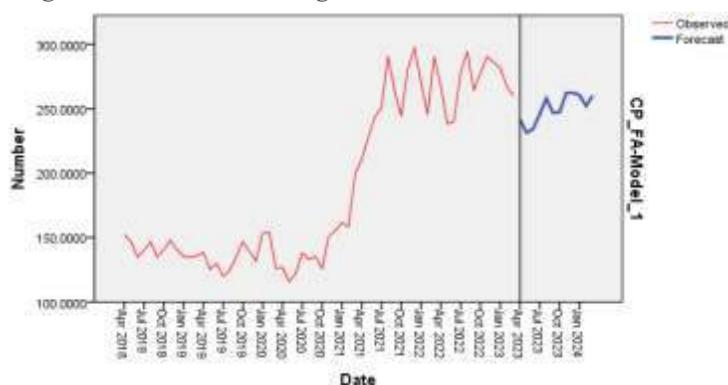
Table 8: Forecast

Model		Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024
CP_FA-Model_1	Forecast	241.5053	231.2149	234.3745	245.7881	257.8929	246.7249	247.2423	262.0614	262.4732	260.5430	252.0546	260.1966
	UCL	274.3246	276.5017	289.3716	309.0216	328.4072	323.8356	330.4279	350.9075	356.6402	359.7458	356.0497	368.7728
	LCL	208.6860	185.9281	179.3773	182.5547	187.3787	169.6143	164.0567	173.2154	168.3063	161.3402	148.0594	151.6205

For each model, forecasts start after the last non-missing in the range of the requested estimation period and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

source: authors compilation

Figure 11: Forecast Closing Price for Fortis Healthcare Stock



source: authors compilation

Interpretation:

Applying Simple Seasonal model for forecasting the future prices of Fortis Health Care for the period

of April 2023 to March 2024 has been shown in Table No. 8. The prices of the stock will remain in a range bound of 240 to 260 in the coming one year with slightest of variation in between.

Narayana Hrudra Stock:

Table 9: Model Description

			Model Type
Model ID	CP_NH	Model_1	ARIMA (0,1,0) (0,0,0)

source: authors compilation

Table 10: Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile							
					5	10	25	50	75	90	95	
Stationary R-squared	-4.441E-16	.	-4.441E-16									
R-squared	.970	.	.970	.970	.970	.970	.970	.970	.970	.970	.970	.970
RMSE	34.436	.	34.436	34.436	34.436	34.436	34.436	34.436	34.436	34.436	34.436	34.436
MAPE	7.254	.	7.254	7.254	7.254	7.254	7.254	7.254	7.254	7.254	7.254	7.254
MaxAPE	37.781	.	37.781	37.781	37.781	37.781	37.781	37.781	37.781	37.781	37.781	37.781
MAE	27.508	.	27.508	27.508	27.508	27.508	27.508	27.508	27.508	27.508	27.508	27.508
MaxAE	93.507	.	93.507	93.507	93.507	93.507	93.507	93.507	93.507	93.507	93.507	93.507
Normalized BIC	7.147	.	7.147	7.147	7.147	7.147	7.147	7.147	7.147	7.147	7.147	7.147

source: authors compilation

Table 11: Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
			Statistics	DF	Sig.	
CP_NH-Model_1	0	-4.441E-16	24.633	18	.135	0

source: authors compilation

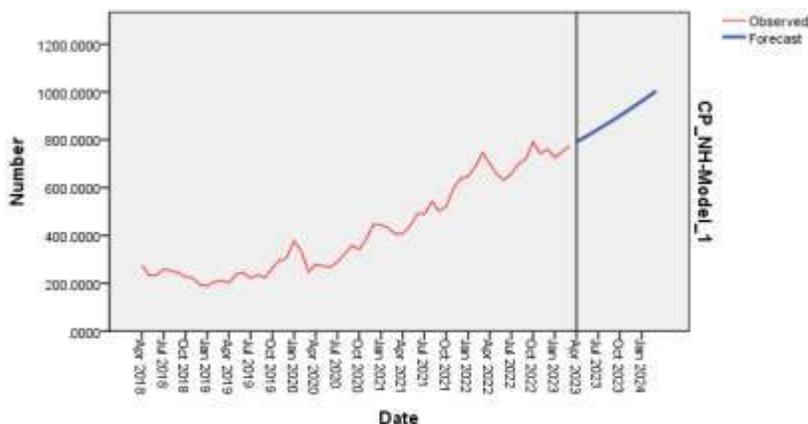
Table 12: Forecast

Model		Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024
CP_NH-Model_1	Forecast	791.1010	808.4231	826.1246	844.2136	862.6987	881.5885	900.8920	920.6182	940.7763	961.3757	982.4262	1003.9377
	UCL	945.0340	1037.0204	1118.1820	1194.8025	1269.2899	1342.8771	1416.3020	1490.0543	1564.4839	1639.8559	1716.3810	1794.2332
	LCL	656.7939	619.8914	595.4108	577.1111	562.6276	550.7721	540.8523	532.4254	525.1896	518.9289	513.4831	508.7299

For each model, forecasts start after the last non-missing in the range of the requested estimation period and end at the last period for which non-missing values of all the predictors are available or at the end date of the requested forecast period, whichever is earlier.

source: authors compilation

Figure 12: Forecast Closing Price for Narayana Hrudra Stock



source: authors compilation

Interpretation:

Applying ARIMA model for forecasting the future prices of Narayana Hrudra for the period of April 2023 to March 2024 has been shown in Table No. 12. The prices of the stock will remain in a range

bound of 980 to 1000 in the coming one year with slightest of variation in between.

Problem 3: To study the relationship between the technical indicators and Healthcare & Services Stocks.

Apollo Hospital Stock:
Table 13: Correlations

		MACD_AH	ROC_AH	RSI_AH	CP_AH
MACD_AH	Pearson Correlation	1	.364**	.487**	.850**
	Sig. (2-tailed)		.005	.000	.000
	N	59	59	59	59
ROC_AH	Pearson Correlation	.364**	1	.848**	.388**
	Sig. (2-tailed)	.005		.000	.002
	N	59	60	60	60
RSI_AH	Pearson Correlation	.487**	.848**	1	.397**
	Sig. (2-tailed)	.000	.000		.002
	N	59	60	60	60
CP_AH	Pearson Correlation	.850**	.388**	.397**	1
	Sig. (2-tailed)	.000	.002	.002	
	N	59	60	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

source: authors compilation

Interpretation:

High correlation has been observed between the price of Apollo Hospital stock and MACD

indicator with a value of .850. The correlation value is low when the security prices are correlated with ROC & RSI indicators with the value of .388 & .397 respectively.

Fortis Healthcare Stock:
Table 14: Correlations

		MACD_FH	ROC_FH	RSI_FH	CP_FH
MACD_FH	Pearson Correlation	1	.477**	.468**	.878**
	Sig. (2-tailed)		.000	.000	.000
	N	59	59	59	59
ROC_FH	Pearson Correlation	.477**	1	.618**	.566**
	Sig. (2-tailed)	.000		.000	.000
	N	59	60	60	60
RSI_FH	Pearson Correlation	.468**	.618**	1	.625**
	Sig. (2-tailed)	.000	.000		.000
	N	59	60	60	60
CP_FH	Pearson Correlation	.878**	.566**	.625**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	59	60	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

source: authors compilation

Interpretation:

High correlation has been observed between the price of Fortis Healthcare stock and MACD

indicator with a value of .878. The correlation value is moderate when the prices are correlated with ROC & RSI indicators with the value of .566 & .625 respectively.

Narayana Hrudra Stock:

Table 15: Correlations

		MACD_NH	ROC_NH	RSI_NH	CP_NH
MACD_NH	Pearson Correlation	1	.582**	.425**	.949**
	Sig. (2-tailed)		.000	.001	.000
	N	59	59	59	59
ROC_NH	Pearson Correlation	.582**	1	.735**	.519**
	Sig. (2-tailed)	.000		.000	.000
	N	59	60	60	60
RSI_NH	Pearson Correlation	.425**	.735**	1	.361**
	Sig. (2-tailed)	.001	.000		.005
	N	59	60	60	60
CP_NH	Pearson Correlation	.949**	.519**	.361**	1
	Sig. (2-tailed)	.000	.000	.005	
	N	59	60	60	60

** . Correlation is significant at the 0.01 level (2-tailed).

source: authors compilation

Interpretation:

High correlation has been observed between the price of Narayana Hrudra stock and MACD indicator with a value of .949. The correlation value is moderate when the prices are correlated with

ROC at .519 & low when prices are correlated with RSI at .361.

Problem 4: To study the relationship between the Healthcare and Services Stocks with the Nifty Healthcare Index.

Table 16: Correlations

		CP_AH	CP_FA	CP_NH	Nifty_HC_Index
CP_AH	Pearson Correlation	1	.960**	.935**	.924**
	Sig. (2-tailed)		.000	.000	.000
	N	60	60	60	60
CP_FA	Pearson Correlation	.960**	1	.929**	.880**
	Sig. (2-tailed)	.000		.000	.000
	N	60	60	60	60
CP_NH	Pearson Correlation	.935**	.929**	1	.835**
	Sig. (2-tailed)	.000	.000		.000
	N	60	60	60	60
Nifty_HC_Index	Pearson Correlation	.924**	.880**	.835**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	60	60	60	60

** . Correlation is significant at the 0.01 level (2-tailed).
 source: authors compilation

Interpretation:

High and strong degree of positive correlation has been observed between the price of Apollo Hospital, Fortis Health and Narayana Hrudra stock prices with the Nifty Health care index having a value of .924, .880 and .835 respectively.

Problem 5: To estimate the selected Health Care and Services Stocks return against the Nifty Healthcare Index return to measure its diversifiable and undiversifiable risks.

Characteristic Regression Line (CRL) is a simple linear regression model estimated for a particular stock against the market index return to measure its diversifiable and non-diversifiable risks (Handa et al., 2015).

The CRL is a simple linear regression model estimated for a particular stock against the market index return to measure its diversifiable and undiversifiable risks.

The model is:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

R_i = Return of the *i*th stock

α_i = Intercept

β_i = Slope of the *i*th stock

R_m = Return of the market index

e_i = Standard Error

The security return is

$$\text{Today's security return} = \frac{(\text{Today's Price} - \text{Yesterday's Price}) * 100}{\text{Yesterday's Price}}$$

$$\text{Today's market return} = \frac{(\text{Today's Index} - \text{Yesterday's Index}) * 100}{\text{Yesterday's Index}}$$

β_i : Beta (β_i) is the slope of the characteristic regression line. It describes the relationship between the stock's return and the index returns.

Correlation: The correlation co-efficient measures the nature and the extent of relationship between the stock market index return and the stock return in the particular period.

Apollo Hospital Stock:

Table 17: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.599a	.359	.348	9.74506
a. Predictors: (Constant), NHCIR				

source: authors compilation

Interpretation:

From the above table it is clear that 35.9% of variations in Apollo Hospital stock's return are

explained by the variation in the Nifty Healthcare Index return and 64.1% variation relates with other factors.

Table 18: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.095	1.280		1.637	.107
	NHCIR	1.201	.213	.599	5.650	.000
a. Dependent Variable: AHR						

source: authors compilation

Interpretation:

Beta value of 1.201 indicates that 1% change in Nifty Healthcare Index return will cause 1.201% change in Apollo Hospital Stock return. This represents that Apollo Hospital Stock return is

more volatile as compared to the Nifty Healthcare Index. When there is a decline of 10% in the market return, the stock with beta of 1.201 would give a negative return of 12%. The stock with more than one beta value are considered to be risky in falling market.

Fortis Healthcare Stock:

Table 19: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.410a	.168	.154	8.161
a. Predictors: (Constant), NHCIR				

source: authors compilation

Interpretation:

From the above table it is clear that 16.8% of variations in Fortis Healthcare stock's return are

explained by the variation in the Nifty Healthcare index return and remaining 83.2% relates with other factors.

Table 20: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.797	1.072		.744	.460
	NHCIR	.605	.178	.410	3.395	.001

a. Dependent Variable: FHR

source: authors compilation

Interpretation:

Beta value of 0.605 indicates that 1% change in Nifty Healthcare Index return will cause 0.605% change in Fortis Healthcare Stock return. This represents that Fortis Healthcare stock return is less

volatile as compared to the Nifty Healthcare Index return. When there is a decline of 10% in the market return, the stock with beta of 0.605 would give a negative return of 6.05% approximately. The stock with less than one beta value are considered to be less volatile stocks.

Narayana Hrudra Stock:

Table 21: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.453a	.205	.191	8.16411

a. Predictors: (Constant), NHCIR

source: authors compilation

Interpretation:

From the above table it is clear that 20.5% of variations in Narayana Hrudra stock's return are

explained by the variation in the Nifty Healthcare index return and remaining 79.5% relates with other factors.

Table 22: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.626	1.072		1.516	.135
	NHCIR	.683	.178	.453	3.834	.000

a. Dependent Variable: NHR

source: authors compilation

Interpretation:

Beta value of 0.683 indicates that 1% change in Nifty Healthcare Index return will cause 0.683% change in Narayana Hrudra Stock return. This represents that Narayana Hrudra stock return is less volatile as compared to the Nifty Healthcare Index return. When there is a decline of 10% in the market

return, the stock with beta of 0.683 would give a negative return of 6.83% approximately. The stock with less than one beta value are considered to be less volatile stocks.

Conclusion

In a comprehensive analysis spanning five years

from April 2018 to March 2023, we have gleaned valuable insights into the dynamics of Apollo Hospital, Fortis Healthcare and Narayana Hrudra stocks. These findings have significant implications for investors, stakeholders and those seeking a deeper understanding of the healthcare and services sector. Trend Analysis unveiled fluctuating patterns and potential reversals in stock prices, with technical indicators like MACD, ROC and RSI acting as crucial navigational tools. All stocks exhibited periods of growth and retracement, with bearish signals emerging in the post-March 2023 period. Share Price Forecasting provided a glimpse into the future, with Apollo Hospital's Winter's Additive model projecting continued growth, Fortis Healthcare's Simple Seasonal model predicting a range-bound scenario and Narayana Hrudra's ARIMA model projecting a steep growth in the stock price. These forecasts empower investors to anticipate potential price movements. Technical Indicator Correlations highlighted the influence of MACD, ROC and RSI on stock prices, with MACD showing particularly strong correlations over all three stocks. These insights enable a more informed approach to technical analysis. The Relationship with the Nifty Healthcare Index underscored the sector's significance, with Apollo Hospital, Fortis Healthcare and Narayana Hrudra stocks exhibiting strong positive correlations. This demonstrates the sector's way over these stocks and the need for monitoring broader healthcare trends. Risk Assessment revealed diversifiable and non-diversifiable risks. While Apollo Hospital exhibited higher volatility and risk in line with its beta value of 1.201, Fortis Healthcare & Narayana Hrudra lower beta value of 0.605 & 0.683 respectively indicated relative stability and lower risk in market downturns. In summation, this study equips stakeholders with multifaceted insights, from trend analysis to forecasting, technical correlations, sectoral relationships and risk profiles. It serves as a valuable compass for investment decisions, risk mitigation and portfolio optimization within the ever-evolving landscape of

healthcare and services investments.

Limitations of the Study

- While technical indicators are valuable tools, they are not infallible predictors of stock price movements. Market sentiment, investor behavior and external factors can override their signals.
- While strong correlations were observed between the selected stocks and the Nifty Healthcare Index, it's essential to recognize that correlation does not imply causation. Other external factors may influence stock and index movements.
- The study's analysis covers a relatively short five-year period. Longer-term trends and patterns that could affect stock prices may not be fully captured within this timeframe.
- The study primarily concentrates on the healthcare and services sector.
- Financial markets, including the stock market, can be highly volatile and subject to sudden and unexpected movements. The study's predictions and risk assessments may not fully account for extreme market events.

It's important to recognize these limitations when interpreting the study's findings and applying them to real-world investment decisions. Financial markets are inherently uncertain and while analysis and forecasting can provide valuable insights, they should be used in conjunction with a comprehensive understanding of market dynamics and risk management.

Implications for Future Research

- Future research can explore more advanced forecasting models, including machine learning

and artificial intelligence techniques, to enhance the accuracy of stock price predictions.

- Extending the analysis to cover longer time horizons can provide a more comprehensive view of stock price trends and behaviors, allowing for better-informed long-term investment strategies.
- Future research can delve deeper into risk management strategies, including portfolio diversification, hedging techniques and options strategies, to mitigate potential losses in volatile market conditions.

References

- Agrawal, M., Khan, A. U., & Shukla, P. K. (2019). Stock price prediction using technical indicators: A predictive model using optimal deep learning. *International Journal of Recent Technology and Engineering*, 8(2), 2297–2305. <https://doi.org/10.35940/ijrteB3048.078219>
- Chong, T. T.-L., Leung, K. W., Ho, A., & Yuen, Y. (2011). Is the Rate-of-Change Oscillator Profitable?. *The Journal of Investing*, 20(3), 72-74.
- Fang, J., Qin, Y., & Jacobsen, B. (2014). Technical market indicators: An overview. *Journal of Behavioral and Experimental Finance*, 4, 25 – 56. <https://doi.org/10.1016/j.jbef.2014.09.001>
- Handa, D., Diwakar, G., & Gupta, R. (2015). Characteristic Regression Line of Components of S&P CNX Nifty and S&P BSE. *International Business Journals*, 3(3). <https://ssrn.com/abstract=2703550>
<http://www.internationalbusinessjournals.com>
- Hoffmann, A. O. I., & Shefrin, H. (2014). Technical analysis and individual investors. *Journal of Economic Behavior and Organization*, 107(Part B), 487–511. <https://doi.org/10.1016/j.jebo.2014.04.002>
- Nollet, J., & Beaulieu, M. (2003). The development of group purchasing: An empirical study in the healthcare sector. *Journal of Purchasing and Supply Management*, 9(1), 3–10. [https://doi.org/10.1016/S0969-7012\(02\)00034-5](https://doi.org/10.1016/S0969-7012(02)00034-5)
- Nor, S.M., & Wickremasinghe, G. (2014). The profitability of MACD and RSI trading rules in the Australian stock market. *In Investment Management and Financial Innovations*, 11(4), 194-199.
- NSE - National Stock Exchange of India Ltd: nseindia.com. Retrieved from https://www.nseindia.com/report-detail/eq_security
- Rout, A. K., & Muppidi, S. (2019). Adoptive Trend Following Strategy in Financial Time Series with Multi-Objective Function. *International Journal of Scientific & Technology Research*, 8. www.ijstr.org
- Shiva, A., Narula, S., & Shahi, S. K. (2020). What drives retail investors' investment decisions? Evidence from no mobile phone phobia (Nomophobia) and investor fear of missing out (I-FoMo). *Journal of Content, Community and Communication*, 10(6), 2 – 20. <https://doi.org/10.31620/JCCC.06.20/02>