Czech University of Life Sciences Prague

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Master's Thesis

Technical Analysis of Reliance Industries Limited (RIL) Stock

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DIPLOMA THESIS ASSIGNMENT

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Thesis title

Technical analysis "Reliance" stock

Objectives of thesis

The objective of this thesis is to make informed investment decisions in Reliance Industries Limited shares based on the premise that historical market data provides insights into the behavior of buyers and sellers in the securities market. The study of market movements can help investors and traders to strategically position themselves in the market to make profits. It will give a thorough idea of when to enter and exit the market and not let emotions influence the trading decisions. The purpose of this technical analysis is to employ technical analysis tools like chart patterns and statistical indicators to find out the price direction of the Reliance Industries Limited shares in the future and develop trading strategies which are profitable for short, medium or long term.

Methodology

The thesis' methodology is based on following market momentum Indicators:

The strength or weakness of a stock's price is determined by measuring the rate of rise or fall of stock prices, depicted as numbers known as momentum indicators. They specifically pinpoint a time period in which the change in market price of a stock is taking place. They are more effective when the market is bullish. These indicators help the traders spot whether a market trend will continue or reverse. Momentum indicators fall into three different categories based on the comparison of the closing price of a stock with various data points. The closing price of a stock is compared to the previous close in the Relative Strength Index (RSI) and the Rate of Change (ROC) (Istigechev, 2022). They help to understand if the market is overbought or oversold at the closing price and if it is bound to change direction. The current price when compared to how the market behaved over a certain time, when it established a range of low to high price or vice versa is indicated in the Stochastic Momentum Index (SMI) and Commodity Channel Index (CCI) (Istigechev, 2022). These indicators show whether the market is stronger or weaker. The current price of a stock is compared to averages over a previous period, allowing traders to observe of the price moves faster or slower relative to its average behaviour in the past (Istigechev, 2022). The example of this type of indicator is the Moving Average Convergence Divergence (MACD).

Trading should always apply the rule of using multiple indicators. Profitable trades occur, when the many indicators like candlesticks, moving averages, MACD and RSI align to communicate the same message, which a stock is about to rise or fall in the future. This thesis provides an understanding of the candlestick

chart patterns, moving averages, MACD and RSI. The trading strategy using MACD and RSI is tested using the price data from the last five years and a detailed analysis is conducted to conclude which trading strategy is profitable.

The proposed extent of the thesis

60-80

Keywords

Stock, Technical Analysis, Momentum Indicator, Trading Strategy, MACD, RSI, Reliance Industries Limited

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Recommended information sources

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Declaration

I declare that I have worked on my master's thesis titled "Technical Analysis of Reliance Industries Limited Stock" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 31.03.2024 _____

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Technical Analysis of Reliance Industries Limited Stock

Abstract

Technical analysis makes an effort to forecast future price changes, giving traders the knowledge, they need to turn a profit. The two most popular types of technical analysis are statistical indicators and chart patterns. Important predictors of a stock's future price swings include prior trading activity and price fluctuations. The purpose of this master's thesis is to evaluate the profitability of the trading strategies of Reliance Industries Limited stock using technical analysis. Trading should always apply the rule of using multiple indicators. Profitable trades occur, when the many indicators like candlesticks, moving averages, MACD and RSI align to communicate the same message, which a stock is about to rise or fall in the future. The trading strategy using MACD and RSI is tested using the price data from the last five years from 01/01/2019 to 31/12/2023 and a detailed analysis is conducted to conclude which trading strategy is profitable for a trader. On a capital of INR 10,000 the MACD strategy generated a loss of INR 13741.77431, while the RSI strategy generated a profit of INR 3811.14142 from the trading signals generated from both the strategies over the five-year period. The MACD strategy generated a profit factor of 0.2310 while the RSI generated profit factor was 2.5786, which is well above the 2.5 benchmark of the industry.

Keywords: Stock, Technical Analysis, Momentum Indicator, Profitable Trading Strategy, MACD, RSI, Reliance Industries Limited, Candlestick Charts, Trend Indicators, Stock Market

Technická analýza společnosti Reliance Industries Limited Stock

Abstraktní

Technická analýza se pokouší předpovídat budoucí pohyby cen a poskytuje obchodníkům informace potřebné k dosažení zisku. Vzory grafů a statistické ukazatele jsou dvě nejběžnější formy technické analýzy. Minulá obchodní aktivita aeifjcbjiucdnvjrrcefjrdelebbgkkbdchkflbilcliv

změny v ceně cenného papíru, jsou cennými indikátory budoucích cenových pohybů akcií. Cílem této diplomové práce je zhodnotit ziskovost obchodních strategií akcií Reliance Industries Limited pomocí technické analýzy. Obchodování by mělo vždy uplatňovat pravidlo používání více indikátorů. K ziskovým obchodům dochází, když se mnoho ukazatelů, jako jsou svíčkové grafy, klouzavé průměry, MACD a RSI, sladí tak, aby sdělovaly stejnou zprávu, které akcie v budoucnu vzrostou nebo klesnou. Obchodní strategie využívající MACD a RSI je testována pomocí cenových dat za posledních pět let od 01.01.2019 do 31.12.2023 a je provedena podrobná analýza k závěru, která obchodní strategie je pro obchodníka zisková. Při kapitálu 10 000 INR vygenerovala strategie MACD ztrátu 13741,77431 INR, zatímco strategie RSI vytvořila zisk 3811,14142 INR z obchodních signálů generovaných z obou strategií během pětiletého období. Strategie MACD vygenerovala ziskový faktor 0,2310, zatímco ziskový faktor RSI byl 2,5786, což je výrazně nad referenční hodnotou 2,5 v tomto odvětví.

Klíčová slova: Akcie, Technická analýza, Indikátor hybnosti, Zisková obchodní strategie, MACD, RSI, Reliance Industries Limited, Svíčkové grafy, Trendové indikátory, Burza cenných papírů

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1. Introduction

Money needs to flow where it is needed the most. Financial markets came into existence to help in the interaction between those who need money with those who have money to invest. Retail and institutional investors are those who have abundant funds whereas businesses and government are those who seek funds. The need for lending and borrowing money for individuals, companies as well as governments is fulfilled by the financial markets. Within any given economy, the credit, money, capital, foreign exchange, and debt markets are the primary financial markets. Trading of financial securities such as bonds, debentures, shares, and other similar instruments is permitted on capital markets. The primary and the secondary markets are the two components of the capital market. Corporate companies raise capital by using the long-term financial instruments that are created by the primary markets. The aftermarkets where previously issued financial instruments are bought and sold are known as secondary markets. Stocks and bonds make up the majority of the financial instruments traded in the secondary market.

The investors trade securities on this the secondary market, also known as the stock market. without the involvement of issuing corporations. The values of the equities in this market are set by market forces, which also give investors access to liquidity. Examples of the secondary market are the famous New York Stock Exchange, NASDAQ, Euronext, Shanghai Stock Exchange, the National Stock Exchange and the Bombay Stock Exchange. This market is a great platform for investors to make good returns and a great way to build wealth. The stock market has the potential to help investors make a lot of money, but it needs thorough stock investment analysis. Technical and fundamental analysis are readily accessible investors based on the duration they wish to stay in the market. Technical analysis is utilized for short- and medium-term holdings, while fundamental analysis is used to select stocks for the long term. Technical analysis is a trading discipline that examines historical price and volume data from the market to analyze and predict price direction. It makes a concerted effort to forecast future price changes, giving traders the knowledge they require to earn a profit. The two most popular types of technical analysis are statistical indicators and chart patterns. The past trading activity as well as changes in the price of a security are valuable indicators of a stock's future price movements.

This diploma thesis focusses on technical analysis of Reliance Industries Limited share, which is an Indian multinational conglomerate spanning industry verticals like petrochemicals, energy, natural gas, telecommunications, mass media, retail as well as textiles. It is listed on

the popular Bombay Stock Exchange (BSE), National Stock Exchange (NSE) in India, Luxembourg Stock Exchange, and London Stock Exchange. The Reliance Industries Limited shares are a part of major stock indices like the Sensex, Nifty and S & P CNX 500.

2. Objectives and Methodology

This section describes the objectives and the methodology of this thesis in detail. The objective is the broader purpose of conducting this thesis, while the methodology is the overall rationale and the study of the theories and principles behind the methods used for the research approach.

2.1 Objectives

The objective of this thesis is to make informed investment decisions in Reliance Industries Limited shares based on the premise that historical market data provides insights into the behavior of buyers and sellers in the securities market. The study of market movements can help investors and traders to strategically position themselves in the market to make profits. It will give a thorough idea of when to enter and exit the market and not let emotions influence the trading decisions. The purpose of this technical analysis thesis is to employ technical analysis tools like chart patterns and statistical indicators to find out the price direction of the Reliance Industries Limited shares in the future and develop trading strategies which are profitable for short, medium, or long term.

2.2 Methodology

The stock market functions on some assumptions, which are the basis for the utilization of the technical analysis to use the tools for the valuation of the scrips. These assumptions are (Konchar, 2023):

1. The stock price reflects all the information in the market
2. Prices of stocks move in trends.
3. As history tends to repeat itself, past prices are predictors of future prices.

Technical analysis helps to read the mind of the seasoned players in the market by observing their behavior in the marketplace through price, volume, and other market data. The purpose of technical analysis is to predict the price of a security. This price is the one precise figure, which synthesizes, weighs, and expresses all rational, irrational, quantifiable and non-quantifiable factors into it and allows the investors to make trading decisions for profit (Prasad, 2022). Since the price of a security reflects all the required information in it, assigning a true market value to the security is a top priority. Technical analysis helps to trace this price from time to time to make future price estimations (Vaidya, 2021). The tools used in this thesis to forecast this price for Reliance Industries Limited shares are as follows:

1. Charts: Subjective form of technical analysis

      Graphical representation of the price and volume movements of a stock in a given frame of time, where the X-axis presents the period, and the Y-axis represents the price or the volume movements are known as charts. The most common charts, which are used to conduct the technical analysis of the shares, are the line charts, bar charts and the candlestick charts. Reliance Industries Limited shares are evaluated for trading strategies using candlestick charts.

2. Technical Indicators: Statistical form of technical analysis

      Market movement forecasted by quantitative tools comprising of formulas and ratios to determine entry and exit points in the market for the stock are known as technical indicators. Technical indicators are broadly divided into four categories, which are trend indicators, momentum indicators, volatility indicators and volume indicators. Trend indicators analyze a stock's momentum in a particular direction through some time-tested strategies (Frattini et al., 2022). The speed at which the price of a stock changes is understood with the help of momentum indicators (Frattini et al., 2022). Volatility indicators measure how far a stock moves from its mean price, either higher or lower (Frattini et al., 2022). Volume indicators measure how much stock has been traded in each period of time (Frattini et al., 2022). Reliance Industries Limited shares are evaluated for trading strategies using momentum indicators.

Trading strategy for the short and medium term is developed using a combination of various charts and technical indicators by studying the movement for Reliance Industries Limited shares for the period between 01/01/2019 and 31/12/2023. In order to help traders and investors make educated decisions and determine which trading method is most successful, the signals produced by different charts and indicators are evaluated, and an analysis is presented.

2.2.1 Candlestick Charts

    Candlestick charts provide a visual depiction of the magnitude of the movements in the price of a security over a given time span (Salvucci, 2023). Four significant stock data points are displayed by the candlestick on the chart., such as the open price, the close price, the highest price, and the lowest price for a single period, which can be a minute, hour, day, or month. One candlestick appears on the chart for each unit of time (minute, hour, day, or month). These charts provide an insight into the buying and selling trends over a unit of time by depicting the

high and low as well as the open and close prices of a security. The figure below explains how a candlestick looks like.

Figure 1:Understanding a Candlestick
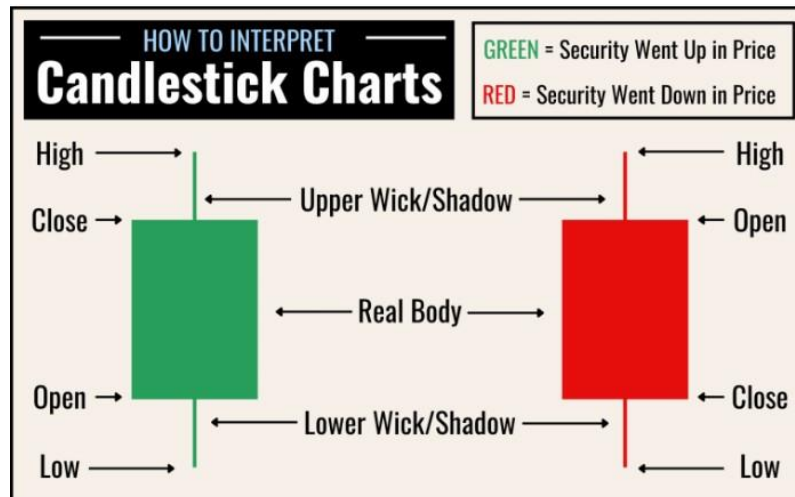
Source: Salvucci, 2023

The popularity of candlesticks has risen over time and there are more than 40 different candlestick patterns, which depict bullish or bearish trends. The charts provide traders with a quick snapshot of the state of the market. Charts, which show trends in a security's price movement over time, are strongly encouraged by most trading platforms (Salvucci, 2023).

2.2.2 Trend Indicators

The direction of the market's movement at any given moment is indicated by trend indicators or oscillators, which are mathematical computations plotted as lines on a price chart (Mitchell et al., 2023). Traders employ two approaches to trading, which are trend trading and counter trend trading. Trend trading is the practice of trading in the trend's direction. Conversely, trading against the market's present direction is referred to as a counter trend. When the price of a security rises, the trend is upwards called the bullish trend. On the other hand, when the price of a security falls, the trend is downwards known as a bearish trend. A sideways trend occurs when a security's price remains constant (Lopez, 2023). There are many types of trend indicators used in the stock market analysis, the most common of which are moving averages like the simple moving average and the exponential moving average. The equations for the computation of both averages are mentioned below:

The formula for calculating SMA $= \dfrac{(A1 + A2 + \text{...............} An)}{n}$

Where A is the average price in period n and n is the number of periods.

Equation 1: Computation of Simple Moving Average Source: Maverick et al., 2022

The formula for computing the exponential moving average is mentioned below:

    (a) Compute the SMA

$$SMA = \dfrac{(A1 + A2 + \text{.............} An)}{n}$$

      Where A is the average price in period n and n is the number of periods.

    (b) Calculate the multiplier for weighing the EMA.

$$= \dfrac{2}{(\text{selected time period} + 1)}$$

    (c) Calculate the current EMA.

$$EMA = Price(t) \times k + EMA(y) \times (1 - k)$$

Where t = today, y = yesterday, N= number of days in EMA, k = 2 ÷ (N+1)

Equation 2: Computation of Exponential Moving Average Source: Maverick et al., 2022

The literature section of this thesis will describe the calculation of the simple moving average and the exponential moving average.

2.2.3 Momentum Indicators

The closing price of a stock over a specific period of time determines a security's strength or weakness, providing a trustworthy indicator of price and momentum fluctuations. (Anand, 2016). A smart trader will always measure the strength of the security market trend before making any entry in the stock.

The strength or weakness of a stock's price is determined by measuring the rate of rise or fall of stock prices, depicted as numbers known as momentum indicators. They specifically pinpoint a period in which the change in market price of a stock is taking place. They are more effective when the market is bullish. These indicators help the traders spot whether a market trend will continue or reverse. Momentum indicators fall into three different categories based on the comparison of the closing price of a stock with various data points. When a stock's price is compared to averages from a prior time frame, traders can see if the price is moving more quickly or more slowly than it has traditionally on average (Istigechev, 2022). The example of

this type of indicator is the Moving Average Convergence Divergence (MACD). The formula to calculate the MACD is as follows (Istigechev, 2022):

    (a) MACD Line = 12-period EMA - 26-period EMA

    (b) Signal Line = 9-period EMA of MACD Line

Equation 3: Computation of MACD Source: Istigechev, 2022

The widely suggested entry signal in the case of the MACD is when the MACD line crosses over the signal line in the trend direction. It is a buy signal when the MACD crosses above the MACD signal line and a sell indication when the MACD crosses below the MACD signal line. Long positions can be entered when the MACD histogram changes from negative to positive (Venketas, 2020). On the other hand, short positions can be entered when the MACD histogram changes from positive to negative.

The closing price of a stock is compared to the previous close in the Relative Strength Index (RSI) and the Rate of Change (ROC) (Istigechev, 2022). They help to understand if the market is overbought or oversold at the closing price and if it is bound to change direction.

(a) RS Calculation

$$= \frac{\text{Average Gain}}{\text{Average Loss}}$$

(b) RSI

$$= 100 - \frac{100}{1 + \text{RS}}$$

(c) Initial Average Gain

$$= \frac{Sum\ of\ Gains\ over\ the\ past\ 14\ days}{14}$$

(d) Initial Average Loss

$$= \frac{Sum\ of\ \text{Losses}\ over\ the\ past\ 14\ days}{14}$$

(e) Average Gain

$$= \frac{[(Previous\ Avg.\ Gain * 13)\ +\ Current\ Day's\ Gain]}{14}$$

(f) Average Loss

$$= \frac{[(Previous\ Avg.\ Loss * 13)\ +\ Current\ Day's\ Loss]}{14}$$

Equation 4: Computation of RSI Source: Istigechev, 2022

The momentum oscillator RSI measures the speed and the change of price movement, which moves between 0 and 100. Originally, when the RSI is above 70, it is an overbought market and when the RSI is below 30, it is an oversold market (Groette, 2019). In an uptrend market situation, the RSI remains between the range of 40 to 90, which has a support at 40-50 levels. On the other hand, during a downtrend, the RSI hovers between 10 to 60, where 50-60 zone is the resistance level (Groette, 2019). The rules for opening positions based on RSI signals are as under (Istigechev, 2022) :

A short position or sell signal is activated if the indicator's line crosses the level 70 from above.

A long or buy signal is activated if the indicator's line crosses the level 30 from below.

The current price when compared to how the market behaved over a certain time, when it established a range of low to high price or vice versa is indicated in the Stochastic Momentum Index (SMI) and Commodity Channel Index (CCI) (Istigechev, 2022). These indicators show whether the market is stronger or weaker.

Trading should always follow the multiple indicator rule. When many indicators, including candlesticks, moving averages, MACD, and RSI, line up to convey the same message—that a stock is likely to grow or fall in the near future—profitable trades can be made (Istigechev, 2022). This thesis provides an understanding of the candlestick chart patterns, moving averages, MACD and RSI. The trading strategy using MACD and RSI is tested using the price data from the last five years and a detailed analysis is conducted to conclude which trading strategy is profitable.

2.2.4 Profit or Loss from the Strategy

The main purpose of the thesis is to identify strategies by back-testing data and prove which of the strategies is beneficial to apply for swing trading the shares of Reliance Industries Limited. For the purposes of calculation of profit or loss from a strategy, the following assumptions have been made.

Trading Amount INR 10,000

Trading Units 9, taking into consideration the units bought on 01.01.2019 at the opening price of INR 1011.938

- Entry: Sell and Buy at Close Price
- Exit: Buy and Sell at Open Price
- Winning Trade: There is a profit from the trade.
- Losing Trade: There is a loss from the trade.

The calculation for the various parameters was conducted using the equations below:

- Percentage of Profitable Trades

$$= 100 * \frac{\text{Winning Trades}}{\text{Closed Trades}}$$

- Profit Factor: The amount of money the strategy made for every unit of money it lost.

$$= \frac{\text{Gross Profit}}{\text{Gross Loss}}$$

- Maximum Drawdown: The measure of a stock's downside risk over a specific period.

$$= 100 * \frac{(\text{Greatest Loss} - \text{Greatest Profit})}{\text{Greatest Profit}}$$

- Average Profit

$$= \frac{\text{Total Profit}}{\text{Number of Winning Trades}}$$

- Average Loss

$$= \frac{\text{Total Loss}}{\text{Number of Losing Trades}}$$

- Average Profitability Per Trade (APPT) or Statistical Expectancy

$$= \frac{\text{Net Profit (Net Loss)}}{\text{Closed Trades}}$$

OR

$$= \text{Win Rate} * \text{Average Win} - \text{Loss Rate} * \text{Average Loss}$$

- Mathematical Outcome or Expectation

$$= \frac{\text{Expectancy}}{\text{Average Loss}}$$

Equation 5: Calculation of Profit/Loss from a Strategy

Using the various equations from Equation 5, different parameters were derived. These parameters were compared against one another and against the benchmark to conclude a profitable trading strategy.

3. Literature Review

The stock market is the heartbeat of any economy, while stock prices are often viewed as barometers of the economic health of a nation. Stock markets allow the companies to sell their shares to millions of investors, thereby creating a vital source of capital for companies. Investors on the other hand, accrue capital gains as a residual claim on the corporate earnings, apart from dividends. The following sections briefly describe what goes into the intricacies of a stock market.

3.1 Stock Market

The stock market is a marketplace for buying and selling financial securities for money. Investors can connect on the stock market to buy and sell investments, most often stocks. A public company's stock represents a portion of its ownership. Share transactions assist businesses in raising capital to expand. The trade of shares help the companies to raise funds to grow their business. In return, the investors make profits when the firms perform well and incur losses when the firms do not perform as per expectations. The stock market consists of a set of stock exchanges and over the counter market places (Davis & Taube, 2023).

Figure 2: What is a Stock Market?
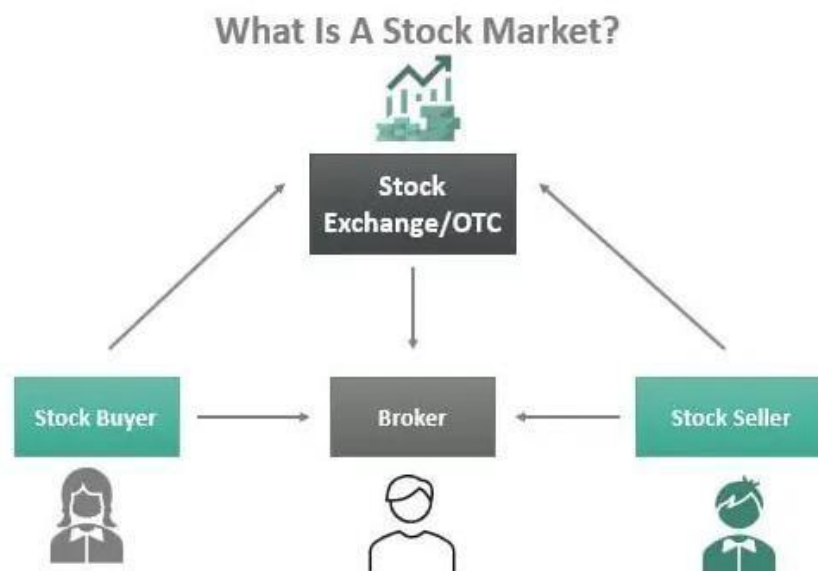
Source: Vaidya, 2020

Companies, who wish to raise capital for their business, list their business on the stock exchange and make their shares available through the process of initial public offering (IPO). Investors purchase the shares of these companies (Vaidya, 2020). The investors can then buy

and sell these stocks among themselves either on the stock exchange or directly among each other in over the counter marketplace. The figure alongside shows the structure of a stock market.

Figure 3: Factors Affecting the Stock Market
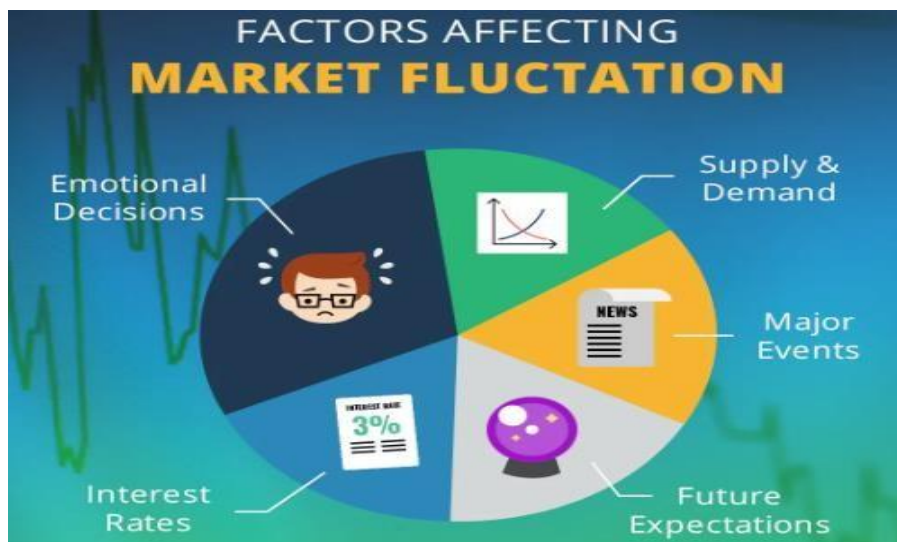
Source: Town, 2022

There are various factors, which affect the functioning of the stock markets and cause fluctuations with prices of stocks going up or down. The stock price is influenced by the number of people who are willing to buy the stock versus the number of people who are willing to sell the stock at a particular time. The imbalance between the demand (buyers) and the supply (sellers) leads to an increase or decrease in the stock price and is the basic premise on which the market functions (Town, 2022). If the demand for stocks is more than its supply, meaning there are more buyers than sellers, the stock price will increase and vice versa. The stock market usually looks at the current events and happenings and see how they will affect the future of the companies' people are invested in. Political factors like government policies, budgets, inflation, elections, trade policies, wars, and conflict with other nations, all play a significant role in driving the stock market. Natural calamities like earthquakes, floods, famines, and pandemics too play a vital role in driving the stock market.

These major events cause damages to assets and decrease people's spending capacity to be able to invest in the stock market (Town, 2022). The prevailing interest rates in the economy affect the prices of the stocks. High interest rates make it expensive for the companies to borrow money as well as reduce the capacity of people to spend. This leads to less growth, resulting in lower company value, which is again reflected in lower share prices (Town, 2022).

On the contrary, when the rate of interest is low, the availability of cheap funds helps companies grow which in turn creates a higher value for the shares of the company. Sentiments and emotions of the investors are a crucial factor, which drive buying and selling decisions. The primary emotions that rule the stock market are greed and fear (Town, 2022). Greed pushes the investors to buy more, thereby creating more demand and pushing the stock price higher. On the other hand, fear prompts the investors to sell quickly, generating more supply, which eventually pulls down the share price.

3.2 Evolution of the Stock Market

The modern-day stock market had a humble beginning around 1600s. The Dutch East India Corporation was the first company who founded Amsterdam's rustic stock market (Vaidya, 2020). The company sent voyages too far off lands to trade gold, porcelain, spices, and silk. These voyages were expensive, and traders approached the local citizens to fund their transportation in lieu of a share in the profits from the international trades. The concept became popular overtime, as it was lucrative for both the company as well as the people who invested in it and many others followed suit. Over the centuries, countries started to have their own dedicated stock exchanges since many companies started offering their shares to the public. Globalization, decline of financial and economic barriers, emergence of new technologies and new regulatory reforms have contributed to the growth of the stock markets across the world (Ben Slimane, 2012).

3.3 Participants of a Stock Market

Figure 4: Participants of a Stock Market

Source: Srivastava, 2022

There are many components of a stock market, which are broadly classified into a few groups like investors, companies, traders, stock exchanges, regulators, financial intermediaries, and stockbrokers.

3.3.1 Stock Exchanges

A stock exchange serves as a physical or electronic medium were buying and selling of securities takes place. There are currently about 60 stock exchanges worldwide, listing over 50,000 companies and transacting trillions of dollars daily (Kohl, 2023). The New York Stock Exchange, NASDAQ, Shanghai Stock Exchange, EURONEXT Stock Exchange, Japan Stock Exchange, Shenzhen Stock Exchange, Hong Kong Stock Exchange, London Stock Exchange, National Stock Exchange, and Toronto Stock Exchange are a few of the world's biggest stock exchanges that are worth mentioning. The erosion of the economic as well as financial barriers at the national and international levels along with rampant globalization, emergence of innovative technologies, new regulatory reforms and the evolution of investment decisions are some of the newer issues which the exchanges around the world face (Ben Slimane, 2012). The competitiveness in the financial market propels the stock exchanges to adopt various strategies like partnerships, demutualization and consolidations to maintain their competitive edge (Ben Slimane, 2012). Although stock exchanges were originally controlled by their members, today they have evolved as publicly traded companies, one unique business whose performance is a proxy for the economic health of a country (Ben Slimane, 2012).

India boasts of two primary stock exchanges, which are the Bombay Stock Exchange (BSE), and the National Stock Exchange (NSE). The BSE is the oldest stock exchange of India, which was established in Mumbai as early as 1875. The electronic exchange in India is the NSE headquartered in Mumbai. The SENSEX is a stock index, which tracks the performance of 30 well established and financially sound companies listed on the BSE. The NIFTY 50 is a benchmark Indian stock index against which all the equities in India are measured. It is a weighted average of 50 of the largest Indian companies listed on the NSE.

3.3.2 Stockbrokers

A stockbroker acts as an intermediary that executes buy and sell orders on the behalf of its clients who charge a commission for their doing the work. There are many types of stockbrokers in India. Full-service brokers offer a myriad of service like financial planning, retirement planning, portfolio management services, research services and advisory services apart from trading at the stock exchanges (Srivastava, 2022). Discount brokers are fully online

brokers who offer trading platforms to clients and help, them carry out buy and sell orders at discounted rates (Srivastava, 2022). Direct access stockbrokers give a direct way to investors to trade on specific stock exchanges directly through online platforms. They focus on the speed and execution of the securities rather than on research and investment advice (Srivastava, 2022). Examples of direct access brokers in India are Zerodha, Upstock, ICICI Direct Trade, Motilal Oswal and many more.

3.3.3 Listed Companies

Listed companies are the ones which offer their shares to the public through the stock exchanges. There are about 58,200 total number of listed companies according to the World Federation of Exchanges (WFE) by the end of 2022. In India, the BSE has over 6000 listed companies and the NSE has over 7400 listed companies (Srivastava, 2022).

3.3.4 Investors

Investors are the engine that propel the stock market. The fundamental purpose of an investor is to generate wealth over a period. Investors range from individuals, firms to a financial entity. Retail investors, high net worth individuals, partnerships, HUFs, companies, societies, trusts, banks, mutual funds, pension funds, provident funds, hedge funds, insurance companies and foreign institutional investors, form an entire gamut of players who buy and sell stocks of companies on the exchanges (Srivastava, 2022).

3.3.5 Traders

Trader is a person who buys and sells stocks to make a profit by analyzing the market meticulously. They make use of technical and fundamental analysis to make their trading decisions. Traders generally trade short term for profits and leverage the price fluctuations for their benefit (Kintu, 2021). Day traders buy and sell securities during the same day capitalizing on short-term opportunities in the market. Scalpers or micro traders make dozens to hundreds of trades daily to make small profit from each trade (Kintu, 2021). Momentum traders focus on stocks that move in one direction with high volume and profit by the momentum of the stock. To assist them in creating buy and sell signals, technical traders make use of a variety of technical charts and indicators. Conversely, fundamental traders analyze a company's corporate events that impact a stock's price and adjust their trading strategy accordingly (Kintu, 2021). Swing traders utilize technical analysis to look for equities with short-term price momentum in order to latch onto a trend by holding onto a security for more than a day. (Kintu, 2021).

3.3.6 Financial Intermediaries

Financial intermediaries are the link, which connect issuing companies, investors, and regulators (Srivastava, 2022). Depositories hold the shares of investors in a digital format. There are two depositories in India currently, which are National Securities Depository (NSDL), and Central Depository Services (CDSL). A depository participant is an agent to the depository through which it interacts with the investors and provides them with depository services. Sharekhan and Motilal Oswal are examples of depository participants in India. Clearing corporations ensure the settlement and delivery of the securities and act to protect the interest of the investors. Clearing banks are commercial banks, which transfer the funds from the payer's account to the payee's account. On the other hand, merchant banks help companies to issue the shares on the stock exchanges b providing them with underwriting, loan services, financial advising and fund-raising services. Examples of merchant banks are Goldman Sachs and Kotak Investment Bank.

3.3.7 Stock Market Regulators

Stock market regulators are set up by the government to ensure that there are no malpractices in the capital market and ensure that the interest of the investors is protected. They have the duty of regulating the market by listing the appropriate companies and delisting the companies, which do not abide by the laws of the land (Srivastava, 2022). In India, the Securities and Exchange Board of India (SEBI) regulates the stock market.

3.3.8 Other Stock Market Participants

There are bunches of participants who play a vital role in the stock market and ensure smooth functioning of the market. Transfer agents maintain an investor's financial records and make sure that shareholders receive their dividend regularly. Investment advisors understand a client's financial objectives; analyze different market opportunities and advice clients with the most suitable investment options to gain maximum profits. Credit rating agencies study the credibility of a company and its capacity to repay its debts by rating the company between investment and non-investment grades (Srivastava, 2022). Underwriters come to the rescue of the companies when the company is not able to generate the capital from the public through its issue of shares (Srivastava, 2022). The underwriters subscribe to the issue of shares or help the company find a party to subscribe the issue.

3.4 Reliance Industries Limited (RIL)

Reliance Industries Limited (RIL) is the largest private sector corporation in India. As of 2023, RIL is ranked at number 88 on the Fortune Global 500 list of companies and number

45 on the Forbes Global 2000 list. Starting from humble beginnings in 1957 with textiles trading, RIL has evolved to become a family-owned company spanning diverse industry verticals. In 1977, Reliance Textiles Industries embarked on the public equity route and pioneered the equity cult in India.

Its issue oversubscribed by seven times, which strengthened its position in the market. Today, RIL boasts of its stalwart presence in the textiles, polyester, energy, materials, retail, entertainment, and digital services. Under the umbrella of RIL there are more than 300 companies spanning across different sectors of the economy and touching the lives of billions of people in India and abroad. The brand value of RIL from 2016 to 2023 is depicted here:

Graph 1: Brand Value of RIL from 2016 to 2023
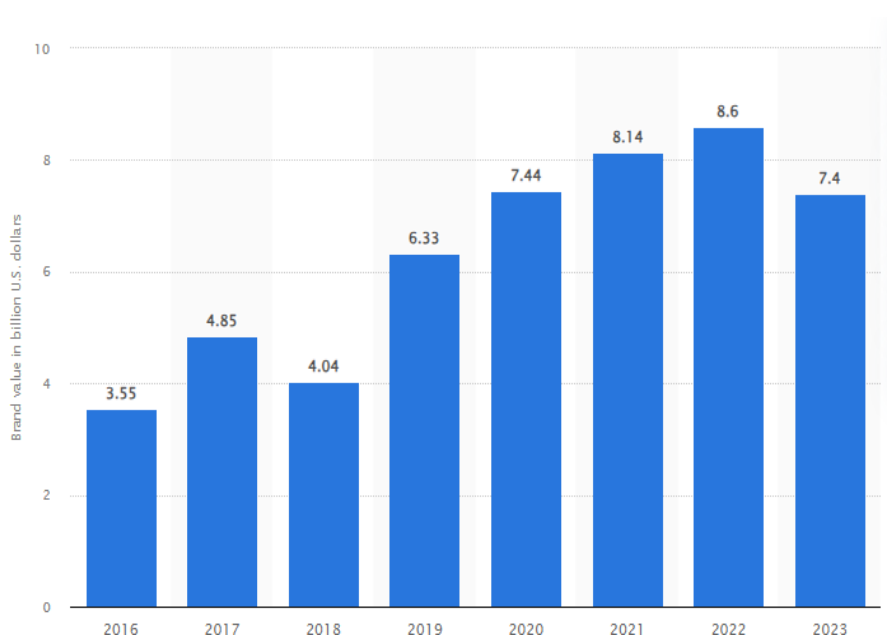
Source: Basuroy, 2023

The brand value of RIL more than doubled from 3.55 billion US dollars in 2016 to 7.4 billion US dollars in 2023 (Basuroy, 2023). In Interbrand's India's top 50 valuable brands list, has a remarkable inclusion of two powerhouses owned by Mukesh Ambani Reliance Industries and Reliance Jio (Basuroy, 2023).

The financial indicators of RIL show quite promising numbers for the financial year ended 2022-2023 in India. Some of the important key indicators are mentioned in the graphs below:
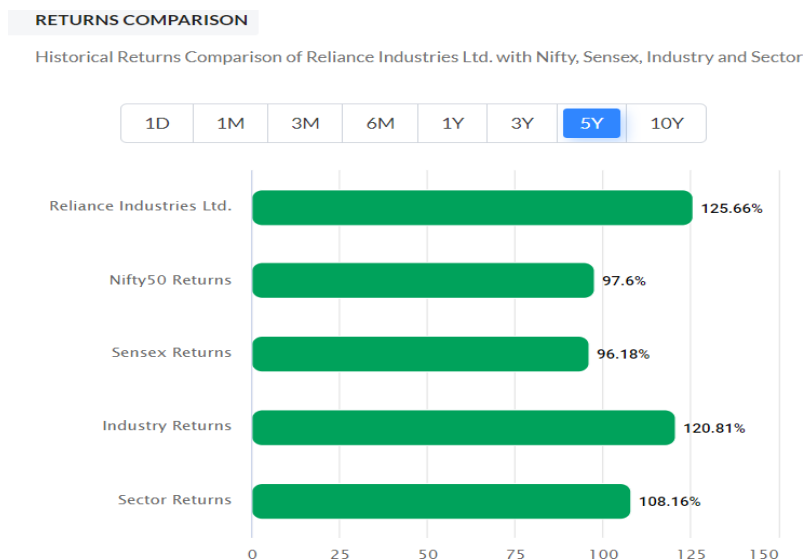
Graph 2:Financial Indicators for RIL for 2022-2023

REVENUE
(₹ crore) ↗ 23.6%

₹9,74,864 CRORE

FY 2022-23	9,74,864
FY 2021-22	7,88,743
FY 2020-21	5,39,238

Strong revenue growth led by high energy prices and robust growth in consumer businesses.

PROFIT AFTER TAX
(₹ crore) ↗ 11.3%

₹73,670 CRORE

FY 2022-23	73,670
FY 2021-22	66,184
FY 2020-21	53,739

Record net profit led by strong operating performance partially offset by higher finance cost, depreciation and taxes.

EARNINGS PER SHARE
(₹) ↗ 9.5%

₹98.0

FY 2022-23	98.0
FY 2021-22	89.5
FY 2020-21	76.4

Strong operating performance with all businesses contributing to earnings growth.

DIVIDEND PER SHARE
(₹) ↗ 12.5%

₹9

FY 2022-23	9
FY 2021-22	8
FY 2020-21	7

Consistent track record of increasing dividend year on year.

Source: Gujral et al., 2023.

It is evident that the growth of the company has been significant over the years, and it has been able to pass on this value to its shareholders in the form of increased dividends. There is an increase in dividend from INR 6.5 per share in 2019-2020 to INR 9 per share in 2022-2023 (Gujral et al., 2023). RIL is a story of continuous growth and corporate reinvention. The historical returns that Reliance Industries has generated in comparison to the Nifty50, Sensex.

Graph 3: Returns Comparison of Reliance Industries Limited

RETURNS COMPARISON

Historical Returns Comparison of Reliance Industries Ltd. with Nifty, Sensex, Industry and Sector

| 1D | 1M | 3M | 6M | 1Y | 3Y | 5Y | 10Y |

Reliance Industries Ltd.	125.66%
Nifty50 Returns	97.6%
Sensex Returns	96.18%
Industry Returns	120.81%
Sector Returns	108.16%

Source: Top Stock Research, 2018

Industry and Sector returns is depicted in the figure.

It can be seen that in the last 5 years, Reliance Industries has outperformed everyone, giving 125.66% from the year 2019 to the year 2023.

3.5 Stock Market Analysis

Investors and traders rely on the stock market to make profits and grow their money. There are thousands of companies, which come up with new issues of shares for raising capital every now and then. There are multiple companies whose securities are bought and sold daily on the stock exchange for making money. It is important that investors and traders both make informed decisions about the trades that they are doing to maximize their returns. The process of evaluating a stock, the sector of the stock, or the market for making buying and selling decisions is known as stock market analysis (Shah et al., 2019) as shown in the figure below:

Figure 5: What is Stock Analysis?
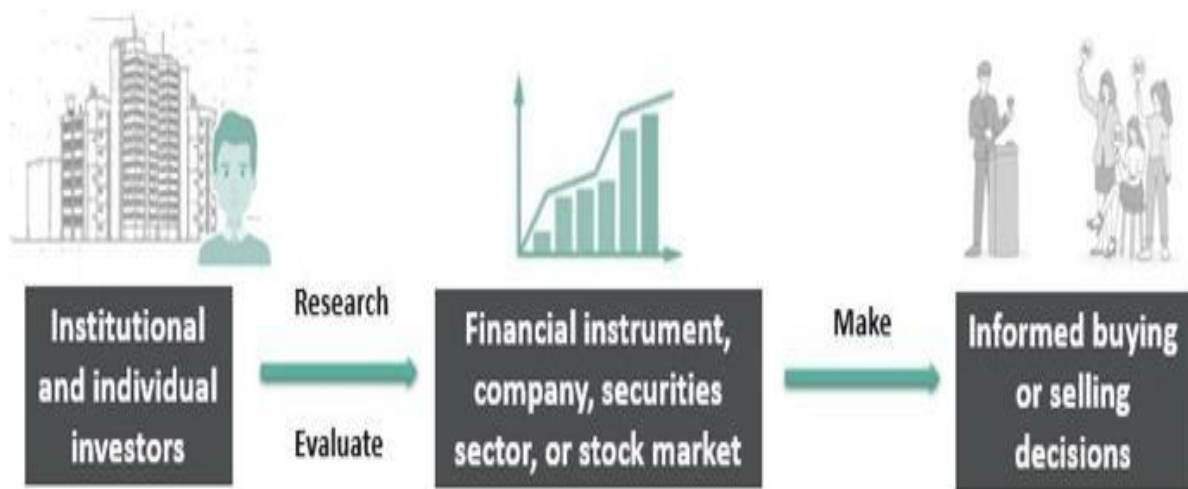
Source: Johnson, 2019

Advancements in technology have changed the landscape of the stock markets today. The market today is built using a combination of different technologies like machine learning, expert systems and big data, which interact, with all the elements of the market to make informed decisions (Shah et al., 2019). Therefore, stock analysis is one of the most important processes of preparing to interact with the stock market to gain an insight into the potential gains and losses of a particular trade. The flow chart below shows the necessary steps that an investor and trader take to analyse the stock market and make his or her choices of trade.

Figure 6: Steps in Stock Analysis
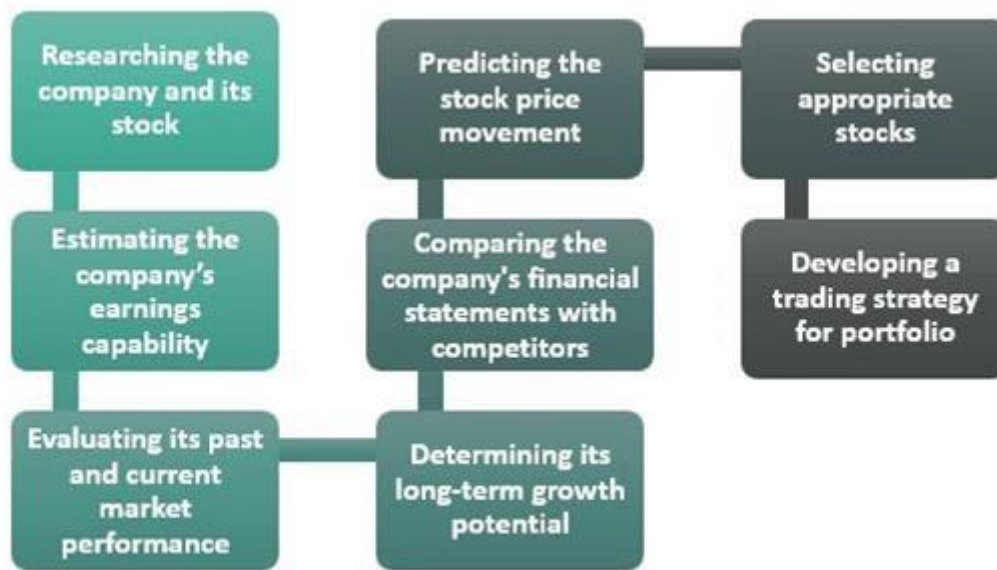
There are two main types of techniques, which are used by a stock market analyst to make the right decision of investing or trading as visible in the figure below:

Figure 7: Stock Analysis Techniques
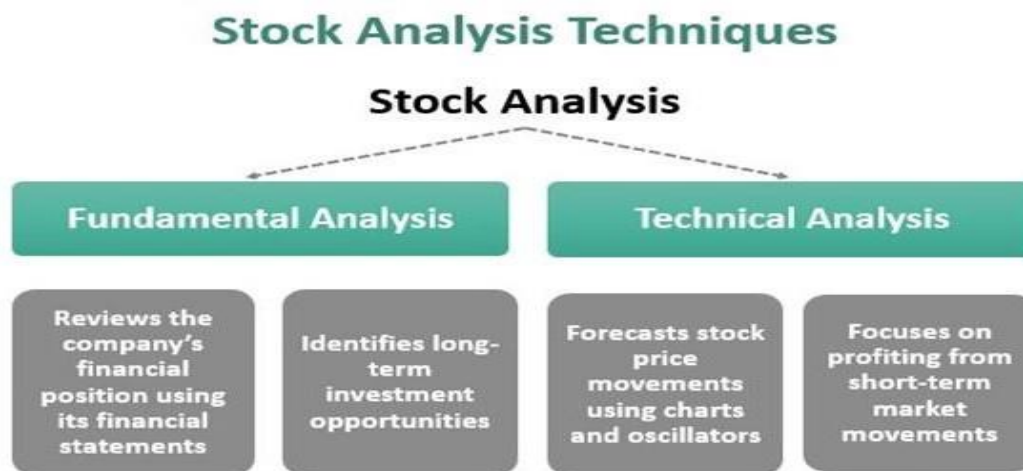
The concept of stock market analysis centres on the idea that one can determine a stock's intrinsic worth by using the information that is currently available about the market. Financial statements, stock price fluctuations, market indicators, and industry trends are all used by traders and investors to inform their trading and investing decisions.

3.5.1 Fundamental Analysis

Fundamental analysis aims to review the financial positioning of a company by calculating the share's intrinsic value. It provides answers to a variety of queries, including: is the business expanding? Is it profitable? How are earnings invested? Is the growth sustainable? Is the macroenvironment supportive of the business's expansion?(Johnson, 2019). Fundamental analysis conducted on a public company evaluate the metrics generated from a company's financial statements like the balance sheet, income statement, cash flow statement and the foot notes. The analysts measure a company's profitability, liquidity, solvency, efficiency, growth prospects, creditworthiness as well as leverage from the financial statements. Fundamental analysis is a long-term method that is helpful for investors who are willing to wait a longer time for their investments to pay off. Price to earnings (P/E) ratios, price to book (P/B) ratios, return on equity (RoE), price to earnings to growth (PEG ratio), dividend payout ratio debt ratio, debt to EBITDA ratio, earnings per share, current ratio, and quick ratio are a few of the frequently used ratios in financial analysis. (Chen, 2023). The graphs below show some of the key performance metrics of RIL for the last three years from 2020.

Graph 4: Financial Indicators for RIL for 2022-2023
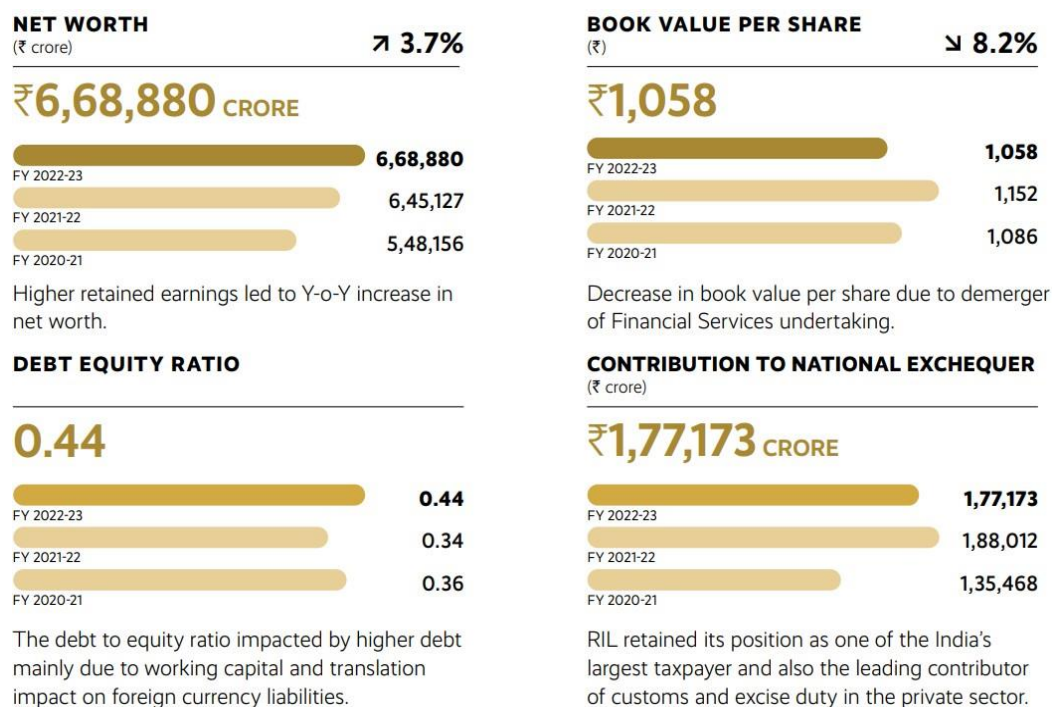
Source: Gujral et al., 2023

The graphs indicate that RIL is growing since the year 2020. The net worth as well as book value per share has increased over the period while the debt ratio of the company has decreased which is an indicator of strong fundamentals of the company.

3.5.2 Technical Analysis

The second method of studying the stock market is called technical analysis.This approach focuses on historical and current price data to forecast the profitability of upcoming price changes (Chen, 2023). Future trends are predicted using charts and indicators under this method. It is very beneficial for traders who seek to make profits from short-term price fluctuations. Technical analysis answers questions like what the current market trend is, what is a good time to enter and exit the market, what are the price levels hit by a stock, after hitting a particular price point and in what direction is the stock headed (Johnson, 2019). Traders evaluate the impact of a stock's demand and supply on its price, volume, and volatility. The figure below describes what comprises of technical analysis.

Figure 8: What is Technical Analysis?

Source: Enosh & Choubey, 2021

The origins of technical analysis dates to the 1800s when Charles Dow popularized the Dow Theory. Traditionally technical analysis relates to price changes but over the years analysts have started tracking numbers other than price which are mainly trading volume or open interest figures (Hayes, 2023).

3.6 Trading Strategies

A trading strategy is a precise methodology which is deployed using predefined rules for making reading decisions related to buying and selling in the securities market. It has typically three stages which are planning, placing trades, and executing trades. A trading strategy involves a lot of parameters like personality type of the trader, lifestyle, available resources, investment style, risk appetite, tax considerations, level of portfolio diversification and much more. The following table highlights the most common trading strategies which are used by technical traders along with their brief description and pros and cons:

Table 1: Types of Trading Strategies

Strategy	Description	Pros	Cons
News Trading	Trading based on news announcements, before and following news releases	1. Defined entry and exit strategy. 2. Multiple trading opportunities	1. Overnight risk 2. Requirement of expert skills
End-of-day Trading	Trading near the close of the markets	1. Suitable for most traders 2. Less time commitment	1. Overnight risk
Swing Trading	Trading on both sides of the market, going long and short on securities	1. time 2. Multiple trading opportunities	1. Overnight risk 2. Ample research
Day Trading	Trading by taking advantage of price fluctuations in-between the market open and close hours	1. No overnight risk 2. intra-day risk 3. Time flexible trading 4. Multiple trading opportunities	1. Needs discipline. 2. Flat trades
Trend Trading	Entering trades in the direction of pre-determined trend	1. Useful as a hobby and uses less time. 2. Multiple trading opportunities	1. Overnight risk
Scalping Trading	Placing very short-term trades with small price movements to get a small profit from each trade	1. No overnight risk 2. Suitable as a hobby 3. Multiple trading opportunities	1. market applicability 2. Needs discipline. 3. Extremely intense activity
Position Trading	Holding a security for a long period of time ignoring minor price fluctuations to get profit from long term trends	1. High profits 2. Less stress	1. Significant loss in case of trend reversal 2. Commission for holding the security

Source: Liptak, T. (2023)

The trading strategy streamlines the process of interpreting information about how the market is behaving by creating a set of rules including analysis of chart patterns, price action patterns, technical indicators, and fundamental analysis (Solanki, 2023). When evaluating the stock market, trading techniques provide structure, consistency, and focus. The swing trading method is among the most popular ones employed by stock market traders. These strategies capitalize on the price fluctuations of a security over a short period of time, usually a few days to a few weeks or months. Swing trading is about buying at troughs and selling at the crest of a stock's price movement. The most common swing trading strategies make the use of candlestick patterns, moving averages, MACD and RSI to make profitable trades.

Swing trading generally focusses on short term price reversals to grab the forthcoming price moves in that direction. The right conditions for a reversal can be confirmed by candlesticks or oscillators like the RSI. In candlestick patterns, the reversals are demonstrated by indecision candles that reflect a strong shift in sentiment from buying to selling or selling to buying. On the other hand, a reversal is highlighted by oscillators via a divergence.

Most of the swing trading strategies, have three components which are mentioned in detail as under:

1. Daily charts depicted via candlesticks which can be weekly or monthly.
2. A trend filter like a moving average
3. An overbought and oversold indicator found at the bottom of the chart.

Any trading strategy will be made with a combination of these three components like the following rules:

1. If the price is above the moving average, enter a long position and buy. On the other hand, if the price is below the moving average, enter a short position and sell.

2. If the MACD is above zero, enter a long position and buy, indicating the momentum turning bullish (Solanki, 2023). On the other hand, if the MACD is below zero, enter a short position and sell, indicating the momentum turning bearish (Solanki, 2023).

A swing trading strategy considers four important components which are widely used in trade setups which are as follows:

The trade direction – long (buy) or short (sell)

Where to enter the market

Price to take profits at

Price to cut losses at

Swing trading follows a middle path between day trading and position trading with difference in the style of market analysis, the size of returns per profit target, the trading frequency, and the trading duration (Schwab, 2022).

3.6.1 Candlestick Charts and Patterns

Swing trading involves identifying the most profitable entry and exit points which can be visually managed with the help of candlestick patterns. Candlestick patterns are widely used by traders; yet, just a few patterns are utilized by traders to help them make trading selections when they are short-term swing traders. Bearish or bullish candlestick patterns are possible. There are various styles that fall under each of these categories. The bullish patterns signal a price reversal after a market downtrend, allowing the traders to gain profits from any open long positions from the upward trajectory (Buchanan, 2023). The bearish patterns on the other hand, indicate a point of resistance which is formed after an uptrend, where traders close their long positions and take advantage of the falling price by taking an open short position (Buchanan, 2023).

3.6.1.1 Engulfing Patterns

Engulfing patterns are made by two candlesticks. It is a pattern which is formed when a small candle is completely eclipsed by a larger candle. These candles signify a potential trend reversal. The bullish engulfing patterns indicate a potential upward move, as they occur at the bottom of a downtrend (Buchanan, 2023). On the other hand, the bearish engulfing patterns indicate a potential downward move, since they occur at the top of an uptrend (Buchanan, 2023).

Figure 9: Engulfing Patterns
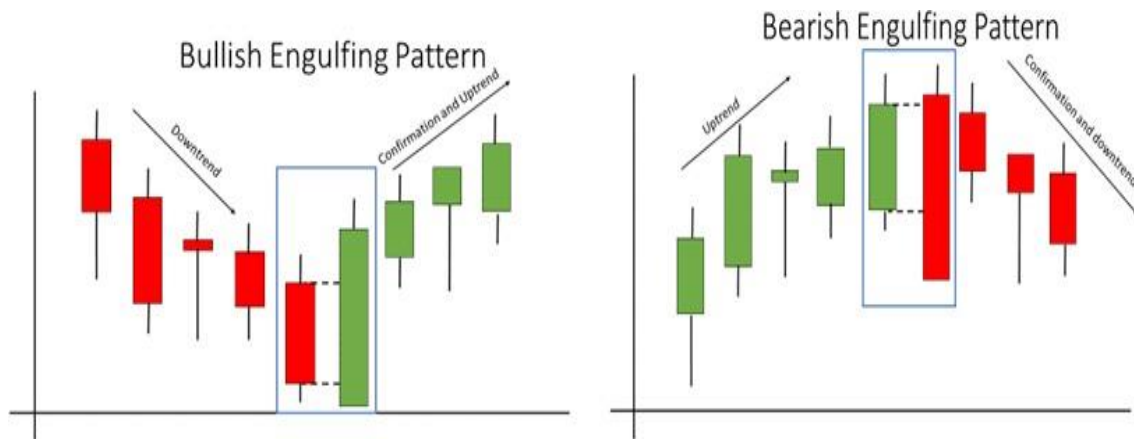
The table below gives a fair idea of how engulfing patterns work in swing trading.

Table 2:Summary of Engulfing Patterns

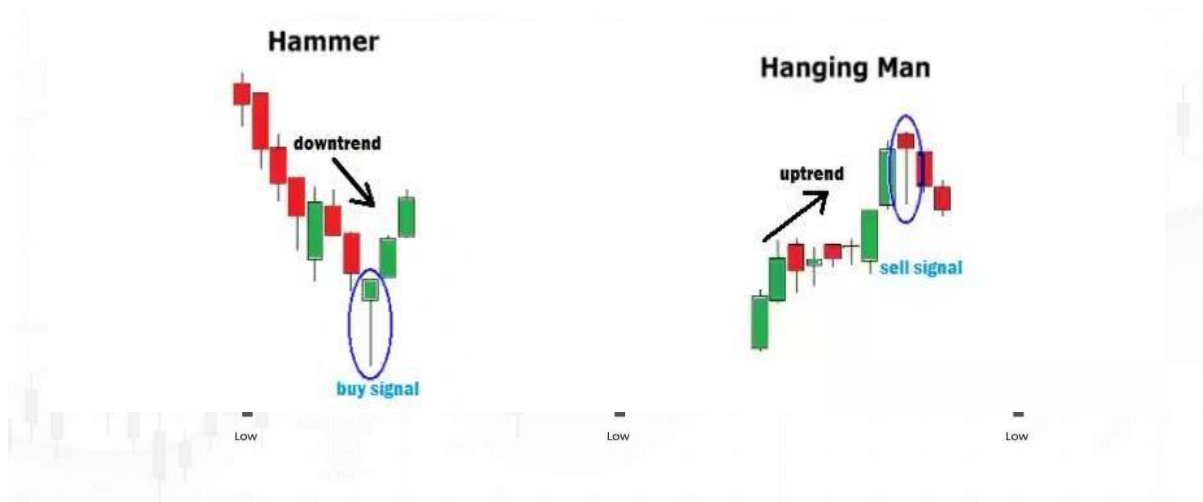| Engulfing Pattern	Features	Location	Signal
Bullish	Green candle engulfs the previous smaller red candle	At the bottom of a downtrend	Bullish reversal
Bearish	Red candle engulfs the previous smaller green candle	At the top of an uptrend	Bearish reversal

3.6.1.2 Doji

In the world of stock trading, the doji candlestick pattern is one of the most unique formations, which is represented by the same open and close price, manifesting the indecision among buyers and sellers. The neutrality of the traders can often trigger reversals in the opposite direction. Since the number of buyers and sellers in the market are almost equal at a doji, it is a strong signal that a reversal of the current trend may be ahead (Moglen, 2023). The doji appears like a plus sign, where the vertical line is the wick, which shows the highest and the lowest price. The horizontal line is the body which represents the opening and the closing price. There are three variations of the doji candlestick formation which is shown in the figure below:

Figure 10: Types of Doji Candlesticks

Source: Moglen, 2023

The table below shows the differences between these three different kinds of doji.

Table 3: Summary of Doji Patterns

Doji Pattern	Features	Location	Signal
Gravestone	Long upper shadow	Peak of an uptrend	Bearish reversal
Long-legged	Long upper and lower shadows Low of a long legged doji shows a strong support level. High of a long legged doji shows a strong resistance level	Appears after a strong price movement. During periods of consolidation	Strong indecision in the market Consolidation or a potential trend reversal
Dragonfly	Long lower shadow	Bottom of a downtrend	Bullish reversal

Source: Prepared by researcher

3.6.1.3 Hammer and Hanging Man

These candlestick patterns are characterized by long lower shadows and short real bodies. Both are almost similar except for in terms of the prior move or short-term trend. The figure below shows how the hammer and the hanging man appear on a chart.

The table below summarizes the about these two candlesticks patterns

Table 4: Summary of Hammer and Hanging Man

Pattern	Features	Location	Signal
Hammer	Small real body at the upper end of the trading range with a long lower shadow	At the bottom of a downtrend	Bullish
Hanging Man	Top reversal pattern	At the top of an uptrend	Bearish Selling pressure at higher levels

Source: Prepared by researcher

3.6.1.4 Morning and Evening Star

Morning and evening stars are three candlestick patterns which indicate trend reversals and are used by traders to identify buying and selling opportunities. The morning star candlestick pattern consists of a first long red candle, followed by a short red or green candle and a third long green candle (Ogunkunle, 2023). On the other hand, an evening star candlestick pattern includes a first long red candle, second red or green candlestick and a third red candlestick (Ogunkunle, 2023). The figure represents a morning and evening star.

Figure 11: Morning and Evening Star Candlestick Pattern
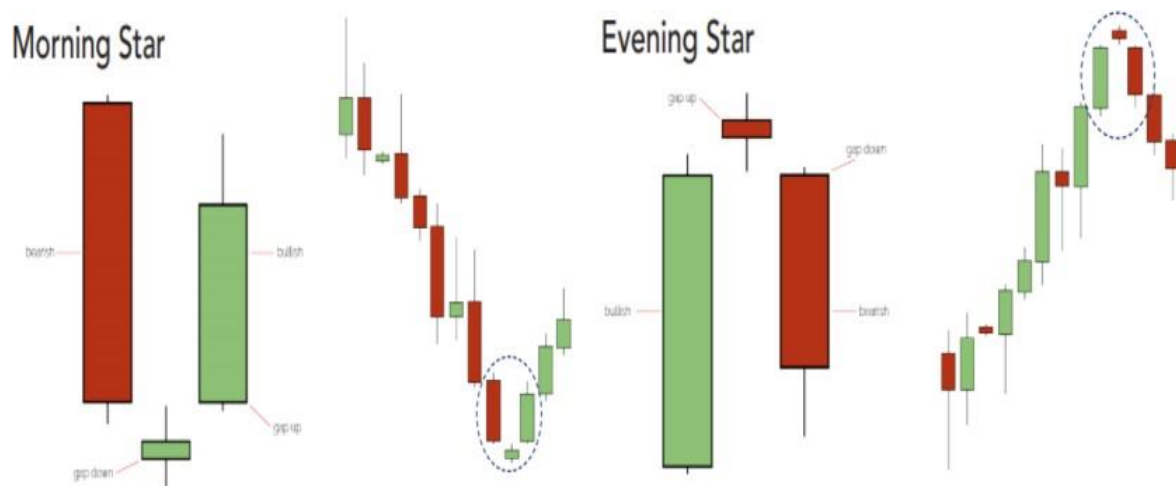
Source: Ogunkunle, 2023

The table below summarizes the differences between morning and evening star candlestick pattern formations.

Table 5: Morning and Evening Star Candlestick Patterns

Pattern	Features	Location	Signal
Morning Star	Long bearish candle, small bodied candle, long bullish candle	Downtrend	Bullish reversal Open long positions
Evening Star	Long bullish candle, small bodied candle, long bearish candle	Uptrend	Bearish reversal in a bullish market Sell a stock before its price falls

Source: Prepared by researcher

3.6.1.5 Candlestick Patterns of Reliance Industries Limited

Useful price formations that provide guidance about the future direction of the stock's price movement is provided by the candlestick chart patterns, one of the primary sources of determining the overall market direction by traders around the world, especially Asia. A candle pattern is best evaluated by understanding, whether it is bullish, bearish, or neutral (Farley et al., 2024). The signals generated from candlesticks come in the form of individual candles like a doji, or multi pattern candles like engulfing lines which can be bullish or bearish, bullish hammers and bearish hanging man patterns (Farley et al., 2024). Candlesticks serve as great forward-looking indicators, however confirmation from the next candlestick is necessary to identify a specific pattern and make trading decisions from it. In summary, candlesticks are a stand-alone tool for chart analysis; that being said, they may also be used in conjunction with other technical analysis tools, such as momentum indicators like the MACD and RSI. The following figures shows the snapshot of the candlesticks discussed in the above sections of what each candlestick or a candlestick pattern signifies.

Figure 12: Signals from Candlestick Patterns
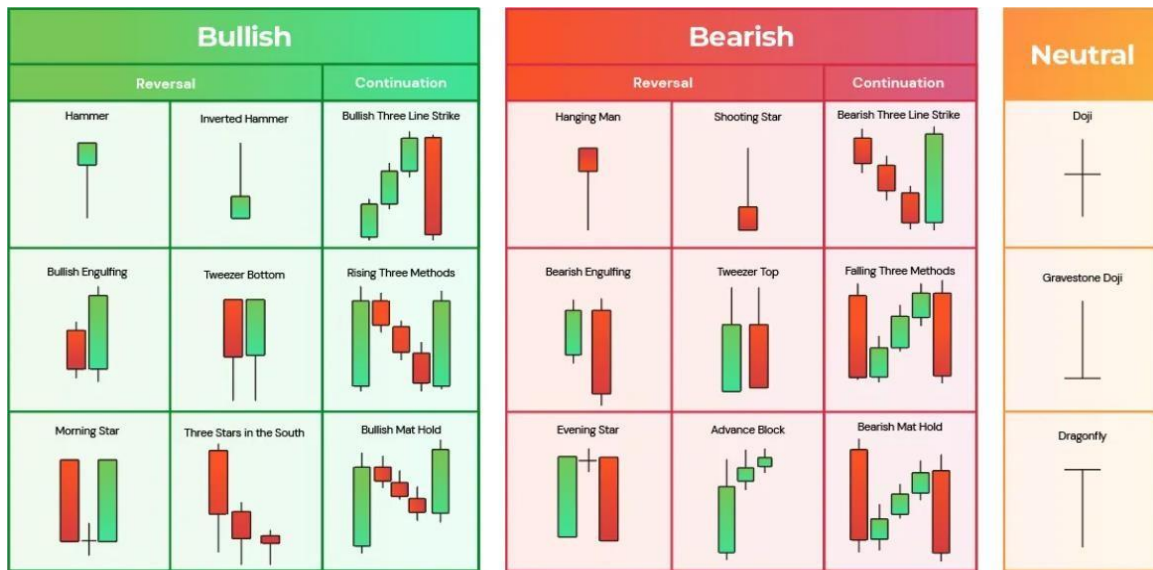
Source: Kong, 2023

As has been previously mentioned, the candlesticks can be generated for minutes, hours, days, weeks, months, and years. The researcher has pulled out the monthly candlesticks of the Reliance Industries Limited shares from 2919 to 2023. What follows is a brief analysis of the candlestick patterns on a yearly basis and the potential signals they have generated.

Graph 5: Figure: Reliance Industries Limited Candlestick Chart Pattern for 2019
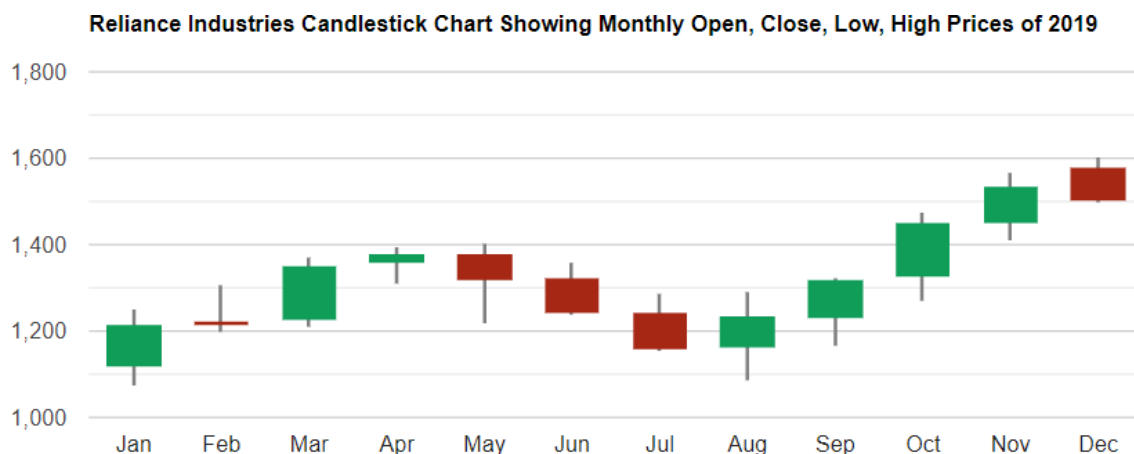
Source: Top Stock Research

The above candlestick chart shows that in the month of February, there was a doji star bearish, which indicated a bearish reversal. The confirmation of the trend reversal is a lower open on the next candle. However, this was not the case in March, hence the signal's reliability was medium. In April of the same year, there was a hanging man, which indicated a bearish

reversal. The confirmation is by a large down gap on the next candlestick which has a lower close in May. The month of July shows a shooting star which is a bearish reversal signal, the reliability of which is high.

Graph 6: Figure: Reliance Industries Limited Candlestick Chart Pattern for 2020
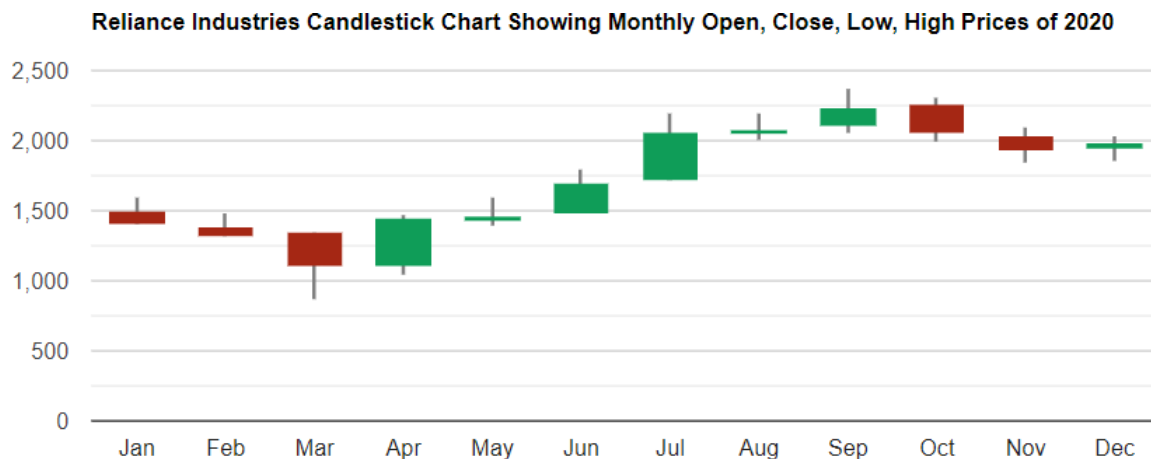
Source: Top Stock Research

The above candlestick chart shows that in the month of February shows a shooting star which is a bearish reversal signal, the reliability of which is high. The month of Aoril shows a bullish engulfing pattern, which indicates a bullish reversal, the reliability of which is medium. The month of October depicts a bearish engulfing pattern which indicates a bearish reversal, the reliability of which is medium.

The chart below for the year 2021, shows that in the month of April, there is a hanging man, which indicates a bearish reversal signal and the reliability of which is medium. In the same year, the month of June throws a shooting star, which is bearish reversal signal and has a medium reliability. The month of October shows an inverted hammer, the reliability of which is medium and is a bullish reversal.

Graph 7: Figure: Reliance Industries Limited Candlestick Chart Pattern for 2021

Reliance Industries Candlestick Chart Showing Monthly Open, Close, Low, High Prices of 2021
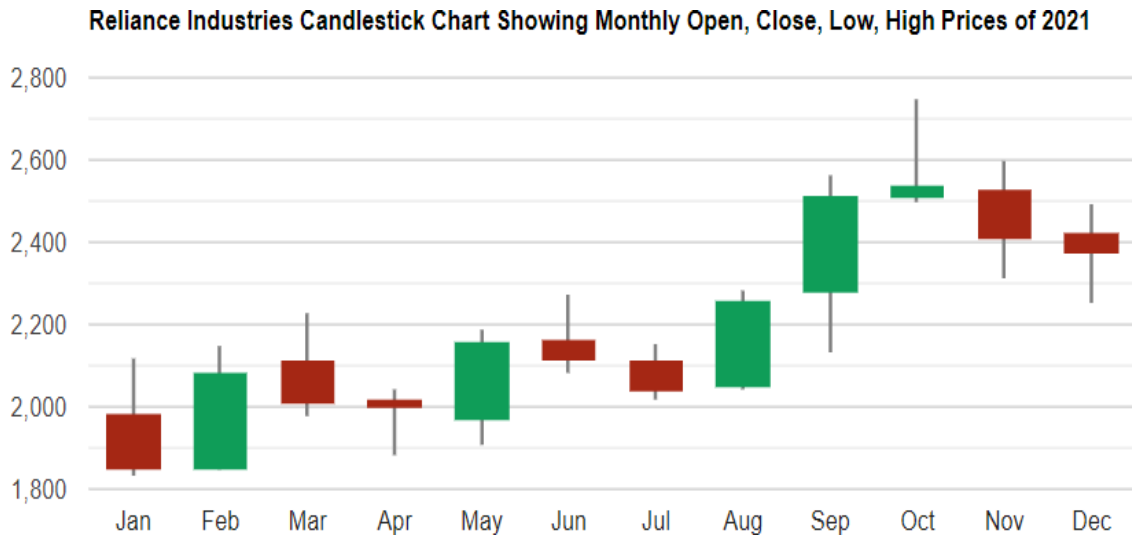
Source: Top Stock Research

Graph 8: Figure: Reliance Industries Limited Candlestick Chart Pattern for 2022

Reliance Industries Candlestick Chart Showing Monthly Open, Close, Low, High Prices of 2022
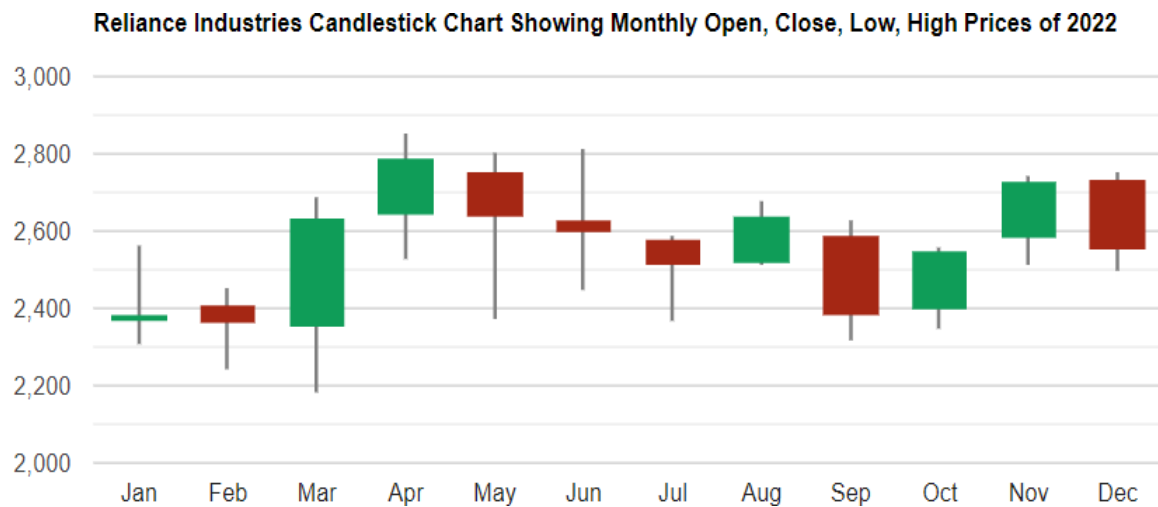
Source: Top Stock Research

The chart above for the year 2022 shows that in the month of March shows a bullish engulfing pattern, the reliability of which is medium, and which signals a bullish reversal. The months of May and July are hanging man, which shows a bearish reversal pattern and has a medium reliability. The month of December shows a bearish engulfing pattern, which is a bearish reversal signal.

Graph 9: Figure: Reliance Industries Limited Candlestick Chart Pattern for 2023

Reliance Industries Candlestick Chart Showing Monthly Open, Close, Low, High Prices of 2023
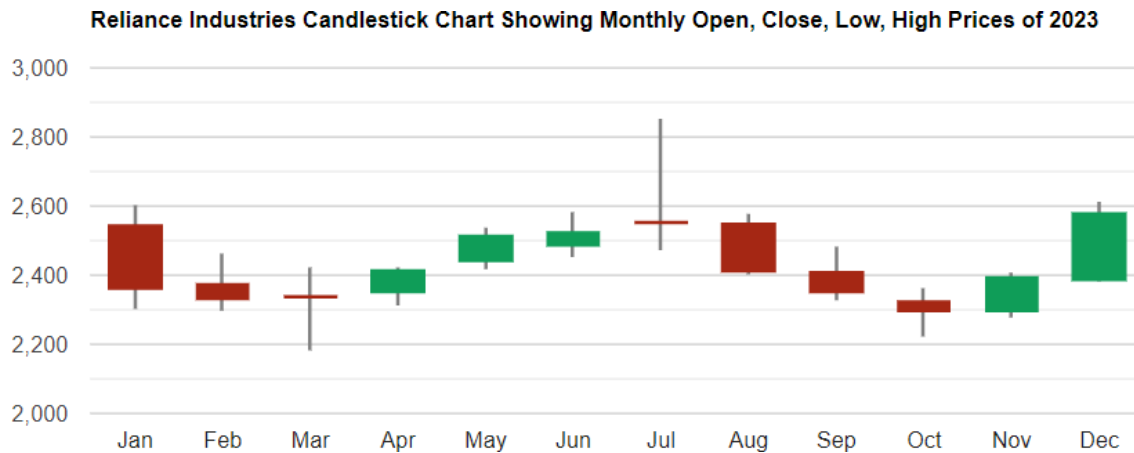
Source: Top Stock Research

The above chart depicts that in the year 2023, in the month of February, it is a shooting star candle, which is a bearish reversal signal, the reliability of which is medium. The month of March shows a doji. The month of July is a gravestone doji. The month of November is an engulfing bullish which shows a bullish reversal signal, the reliability of which is medium.

3.6.2 Moving Averages

Moving averages are a simple technical analysis tool that smooth out the price data by creating a constantly updated average price, which is calculated over a period. All the data points of a stock over a period are summed up and divided by the number of data points to arrive at an average. This average is called a moving average since; it is continuously recalculated based on the latest price data (Taylor, 2023). An indication to buy occurs when the price of a stock moves above the moving average line and an indication to sell when the price falls below the moving average line (Taylor, 2023). The length of a moving average depends on the trader's financial objective and time horizons. Generally used moving average time frames are depicted in the table below:

Table 6: Moving Average Time Frames

Type of Trading	Type of Moving Average	SMA	EMA
Intraday Trading	Slow Moving Average	13 Periods	20 Periods
	Fast Moving Average	5 Periods	5 Periods
Swing Trading	Slow Moving Average	50 Periods	50 Periods
	Fast Moving Average	20 Periods	12 Periods

Source: Prepared by researcher

There are two basic forms of moving averages, which are mentioned below:

3.6.2.1 Simple Moving Average (SMA)

The recent price data is added up and divided by the number of periods to get the simple moving average (Maverick et al., 2022). This number can be calculated for the open, close, high, and low prices, among others. The most commonly used prices are the closing prices for finding out the averages. The formula for calculating SMA is as follows (Maverick et al., 2022):

$$SMA = \frac{(A1 + A2 + ...An)}{n}$$

Where A is the average price in period n and n is the number of periods.

Equation 6: Computation of Simple Moving Average

SMA helps to determine buy and sell signals for traders. Swing traders and positional traders can use SMA (Taylor, 2023). The interpretation of the simple moving average is as follows (Taylor, 2023):

(a) Price above the SMA – Bullish
(b) Price below the SMA – Bearish
(c) SMA sloping up – Bullish.
(d) SMA sloping down – Bearish.

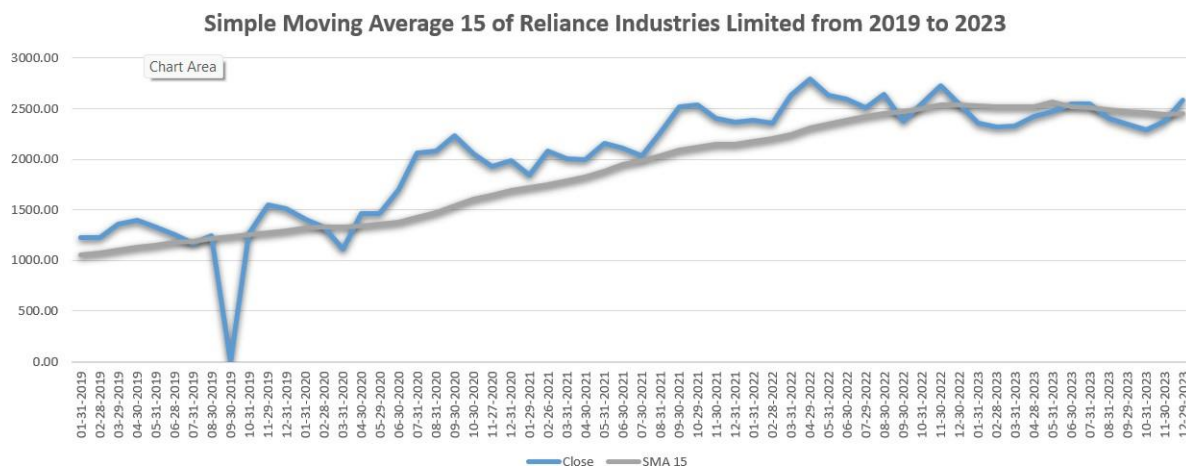The following chart figure depicts a simple moving average.

Figure 13: Interpretation of Simple Moving Average (SMA)
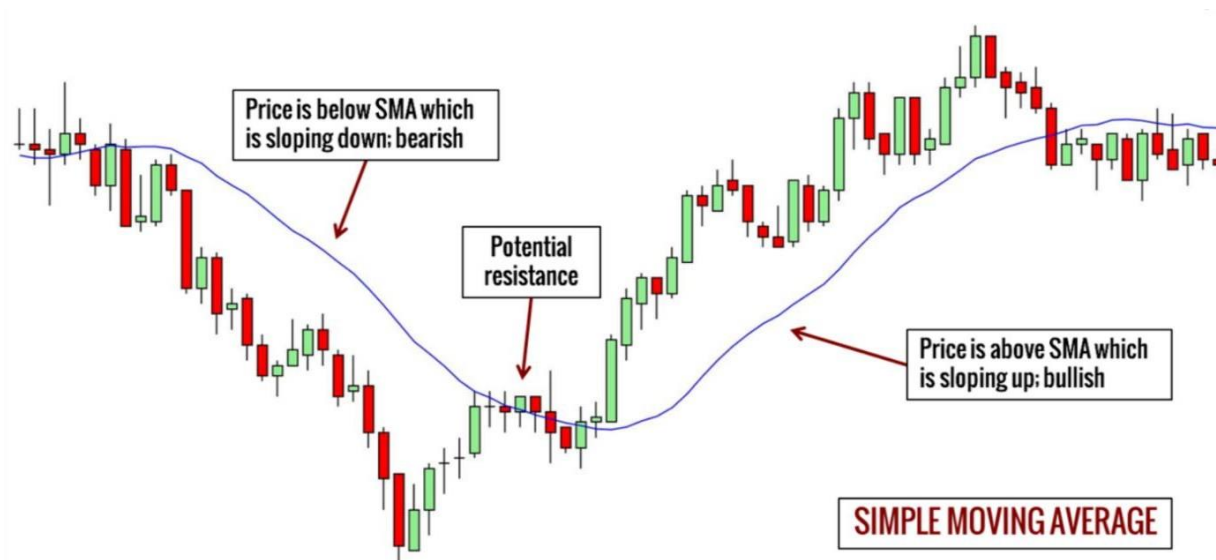
Source: Woods, 2014

The figure below depicts the simple moving average of Reliance Industries Limited shares from the year 2019 to 2023 on the monthly close prices of the share.

Graph 10: SMA 15 of RIL from 2019 to 2023 on Monthly Close Prices

Source: Prepared by researcher from India Stock Market.

It can be inferred from the chart above that for most of the period, the price of the share is above the SMA 15. However, there are some instances when the price of the share is below the

SMA, which indicates a bearish signal. On the other hand, when the price of the share strikes through the SMA, there are chances of potential resistance in the share prices.

3.6.2.2 Exponential Moving Average (EMA)

Technical analysts frequently employs the second kind of moving average, known as an exponential moving average, which gives greater weight to the most recent price points. (Maverick et al., 2022). EMA is more responsive to the latest prices of a stock (Taylor, 2023). The calculation of EMA involves three steps, which are:

(d) Compute the SMA

$$\text{SMA} = \frac{(A1 + A2 + \ldots\ldots\ldots An)}{n}$$

Where A is the average price in period n and n is the number of periods.

(e) Calculate the multiplier for weighing the EMA

$$= \frac{2}{(\text{selected time period} + 1)}$$

(f) Calculate the current EMA

$$= Price(t) \times k + EMA(y) \times (1 - k)$$

Where t = today, y = yesterday, N = number of days in EMA, k = 2÷(N+1)

Equation 7: Computation of Exponential Moving Average

EMA is used to provide a trade direction. They are generally used by traders doing intraday trading and scalping. The following is a depiction of an EMA.

Figure 14: Interpretation of Exponential Moving Average (EMA)
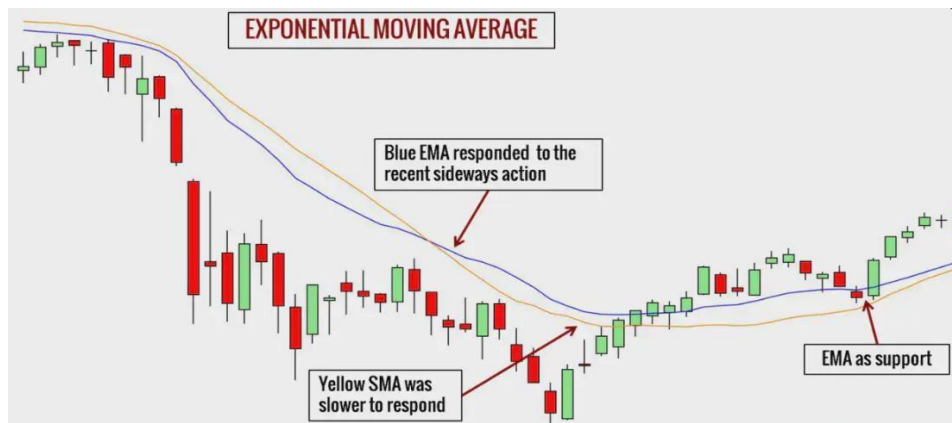
The interpretation of the EMA is the same as that of the SMA, which is shown as below:

    (a) Price above the EMA – Bullish

    (b) Price below the EMA – Bearish

    (c) EMA sloping up – Bullish.

    (d) EMA sloping down – Bearish

The moving average is one of the most basic types of price-based technical indicators. Moving averages are a useful tool for traders as they may quickly and readily validate possible trend reversals by complementing candlestick patterns with moving averages. Finding potential swing trading chances involves analyzing how the current stock price and the simple moving average relate to one another (Bhatt, 2023). If the current price is above the simple moving average, the signal is a potential uptrend and an opportunity to enter long position (Bhatt, 2023). On the contrary, if the current stock price is lower than the simple moving average, the signal is a potential downtrend and an opportunity to enter a short position (Bhatt, 2023).

The figure below depicts exponential moving average of Reliance Industries Limited shares from the year 2019 to 2023 on the monthly close prices of the share.

Graph 11: EMA 50 of RIL from 2019 to 2023 on Monthly Close Prices

Exponential Moving Average 50 of Reliance Industries Limited from 2019 to 2023
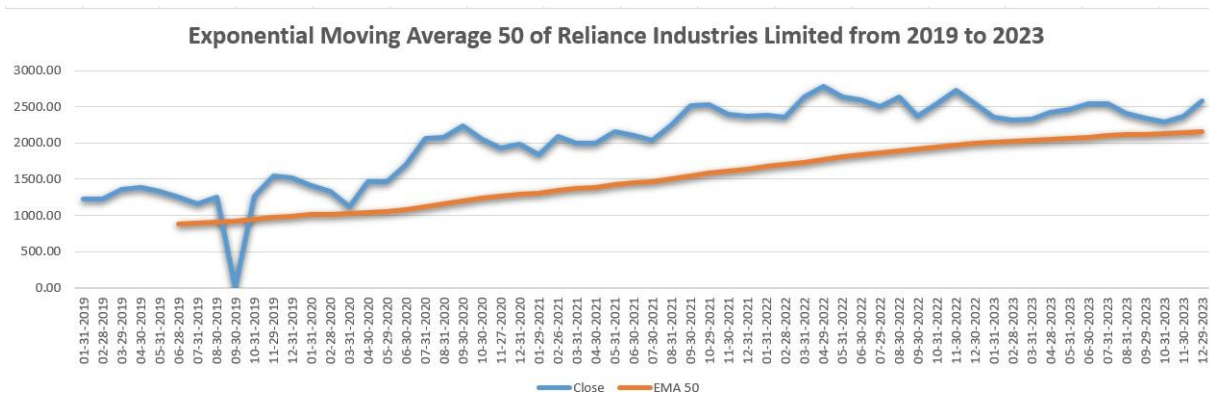
Source: Prepared by Researcher from NSE India.

The preceding chart suggests that the share price has been above the EMA 50 for the most of the period. Nonetheless, there are times when the share price is below the EMA, indicating a bearish indicator. However, there is a possibility that the share prices will encounter resistance when the share price crosses the EMA.

3.6.3 Moving Average Convergence Divergence (MACD)

Gerald Appel created a new technical indicator known as the Moving Average Convergence Divergence in the 1970s with the goal of revealing information about the direction, momentum, and strength of a security (Pines, 2022). Trend continuity in stock prices is understood using the Moving Average Convergence Divergence (MACD) indicator.

Two EMAs, one calculated over a shorter period of time and the other over a longer period, are compared by the MACD. The MACD line, which shows the difference between the larger (26 days) and shorter (12 days) EMAs, is used to determine shifts in a stock's momentum and trend. The nine-day EMA is the signal line (Polly, 2021). The trend is expected to continue if the MACD line and the signal line converge (Polly, 2021). A possible trend reversal is indicated if, on the other hand, the two lines diverge. The formula to calculate the MACD is as follows (Polly, 2021):

    a.   MACD Line = 12-period EMA - 26-period EMA
   b.   Signal Line = 9-period EMA of MACD Line

Equation 8: Computation of MACD

The 12-day EMA is above the 26-day EMA when the MACD is positive, indicating an upward trend. (Polly, 2021). Likewise, negative MACD values indicate that there is increasing bearish

momentum since the 12-day EMA is below the 26-day EMA (Polly, 2021). The depiction of the MACD is as follows:

Figure 15: Interpretation of Moving Average Convergence Divergence (MACD)
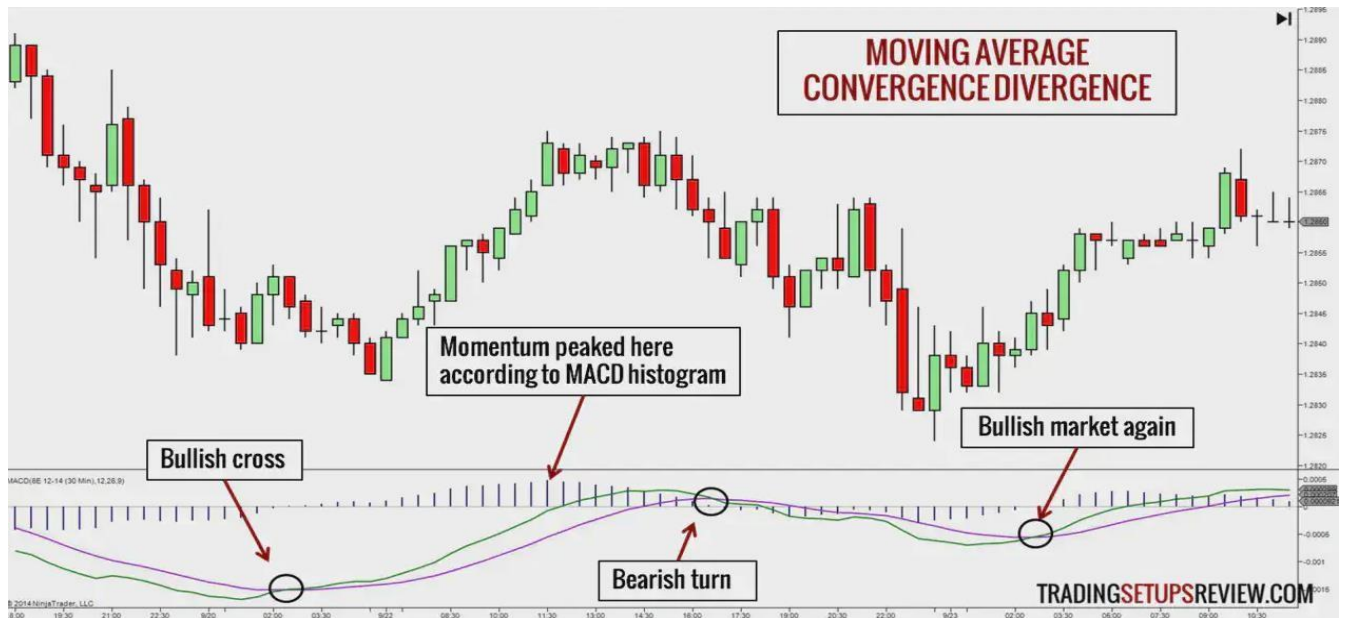
Source: Woods, 2014

The MACD is one of the most intuitive technical indicators as it amplifies the value of the moving averages to track both the trend and the momentum. In a trending market, the space between two different moving averages expands and therefore the MACD works. The value of MACD rises in a bull market and falls in a bear market. The interpretation of the MACD is as follows (Polly, 2021):

MACD above the signal line – Bullish

MACD below the signal line – Bearish

The MACD histogram is constructed by deducting the signal line from the MACD line. The momentum of the market is highlighted by a histogram which is interpreted as follows:

High positive histogram values – Strong bullish momentum

High negative histogram values – Strong bearish momentum

By highlighting buy and sell signals, the MACD functions as a momentum indicator to assist traders in determining the pulse of the market. The MACD histogram is frequently used by traders to identify overbought and oversold trends as well as to determine when the momentum is more bearish or bullish. The histogram graphs the distance between the MACD and its signal line. Since the MACD is based on the EMAs it is very sensitive to changes in the current price move.

3.6.4 Relative Strength Index (RSI)

A trading instrument called the RSI can assist a trader in determining when a stock is overbought and prepared for a price decrease as well as when a stock is oversold and prepared for a price gain. (Wendorf, 2022). The Relative Strength Index (RSI) was developed by the famous mechanical engineer J. Welles Wilder (Wendorf, 2022). In order to determine whether the stock is more likely to move in the index's direction or in a different direction, the price gains and losses are averaged over a 14-day period (Wendorf, 2022). The RSI is a number between 0 to 100. An RSI above 50 indicates a positive momentum, signalling an increase in the prices. An RSI below 50 indicates that a stock is losing momentum and the price will continue to decrease. The formula for calculating the RSI is as under (Istigechev, 2022):

(a). RS Calculation

$$= \frac{\text{Average Gain}}{\text{Average Loss}}$$

(b). RSI

$$= 100 - \frac{100}{1 + \text{RS}}$$

(c). Initial Average Gain

$$= \frac{Sum\ of\ Gains\ over\ the\ past\ 14\ days}{14}$$

(d). Initial Average Loss

$$= \frac{Sum\ of\ Losses\ over\ the\ past\ 14\ days}{14}$$

(e). Average Gain

$$= \frac{[(Previous\ Avg.Gain * 13)\ +\ Current\ Day's\ Gain]}{14}$$

(f). Average Loss

$$= \frac{[(Previous\ Avg.Loss * 13)\ +\ Current\ Day's\ Loss]}{14}$$

Equation 9: Computation of RSI

When the magnitude and quantity of closes rise, the RSI will rise; conversely, when they fall, the RSI will fall (Barrantes, 2023). The following figure shows the RSI.

Figure 16: Interpretation of Relative Strength Index (RSI)

Source: Woods, 2014

A rising RSI signals that a stock is moving up at a very fast pace. On the other hand, a falling RSI signals that a stock is moving down at a very fast pace. The interpretation of the RSI is as follows (Istigechev, 2022):

RSI value above 70 – Overbought, signal to sell.

RSI value below 30 – Oversold, signal to buy.

The RSI is primarily used by traders to get signals about overbought and oversold conditions in a market. However, it is not sure, that the overbought and oversold securities turn around the same way, so it is always helpful to get a confirmation from another trade signal before any trading decision is made.

3.6.5 Combination of Strategies

Any competent trader will use a combination of many technical indicators to base their trading decisions on. Profit can be gained easily in swing trades using a combination of various indicators like moving averages, RSI and MACD to confirm the signals which are generated by the candlestick patterns. Some of the ways in which technical indicators aid in making trading decisions are mentioned below:

1. The bullish engulfing pattern can be used along with the RSI indicator to verify that the stock is oversold and ready for a trend reversal (Batson, 2023).

2. Appearance of a bullish candlestick pattern during a downtrend along with a price below the 200-day moving average is not a strong signal to buy a stock and enter a long position (Batson, 2023).

3. If the price is above the 200-day moving average, it is a confirmation of a bullish signal which is provided by the candlestick pattern (Batson, 2023).

4. In a bearish candlestick pattern during an uptrend, with the RSI in the overbought zone, can confirm the potential reversal and indicate a sell signal (Batson, 2023).

5. The moving average works like a dynamic support line, so any bullish reversal candlestick patterns around these have higher chances of success (Groette, 2023). After a pullback to the moving average, bullish reversal candlestick patterns will appear. The idea is to find a bullish reversal signal in an oversold situation, when indicators like the RSI are low suggesting the right time to buy (Groette, 2023).

6. The moving average works like a dynamic resistance line, so any bearish reversal patterns around these have higher chances of success (Groette, 2023).

Incorporation of the technical indicators with the candlestick patterns can help traders to gain a more comprehensive analysis of the market.

4. Practical Part

The aim of this thesis is to find out, the use of which technical indicator generates a profitable trade using back testing strategy of historical price data. Historical share price data for Reliance Industries Limited, which is listed on the National Stock Exchange of India (NSE), was pulled out for the period 01/01/2019 to 31/12/2023. The following data points were included in the historical price data which yielded a total of 1238 data sets:

Date, Open Price, High Price, Low Price, Close Price, and Volume.

The excel sheet for these data sets can be found in the Annexure section of this thesis. On the trading platform, wwwtradingview.com, a daily candlestick chart was generated for the period from January 1, 2019, to December 31, 2023. The technical indicators like moving average convergence divergence (MACD) and relative strength index (RSI), were input for data generation. Hovering around each candlestick, revealed the values for each day's MACD and RSI, which were noted down against the date in the excel sheet. After this data was collected on the excel sheet, the MACD and the RSI strategies were applied individually to the data set to see which indicator provided the most profitable trades.

4.1 Moving Average Convergence Divergence (MACD)

The 26-period EMA and the 12-period EMA are the two exponential moving averages that form the basis of the MACD, a momentum indicator used in trend trading (Venketas, 2020). The MACD is represented by two lines on candlestick charts: the MACD line and the signal line, which oscillates with no upper or lower bounds above or below the zero line, the center line. The MACD line fluctuates above and below the zero level, while the signal line oscillates around the MACD line (Venketas, 2020).

It is bullish when the MACD line rises above zero and bearish when it falls below zero. When the MACD line crosses the signal line from below to above, it is bullish; when it crosses the signal line from above to below, it is bearish (Venketas, 2020). When the MACD line crosses over the signal line in the trend direction, it is generally accepted that this is the entry signal for the MACD. The following figure shows how the buy and sell signal is generated when the MACD line crosses the signal line:

Figure 17: MACD Signals to Buy and Sell
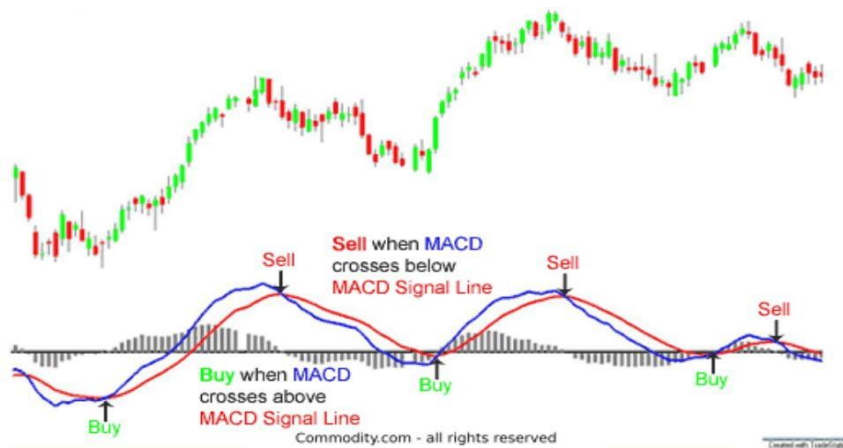
Source: Pines, 2022

The difference between the MACD and the signal line is plotted as a histogram, if the MACD is above the signal line, the bar is positive and if the MACD is below the signal line, the bar is negative. Long positions can be entered when the MACD histogram changes from negative to positive (Venketas, 2020). On the other hand, short positions can be entered when the MACD histogram changes from positive to negative. The buy and sell signals generated from the histogram are shown in the figure below:

Figure 18: MACD Histogram Signals to Buy and Sell

Source: Pines, 2022

The MACD is a widely used technical analysis tool, however it is not devoid of limitations. One of the most prominent limitations of the MACD is that there are high chances that the MACD divergence can provide false reversal signals, meaning it can produce a false positive (Mitchell & Ganti, 2022). Actually, no reversal happens even when the signal was a possible reversal. The reversal signal could indicate a sideways move or a temporary pause, before the trend continues.

The second limitation of the MACD is that it gives inaccurate analysis of a trend most of the times, as trend following signals fail (Mitchell & Ganti, 2022). The third limitation of the MACD is that the divergence does not forecast all the trend reversals, meaning it generates a lot of reversals which don't occur, and there are not enough actual real price reversals (Mitchell & Ganti, 2022).

4.2 Relative Strength Index (RSI)

The velocity and variation of price movement, which fluctuates between 0 and 100, are measured by the momentum oscillator, or RSI. Originally, a market was considered to be overbought when the RSI was above 70 and oversold when it was below 30 (Groette, 2019). The following figure shows very accurately how to use an RSI indicator:

Figure 19: RSI Indicator Strategy

Source: Basi, 2019

In an uptrend market situation, the RSI remains between the range of 40 to 90, which has a support at 40-50 levels. On the other hand, during a downtrend, the RSI hovers between 10

to 60, where 50-60 zone is the resistance level (Groette, 2019). The rules for opening positions based on RSI signals are as under (Groette, 2019):

A short position or sell signal is activated if the indicator's line crosses the level 70 from above.

A long or buy signal is activated if the indicator's line crosses the level 30 from below.

The RSI signal is a leading indicator designed to be used as a filter and not a main instrument. The RSI complements raw price action signals generated from candlestick charts. The strength or weakness of a security's price momentum is indicated by the RSI value that is created between 0 and 100.

The term "RSI trading strategy" refers to a set of guidelines that use the RSI indicator to pinpoint possible trading entries based on momentum shifts or overbought and oversold levels. This indicator is the most suitable for swing traders as it does not support entry signals and long-term trades. The RSI indicator is not flawless. The RSI can give false signals in an economy impacted by low liquidity or sudden news events (Goold, 2023).

It is essential to understand why the news are impacting the security prices as well as the why the market is moving when trading against the trend. The RSI is a lagging indicator which may fail to provide timely signals in a fast-moving market (Goold, 2023). In contrast with other technical indicators the RSI generates fewer trading opportunities to the traders. The RSI can stay in the overbought or oversold territory for a longer period, which means that it can lead to considerable losses (Goold, 2023).

4.3 Trading Strategy based on MACD Values of RIL Shares

The historical price data of Reliance Industries Limited which was plotted on an excel sheet was used as the main dataset for finding out profitable trades using the MACD strategy. As mentioned earlier, the daily candlestick chart for the last five years from January 1, 2019 to December 31, 2023 was pulled out from the website. Technical indicator MACD was fed into the chart which showed the MACD values on the chart for the last five years. The results generated from the charts are displayed below:

Figure 20: MACD Values for RIL Share Listed on NSE from 01.01.2019 to 31.12.2023
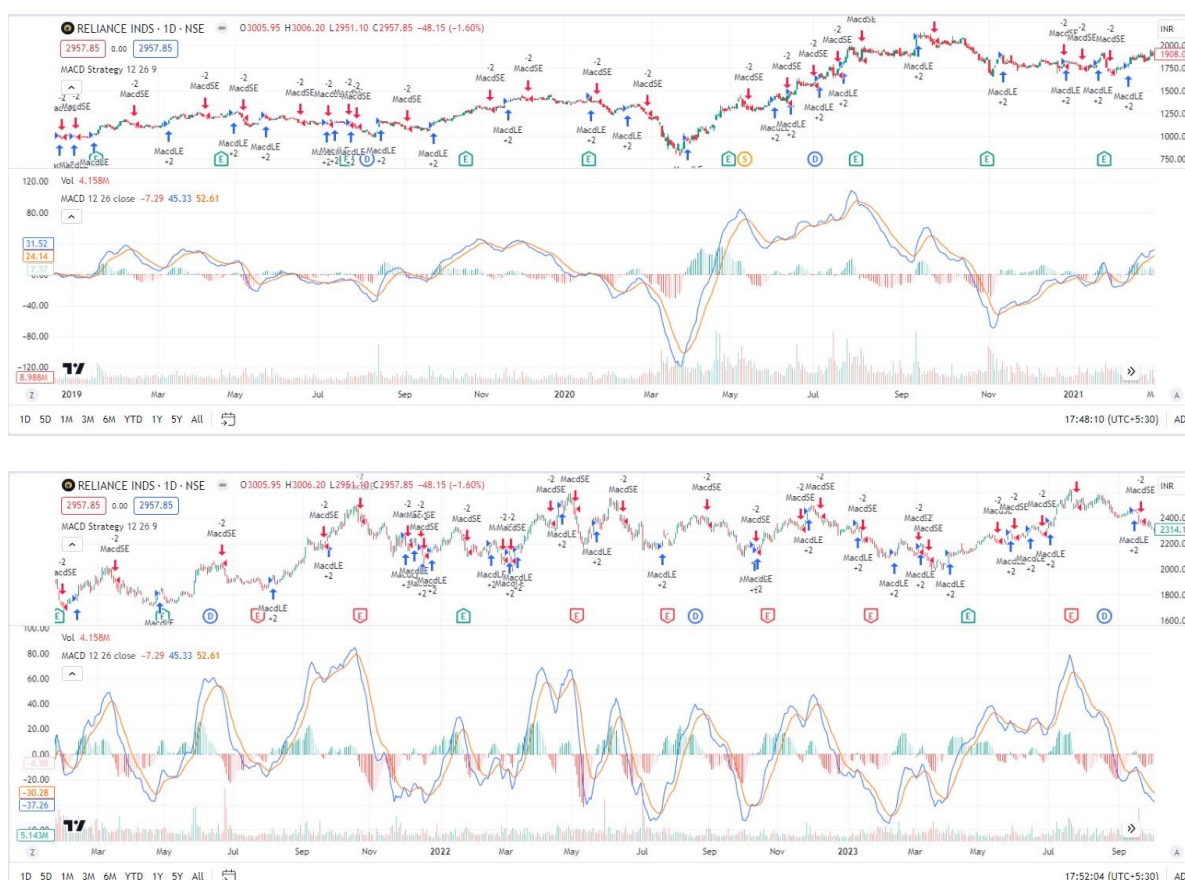

Source: Trading View

The MACD values were noted down from these charts in an excel sheet and wherever the MACD line crossed the signal line, a signal for buy or sell was generated which was noted down in the excel again. This was again double confirmed from the histogram values. When the histogram changed from positive to negative it was a sell signal and when it changed from negative to positive, it was a buy signal. Out of the data set of 1238, MACD indicator gave 94 signals of buy and sell.

According to the buy or sell signal generated using the MACD parameter, trades were made using the initial capital of INR 10,000. The open and the close prices were considered to enter long or short positions as per the case. Each trade was either a winning trade or a losing trade depending on the profit or loss it made from the sell or purchase of the Reliance Industries Limited shares. The profit or loss from each trade is depicted on the graph below for the period of five years from 2019 to 2023, which generated a total of 94 signals.

Graph 12: Profit or Loss from Trade using MACD
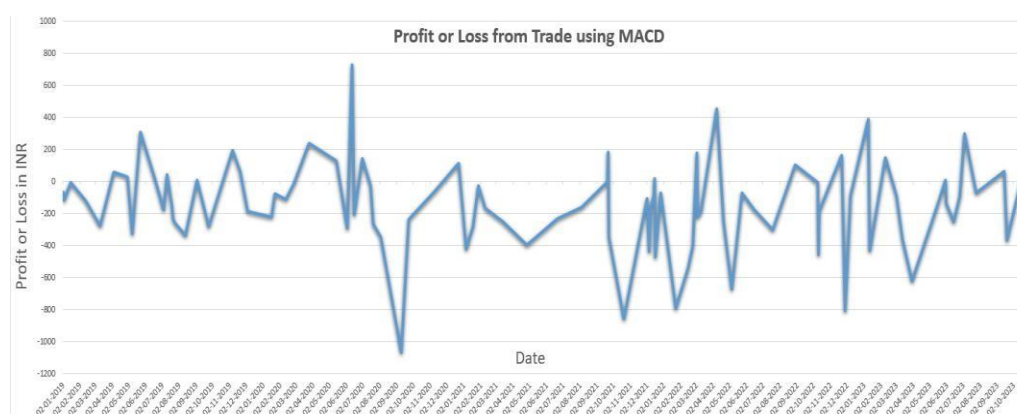
Source: Prepared by Researcher from NSE India

At first glance, the figure above gives the impression that there was more prominent loss than profit from using the signals generated from using the MACD technical indicator. This impression is confirmed by the figure below which shows the yearly loss through the trading decisions using the MACD indicator strategy.

Graph 13: Yearly Loss using MACD Strategy
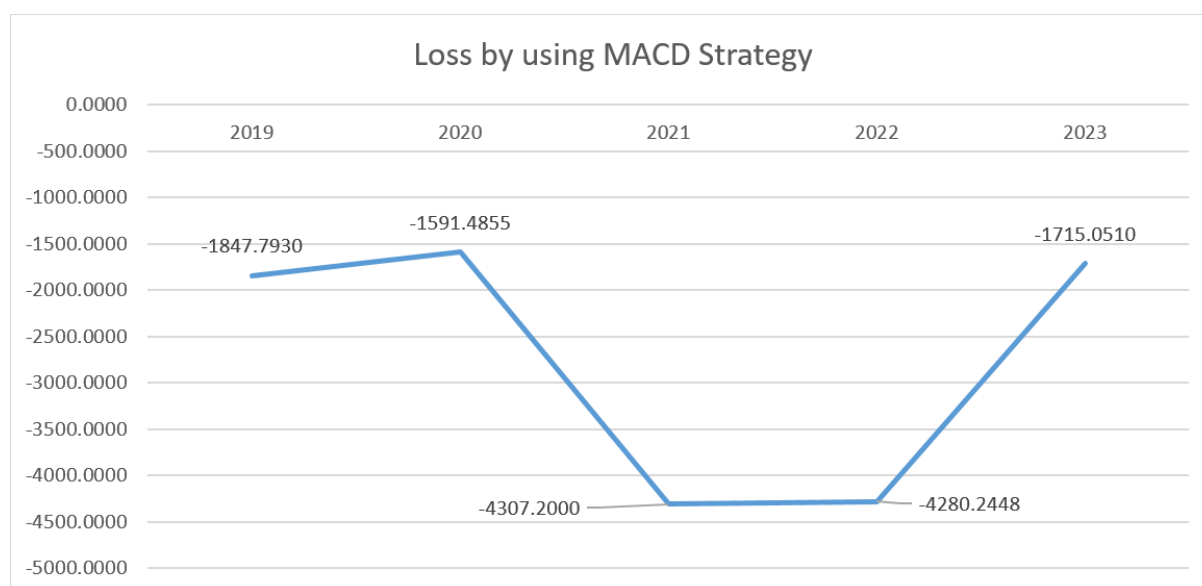
Source: Prepared by researcher from NSE India

The historical data of the Reliance Industries Limited share prices reveal that the share of RIL trading was not very profitable using the MACD strategy. It can be seen from the figure above that the loss from an INR 10,000 investment was about INR 1847.7930 in the year 2019, which stooped as low as a loss of INR 4307.2000 in the year 2021 and recovered to a loss of

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INR 1715.0510 in the year 2023. It is noteworthy to mention here that the period of 2019 to 2023 had a lot of uncertainties which influenced the share prices, the major of them being the novel Corona virus which upturned the entire global society and particularly threw the entire Indian nation of 1.4 billion people into a lockdown for many days in a row. The figure below shows the yearly loss from trades of Reliance Industries Limited shares using the MACD strategy:

Table 7: Loss from Trade using MACD Strategy

Year	Loss from Trade in INR	% Change in Loss
2019	-1847.7930	
2020	-1591.4855	-13.8710
2021	-4307.2000	170.6402
2022	-4280.2448	-0.6258
2023	-1715.0510	-59.9310

Source: Prepared by researcher

The table above clearly shows that all the five years from 2019 to 2023 generated a loss on the investment, with the highest loss in the year 2021. The trading strategy using MACD suffered an overall loss in all the years, while showing a significant recovery of around 59.93% in the year 2023 from a huge loss in 2022.

4.4 Trading Strategy based on RSI Values of RIL Shares

The historical price data of Reliance Industries Limited which was plotted on an excel sheet was used as the main dataset for finding out profitable trades using the RSI strategy. As mentioned earlier, the daily candlestick chart for the last five years from January 1, 2019 to December 31, 2023 was pulled out from the website. Technical indicator RSI was fed into the chart which showed the RSI values on the chart for the last five years. The results generated from the charts are displayed below:

Figure 21: RSI Values for RIL Share Listed on NSE from 01.01.2019 to 31.12.2023
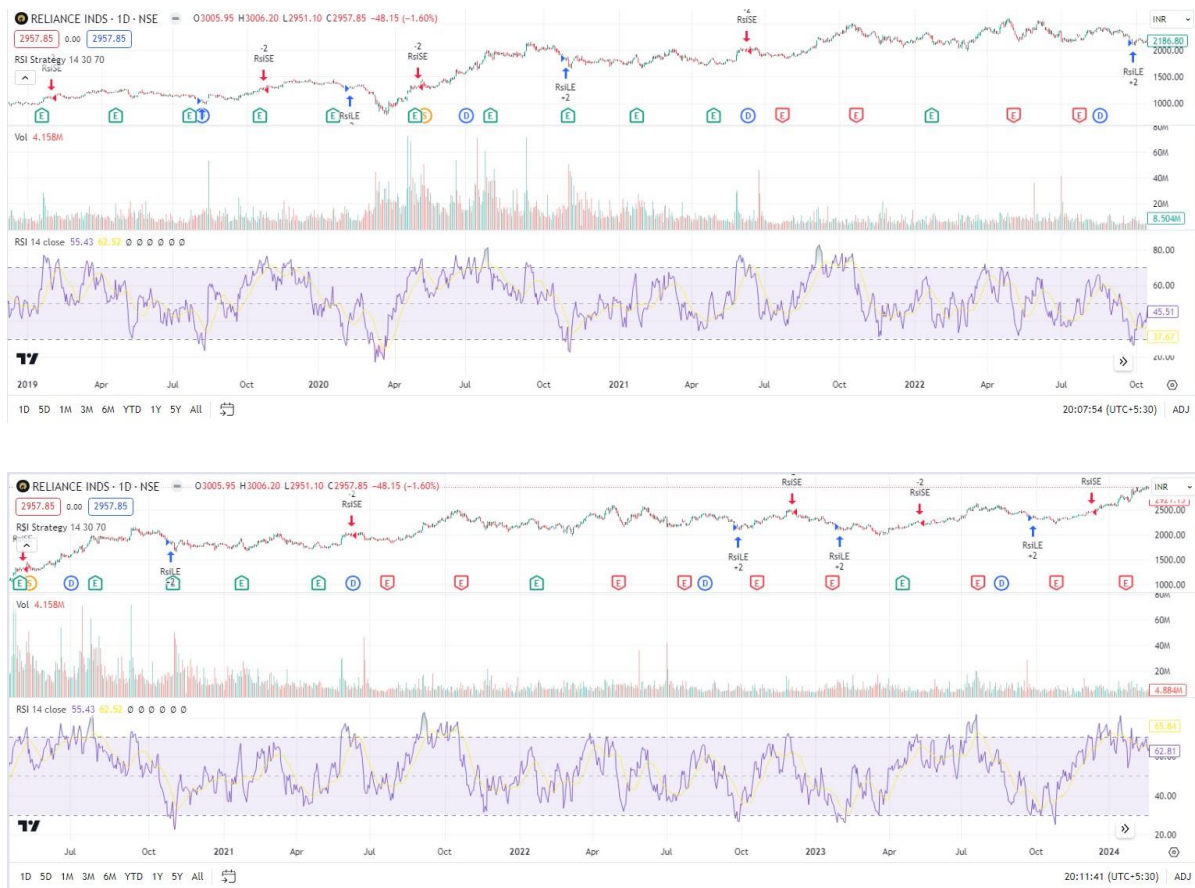
Source: Trading View

The RSI values were noted down from these charts in an excel sheet and wherever the RSI crossed the 30 or the 70 value, a signal for buy or sell was generated which was noted down in the excel again. Out of the data set of 1238, RSI indicator gave 35 signals of buy and sell.

According to the buy or sell signal generated using the RSI parameter, trades were made using the initial capital of INR 10,000. The open and the close prices were considered to enter long or short positions as per the case. Each trade was either a winning trade or a losing trade depending on the profit or loss it made from the sell or purchase of the Reliance Industries Limited shares. The profit or loss from each trade is depicted on the graph below for the period of five years from 2019 to 2023, which generated a total of 35 signals:

Graph 14: Profit or Loss from Trade using RSI
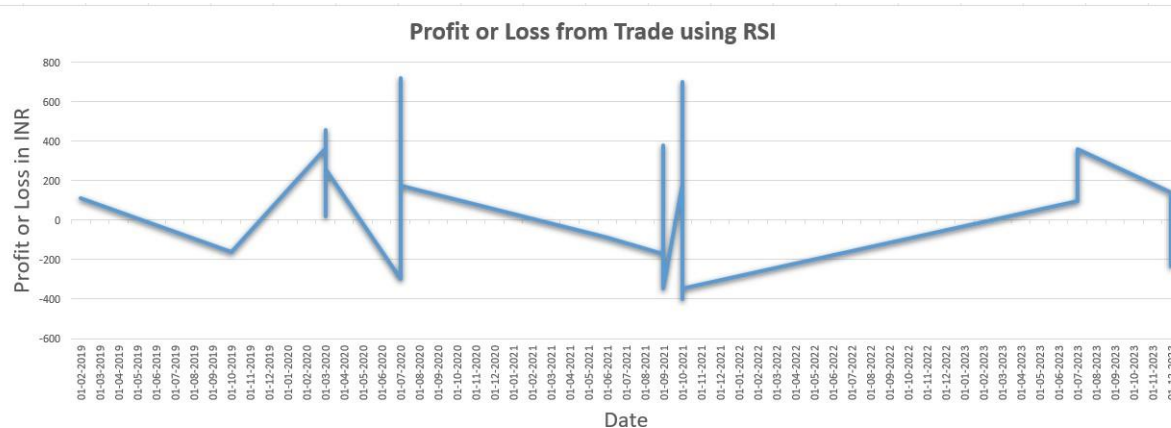
Source: Prepared by researcher from NSE India Data

At first glance, the figure above gives the impression that there was more prominent profit than loss from using the signals generated from using the RSI technical indicator. This impression is confirmed by the figure below which shows the yearly profit or loss through the trading decisions using the RSI indicator strategy.

Graph 15: Yearly Profit or Loss using RSI Strategy

Source: Prepared by researcher from NSE India Data

The historical data of the Reliance Industries Limited share prices reveal that the share of RIL trading was profitable using the RSI strategy. It can be seen from the figure above that the loss from an INR 10,000 investment was about INR 45.7294 in the year 2019, which

magnanimously recovered as a profit of INR 1832.6617 in the year 2020 and plummeted to a profit of INR 2008.3665 in the year 2021. The RSI strategy did not generate any signals for the year 2022, therefore there is no profit no loss of the investment in that year. It is noteworthy to mention here that the period of 2019 to 2023 had a lot of uncertainties which influenced the share prices, the major of them being the novel Corona virus which upturned the entire global society and particularly threw the entire Indian nation of 1.4 billion people into a lockdown for many days in a row. The figure below shows the yearly profit or loss from trades of Reliance Industries Limited shares using the RSI strategy:

Table 8: Profit or Loss from Trade using RSI Strategy

Year	Profit or Loss from Trade in INR
2019	-45.7294
2020	1832.662
2021	2008.367
2022	NA
2023	15.84271

Source: Prepared by researcher

The table above clearly shows that the year 2019 generated a loss from the trading strategy using the RSI indicator. On the other hand, the years 2020,2021 and 2023 generated profits with the year 2021 as a stellar performer. The year 2022 did not generate any trade signals, so the value is shown as NA meaning not applicable.

4.5 Calculation of Profit or Loss based on Strategy.
The assumptions made for the purpose of profit or loss calculation are as follows:

Trading Amount INR 10,000

Trading Units 9, taking into consideration the units bought on 01.01.2019 at the opening price of INR 1011.938

   a. **Entry:** Sell and Buy at Close Price

b. **Exit:** Buy and Sell at Open Price

c. **Winning Trade:** There is a profit from the trade.

d. **Losing Trade:** There is a loss from the trade.

e. Percentage of Profitable Trades

$$= 100 * \frac{\text{Winning Trades}}{\text{Closed Trades}}$$

f. Profit Factor: The amount of money the strategy made for every unit of money it lost.

$$= \frac{\text{Gross Profit}}{\text{Gross Loss}}$$

g. Maximum Drawdown: The measure of a stock's downside risk over a specific period.

$$= 100 * \frac{(\text{Greatest Loss} - \text{Greatest Profit})}{\text{Greatest Profit}}$$

h. Average Profit

$$= \frac{\text{Total Profit}}{\text{Number of Winning Trades}}$$

i. Average Loss

$$= \frac{\text{Total Loss}}{\text{Number of Losing Trades}}$$

j. Average Profitability Per Trade (APPT) or Statistical Expectancy

$$= \frac{\text{Net Profit (Net Loss)}}{\text{Closed Trades}}$$

OR

$$= \text{Win Rate} * \text{Average Win} - \text{Loss Rate} * \text{Average Loss}$$

k. Mathematical Outcome or Expectation

$$= \frac{Expectancy}{Average\ Loss}$$

The description of the data is shown in the table below:

Table 9: Calculation of Profit from the MACD and RSI Strategies

Parameter	MACD	RSI
Signals Generated (Closed Trades)	94	35
Buy Signals	44	5
Sell Signals	50	30
Winning Trades	25	24
Losing Trades	69	11
% of Profitable Trades	26.5957%	68.5714%
Gross Profit	INR 4128.05117	INR 6225.33588
Gross Loss	INR -17869.82548	INR -2414.19445
Total Profit/Loss	INR -13741.77431	INR 3811.14142
Profit Factor	0.2310	2.5786
Average Profit	INR 165.1220	INR 259.3890
Average Loss	INR -258.9830	INR -219.4722
Greatest Profit	INR 725.56091	INR 720.24912
Greatest Loss	INR -1069.54787	INR -398.32313
Maximum Drawdown	47.41%	44.70%
Average Profitability Per Trade (APPT) or Statistical Expectancy	INR -146.189	INR 108.890
Expectation or Mathematical Outcome	0.5645	-0.4914

One of the most practical ways to alleviate risks is the use of a trading strategy with the help of technical indicators. Trading in the stock market requires a strategic outlook and meticulous planning. A trading strategy is a very detailed and specific methodology which defines the price points at which traders enter and exit the markets. Trading does not have a one size fits all approach as a lot is dependent on the trading style of the investor, the risk appetite, level of motivation, dedication, practice, and time, when it comes to choosing and implementing a strategy.

4.6 Equity Curves of Trading Strategies

An equity curve depicts the change in the value of a trading account over a period, which is alternatively known as a net profit and loss account as well (Chen & Anderson, 2022). An equity curve gives a rapid snapshot of the how the strategy has fared in a graphical format. A lucrative strategy is depicted by a constantly positive slope, whereas a losing strategy is denoted by a negative slope. A strong equity curve is characterized by the below features (Sky, 2021):

1. Equal slope

2. Brief and few drawdowns

3. Numerous transactions to make the results statistically significant

4. Jagged edges on the curve

An equity curve plots the cumulative returns of a portfolio over a given period. The x-axis of the curve depicts the time frame while the y-axis denotes the cumulative returns of a strategy over time, which are expressed as a percentage or in the currency values (Sky, 2021). The returns plotted on the equity curve are a net value of the portfolio, meaning that the money paid towards any brokerage and statutory taxes is considered in the calculations and then deducted to arrive at net portfolio values (Sky, 2021). It is very important for a trader to understand the real cost of buying or selling a security on a stock exchange through a broker. Here is the description of the charges which a trader has to take into consideration while entering trades (Centre for Investment Education and Learning, 2024):

1. Brokerage Fee

A flat rate agreed between the parties or a percentage of the value of the contract levied by the broker for the transactions carried out by the investor. The increasing competition in the trading market and the establishment of many brokerages have propelled most of the houses to charge a zero commission on the trades.

2. Securities Transaction Tax (STT)

A mandatory charge levied by the Government of India at the rate of 0.1% of the transaction value for delivery-based equity share trades.

3. Stamp Duty and GST

Stamp duty is charged by the state government at the rate of 0.015% or Rs. 1500 per crore on the buy side. GST is a percentage of the brokerage with a current rate of 9% CGST and 9% IGST.

4. Transaction Charges

A transaction fee charged by the stock exchange on both sides of the trading. The NSE charges a turnover fee of 0.00325%

The turnover fee of the SEBI is charged at 0.0001% or Rs.10 per on buy as well as sell transactions.

5. Depository Participant Charges

Charges levied by the depository participants for safekeeping of the investors' securities. The charge is generally Rs. 13.5 plus GST per scrip irrespective of the quantity of the shares.

6. Capital Gains Tax

The profit earned from the sale of a security is taxed depending upon the holding period as a short-term capital gains (STCG) tax at the rate of 15% or a long-term capital gains tax (LTCG) at the rate of 10%.

All these taxes, combined, show a composite figure of around 0.0016% of the turnover value. The cumulative portfolio value after deducting the brokerage and commission gives the equity values to plot on the curve for each trade. Taking into consideration, zero brokerage and taxes

at 0.0016% of the turnover, the MACD strategy generated a total of INR 4991.25 in brokerage and taxes, while the RSI strategy generated a total of INR 1987.2 in brokerage and taxes.

The net equity curve for the MACD strategy is depicted in the chart below. It shows that the curve is a jagged line, with very less data points above the INR zero mark in the positive section. This indicates that there are very fewer positive trades for the MACD strategy, after the deduction of brokerage and taxes. There are multiple data points which are below the INR zero line, meaning the strategy generated more negative trades after the deduction of brokerage and taxes. The cumulation of portfolio values on this curve gave a total loss of INR 18732.9931 by using the MACD strategy.

Graph 16: Net Equity Curve for MACD Strategy from 2019 to 2023
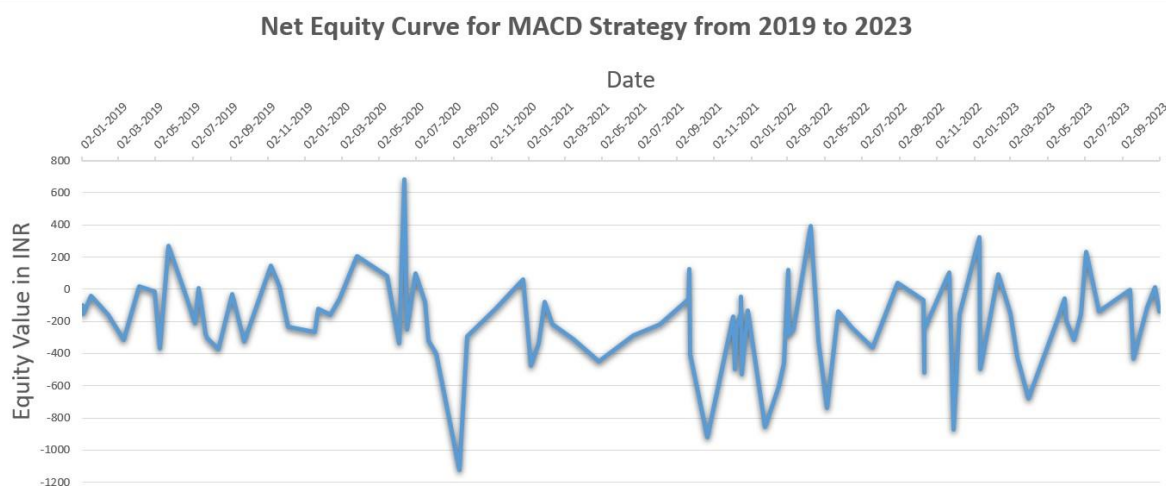
Source: Prepared by researcher from NSE India Data.

The net equity curve for the RSI strategy is depicted in the chart below. It shows that the curve generally sloping upwards, with very less data points below the INR zero mark in the negative section. This indicates that there are very fewer negative trades for the RSI strategy, after the deduction of brokerage and taxes. There are multiple data points which are above the INR zero line, meaning the strategy generated more positive trades after the deduction of brokerage and taxes. It is to be noted on the equity curve, that there are many areas of stagnation on the curve which indicate a period of little to no growth. The cumulation of portfolio values on this curve give a total profit of INR 1823.94142 by using the RSI strategy.

Graph 17: Net Equity Curve for RSI Strategy from 2019 to 2023

Net Equity Curve for RSI Strategy from 2019 to 2023
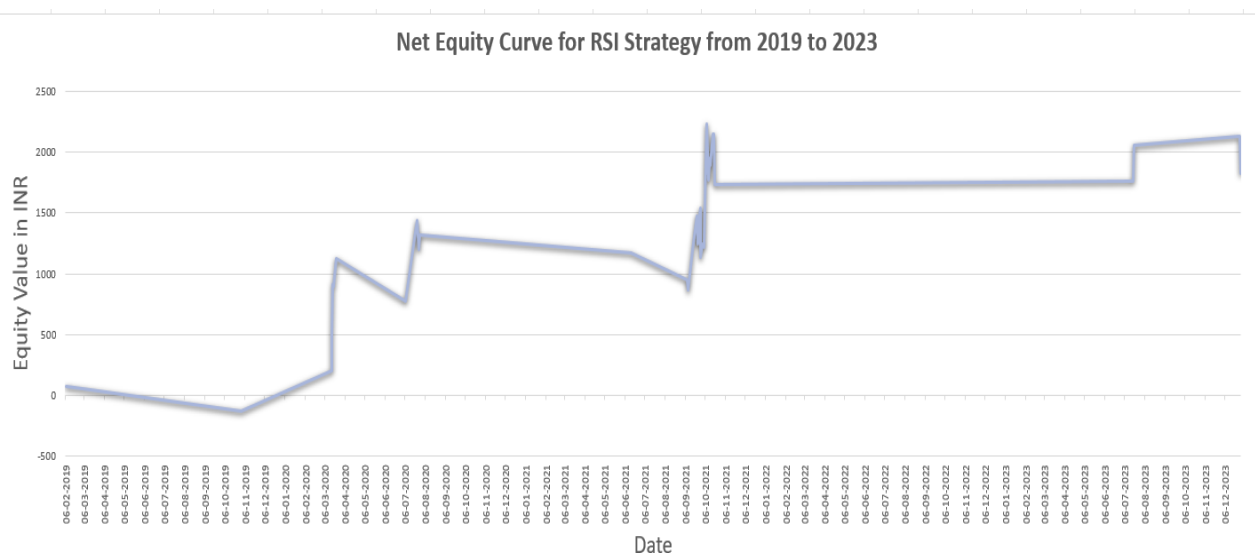
Source: Prepared by researcher from NSE India Data.

The primary use of an equity curve is to evaluate a trading strategy by aiding the traders to understand the performance of their assets overtime by identifying the periods of growth and decline. It also helps the trader to evaluate which trading strategy is producing favorable outcomes, thereby giving the trader a chance to optimize and duplicate an effective strategy, while ignoring the less successful strategies. Along with helping traders for making educated investment decisions and serving as a risk management tool, the equity curve also measures the consistency of the approach. A smooth and upward sloping curve indicates a consistent and strong approach to the market, which in the above case is denoted by the RSI strategy. On the other hand, a jagged curve line denotes a very volatile approach with many extreme peaks and valleys, as is witnessed in the MACD strategy.

5. Discussion and Recommendations

The table above in the earlier chapter indicates that the MACD strategy generated about 94 signals versus 35 signals generated by the RSI strategy from the same data set of 1238 units of price data for the shares of Reliance Industries Limited from the year January 1, 2019, to December 31, 2023. The percentage of profitable trades for the period in consideration is approximately 26.6% for trades carried out using the signals generated from the MACD strategy. Contrary to this, 68.57% of the trades turned profitable from the signals generated from the RSI strategy. These results prove the fact that MACD tends to generate false positives, meaning it gives a lot of signals of reversal, however no real reversal takes place. If traders follow the MACD strategy route, they are likely to generate less profitable trades as in the case of our analysis. The profitable trades from using the signals based on RSI is 68.57% which is almost more than double the number of profitable trades generated from using the MACD strategy.

The signals generated from the MACD strategy gave a loss on an investment of INR 10,000 compared to the RSI strategy, cumulatively over the five-year period. The profit factor, which is the gross profit divided by the gross loss for MACD strategy is 0.2310 and for the RSI strategy is 2.5786. An ideal profit factor should be a number greater than one to have a winning strategy (Soberman, 2018). This indicates that while the RSI strategy made around 2.5 times the money compared to the loss it incurred, the MACD strategy only made 0.23 times the money compared to the loss it incurred. Surprisingly, the greatest profit which was generated from each trade of 9 units from using the MACD and RSI signals, was around the same at INR 725.56 and INR 720.25 respectively. However, the greatest losses from both the MACD and RSI differed significantly. The greatest loss from using the signals generated from the MACD strategy was about INR 1069.55, while the concurrent loss using the RSI strategy signals was around INR 398.32, which is just a little more than one third of the loss from the MACD strategy.

Maximum drawdown (Max DD) represents the downside risk of an asset over a period, which is an asset's largest price drop from a peak to a trough (Hayes & Scott, 2022). It evaluates the amount of the biggest loss in a certain period of time without taking into account the frequency of losses. It is used as a stand-alone metric and is typically represented in percentage terms (Hayes & Scott, 2022). As a result, it doesn't say how long it took the investor to make up the loss or whether their entire investment was returned. The goal of maximum drawdown

is to preserve cash, which is crucial to investors. This metric asseses the riskiness of various stock screening techniques. (Hayes & Scott, 2022). Two or more strategies which have almost the same volatility and average outperformance, can have different maximum drawdowns compared to the benchmark.

The MDD is an important risk metric as it catches the worst-case scenario for an investment, providing an insight into the largest decline in the value of the investment in the times of market turmoil (Tamplin, 2024). Investors prefer a low maximum drawdown as it signifies that the losses from an investment are small. In an ideal situation, where the investment never lost any money, the maximum drawdown will be zero (Tamplin, 2924).On the flip side, the worst possible maximum drawdown is -100% indicating that the investment is not worth any money. To reap the maximum benefit from the maximum drawdown, particular attention needs to be paid to the time in consideration, which should be the same all the screening strategies evaluated (Hayes & Scott, 2022). In the case of the screening strategies used for the shares of Reliance Industries Limited, the maximum drawdown for MACD is 47.41% and for RSI is 44.70%.

The concept of average profitability per trade (APPT) is insightful when comparing trade plans. Basically, it is the difference between the product of the probability of winning trade and average winning trade and the product of the probability of losing trade and average losing trade (Soberman, 2018). The average profitability per trade is also known as the statistical expectancy, which calculates the expected profit per trade in any trading plan. For the purposes of evaluating any trading strategy, based on any indicator, it is advised to examine win rates, average win rate, average loss rate, profit factor and the statistical expectancy.

The robustness of a trading strategy is determined by the expectation also known as the mathematical outcome, which is the statistical expectancy divided by the average loss. This statistic measures how sensitive a trading strategy is to changes in average loss (Soberman, 2018). A robust strategy is in place when the expectation is above 0.5, the strategy is moderately robust, while an expectation below zero, means that the strategy is not worth executing (Soberman, 2018). An expectation ratio that is high, small changes in the average loss will have little impact on net profit. On the other hand, an expectation ratio that is small, small changes in average loss will have a larger impact on the net profits (Soberman, 2018). In the case of MACD strategy, the expectation is 0.5646, while RSI strategy has an expectation of -0.4961. Since the figure for the RSI strategy is less than zero, it means that in this trading

plan, even a small change in the average losses will have a significant impact on the net profits, while for the MACD strategy, it is moderately robust, meaning the strategy should be monitored to make sure that the average loss does not increase.

Table 10: Comparison of Statistics from Each Strategy against Benchmark

Parameter	MACD Strategy	RSI Strategy	Benchmark
% of Profitable Trades	26.5957%	68.5714%	50% or more
Profit Factor	0.2310	2.5786	Good above 1.5 Ideal above 2
Total Profit/Loss	INR -13741.77431	INR 3811.14142	Positive Number
Maximum DD	47.41%	44.70%	As low as possible, ideally less than 25%
APPT	INR -146.189	INR 108.890	Positive Number
Expectation	0.5645	-0.4914	Above 0.5

Source: Prepared by researcher

The above table indicates the most employed statistics to compare two trading strategies. Comparing the statistics with one another and with the benchmark, it is inferred that the trading strategy using RSI as the technical indicator is more profitable compared to the MACD strategy since it gives a higher percentage of profitable trades, a profit factor above 2.5, a positive number in profit, a lower maximum drawdown compared to the MACD strategy and a positive average profitability per trade. The only statistic where the RSI fares below the MACD strategy is the expectation which is the mathematical outcome generated to test the robustness of the trading plan. Since the expectation for RSI is lower than zero, it means that small changes in average losses will have a higher impact on the overall profits. It is safely concluded that the RSI can be a useful strategy to trade the shares of Reliance Industries Limited as a swing trading strategy.

The selection of the right stock for the purposes of profitable trading is the first and the most important step for a trader. Trading does not have a one size fits all approach as a lot is dependent on the trading style of the investor, the risk appetite, level of motivation, dedication, practice, and time. Technical indicators are used extensively by investors or traders to make profitable trades, however there are a multitude of indicators which can overwhelm a trader or investor. There is no need to master all the trading indicators, however each investor or trader should be aware about at least one price moving averages like the simple moving average or the exponential moving average, one trading oscillator like the relative strength index and one trend indicator like the moving average convergence and divergence.

One of the most important factors while selecting a trading strategy based on the technical indicators is the accuracy of the forecasting. Experienced as well as novice investors traders extensively use the MACD and RSI to depict the relationship between two moving averages of a stock (Aggarwal, 2020). In the practical part of this thesis, the researcher made use of the MACD and the RSI strategy to compare both for profitability. The MACD is a lagging indicator which filters out the noise in the short-term market movements and confirms long term trends. A signal is provided by the two moving averages in the MACD only when they cross each other, by which time, the trend is already started and in motion (Aggarwal, 2020). This will indicate that there will be junctures where the market price may reach a reversal point ahead of a signal generation which is understood as a false signal (Aggarwal, 2020). The MACD is proved to be a very successful indicator in widely swinging markets. The RSI is a leading indicator, indicating the potential future changes in the price of an asset. The idea of RSI is simple, it will increase when the number and size of the positive closes rises and vice versa. There is a possibility that the market will sustain in the overbought and oversold territory for long time periods, when the RSI is used, without any signs of reversal (Aggarwal, 2020). Therefore, while trading with the RSI it is important to have risk hedging strategies like stop losses and limits. The power of the current market buys or sell actions is depicted by the RSI.

The goal of both the MACD and RSI based trading strategies is to aid traders understand the stock's recent trading activity, by identifying trends and opening positions according to the direction of the trend. However, both the MACD and the RSI accomplish this goal by using different approaches, although they both measure market momentum by measuring different factors, which sometimes gives contrarian indications as was the case in this thesis. While the MACD is renowned for spotting trends and momentum in the market, the RSI is better off at detecting overbought and oversold conditions. The choice between MACD and RSI depends a

lot on the individual trading style and goals of an investors. MACD is more suitable if a trader prefers trend following strategies, while RSI is for those who like to play around trade reversals and range bound markets. Trading decisions of buying, selling, or holding a security are made on the basis of the weight of the technical evidence by traders who use technical analysis for their trading strategies, which corroborates the fact that no single technical indicator can be used in isolation (Anand, 2016). For better success in trading, traders should look for a confirmation from other technical indicators and then only imitate action in the direction of the signal. It is always recommended that a trader use multiple indicators in conjunction with one another to confirm the signals and mitigate the risk of the false signals, thereby increasing the chances of profitable trades in an ever-changing stock market.

6. Conclusion

Capital markets are essential for any economy as they are a reliable source of cash and liquidity and help to reduce the cost of doing business, bringing the borrowers and lenders together in an effective way. Capital markets allow trading of the funding instruments like shares, debentures, debt instruments, bonds, and the like. There are two components of the capital market, the primary market, and the secondary markets. The primary markets create long-term financial instruments through which funds are raised by corporate entities. The secondary markets on the other hand are the aftermarkets in which previously issued financial instruments are bought and sold. The financial instruments that are traded in the secondary market are mainly stocks and bonds.

The secondary market is often known as the stock market because it is on this platform that the trading of the securities takes place between the investors without the involvement of the issuing companies. The market forces determine the prices of the stocks in this market and provides the investors with liquidity. This market is a great platform for investors to make good returns and a great way to build wealth. The stock market has the potential to help investors make a lot of money, but it needs thorough stock investment analysis. Depending on the time horizon that an investor wants to stay invested in the market, there is fundamental analysis and technical analysis. Fundamental analysis is used to pick up stocks for the longer term while technical analysis is used for short term and medium term holding. Technical analysis is a trading discipline, which is used for analyzing and forecasting the direction of the prices by studying the past market data of prices and volume. It attempts to predict the future movements in price, equipping the traders with information needed to make profits. Chart patterns and statistical indicators are two most common forms of technical analysis. The past trading activity as well as changes in the price of a security are valuable indicators of a stock's future price movements.

The purpose of this technical analysis thesis is to employ technical analysis tools like chart patterns and statistical indicators to find out the price direction of the Reliance Industries Limited shares in the future and develop trading strategies which are profitable for short, medium, or long term. To achieve this aim, this thesis is divided into various chapters like methodology, literature review, practical part and discussion and recommendations. The methodology section provides an understanding of how the thesis was conducted allowing readers to check whether the approach was accurate and dependable. The literature review talks

about the basic understanding of a stock market, the evolution of the stock market, the participants in the stock market, a snapshot of Reliance Industries Limited, an analysis of the stock market consisting of the fundamental and technical analysis and an understanding of the trading strategies. Technical analysis is a very comprehensive area of study and there are numerous charts and indicators which have been developed by people over the years, which are highly popular in the trading circuit. An explanation of the vast array of the charting tools and technical indicators is beyond the scope of this thesis. However, this thesis has touched upon the most popular charting patterns which are candlestick giving detailed explanation of the engulfing patterns, doji, hammer and hanging man, and morning and evening star. After an explanation of the candlesticks, the researcher has explained the two most popular moving averages, which are the simple moving average and the exponential moving average. Later on, two technical indicators – moving average convergence divergence (MACD) and relative strength index (RSI) are talked about at length.

This thesis provided an understanding of the candlestick chart patterns, moving averages, MACD and RSI. The trading strategy using MACD and RSI was tested using the price data from the last five years and a detailed analysis was conducted to conclude which trading strategy is profitable for the shares of Reliance Industries Limited. Historical share price data for Reliance Industries Limited, which is listed on the National Stock Exchange of India (NSE), was pulled out for the period 01/01/2019 to 31/12/2023. On the trading platform, a daily candlestick chart was generated for the period from January 1, 2019, to December 31, 2023, and MACD and RSI were fed individually as input data. Out of the data set of 1238, MACD indicator gave 94 signals of buy and sell, while the RSI indicator gave 35 signals of buy and sell over the 5-year period.

On a capital of INR 10,000 the MACD strategy generated a loss of INR 13741.77431, while the RSI strategy generated a profit of INR 3811.14142 from the trading signals generated from both the strategies over the five-year period. The trader faces charges of brokerage and statutory taxes, which are considered for the purposes of evaluating the exact net profit or loss from the portfolio value, depicted by the equity curve. In today's competitive markets, most of the brokerage houses do not charge any brokerage on delivery. However, the statutory taxes account for almost 0.0016% of the total turnover. The MACD strategy had a total of INR 4991.25 in statutory taxes, which left it with a net loss of INR 18732.9931. On the other hand, for the RSI strategy, the total of statutory taxes accounted to INR 1987.2, which reduced the overall profit to a net amount of INR 1823.94142. The MACD strategy generated a profit factor

of 0.2310 while the RSI generated profit factor was 2.5786, which is well above the 2.5 benchmark of the industry. The average profitability per trade (APPT) was a negative number of INR 146.18 for the MACD strategy, while this was a positive number of INR 108.890 for the RSI strategy. Comparing the statistics with one another and with the benchmark, it is inferred that the trading strategy using RSI as the technical indicator is more profitable compared to the MACD strategy since it gives a higher percentage of profitable trades, a profit factor above 2.5, a positive number in profit, a lower maximum drawdown compared to the MACD strategy and a positive average profitability per trade.

The MACD and the RSI are commonly used in technical analysis in various trading strategies, majorly in swing trading. There is no indicator in the technical analysis which is 100% accurate. Traders can combine the MACD and the RSI to maximize the value of the two and get more insights into how the market may move in the future and what it can do next. However, disciplined risk management, meticulous planning, and ongoing adaptation to evolving market conditions are needed by swing traders to book profit from short to medium term swings in the prices of the securities.

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8. List of figures, graphs, and tables

8.1 List of Figures

8.2 List of Graphs

8.3 List of Tables