Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Languages

Bachelor Thesis

Types of investments and investment strategies: A study of India versus Western countries

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Types of investments and investment strategies: A study of India versus Western countries

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Objectives of thesis

The main aim of the bachelor thesis is to identify investment alternatives available in India and Western countries, including equities, bonds, real estate, mutual funds, and alternative investments such as cryptocurrencies.

Methodology

The work consists of two parts – theoretical and practical. The theoretical part will be based on the study of secondary sources. The empirical part will be compiled on the basis of outputs from quantitative/qualitative research.

The proposed extent of the thesis

30 – 40 pages

Keywords

Cryptocurrency, Blockchain technology, Robot advising, Trading, REIT'S, Investor behavior, Forex, Debt investments, Equity investments, Commodities, NFT'S

Recommended information sources

BOGLE, John C. *The little book of common sense investing : the only way to guarantee your fair share of stock market returns.* Hoboken, NJ: Wiley, 2017. ISBN 9781119404507.

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MCMILLAN, Michael G.; PINTO, Jerald E.; PIRIE, Wendy L.; VENTER, Gerhard Van de. *Investments : principles of porGolio and equity analysis.* Hoboken (NJ): Wiley, John Wiley & Sons, Inc., 2011. ISBN 978-0-470-91580-6.

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Declaration

I declare that I have worked on my bachelor thesis titled " Types of investments and investment strategies: A study of India versus Western countries " by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 15-03-2024 _____

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Types of investments and investment strategies: A study of India versus Western countries

Abstract

This bachelor thesis compares the investing alternatives and tactics available in India to those in Western nations. It evaluates the acceptance of equity, fixed-income assets, property, venture capital, and other kinds of investments, as well as their risk profiles and legal frameworks in both regions. This thesis also examines several investment methods, including active and passive ones like value and growth investing as well as index investing. This research looks at performance over the last ten years while taking political and technical developments as well as economic stability into account. Taking advantage of cutting-edge information technology methods for data analytics and trend research, it evaluates their popularity, risk profiles, and regulatory frameworks in both areas. The thesis also looks at specialised investment techniques developed for the fast-paced IT industry, using the most recent technological developments, market information, and risk assessment models.

Keywords: Cryptocurrency, Blockchain technology, Robot advising, Trading, REIT'S, Investor behaviour, Forex, Debt investments, Equity investments, Commodities, NFT'S.

Typy investic a investiční strategie: Studie Indie versus západní země

Abstrakt

Tato bakalářská práce porovnává investiční alternativy a taktiky dostupné v Indii a v západních zemích. Hodnotí akceptaci vlastního kapitálu, aktiv s pevným výnosem, majetku, rizikového kapitálu a dalších druhů investic, jakož i jejich rizikové profily a právní rámce v obou regionech. Tato práce také zkoumá několik investičních metod, včetně aktivních a pasivních, jako je hodnotové a růstové investování a také indexové investování. Tento výzkum se zabývá výkonností za posledních deset let, přičemž bere v úvahu politický a technický vývoj i ekonomickou stabilitu. S využitím nejmodernějších metod informačních technologií pro analýzu dat a výzkum trendů hodnotí jejich popularitu, rizikové profily a regulační rámce v obou oblastech. Práce se také zabývá specializovanými investičními technikami vyvinutými pro rychle se rozvíjející IT průmysl s využitím nejnovějšího technologického vývoje, tržních informací a modelů hodnocení rizik.

klíčová slova: kryptoměna, technologie blockchain, robotické poradenství, obchodování, REIT'S, chování investorů, forex, dluhové investice, akciové investice, komodity, NFT'S

Table of Content

1. Introduction

This bachelor thesis examines the economic conditions in India and western countries, focusing on the characteristics and preferences that affect financial markets. The vibrant and expanding Indian economy stands in stark contrast to the mature and regulated markets of the West. Exploratory research can thrive in the context of economic mechanisms, legal contexts, and cultural artifacts.

An age of remarkable efficiency and class has been led the way thanks to data generation IT, which has changed the investing environment. In-depth analysis of the transformational function of IT in various investment kinds is provided in this thesis, highlighting a tapestry of possibilities spawned by using era development. IT acts as a channel for processing and analysing big quantities of economic statistics in a time while there may be an extra of data. This revolution has reshaped investing strategies and given buyers a plethora of statistics and resources to apply in making clever alternatives.

A new generation of accuracy and speed in investment execution has been leading the way via IT, from algorithmic buying and selling to AI-pushed predictive analytics. Traditional assets had been simplified, but it has also given upward push to emblem-new options like crowdfunding web sites and cryptocurrency. This observe explores the changing connection among financial property and generation, illuminating the jointly useful interaction between IT and various funding possibilities. We want to offer a radical draw close of how era has advanced into an important best friend in the quest of economic success and security by way of exploring IT's integration throughout assets and techniques.

In latest instances, the landscape of investing has experienced a significant transformation, in large part because of the speedy progress in facts generation. These advancements have caused a big change in conventional methods of investment, as buyers now have got admission to a great array of information analysis equipment and real-time facts. Additionally, the upward push of robo-advisors and online trading platforms has made investing more inclusive, attractive to a broader target market of individuals. This will discover the several methods wherein statistics technology is revolutionizing the funding realm and the ways-achieving implications it has for the monetary quarter. Information generation has revolutionized the sphere of funding, offering investors with a huge variety of equipment and sources to make informed selections and maximize returns. From information analysis to computerized trading systems, era has grown to be a fundamental part of the funding process. One of the important thing ways records generations is applied

in investment is through statistical analysis. With the help of superior algorithms and powerful computing structures, buyers can examine huge quantities of information quickly and as it should be. This permits them to detect patterns, become aware of traits, and benefit insights into market conditions and investment possibilities. By leveraging records analysis, traders can make extra knowledgeable decisions and doubtlessly obtain higher investment consequences.

Apart from analysing data, technology plays a role in the world of trading and execution. Electronic trading platforms give investors real time access to markets making it easier and faster to execute trades. This does not enhance efficiency. Also minimizes the chances of manual errors. Moreover, technology enables the creation of algorithmic trading systems that automatically execute trades based on market conditions or investment strategies using predetermined rules and algorithms. Information technology is also invaluable in risk management. Advanced risk management systems assist investors in evaluating and mitigating risks associated with their investment portfolios. These systems consider factors like market volatility, asset correlations and historical performance to provide an understanding of portfolio risk. By utilizing these tools investors can make decisions and implement effective risk mitigation strategies.

Moreover, technology offers investors a range of tools that aid in managing their investment portfolios. From models for asset allocation to systems for tracking performance, investors can leverage technology driven solutions to monitor and optimize their portfolioefficiently. These tools empower investors to keep tabs on the performance of their investments, analyse diversification strategies and adjust based on changing market conditions. Furthermore, information technology plays a role in enhancing research and market analysis within the investment industry. Through platforms investors gain access to an abundance of market data, news updates, research reports and expert opinions.

In today's world the investment landscape has been greatly influenced by information technology. It has given investors access to tools, insightful data, and real time updates from markets. By using technology to their advantage investors can make decisions to improve theirportfolio performance and reduce risks, for successful investments.

2. Objectives and Methodology

2.1 Objectives

The main aim of the bachelor thesis is to identify investment alternatives available in India and Western countries, including equities, bonds, real estate, mutual funds, and alternative investments such as cryptocurrencies. To fulfil the main objective, it is necessary to set sub-goals consisting of:

- Detailed understanding of traditional investment types such as stocks, bonds, real estate, commodities, and mutual funds.
- Demonstrate the methods through which information technology has been incorporated into the investment process encompassing tasks such, as data analysis, trading platforms and tools, for managing portfolios.
- Data analytics, big data, and machine learning play roles, in shaping investment decisions improving risk assessment methodologies and uncovering opportunities. These technologies provide insights that help investors make choices evaluate potential risks more accurately and identify lucrative prospects.
- Discover the possibilities of technology for ensuring transparent transactions particularly when it comes to investments that involve cryptocurrencies and tokenized assets.

2.2 Methodology

The work consists of two parts - theoretical and practical. The theoretical part is based on the study of secondary sources. The empirical part is compiled based on outputs from quantitative/qualitative research. The association between investment types and strategies for investing is examined in this study using an explanation-based approach within the market of India and Western countries. In the practical part of thesis, the focus is on comparing volatility and return.

In addition to that, this thesis consists of machine learning techniques for stock market price predictions of Indian and Western market by using four different types of neural language which helped in finding if machine learning and Artificial intelligence can be beneficial for financial market.

3.Literature review

This literature review aims to provide analysis of types of investments and investment strategies. It focuses on the comparison of Indian and western markets based on various investment types such as stock market real estate bonds cryptocurrency and many more. By evaluating existing research, articles, and relevant resources, this review gives us valuable aspects into the factors that investors should consider when investing in market.

3.1 Definition of Investments

Investments refer to assets that individuals purchase with the intention of generating income or achieving profitability. These investments can take forms, such as stocks, real estate properties, cryptocurrency, or bonds. Each type of investment carries its set of risks and potential rewards. Therefore, it is essential for investors to thoroughly analyse these factors before making any decisions. For instance, when it comes to the stock market high risk stocks may offer a return on investment. Also comes with a higher probability of incurring losses. Conversely safer investments like government bonds may provide returns. Carry less risk. As emphasized in the statement "Investors must carefully analyse risks and returns before making investment decisions " it is crucial for investors to conduct research and evaluate their options to make well informed choices that align with their financial objectives. Achieving this requires an understanding of trends, market fluctuations well as personal financial considerations such as risk tolerance and expected timeframes for returns. By conducting research and employing decision making techniques investments can serve as a valuable tool for augmenting income or building wealth over time. (Barton, Robin L, 2020)

3.1.1 Types of Investments

There are kinds of investments which're financial assets or instruments that people, companies, or organizations put their money into in the hope of making a profit over a certain period. These investments come in forms each, with their unique features, level of risk and potential, for returns. (Doe, John 2023)

Types of investments: Stocks, Bonds, Real Estate, Mutual Funds, Commodities, Cryptocurrency, Bank FD, Collectibles (NFT’S), Private Equity (invest in startup), Forex.

1. **Stocks**: When you buy stocks, you're essentially buying ownership in a company. This means that if the company succeeds, you can share in its profits. However, it also means that if the company suffers losses, you'll be affected too. Stocks are traded on stock exchanges and their value goes up and down based on supply and demand. In recent years, there has been a rise in passive index investing, which is driven by advancements in technology that make it easier to access and track stock performance. This shift has resulted in less active management by professionals with proper knowledge and research, stocks can be a valuable addition to one's investment portfolio as they provide potential long-term gains while also supporting companies growth and development. (Heugh & Fox, 2018).

2. **Bonds**: Bonds are an essential part of the financial world, used by both governments and corporations to raise capital. They come in various forms, such as corporate bonds, municipal bonds, and government bonds. Understanding how bond prices fluctuate based on factors like interest rates and credit ratings is crucial for investors looking to make informed decisions. (Lough and Kawecki, 1996)

3. **Real estate**: With the potential for both short-term financial gains and long-term financial stability, real estate has long been a favorite investment choice for both private investors and corporate investors. Real estate investments are viewed as a dependable source of income and wealth building because property values can increase over time. But like any investment, real estate investing has risks that should be carefully considered. The success of one's investment strategy can be impacted by market fluctuations and property management. (Van Alstede, PTS, 2014)

4. **Mutual Funds**: Building a diversified portfolio is a difficult task for individual investors in today's complex financial environment. Fortunately, mutual funds offer a practical solution. These portfolios pool funds from many investors to buy securities, providing a quick and easy way for people to diversify their holdings without having a deep understanding of the market. (Covachev, Svetoslav, 2023)

5. **Commodities**: For investors looking to diversify their portfolio, commodities are a popular choice. These physical assets, which can include everything from agricultural

goods like wheat and corn to precious metals like silver and gold, are bought and sold on the open market. Commodities are frequently used by investors as a form of inflation protection or as a haven during uncertain economic times. However, other factors, such as geopolitical events, natural disasters, and supply and demand, also have a significant impact on the performance of commodity investments. (Mercer, Jeffrey M. 2011)

6. **Cryptocurrency**: Due to its decentralised nature and potential for high returns, cryptocurrencies have become commonly used in the financial industry. It operates independently of a central bank and can be transferred directly between people without the need for intermediaries like banks because it is a digital or virtual currency secured by cryptography. There are risks, though, just as there are with any investment. (Rif'an, G. G., 2022)

7. **Bank FD**: Fixed deposit accounts, also referred to as bank FDs, have long been a popular investment choice for people looking for returns with minimal risk. As FDs provide guaranteed result in and act as a safeguard against inflation. Before making this kind of investment, it's crucial to consider the state of the economy. (Shantnu, R., Ray, M., 2021)

8. **NFT'S**: Traditional collectibles have fallen out of favour in today's digital age in favour of the growing trend of Non-Fungible Tokens (NFTs). These distinctive digital assets are becoming more and more well-liked among investors as well as art enthusiasts. Due to their unmatched ownership and rarity, NFTs are highly prized by collectors. Early adopters in the art industry have also already realised sizable returns on their NFT investments. NFTs offer a desirable alternative to traditional collectibles for those looking to diversify their portfolios due to their low transaction costs and high liquidity. (Osborne, Francesca, 2023)

9. **Private Equity (invest in startup)**: Investments in private equity have grown in popularity in recent years. Private equity, compared to traditional investments, includes purchasing and holding shares of privately held businesses as compared to publicly traded ones. This type of financing can give companies the money they need to expand, restructure, or buy other companies. But it's crucial to remember that private equity comes with greater risk when compared to more traditional investment options. (Snow, David, 2021)

10. **Forex**: With an average daily trading volume of $5.3 trillion, the foreign exchange market is the biggest and most liquid financial market in the world. This market is open to traders from all over the world, who can buy and sell currencies seven days a week, twenty-four hours a day. The ability of the forex market to offer opportunities for traders to profit from both rising and falling currency prices. (Augar, Philip,2015)

3.1.2 Investments Strategies

Developing investment strategies is crucial, for individuals aiming to grow their wealth and secure their future. Given the nature of today's banking landscape it is vital to adopt an approach that takes into account risk tolerance and long term goals. Diversification plays a role in formulating an investment strategy as it minimizes the potential, for losses while maximizing overall profitability. (Emilia Karlsson, Johanna Strand 2019)

Diversifying your investment strategy is crucial, as emphasized by Hansen. By spreading your investments across different asset classes like stocks, bonds, and real estate you minimize risk and potentially enhance returns. This approach prevents overreliance on a sole investment's success and instead creates a well-rounded portfolio capable of withstanding market fluctuations while minimizing losses. For college students with limited resources aiming to secure their financial future, diversification is particularly vital. With a diversified portfolio they can gradually accumulate wealth and confidently handle unexpected expenses or emergencies that may arise. (Hansen, David L 1982)

Investment choices may be complex and discouraging, for beginners who're simply beginning to navigate the world of economic making plans. It's important to recollect chance tolerance and economic dreams when making funding decisions as they substantially effect the results of one's investments. As said More institutional investors understand environmental, social, and governance elements as drivers of price. This suggests that beyond conventional economic metrics, it's crucial to also consider different factors consisting of environmental sustainability, social duty, and proper corporate governance practices. These concerns no longer only align with personal values however can also have a massive effect at the cost of investments inside the long time. beginners need to additionally consider their chance tolerance when making funding choices. While excessive

threat investments might also provide better returns in the short term, they will no longer be appropriate for people with a decrease chance tolerance or long-time period financial goals. Therefore, it's vital to carefully examine each chance tolerance and monetary desires before making any funding decisions. (Bernow, Sara, Klempner, Bryce, Magnin, Clarisse 2017)

Types of investments strategies: Buy and Hold, Value investing, Growth investing, Real estate investment strategies, Income investing(dividend)

1. **Buy and Hold:** There are numerous strategies and methods that people use to try to maximise their returns in the world of investing. One popular strategy is "buy and hold." This strategy involves buying stocks and holding them for a long time, no matter short-term market fluctuations. Its goal is to reduce risk by relying on the stock market's overall growth over time. Buy and hold can be a profitable strategy if implemented with patience and discipline. (Ameri, M., 2023)

2. **Value Investing:** Investing is an important part of both personal finance and the economy as a whole. Value investing, which focuses on finding undervalued stocks in order to achieve long-term returns, is one strategy that has stood the test of time. This approach differs from other investment strategies that prioritise short-term gains, such as growth investing or day trading. (Mauboussin, 2020)

3. **Growth Investing:** Growth investing, also known as capital appreciation, is a type of investing in which stocks of companies with the potential for long-term growth and higher returns are purchased. This strategy is centred on identifying companies with solid fundamentals and promising future prospects. Value investing has endured a long history of dominance, but it is not always the most effective approach. Indeed, from mid-2007 to late 2020, value investing underperformed across all areas. (Weng and Butler 2022)

4. **Real estate investment strategies:** Real estate strategies include buy and hold rental properties, fix, and flip, real estate investment trusts (REITs). (Altman, K., 2022)

5. **Income Investing:** Income investing is a popular method of generating passive income through a variety of investment. Rather than focusing on capital

appreciation, this strategy aims to provide a consistent stream of cash flow. Investors can supplement their primary source of income or plan for retirement by selecting dividend-paying stocks, bonds, or real estate investment trusts (REITs). (Calvi, Barbara, 2023)

3.2 Background of study

In the world of finance and investments, India and western countries are two interconnected yet distinct realms. India is a rapidly emerging economy with a rich cultural and historical background, which brings unique investment dynamics influenced by its diverse industries, evolving regulatory framework, and demographic dividend. On the other hand, western countries have matured financial markets and established institutional frameworks. They have a tradition of sophisticated investment practices.

This study aims to analyse and compare the range of investment options and strategies used in both India and western countries. By understanding the intricacies of these investment landscapes, we can better understand the various factors that impact investor choices, market behaviour, and economic growth patterns in these regions.

Moreover, in today's age of widespread technology the significance of information technology in the field of investments cannot be underestimated. This study will explore how technological advancements have transformed investment strategies, offering new opportunities for wealth growth, risk control, and portfolio optimization.

3.3 History of Investment

Investing is not a new concept it has been around for centuries. In fact, evidence of investing can be traced back to ancient civilizations like Greece and Rome. Over time investing has undergone changes and advancements adopting new methods and technologies. Today, it plays a crucial role in our economy, offering individuals opportunities to grow their finances such as stocks, real estate, or cryptocurrency. However for those unfamiliar with investing, it can seem overwhelming. Successful investing requires thorough research and strategic decision making to achieve favourable outcomes. One important aspect is understanding risk management

techniques and diversification strategies. The majority of the early investments were made in agricultural land and livestock. (Rubinstein, 2006)

It is important for us, as beginner, to understand the history of investments and how it can inform our financial decisions for the future. One such investment option that has stood the test of time is stocks. Stocks have been a valuable asset for investors for centuries, originating in 17th century Amsterdam and evolving into a global phenomenon. This demonstrates their significance as an investment option with a rich history. Another option is bonds, which are debt instruments issued by governments or corporations that provide fixed interest payments over a specific period. Real estate has also proven to be a popular form of investment due to its potential for high returns and stability. Cryptocurrency is a relatively new investment option that has become increasingly popular in recent years. By delving into the history of these digital currencies, we can make informed decisions about which ones align with our financial objectives and comfort level with risk. (Masuyama, 2004).

3.4 Technologies that can transform financial markets

Artificial Intelligence and Natural Language Processing Machine learning algorithms and artificial intelligence techniques enable systems to learn from user interaction and patterns without being explicitly programmed for it. These technologies have provided help in developing self-driving cars, speech recognition, and chess championship. In the financial markets, these technologies can automate decision. making processes in the fast-paced trading environments. They can also identify new patterns of trading or system abuse in capital markets. (Prasanna Chandra 2021)

Robo Advising Algorithms can understand financial goals, assess risk profile, and develop personalised investment portfolios. Self-learning algorithms can book profits, square-off positions, and reallocate funds on platforms that can be web-based and/or smartphone-based. As opposed to a human advisor who charges a recurring portfolio management fee, this service may not entail recurring expenses. (Prasanna Chandra 2021)

Quantum 'Sealed Envelope' So far, hackers have managed to penetrate security programs. A newly evolving technology called quantum "sealed envelope" promises to provide "unconditionally guaranteed" security and sanctity of messages. If all goes well, financial markets can be guarded against information invasion. (Prasanna Chandra 2021)

Bitcoin and Blockchain Technologies Bitcoin is a virtual currency. The European Banking Authority defined virtual currency as "a digital representation of value that is neither issued by a central bank or a public authority, not necessarily attached to a fiat currency, but is accepted by natural or legal persons as a means of payment and can be transferred, stored or traded electronically." Blockchain, the technology underlying virtual currency bitcoin, records financial transactions, or any digital interaction in a secure, transparent, and efficient manner. It facilitates digital accounting and auditing of financial transactions of any kind. (Prasanna Chandra 2021)

Big Data and Analytics Massive amounts of data are generated every second by financial markets. Cloud technology enables the storage and real-time access to this ocean of data at an affordable price. Big data analytics makes it possible to decipher correlations that were otherwise possible. (Prasanna Chandra 2021)

3.5 Advantage/Disadvantage of Investments

Advantage: Diversifying investments can reduce overall risk and increase potential for greater returns. Investing can provide financial security and help individuals achieve their long-term goals. This is because diversification allows investors to spread their money across different assets, reducing the impact of any single investment's performance. In other words, if one investment fails, the others may balance it out or even yield positive returns. For those just starting on their investing journey, this is particularly crucial as they have fewer financial resources to fall back on in case of a loss. By diversifying their portfolio with a mix of stocks, bonds, and other assets, beginners can reduce risk while still pursuing higher returns. Additionally diversification helps protect against market volatility and unexpected events that could disrupt an individual's financial stability. Through proper education and understanding

of various investment options beginner can start building a diverse portfolio that sets them up for financial success in the long run.(Birla, Richa, 2012)

Disadvantage: Investing is a great way to grow your wealth and secure a comfortable future, but it comes with its own set of risks. One such risk is market volatility which refers to the unpredictable fluctuations in stock prices. This can be influenced by various factors such as economic events, political changes, or even natural disasters. As an investor it's essential to understand that these market swings are normal and can result in significant gains or losses. Additionally investing also involves the loss of liquidity, meaning that you may not be able to access your funds immediately if needed. This can be challenging for those who require quick access to cash for emergencies or other expenses. Market volatility and loss of liquidity are some of the disadvantages of investments. (Štaffenová, N., 2023)

3.6 Use of Artificial Intelligence in Stock Trading

- **Introduction:**Artificial Intelligence (AI) implies the imitation of human intelligence in machines that are programed to think like humans and replicate their actions. Stock trading means buying and selling of shares of a particular company. AI-based stock trading refers to buying and selling of shares using technology which is programed to act like a human being and ensures more accuracy and speed. AI-based apparatusesare already in use to forecast stock market trends. AI not only analyzes data on the stock market, but can also predict stock market trends, trading patterns of investors,stockbrokers and the market. Well-renowned companies on Wall Street such as Goldman Sachs and Morgan Stanley have started to focus on narrow AI solutions through data mining, natural language processing, and using self-learning algorithms tools, which are capable of interacting faster than our daily use applications like the Google Assistant of Android, Alexa of Amazon and Siri of Apple. It also helps wealth management companies to keep a constant control on the stock market movement and rebalance the portfolios to ensure the target profit. At present, AI canreduce the work load and save time by performing multiple tasks and provide real- time suggestions but it cannot remove the human involvement entirely.

- **Impact of AI in Stock Trading**

  Use of AI in stock trading is not something new to the world. Earlier only financially sound, large companies could afford it. The main objective of trading on the stock market is to earn profit. During the decision making process of buying and/or selling of stocks, it does not consider any emotional factors. When human beings include emotions such as greed, fear etc. in decision making process, they end up with wrong decision and pay for it (Chowdhury, 2012).

  A machine takes quick decisions with highest accuracy considering only the pragmatic factors such as price variations, macroeconomic data, news on listed companies and government decisions ignoring the emotion. Coalition, an UK based research firm observed that in the wall street, 45 percent revenues from the stock trading is generated by AI driven decisions. AI can alleviate risk by analyzing market fluctuations. It generates new ideas and can create exceptional portfolios by scrutinizing big data. It is also capable of recognizing voice, reading notes in different forms, access multiples versions of data and thus continuously complies the risk assessment standards. Different organizations use AI to establish a platform of intelligence which come up with unique models by interpreting different sets of data. For example, “Trade Schedule” is a smart tool used by traders in many Asian stock markets to fix when to buy and sell specific stocks. “Aidiya” is another AI based tool used in Hong Kong to form a hedge fund without any intervention of human being. High-skilled human beings are used to interpret few unmeasurable factors such as sentiments and emotions. Risky transactions can easily be spotted and prevented by applying advanced AI and deep learning (Chowdhury, 2017).

  has had a profound impact on the field of stock trading, revolutionizing the way investors make decisions and manage portfolios. With the aid of AI algorithms and machine learning techniques, traders are able to process vast amounts of data quickly and accurately, leading to more informed investment choices. This has resulted in improved efficiency, reduced transaction costs, and increased profitability in the stock market. One of the key advantages of AI in stock trading is its ability to analyze large volumes of information in real-time (Chowdhury, 2021).

AI algorithms are capable of monitoring numerous data sources, including financial statements, news reports, social media sentiments, and market trends, to identify patterns and extract valuable insights. This allows traders to react swiftly to market changes, such as fluctuations in stock prices or unexpected events, and adjust their investment strategies accordingly. By leveraging AI, investors can stay ahead of the curve and make more informed trading decisions. Furthermore, AI-powered trading systems are designed to learn and adapt from historical data, enabling them to continuously improve their decision-making capabilities. Through the use of machine learning algorithms, these systems can identify patterns and trends in stock prices and market behavior, as well as recognize the efficacy of certain trading strategies. As a result, AI models are able to fine-tune their predictions and recommendations over time, leading to higher accuracy rates and better trading outcomes. Additionally, AI's impact on stock trading extends beyond decision-making and analysis. AI algorithms have also been utilized to automate trading processes, bringing speed and efficiency to the market. High-frequency trading (HFT), for example, relies heavily on AI algorithms that execute trades at incredibly fast speeds, often in milliseconds. This allows HFT firms to take advantage of even the smallest market inefficiencies and gain profits through rapid and automated trading (Chowdhury, 2022).

Moreover, AI has also played a role in reducing transaction costs for investors. By automating trading processes and eliminating the need for human intervention, AI systems have minimized costs associated with human error or emotional biases. These systems can execute trades with precision and remove the potential for human-induced errors, resulting in increased accuracy and reduced transaction costs. Despite the many benefits, it is important to acknowledge that the rise of AI in stock trading is not without its challenges. One major concern is the potential for AI models to exhibit biased behavior. If an AI algorithm is trained on biased or incomplete data, it may perpetuate discriminatory practices or miss important market signals. It is crucial to ensure that the data used to train AI models is representative and diverse to mitigate these biases.(GRÜNDL, HELMUT, DONG, MING (IVY), GAL, JENS**,** 2016)

- **Use of AI in technical analysis**

  As technical analysis deals with volume and price movement of stocks, AI and machine learning(ML) can easily be applied. After analyzing the pattern, AI develops an algorithm and can successfully predict the stock index movement. It considers various types of information and handles the data in such a way that it can safely ensure satisfactory return on investment. AI can be used to achieve both short-term and long-term investment goals. It helps to reduce the level of volatility as AI concentrates on data mining and takes decision after analyzing previous algorithm and records. The results generated by using AI and ML are easy to understand and help to make long-term decision. Artificial intelligence (AI) has found practical applications in technical analysis, transforming the way traders analyze and interpret market data to make investment decisions. Through the use of AI algorithms and machine learning techniques, technical analysts are able to process vast amounts of historical and real-time market data to identify patterns, trends, and potential trading opportunities. This has resulted in improved accuracy, enhanced forecasting capabilities, and more efficient trading strategies(Chowdhury, 2015).

  One of the practical uses of AI in technical analysis is pattern recognition. AI algorithms are capable of scanning large volumes of historical price data, such as charts and candlestick patterns, to identify recurring patterns that may signal future market movements. These patterns could include head and shoulders, double tops, or triangle formations. By recognizing these patterns, AI models can provide traders with buy or sell signals, allowing them to make well-informed decisions based on historical precedents. Another application of AI in technical analysis is trend identification. Through the use of machine learning algorithms, AI models can analyze price data to identify the direction and strength of market trends. This enables traders to identify and capitalize on upward or downward trends in the market. By following trends, traders can strategically enter or exit positions to maximize profitability (Cover, 2007; Chowdhury, 2016).

  Furthermore, AI can be used in technical analysis to generate forecasts and predictions. By training AI algorithms on historical price data, as well as other relevant market indicators, the models can learn patterns and correlations that exist in the data. This allows the AI models to generate predictions about future price

movements, helping traders anticipate market trends and make more accurate trading decisions (Chowdhury et al., 2012).

These predictions can provide valuable insights and assist traders in building profitable trading strategies. Moreover, AI has proven to be effective in optimizing trading strategies. Through the use of advanced optimization algorithms, AI models can evaluate and optimize parameters, such as entry and exit rules, position sizing, and risk management, to maximize trading performance (Davenport and Ronanki 2018).

This includes strategies such as moving average crossovers, relative strength indicators, or stochastics. By fine-tuning these strategies based on historical data and market conditions, AI models can enhance the profitability and efficiency of trading systems (Chowdhuryet al., 2019).

However, it is important to note that the practical use of AI in technical analysis comes with its own challenges. One challenge is the potential for overfitting, where an AI model is excessively fit to historical data, resulting in poor generalization to future market conditions. To mitigate this risk, it is crucial to regularly validate the performance of AI models on out-of-sample data and adopt appropriate validation techniques to ensure the reliability and robustness of the models (Davis and Anderson, 2017).

The practical use of AI in technical analysis has transformed the field, providing traders with powerful tools for analyzing and interpreting market data. AI algorithms excel in pattern recognition, trend identification, forecast generation, and trading strategy optimization. By leveraging AI, technical analysts can make more accurate predictions, identify profitable opportunities, and optimize trading strategies for enhanced performance (Chowdhury et al., 2018).
However, it is important to monitor and validate AI models to mitigate the risk of overfitting and ensure their reliability. With ongoing advancements in AI technology, the practical use of AI in technical analysis is likely to continue evolving,

empowering traders with improved decision-making capabilities. (DOWLING, M.2019*).*

- **Future of AI use in investment**

  AI integration is becoming increasingly crucial for investors to stay competitive in the market. As technology continues to advance, artificial intelligence is revolutionizing the investment industry by streamlining processes and improving efficiency. With AI, investors can analyze vast amounts of data at a faster and more accurate rate than humans ever could. This allows them to make better informed decisions and stay ahead of the competition. (Rajan, 2021)

  Additionally, AI can identify patterns and trends that may not be obvious to humans, providing valuable insights for investment strategies. Furthermore, it reduces human error and bias in decision making, leading to more objective and profitable outcomes. The potential impact of AI on the investment industry is immense with many experts predicting that it will become a standard tool for investors in the near future. An Introduction to Alternative Investments this integration of AI is essential for investors who want to thrive in today's fast-paced market environment. (Rajan, 2021)

  As technology continues to advance, investors must adapt and embrace AI integration to remain competitive in the market. Long-term investing is an idea whose time has come again. With the rapid growth of artificial intelligence and its potential impact on various industries, it's crucial for investors to understand and utilize this technology. Through AI businesses can gain valuable insights into consumer behaviour, optimize their operations, and make more informed decisions. For example AI-powered algorithms can analyse vast amounts of data to identify patterns and trends that humans may miss. This can give companies a competitive edge by enabling them to anticipate market changes and adjust their strategies accordingly. Additionally AI can automate tedious tasks such as data entry or customer service inquiries, freeing up employees time for more critical roles. As we continue to see advancements in AI technology, it's essential for investors to recognize its potential value in improving business processes and driving long-term success. (Rajan, 2021)

Data has become the center point of intelligence. Earlier owning physical assets used to be considered as symbol of prestige and status. But now, data has occupied the position of physical assets. Updated data rules everywhere and outperforms people and organizations having old and obsolete data. Data is now used as a weapon to defeat others and to stay ahead in competition. It's not so long when people had very limited access to data, but now, people have very easy access to data. They can analyze the data and take sophisticated decisions by using the same. Most of the organizations in the world now prioritize investment in data management ahead of other operational and managerial needs and demands. (Lee and Choi, 2020)

According to KPMG, investment in AI will increase from $12.4 billion (2018) to $232 billion (2025). AI will take proactive decisions rather than that of reactive through deep learning. AI is already being used in fields like healthcare, e-commerce, logistics, supply chain, and transport and it is predicted to be used extensively in stock trading as well. PwC estimates that by 2030, the contribution of AI to the global economy will be up to $ 15.7 trillion. Interestingly, this contribution will be more than the aggregated contributions of both India and China.

Artificial intelligence (AI) has already begun to revolutionize the business landscape, and its future looks incredibly promising. As AI capabilities continue to advance, it is expected to have a profound impact on various aspects of business operations and decision-making. From enhanced automation to improved customer experience, AI is set to transform the way organizations operate and create value. One key area where AI is expected to play a significant role is in automation. AI technologies, such as robotics process automation (RPA), machine learning, and natural language processing, have the potential to automate repetitive and mundane tasks, freeing up human employees to focus on more strategic and creative endeavors (Friedman, 2021).

This can result in increased efficiency, reduced operational costs, and faster turnaround times. AI-driven automation has already proven its worth in industries like manufacturing, customer service, and logistics, and its continued adoption in

other sectors is expected to reshape business operations. Another significant impact of AI in the future of business is improved decision-making. AI algorithms have the ability to ingest and analyze vast amounts of data from multiple sources, enabling businesses to make more informed and data-driven decisions. With the ability to uncover hidden patterns, correlations, and insights, AI can provide valuable insights for business leaders to optimize their strategies, identify market trends, and forecast future outcomes. From predicting customer behavior to optimizing supply chain operations, AI-powered decision-making has the potential to unlock new opportunities for growth and competitiveness. Moreover, AI is poised to transform customer experience (Goodfellow et al., 2016).

By leveraging AI technologies, businesses can personalize interactions and offer tailored experiences to individual customers at scale. Natural language processing and machine learning algorithms can be used to understand customer preferences, anticipate their needs, and provide personalized recommendations. Chatbots and virtual assistants powered by AI can deliver real-time customer support, reducing response times and enhancing customer satisfaction. As AI continues to advance, businesses will be able to create highly personalized and seamless customer experiences, leading to improved customer loyalty and increased revenue (Gupta and Kapoor, 2020).

Furthermore, AI has the potential to revolutionize business analytics and insights. With its ability to process and analyze large volumes of data, AI can derive valuable insights that were previously unachievable. AI-powered analytics can uncover market trends, identify emerging risks, and optimize business processes. By combining AI with technologies like big data and the Internet of Things (IoT), businesses can gain real-time and actionable insights, helping them make informed decisions and stay ahead of the competition. However, it is important to address the challenges and considerations associated with the future of AI in business. Ethical considerations, privacy concerns, and the ethical use of data in AI systems are critical aspects that need to be carefully managed. Businesses must ensure that AI systems are transparent, explainable, and built upon unbiased datasets to avoid perpetuating biases or discriminatory practices. Additionally, addressing the potential impact on

employment and workforce displacement is important, as AI-powered automation may change job roles and require new skill sets (Gupta and Pfedder, 2009).

Real Applications of AI in stock trading

The following list contains few companies which use AI for smart trading

company	How did they apply AI	location
Shoonya	It has recently launched AI-powered stock market predictions to help investors make wise and timely investment decisions.	India
Epoque	It uses AI as an order engine that creates orders and performs operational actions and uses ML to improve its performance.	Switzerland
Sigmoidal	It uses AI as an intelligent asset allocation system that uses deep learning to predict every asset in a particular portfolio.	Poland
AITrading	The company scans their markets by using blockchain-based smart contracts to increase earnings.	London, U.K.
EquBot	The company systematizes the investment process to build a cause-and-effect understanding of markets,	San Francisco

	companies and management by gathering information from different sources.	
Trading Technologies	It identifies complex trading patterns and reduces compliance risk	Chicago

Source: Own processing

3.7 AI in investment strategies

- **Investment decision made by algorithms:** The way investment decisions are made in the financial markets has been revolutionised by algorithmic trading which is powered by artificial intelligence (AI). Huge volumes of data are analysed, trends are found and insights are produce by AI-driven algorithm to guide investment strategies. 1) Data analysis and pattern recognition, 2) Forecasting and Predictive Modelling, 3) Portfolio optimisation and risk managment, 4) Automated Trading Execution, 5) Real time Insights and Market Monitoring, 6) Adaptive learning and Improvement, 7) Increased Scalability and Efficiency.

    1) *Data analysis and pattern recognition*: AI algorithms are capable of analysing a variety of financial data such as past price trends editorial tone in the news and market indicators. AI assists traders in making data driven investing decisions and seizing trading opportunities that may not be obvious to human traders by seeing complicated patterns and connections.(T. Marwala & Co. 2020)
    2) *Forecasting and Predictive Modelling*: AI powered models are more accurate in forecasting market trends, asset values and other pertinent variables. AI enables traders and investors to forecast market movement and modify their tactics as necessary by taking into account a variety of variable and past data.(stmann, F. 2021)
    3) *Portfolio optimisation and risk managment*: AI can help with risk management by assessing portfolio risk, spotting potential weaknesses, and

recommending hedging tactics. By taking into account risk-return trade offs diversification and asset allocation AI algorithms may also optimise portfolios, assisting investors in reaching their finacial objectives while efficiently managing risk.(Fernández 2019)

4) *Automated Trading Execution*: Using pre established rules and market conditions AI algorithms can carry out trades automatically. AI driven trading systems can respond swiftly to market movements by eliminating human emotions and biases from the trading process resulting in consistent and disciplined trade execution.(Qi 2018)
5) *Real time Insights and Market Monitoring*: AI powered systems can continuously monitor market conditions, news feeds, and senitments on social media. These perception assist trader in keeping knowledge of market trends and breaking news and variations in public opinion that may have an impact on investing choices.(Ryll,2020)
6) *Adaptive learning and Improvement*: AI systems can develop over time by assessing the result of earlier transactions and changing their methods as necessary. AI systems can react to shifiting market condition, improve their models and improve trading performance through adaptive learning. (Ryll,2020)
7) *Increased Scalability and Efficiency*: AI driven algorithmic trading helps traders to swiftly and precisely process and analyse enormous amounts of data. Trading prospects are increased by the scalability and efficiency that enable traders to investigate a wider variety of assets, markets and trading techniques. AI-driven algorithmic trading provides traders and investors with powerful analytical tools that help them make wise decisions optomise portfolios and react quickly to market changes. As AI develops, it is anticipated that it will have a greater impacht on how investment decision are made in the future.(Aziz,2019)

- **Risk Management and Fraud Detection:** Utilising a collection of algorithms that watch incoming data and fraud threats before they manifest is known as artificial intelligence(AI) in fraud detection. AI can adapt its algorithms to counter dangers it may have never encountered before by learning from prior data, which is something that regular fraud software cannot accomplish. Dur to its dynamic nature, AI constantly strives to increase the precision of its rules in orfer to decrease the amount of false positives (real users being barred). It completes all of this quickly enough to have no negative effects on the user experience. The performance of the website or mobile app won't be affected by the top AI cyber security solutions because they are so lightweight. 1) Anomaly Detection, 2) Real time monitoring, 3) Predicitve analystics, 4) Enhanced security and fraud prevention, 5) Efficiency and Automation, 6) Regulatory Compliance.

    1) *Anomaly Detection***:** AI systems are capable of analysing enormous volumes of transactional data, investor behaviour patterns and historical records to find deviations from the norm. AI systems can identify anomalies and alert users to unusual activity that might be a sign of fraud or other dangers. AI powered fraud detection systems can discover fraudulent tendencies by recognising intricate patterns and correlations inside data. AI system can react to changing fraud tendencies and keep one step ahead of criminals by continuously learning from new data.(vesna,2021)
    2) *Real time monitoring*: AI technologies make it possible to track transactions and activities in real time which makes it possible to spot suspicious activity right away. This makes it possible to stop any potential hazards or fraudulent activity in their tracks quickly.(Hilary,G,2022)
    3) *Predictive analytics*: AI systems can use previous data to build models that forecast the likelihood of fraud or other risks happeing. AI- powered models can evalute the likelihood of fraudulent activity and help proactive risk management techniques by taking into account a variety of risk indicators.(Al-Fattah, S.M. ,2019)
    4) *Enhanced security and fraud prevention*: AI based solutions, including biometric authentication can strengthen security precautions and identify fraud or unauthorised access. Artificial intelligence (AI) systems can examine

biometric information like face recognition or fingerprints to confirm user identities and spot potential fraud attempts.(Lahmiri,S. 2011)

5) *Efficiency and Automation*: By automating the fraud detection process AI saves a lot of time and effort compared to manual inspection. This makes it possible to spot fraudulent activity more quickly and frees up resources to concentrate on fraud situations that are more complicated.(Wang, C., 2019)
6) *Regulatory Compliance*: By keeping an eye out for compliance issue in transactions, AI systems helps organisations adhere to laws and industry norms. AI system can spot illegal actions and transactions, ensuring that legal standards are followed.(McCalman, 2022)

4. Practical Part

In this part of bachelor thesis focusing on comparing Nifty which is Indian stock market with other stock market of world with graph and will see the volatility and riskiness of investing in different stock market.

4.1 How does the nifty return distribution compare to the overall distribution of other stock indexes?

It is critical to compare the distribution of returns across several stock exchanges while doing Mean-Variance and Risk Analysis. This can be an effective tool for making judgements about overseas investment. this section focuses and examine the predicted return and variance of each index and compare them to nifty.

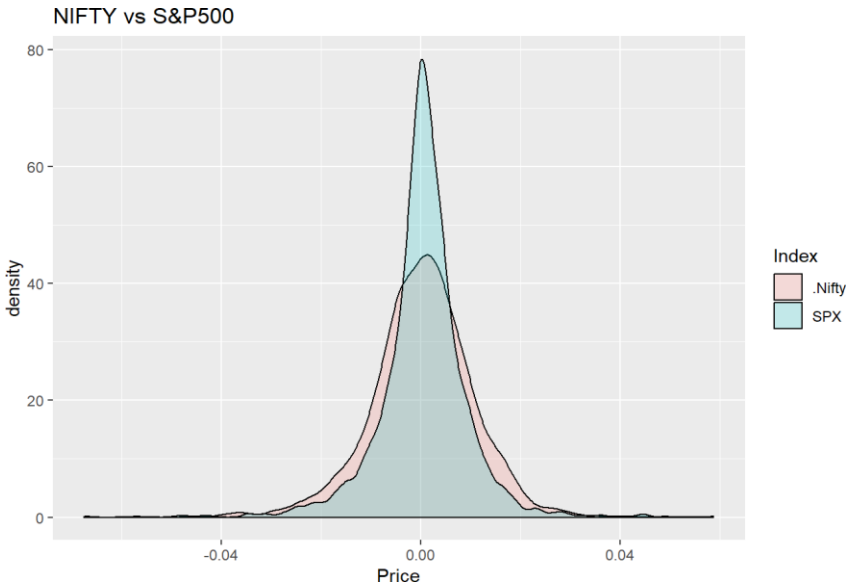
For visualization, a density plot using ggplot2 graph is generated. A density plot displays data distribution across a continuous interval or period. To easily identify between the graphs so here light red for the nifty index and light blue for another index, which blends a light warm and a light cold colour. (Data is from 01-05-2011 to 11-09-2018)

```
##       Index    Mean     Standard Deviation   Skewness       Kurtosis
## 1     NIFTY   0.033              1.04         -0.19            2.24
## 2       SPX   0.043              0.86         -0.51            6.20
## 3       UKX   0.011              0.95          0.02            4.02
## 4      N100   0.020              1.08         -0.58            6.80
## 5     SPTSX   0.009              0.77         -0.39            4.96
## 6      IBOV   0.005              1.45         -0.03            2.38
## 7    SHCOMP  -0.003              1.44         -1.18            9.31
## 8 HangSeng   0.007              1.15         -0.15            3.12
## 9       NKY   0.041              1.25         -0.40            3.78
```

The table above summarises the mean and standard deviation in percentages for each index. Skewness and Kurtosis are not measured in percentages. The mean is relatively low. However, in comparison to most other stock exchanges, the Indian stock market has a higher-expected return of 0.033%, with the exception of the US (SPX) and Japan (NKY), both of which have returns more than 0.04%. However, we cannot determine if the difference between the means is significant or not. future analysis is focused on using a statistical test such as the t-test to evaluate the significance.

The skewness indicates that the distributions are largely symmetric, with values extremely near to zero, with the exception of SHCOMP, which is slightly left-skewed.

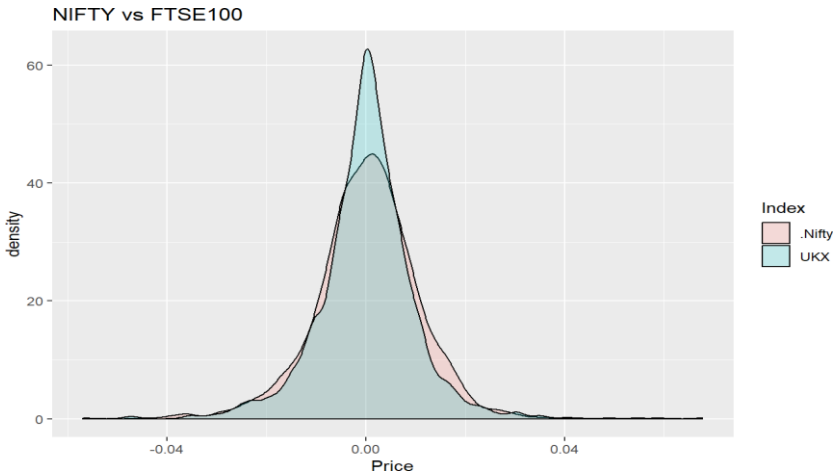
Figure:1 **comparison of Nifty and S&P500**



source: own processing,2023

The attached chart shows that the Nifty has higher volatility and high risk than the S&P500. However, the S&P 500 has a higher peak than the Nifty. That is supported by the numerical numbers in the table, which clearly explain the same occurrence (see the table's standard deviation and kurtosis for the relevant index). So from this graph it shown that US maket is heaven for investors.

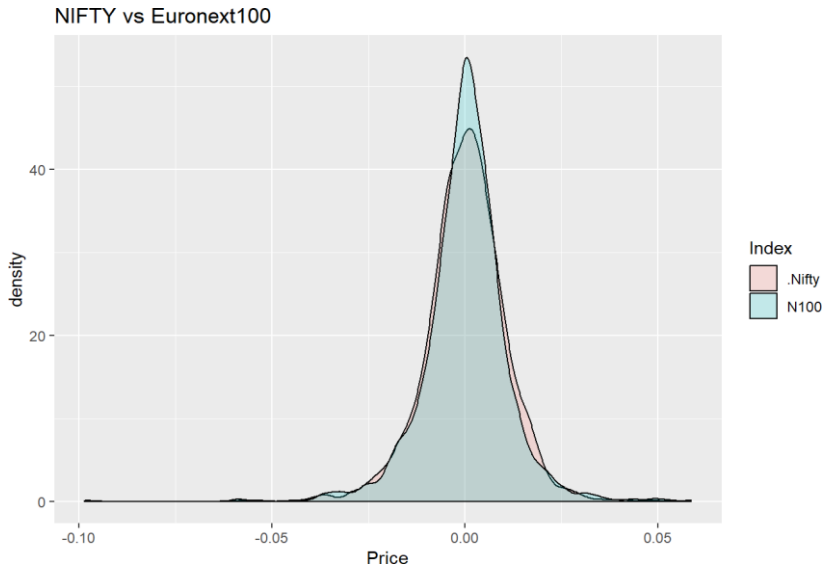
Figure:2 **comparison of Nifty and FTSE100**



Source:own processing,2023

As shown in above plot it shows that Indian stock market shows similar volatility but Indian stock market is more riskier in comparison with UK market.

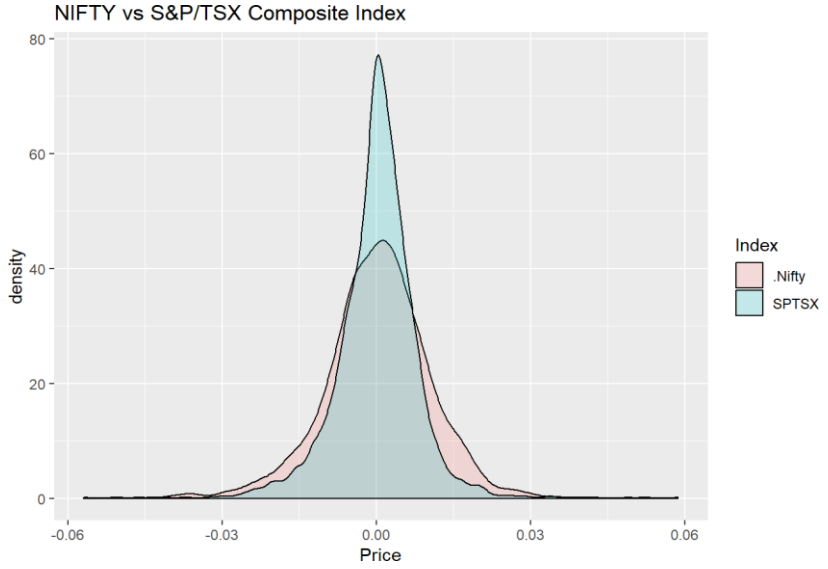
Figure:3 **comparison of Nifty and Euronext100**



Source: own processing,2023

So here Nifty and Euronext100 has almost same volatility as shown from above plot but Euronext100 has greater peak in comparison with Nifty.Thus Indian market is riskier compare to European market.

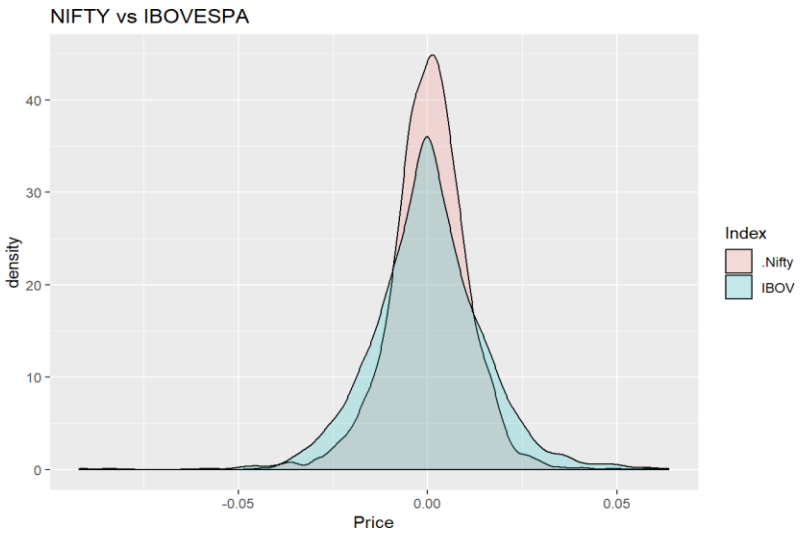
Figure:4 **comparison of Nifty and S&P/TSX**



Source:own processing,2023

Therefore Nifty has more variability compared to S&P/TSX Composite.and at time S&P/TSX Composite has a greater peak compared to Nifty. So from this comparison Indian stock market shows more volatility and is riskier compared to Canadian Stock market.

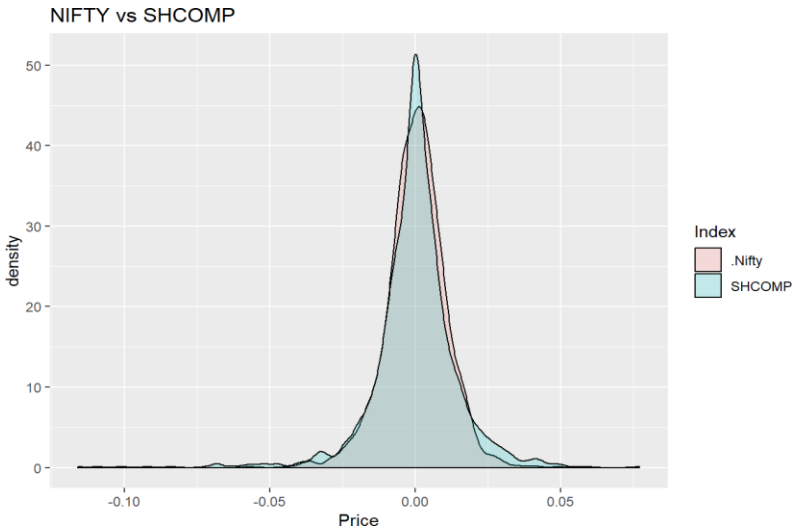
Figure:5 **comparison of Nifty and IBOVESPA**



Source:own processing,2023

From above graph it defines that Nifty has less volatility compared to IBOVESPA. And Nifty has higger peak compared to IBOVESPA. But Indian stock market is less risker than Brazilian market.

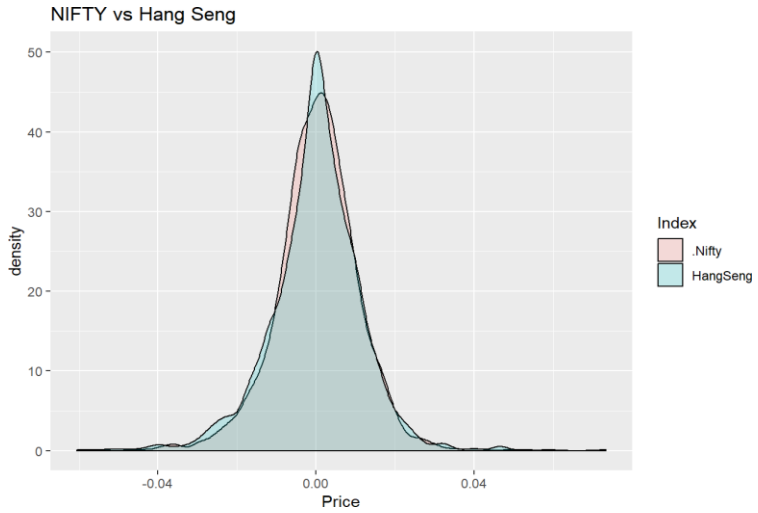
Figure:6 **comparison of Nifty and SHCOMP**



Source: own processing,2023

Nifty has slightly less volatility compared to SHCOMP. But, the SHCOMP has greater peak compared to Nifty. but the Indian Stock Market is riskier compared to the Chinese market.

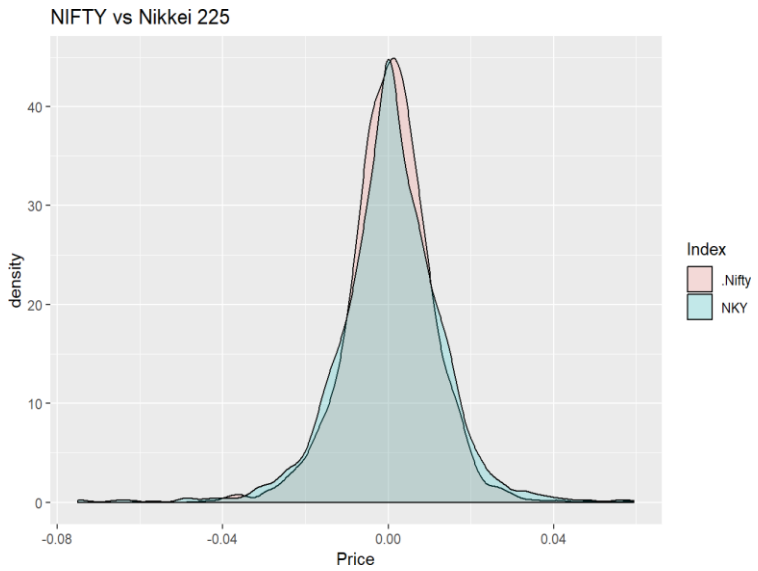
Figure:7 **comparison of Nifty and Hang Seng**



Source: own processing,2023

Nifty has almost the same volatility compared to Hang Seng and Hang Seng has slightly greater peak compared to Nifty. But the Indian Stock Market is slightly riskier compared to the Hong Kong market.

Figure:8 **comparison of Nifty and Nikkei 225**



Source: own processing,2023

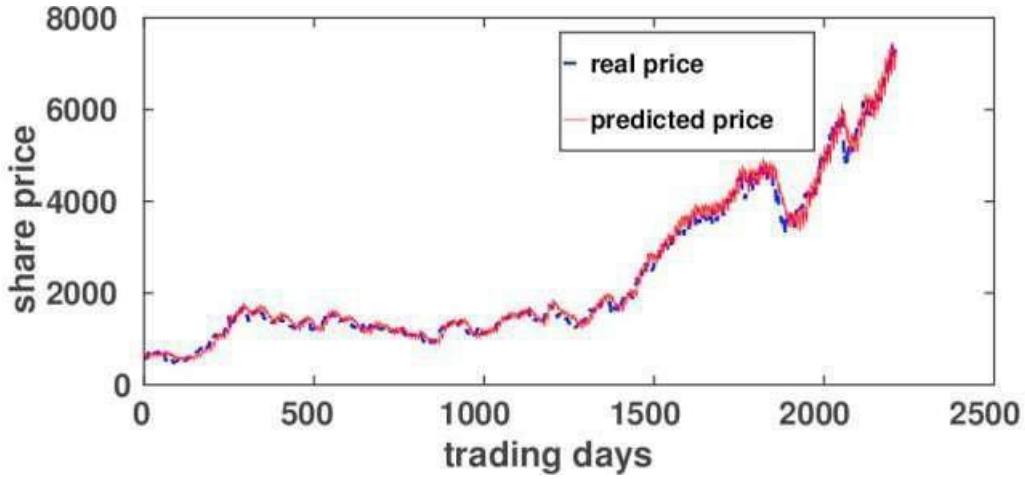
Nifty has almost the same variability compared to Nikkei 225. And Nikkei 225 has almost same peak compared to Nifty. Indian Stock Market are almost equally risky compared to the Japanese market.

4.2 Prediction of stock prices by using machine learning techniques for Indian market.

After doing the analysis on Indian stock markets data, and it is NSE (National stock exchange). In this case there are four types of deep neural networks used which are named MLP (Multi Layer Perceptron), RNN (Recurrent Neural Network), LSTM (Long Short Term Memory), and CNN (Convolutional Neural Network). All these networks were trained with NSE data of Maruti, Axis bank, HCL which belong to the automobile, financial and IT sector respectively.

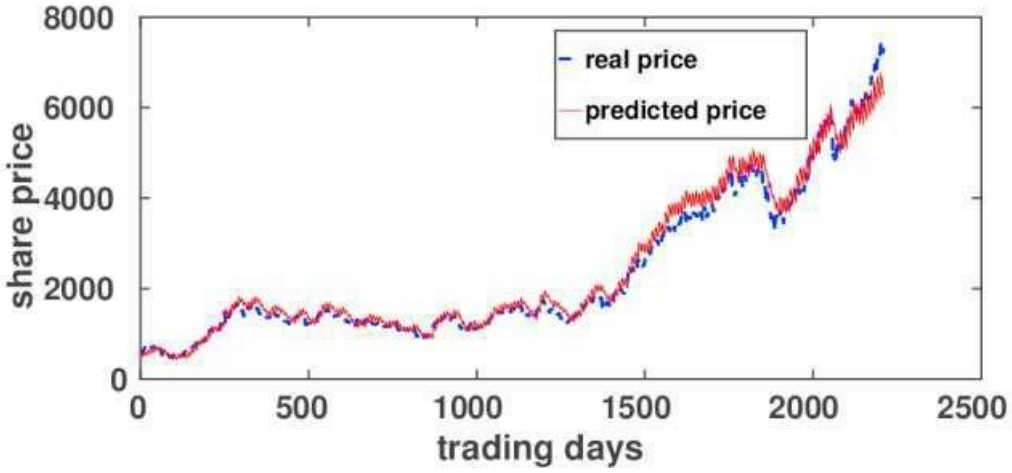
In this case of Maruti, figure (9.1) shows that MLP network which was successful in capturing the pattern because it uses the current window information for the prediction. But in case of figure(9.2) and figure(9.3) between the period of 1500 and 2300 days RNN and LSTM failed to identify the seasonal pattern which can be considered as change in behavior of system.In figure(9.4) CNN almost captured the pattern since it accounts only the data in a particular window.

Figure:9.1 **MLP graph of maruti**



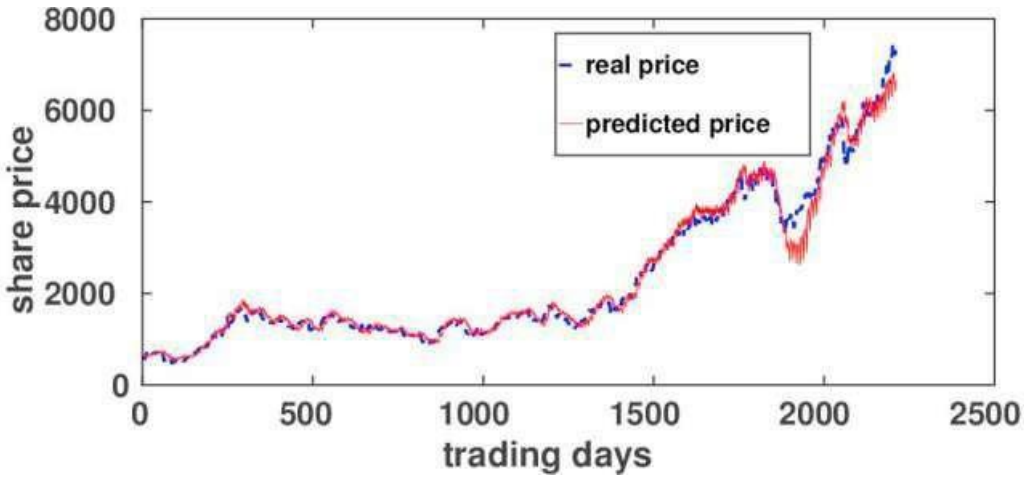
Source: own processing,2023

Figure:9.2 **RNN graph of maruti**



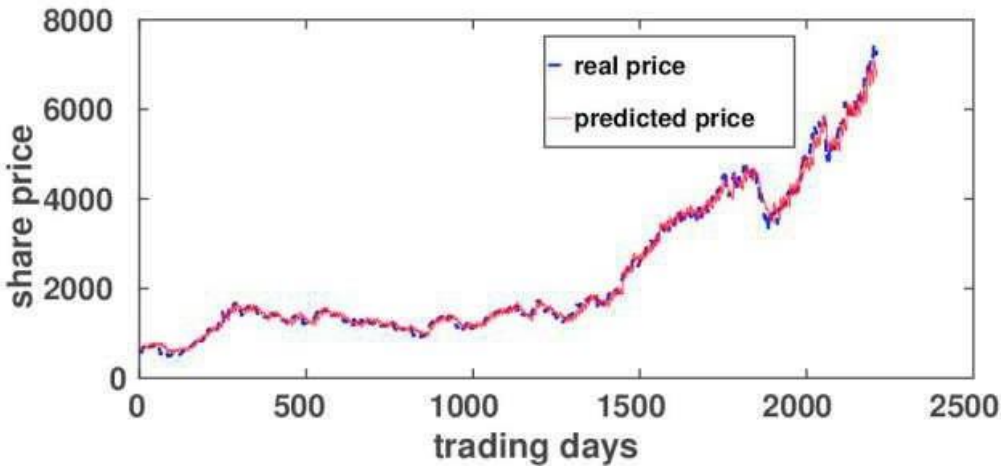
Source: own processing,2023

Figure:9.3 **LSTM graph of maruti**



Source: own processing,2023

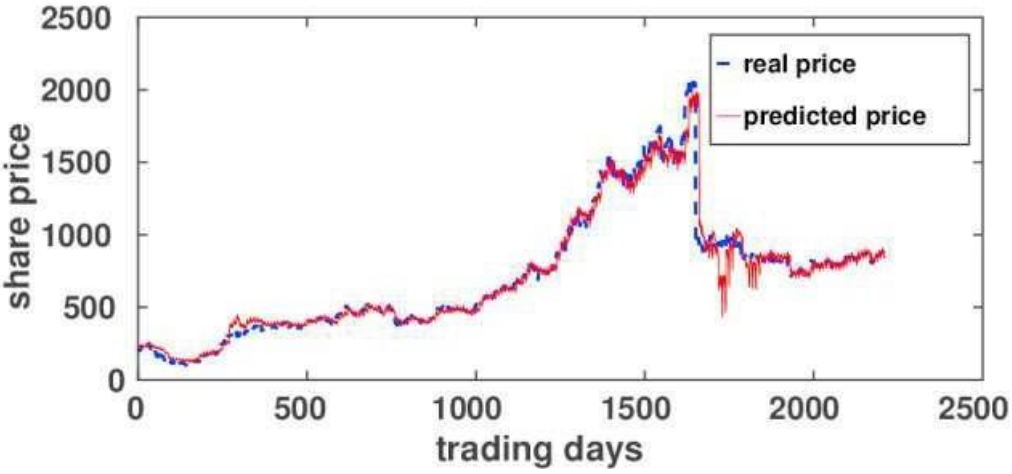
Figure:9.4 **CNN graph of maruti**



Source: own processing,2023

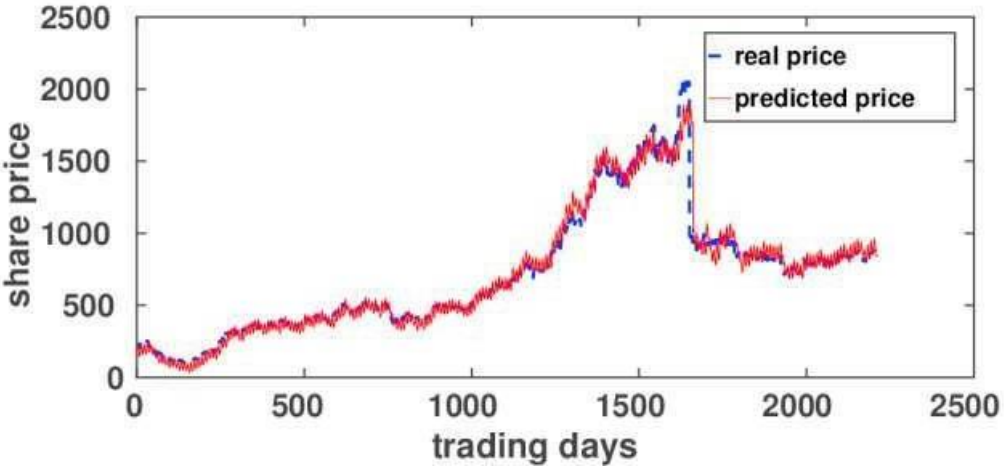
In case of HCLTECH, figure (10.1), MLP network is successful in capturing the seasonal pattern but between the time period 1600 and 1900 days it failed to capture the pattern. In figure(10.2) RNN was almost successful in identifying the pattern where as figure(10.3) and figure(10.4) shows that LSTM and CNN fail to capture change in system between the period 1400 and 1800 days.

Figure:10.1 **MLP graph of hcl**



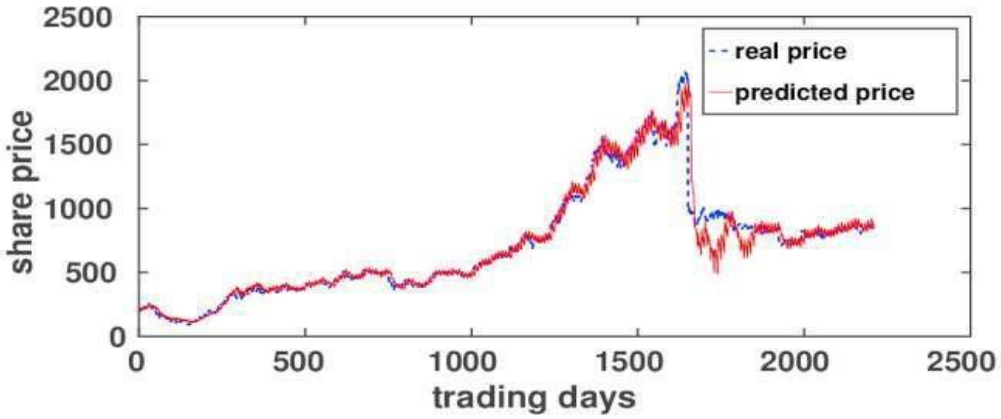
Source: own processing,2023

Figure:10.2 **RNN graph of hcl**



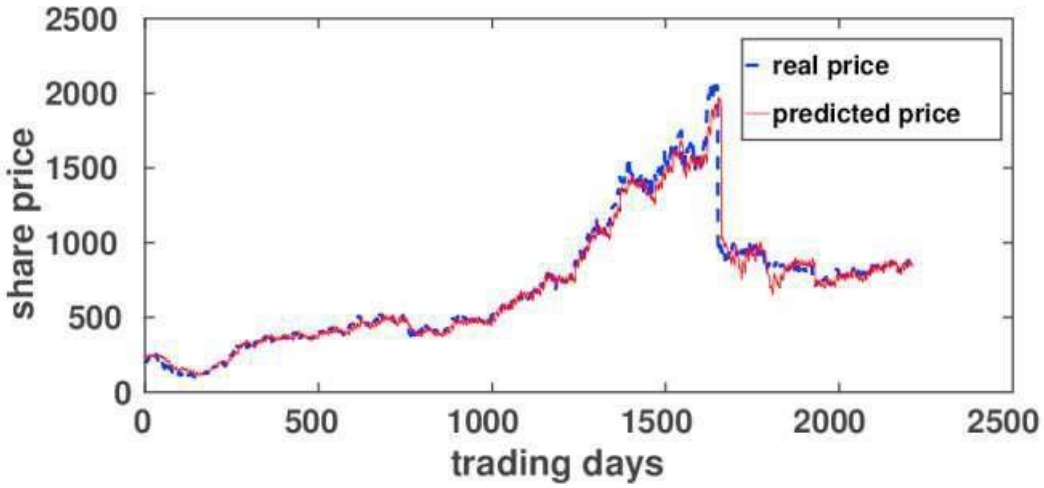
Source: own processing,2023

Figure:10.3 **LSTM graph of hcl**



Source: own processing,2023

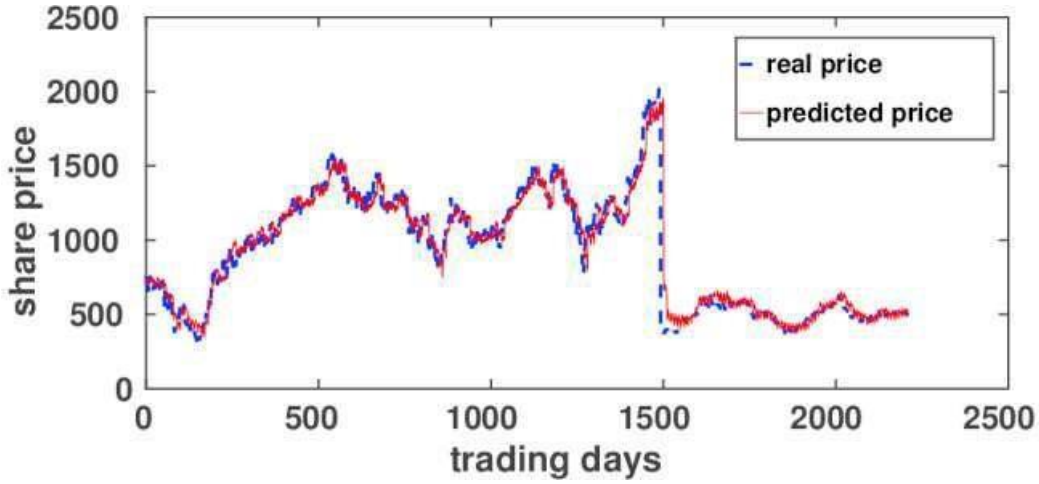
Figure:10.4 **CNN graph of hcl**



Source: own processing,2023

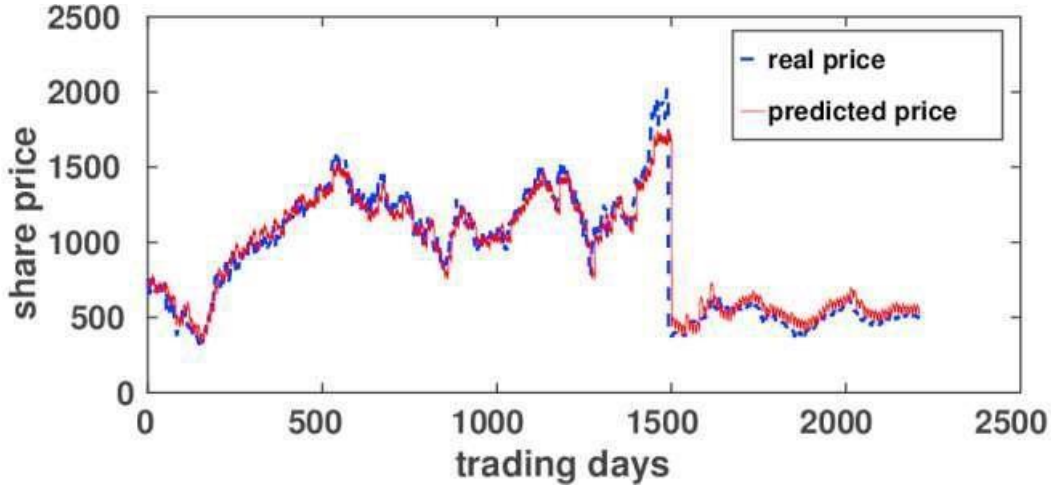
In case of AXIS BANK, from figure(11.1), MLP network identified the pattern at the beginning but on reaching the time period between 1400 and 1700 days it failed to capture the pattern. Similar effects can be found in figure(11.2) where RNN captured the pattern at the initial stage but on reaching the time period between 1300 and 1600 it fails to identify the pattern. From figure(11.3) and figure(11.4), LSTM and CNN, LSTM network is not identifying the pattern for timeperiods between 200 and 500 days where as CNN almost captured the pattern except at the period between 1600 and 1800 days

Figure:11.1 **MLP graph of axis bank**



Source: own processing,2023

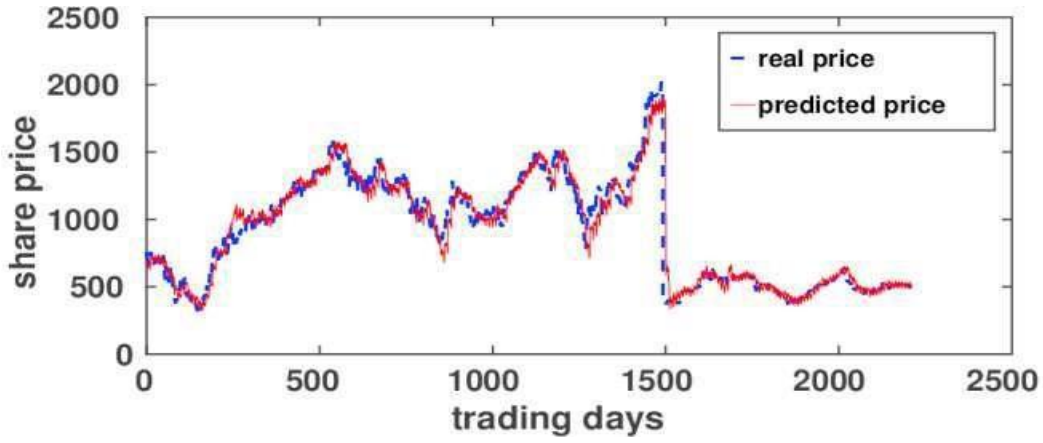
Figure:11.2 **RNN graph of axis bank**



Source: own processing,2023

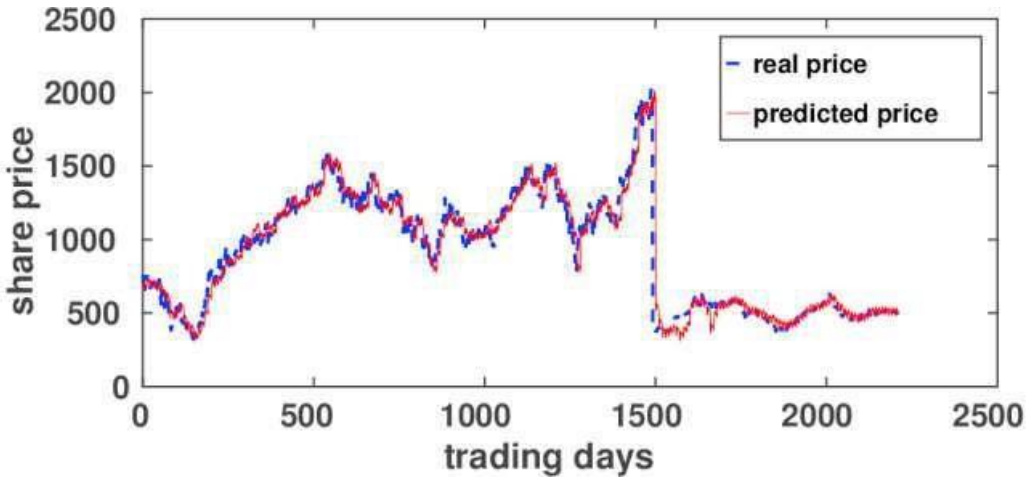
Figure:11.3 **LSTM graph of axis**

bank



Source: own processing,2023

Figure:11.4 **CNN graph of axis bank**



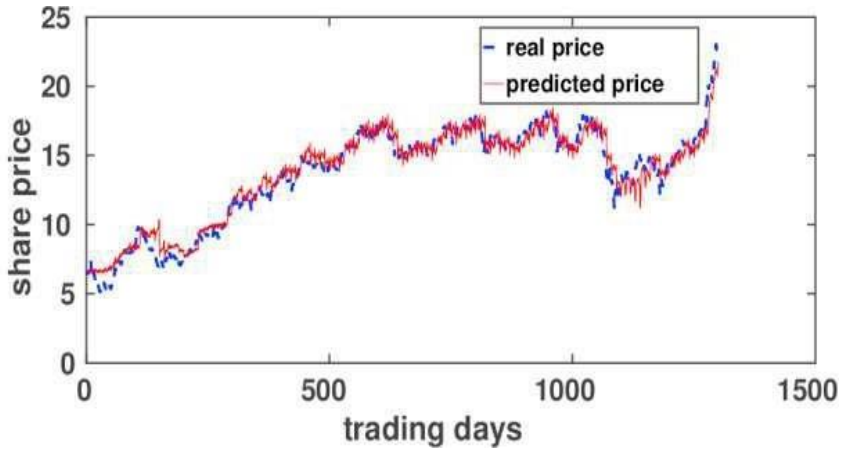
Source: own processing,2023

4.3 Prediction of stock prices by using machine learning techniques for Western markets.

After doing the analysis on Western stock markets data, and it is NYSE (New York Stock Exchange). In this case there are four types of deep neural networks used which are named MLP (Multi Layer Perceptron), RNN (Recurrent Neural Network), LSTM (Long Short Term Memory), and CNN (Convolutional Neural Network). All these networks were trained with NYSE data of Bank of America and Chesapeake Energy which belong to the financial and Energy sector respectively.

In case of Bank of America, figure(12.1), MLP network failed to identify the pattern in beginning but later on it almost captured the pattern. From figure(12.2), RNN also exhibits similar behavior in beginning time period from 50 to 600 and later on it captured the pattern but on reaching the end prediction is little lagging compared to the actual values. From figure(12.3) we can see LSTM failed to capture the pattern at the beginning and also between the period 1100 and 1250 days. In figure(12.4), CNN almost captured the pattern compared to other three networks.

Figure:12.1 **MLP graph of BOA**

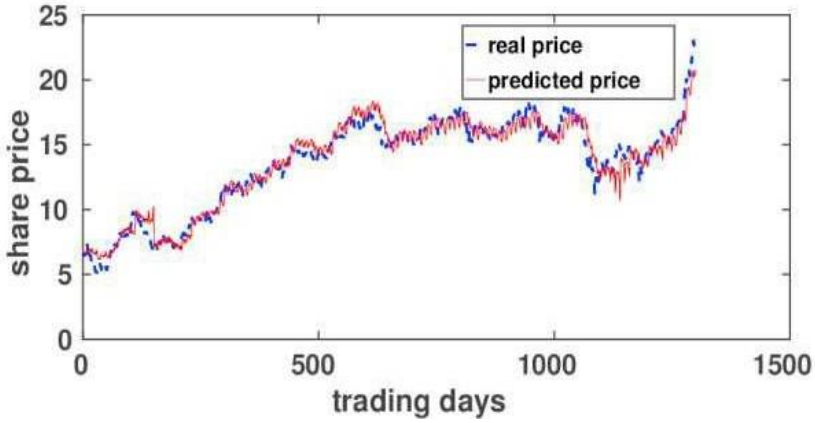


Source: own processing,2023

Figure:12.2 **RNN graph of BOA**

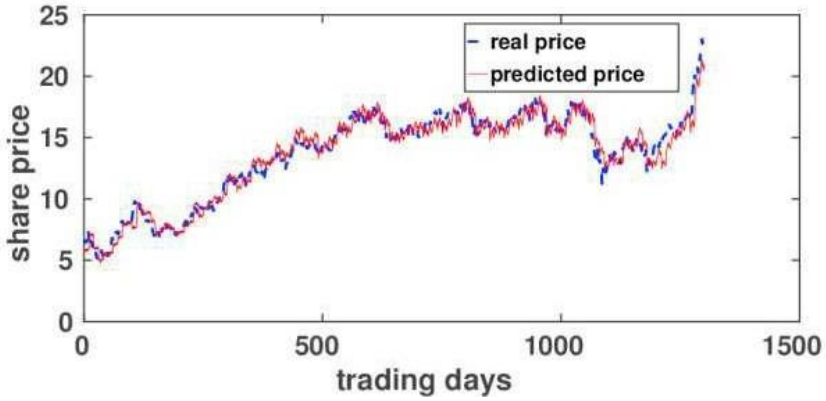
Source: own processing,2023

Figure:12.3 **LSTM graph of BOA**



Source: own processing,2023

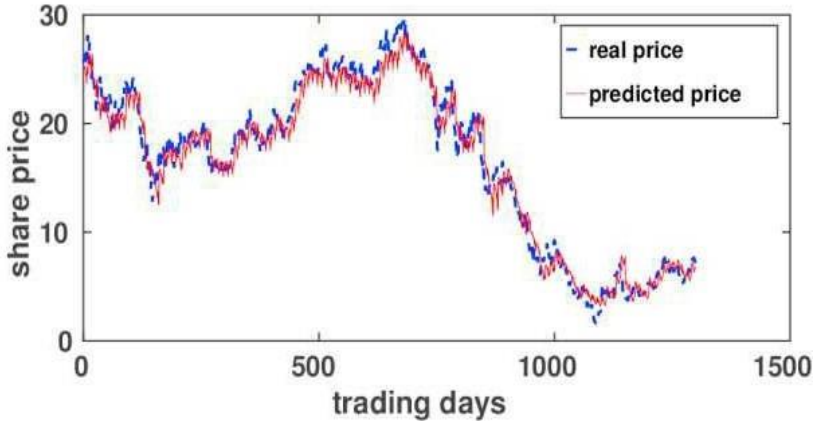
Figure:12.4 **CNN graph of BOA**



Source: own processing,2023

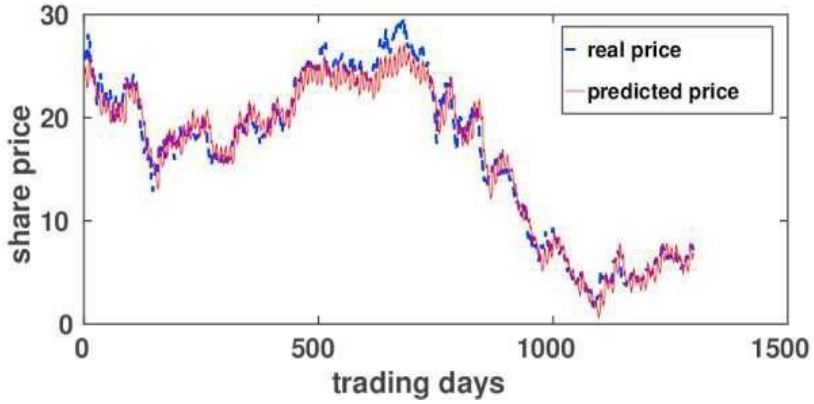
In case of Chesapeak Energy, figure(13.1) and figure(13.2), MLP and RNN failed to identify the pattern between a period of 500 and 900 days. In figure(13.3), LSTM, failed to capture the seasonal pattern at the beginning and also for the period between 600 and 800 days. But towards the end, it almost identified the pattern. In figure(13.4) we can observe that CNN performed better compared to other three networks even though there are some region which shows less accuracy for the predicted values

Figure:13.1 **MLP graph of Chesapeak Energy**



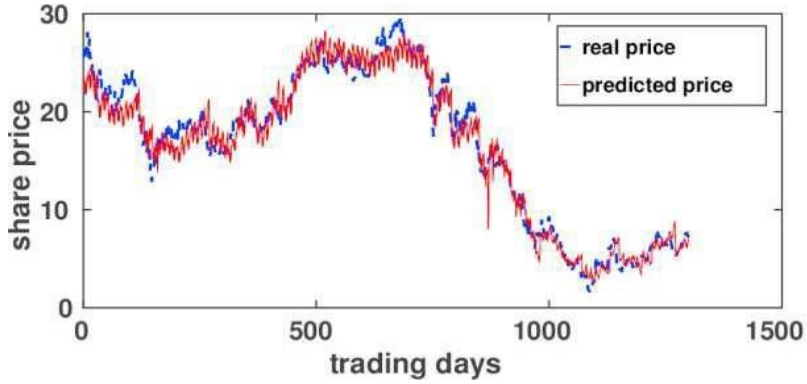
Source:own processing,2023

Figure:13.2 **RNN graph of Chesapeak Energy**



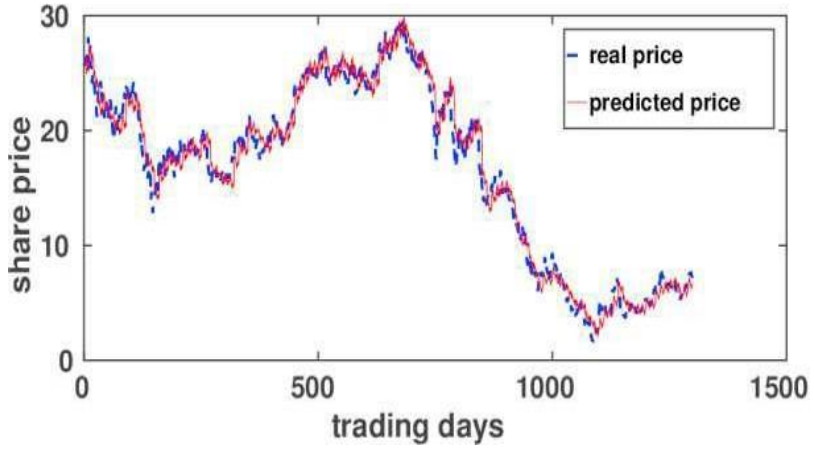
Source:own processing,2023

Figure:13.3 **LSTM graph of Chesapeak Energy**



Source: own processing,2023

Figure:13.4 **CNN graph of Chesapeak Energy**



Source: own processing,2023

5. Results and Discussion

5.1 Investors behaviour

To begin with and by doing analysis it is found that the Indian and Western markets had varied preferences for investment kinds and methods. In India, there is a significant preference for real estate and gold, as well as a growing interest in stock and mutual funds, inspired by internet channels. Western investors, on the other hand, have a more diverse investment portfolio, with a strong focus on equities, bonds, and new investment options such as ETFs and cryptocurrencies.

5.2 Return on investment (ROI)

In India, ROI on real estate in metropolitan cities has offered an annual return of 3-6% whereas commercial properties can offer a higher return. In Western Countries, the average ROI on residential real estate typically ranges between 5-10%, commercial real estate especially datacentres have seen increased demand potentially offering higher ROIs.

Investing in gold completely depends on US dollar price fluctuations, the value of the Indian Rupee (INR) against the US dollar can significantly affect gold price and ROI. Generally, Indians invest in gold by buying physical or gold bonds. due to more culturally connected.

5.3 High risk high return

The comparative analysis of international stock markets and their linkages with the Indian Stock Market shows the unpredictability and risk associated with developing markets. The Indian Stock Market, known for its volatile performance, stands out against the circumstances of more stable markets seen in advanced economies. This difference is crucial for investors who want to understand the complicated nature of the global investing market.

5.4 Limitations of AI in investment decisions

Despite doing more work with accuracy and working with large data AI or ML cannot be 100 percent accurate so cannot rely on them because machines or robots cannot predict big diseases like COVID-19 and if they can predict they will just predict that there is fall stock but cannot say how much fall will be there. And always the threat of cyber-attacks and

breakdown time. It can be biased as someone who developed and train the data so ensuring fairness and ethical use of AI in investment decisions remains challenging. Incomplete data can lead to false predictions and decisions.

5.5 Four types of deep neural networks

Four types of deep neural networks are MLP, RNN, CNN, LSTM which are used for stock price predictions of Indian companies from different sectors like automobiles, finance, and IT. A Multi-Layer Perceptron is a type of artificial neural network designed for supervised learning, featuring multiple layers of interconnected nodes. (MLP), A Recurrent Neural Network is a type of artificial neural network designed for processing sequential data by maintaining internal memory for context awareness.(RNN), A Convolutional Neural Network is a type of artificial neural network specifically designed for image recognition and processing tasks, using convolutional layers for feature extraction.(CNN), Long Short-Term Memory is a type of recurrent neural network architecture designed to handle the challenges of vanishing and exploding gradients in deep learning, enabling better retention of sequential information.(LSTM).

This all are generally used in stock price predictions and from that CNN has more accurate predictions till now. There is two lines in graph which shows real price(blue) and predicted price (red). Therefore, this indicates that to predict more accurate all the neural networks of AI need to be integrated with each other so by this it will predict more accurate and process more data. And there will be great revolution in Investment industry.so current AI and all other neural networks will need to undergo major updates and upgrades to achieve a successful outcome.

6. Conclusion

In conclusion, successful investing needs a careful balance of knowing the many investment possibilities, combining strategies with financial objectives, and responding to market fluctuations. To handle the ever-changing financial landscape, investment portfolios must be constantly monitored and at regular intervals updated.

Al transforms corporate operations in the financial and economic sectors by enabling efficient trading, advanced data analysis, and predictive modelling. Improves decision-making, risk management, and processes.

From the analysis, of all the different market world, it concluded that the Indian Stock Market is volatile and risky compared to most of the Stock Markets. This may be due to fact that Indian Market is an emerging market and most of the other markets were from developed economies.

This work is based on four deep learning architecture for the stock price prediction of NSE. They are trained with four networks MLP, RNN, LSTM and CNN with the stock price from NSE. The models obtained were used for predicting the stock price of MARUTI, HCL and AXIS BANK from NSE stock market. In the proposed work , CNN has performed better than other three networks as it is capable of capturing the abrupt changes in the system since a particular window is used for predicting the next instant.

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8. List of Pictures, Tables and Abbreviations

8.1 List of pictures

8.2 List of table

8.3 List of abbreviations

MLP .....Multi Layer Perceptron
CNN .....Convolutional Neural Network
RNN ..... Recurrent Neural Network
LSTM ..... Long Short Term Memory
AI .....Artificial intelligence
ML..... Machine learning
BOA .....Bank of America
INR.....Indian Rupee
USD.....US Dollar

9. Appendix

9.1Questionnaire

1) How would you rate your knowledge of investment concepts and strategies?

- Well, I do have a knowledge of investments as I was working in an investment firm.

2) How familiar are you with artificial intelligence technologies, especially in the context of investment decisions?

-I am familiar with AI in investment industry but never used one for trading or making investments decisions

3) Have you ever used AI-based tools or platforms for investment analysis?

- No, as all the AI based tools are still in there beta versions its always good to use after there full version release

4) If yes, please specify the type of AI applications used (e.g., robo-advisors, machine learning algorithms, sentiment analysis, etc.).

- I have not use any but heard about robo-advisors and machine learning algorithms.

5) How confident are you in the accuracy and reliability of AI-generated investment recommendations?

- I would say netural as of now.

6) Are you aware of AI-driven investment strategies employed in Indian and Western markets?

- No.

7) How would you describe the level of acceptance and adoption of AI in investment practices in these markets?

- Once its out in full format it would do best but I think adopting would be faster if they develop respecting's needs and conditions of each country.

8) Which of the following types of investments have you ever engaged in?

- I used to invest in stocks, mutual funds, gold bonds.

9) In your view, are there cultural factors that may influence the acceptance and adoption of AI in investment practices in India and the West?

- yes definitely cultural factors will influence the adoption of AI

Source: own processing ,2023