



# **Advantages and Disadvantages of AI-based Trading and Investing Versus Traditional Methods**

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## **ABSTRACT**

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Artificial intelligence (AI) is one of the most discussed topics in finance. AI is expected to learn and execute more efficient decisions and perform more than routine and repetitive tasks. Researches have shown that AI is already dominating and outperforming humans in some financial corporations. The research was aimed to find the profitability of traditional versus AI-based approaches in trading and investing in the financial market.

Building on existing work on AI trading and investing, asks: what are the advantages and disadvantages of using AI in trading in financial markets? Furthermore, how effective or risky AI-based trading versus a traditional approach is?, Considering expenses and maintenances.

In this research-based thesis, a literature review on using AI in trading and investing and theories of chaos and automata, an online AI-based trading platform, a TEDx presentation, and an interview with a software engineer was presented. Analysis of the above material demonstrated that traditional trading methods take much time to collect data and make strategies by analyzing it, which is time-consuming. While an AI trading system is expensive to develop, it can explore vast data and make more and better results once built, for example, picking stocks quickly.

The results indicated that artificial intelligence does have a huge impact on trading and investing in financial markets. While it is expensive to invest in it as an individual or small company, at the same time, it is proven to be more profitable for big finance companies.

Applying AI and its applications in different AI-based methods vary according to various financial markets' stocks and assets. Different time frames and small changes while scaling the AI-methods results in different outcomes; therefore, further research is demanded to identify specific data patterns on particular sections that could prove AI trading and investing effectiveness in more precision.

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Keywords: artificial intelligence, AI-based trading, AI impact on financial markets, stock trading, investing in the stock markets

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## 1 INTRODUCTION

Technology is playing a remarkably significant role in everyday experiences. It has revolutionized almost every aspect of people's lives, including financial trading and investing. Trading and investing in the stock markets has not been this simple ever before and advancements in technology have paved the ground for AI to involve in various trading and investing processes. AI goal which simulates human intelligence, is that machines learn and do problem-solving as humans do with less cost and less time.

Computing has already brought massive improvement to financial trading, enabling immense calculations in less than a second and tracking and analyzing the market patterns at very high speeds. AI is expected to enforce financial trading that can be a huge success in the finance field. AI and finance fulfill each other's needs and gaps very well. Different techniques are under development in trading and investing that work even better than the human brain, such as machine learning, capable of detecting spots in patterns. Using AI is not a new topic for some financial corporations. Only some big finance corporations were using AI in stock trading, but slowly using AI in financial trading becomes mainstream for others. (Zamagna 2018.)

AI might take jobs from people, or in other words, AI brings a change in the job market. Computational power was not cheap before, but using machines solving complex problems made it economically feasible. Software and hardware technology advancements enable AI and its applications such as Machine learning (ML) and Neural Networks (NN) to identify and analyze valuable factors together using with other classifiers to develop various profitable strategies and models. (Harris 2017.)

As mentioned above, many industries, especially in finance, already use AI in their processes. Companies such as hedge funds use AI for investment ideas and develop portfolios, and half of the total revenues from cash equity trading are accounted for from electronic trades. AI simplifies data analysis with very fair cost, and forecasting markets are possible with higher accuracy; moreover it reduces

risks and brings greater profits. With all expectations and hopes from AI, there are some doubts about its capabilities, like mostly random price predictions. When the volatility is high in the market, AI-based predictions are not very accurate, and it is not suitable for an automated trading strategy. Therefore, traders are interested in quant trading strategies such as arbitrage trading and high-frequency trading. (Platinum Crypto Academy 2020.)

The new generation uses digital applications more than ever, which increases the demand and transforms the methods in almost every area and industry, the same way, it has affected the trading and investing in financial markets. Investing or trading in financial markets takes only some minutes to access, invest, and trade, using numerous digital platforms in just a few steps. The high demand and ease of access can be one reason that there is much focus on using AI to automate, detect, analyze, and execute profitable trades in split seconds. The author's trading journey is also similar, starting from the corporate finance studies and later got interested in the related subjects and materials until trading using a brokerage platform. Understanding and facing many hustles and challenges reached the point of doing the thesis related to an important and attractive topic, AI, and trading.

The data in this thesis is collected to understand a broader conception of the topic, and it extends with more profound materials to get to the actual points and reaches the line between information technology (programming languages) and finance. This thesis is written to serve as a good guide to look at what AI is in trading and investing and the advantages and disadvantages of using AI and its applications in trading and comparing the cost and maintenance of AI-based and traditional-based approaches trading investing.

## **2 THESIS PLAN**

The thesis plan introduces the topic, objective, and purpose of the thesis and a broad explanation of the relevant concepts and theories related to the thesis topic and thesis questions.

### **2.1 Thesis topic**

The topic of this thesis is “Advantages and Disadvantages of AI-based Trading and Investing Versus Traditional Methods.” It is a trendy topic, and it has been applied to various fields and industries. Financial industries are among the most complex creations of humans with immense potential to grasp Artificial Intelligence and take the industry to a higher level. AI can get the work done in less time, more accurately, and always updated.

It is the early days of AI in the Financial Industry, it is growing abruptly and changing the face of ordinary services and challenges, especially when it comes to trading in the financial markets. Technically investing in the financial markets is getting challenging, and at the same time, the number of first-time investors is increasing. Hence, companies in financial services and financial markets must be innovative in artificial intelligence to compete.

This thesis is focused on the effect of artificial intelligence on investment in the stock markets. AI exists in a wide range in financial markets and financial services. Automation enhances efficiency and productivity, reduces the faults which are resulted from psychological and emotional reasons, fulfilling or pinpointing the gaps like the variances and long-term trends which are not easily recognized with ordinary reporting methods, to improve the quality and conciseness of the management data. (Chan et al. 2019.)

## 2.2 Thesis objective, purpose and research questions

This thesis aims to identify AI's influences and the changes it brings in trading and investing in financial markets and produce a reliable outcome for humans compared to AI or machines in trading in stock markets. The purpose is to comprehend the effectiveness and applicability of AI and its tools in trading assets in the stock market. A good ground writing about Artificial Intelligence-based Trading in Financial Markets identifies the gaps and in finance, prominently in trading processes. This thesis researches and analyses the following factors:

- The role of AI's development in the finance and finance industry
- The possible changes AI brings to investing and trading methods in financial markets
- The applicability of AI and its parts and enablers in various processes are also discussed

The research question is, "What are the advantages and disadvantages of using AI in trading in financial markets?" Moreover, the sub thesis question is, "How effective or risky AI-based trading compared to traditional approaches is? considering the expenses and maintenances." The answers to the thesis's main question and sub-question is discussed in separate chapters.

The objective is to measure and ascertain how profitable trading assets in the stock markets is, using AI-enabled systems compared to traditional approaches. Some rich sources have been considered and analyzed to experiment with some basic AI-based trading examples further. The sources are such as ALGORIZ, a trading platform developed to generate results by entering various inputs. A TEDx presentation by Marshall Chang, CIO of AI Capital Management, reflects how AI is dominating the hedge fund industry. Including an interview with Sebastian Dobrinicu, a freelancer and software engineer, built a stock trading bot using machine learning approaches to efficiently predict and automate selling and buying in the stock market.

### **3 CONCEPTS, THEORIES AND BACKGROUND INFORMATION**

In this thesis, different concepts related to the thesis topic “Artificial Intelligence based trading in the stock markets” are discussed, related to artificial intelligence, trading stocks, investments, and financial market concepts and theories.

#### **3.1 Chaos and Automata theories**

Chaos theory’s relation to the thesis topic is when the complexity of financial markets is debated because they are complex, and its precision is only to a certain extent. Chaos theory deals with impossible or complicated events to control or predict, such as weather, and with the same characteristics come markets that are not being maintained or anticipated.

Chaos theory, which is an interesting theory, once was one of the solemn topics, but it has not been used adequately in finance and finance-related topics. Financial markets are being random and unstable more than ever, meanwhile it brings attention to chaos theory. Chaos theory could be used as the right part of knowledge in finding order in disorder. The chaos theory meant to be used mainly in stock trading, but its application in finance expanded. The theory has been applied to the financial market, and the arguments are that it is competitive and a convenient theory for the financial markets. The chaos theory considers dynamics while traditional finance methods do not, and instability of finance is correlated to its innovativeness. (Klioutchnikov, Sigova & Beizerov 2017.)

As mentioned above, chaos theory is about finding order in disorder, and using chaos theory allows us to measure the dynamics of uncertainty. It shows how a simple deterministic could cause complexity. Chaos and order co-exist, and when there is order, a chaotic process is impossible to predict, or according to the chaos theory, long-term predictions are impossible. Chaos theory dates from the work of Henri Poincare in the late 19th Century. (Peters 1991.)



The second theory in this thesis is the theory of Automata. This theory is discussed because of the use of automation in various finance-related areas. The word automata is derived from Greek means “self-acting,” and automata is the plural form of automation. Automata theory is a theory in theoretical computer science that emerged during the 20<sup>th</sup> Century because of mathematicians’ work when machines were developed to imitate certain features such as fast and unswerving calculations. The theory deals with the logic of computation. Automata enable technicians or scientists to perceive the function ability of machines and how machines solve problems. (Salomaa 1969, 11-21.)

### **3.2 Artificial intelligence**

Artificial intelligence is not a new topic, its extent and steady development in various fields and industries make it a trending topic. That could be one reason why it is selected as the topic of this thesis. In this part of the thesis, AI is discussed further with its definitions, history, types, capabilities, and finance relation, mainly trading in financial markets.

Artificial Intelligence is defined as a technology suite that incorporates computers and algorithms to augment and simulate human intelligence. AI can be an optimization machine that enables adaptive pattern recognition using many data and statistical methods to present the best guess. (Chan et al. 2019.)

AI is taking its first steps in the financial services industry, and it is going to expand broadly and get used in more innovative and competitive ways. Artificial intelligence is used to produce what intelligent people would do in much extended and complicated procedures. It has a wide range and is used in various techniques. AI is fed the data to identify better opportunities that otherwise would be missed, making organizations compete. (Narrative Science, 2018, 11-21.)

When the subject of AI evolved, there were many names given to it, such as complex information processing, machine intelligence, heuristic programming, and cognology. Since the term artificial intelligence was being used in different printings and conferences, it persisted.

The very first steps of artificial intelligence were taken by Aristotle (384-322 BC). Simultaneously, it has been explained and codified some styles of deductive reasoning, which was called syllogisms—continued by that many others like Ramon Llull were turning up and down the notion. The latter built the *Ars Magna* (Great Art), a machine able to answer all questions. Martin Gardner (1916-1982), with his *calculus philosophicus* or *ratiocinator*; in 1958, John McCarthy proposed using the predicate calculus as a language to represent knowledge, and the system was called “*Advice Taker*.” In the twentieth-century, logicians stated most of what is possible and impossible to use logical and computational systems. In 1961 some philosophers and other people in the field declared the confirmation that human intelligence is impossible to mechanize. The reasons were that humans are unlimited.

As shown in Figure 1, the first publication discussed the possibility of mechanizing human-style intelligence by Alan Turing in 1950. That was when Warren McCulloch and Walter Pitts conjectured the connection between simple computing elements and biological neurons. The result showed that it was possible to compute any computable function by networks of logical gates. The result of 1960 and early 1970 AI work opened the way to various problem representations, search techniques, general heuristics, and using them in computer programs for solving basic puzzles, playing games, and retrieving information. More powerful systems were built in 1970 and early 1980, mimicking some expert human performance and many other tasks like diagnosis, design, and analysis. In May 1997, Deep Blue, an IBM program that beat the world chess champion, took much attention to Artificial intelligence. A natural language understanding system was developed by Terry Winograd, followed by a multisite capable of speech understanding. LUNAR was able to answer questions about rock samples from the moon by NASA. (Nils 1998.)

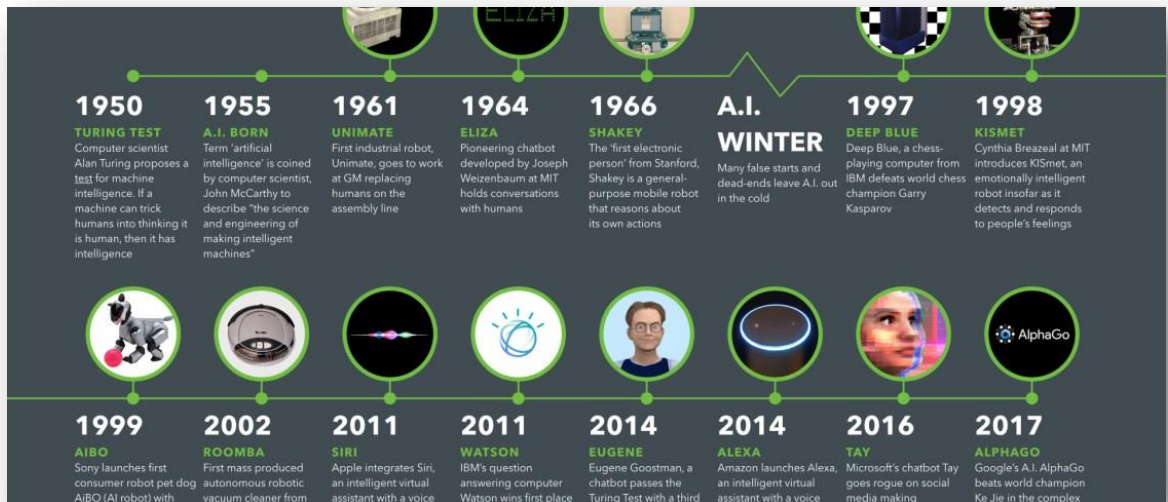


FIGURE 1. Artificial Intelligence Timeline (digitalwellbeing.org)

### 3.3 Branches of AI

#### Machine Learning

Machine learning (ML) using big data has become conventional, and in the field of finance and trading in markets, it is used as a part of algorithmic trading. This kind of tool or model derives most transactions in the New York Stock Exchange (NYSE). (Sezer, Ozbayoglu & Dogdu 2017.)

#### Deep Learning

Financial prediction has become one crucial part related to AI and the financial industry. According to the theory, much financial prediction data is scattered. Getting direction from analyzing big data is challenging, and financial, economic theory cannot specify the data. There are several predictive models in which prediction is not well justified. Therefore, deep learning is reckoned as a method or tool that learns the sophisticated data features and results in a reasonable prediction. Deep learning is one form of Machine Learning, and Machine Learning

uses data to train models to make predictions from the given data. (Heaton, Polson & Witte 2016.)

## **Neural Networks**

An Artificial Neural Network (NN) is a model inspired by the human brain or biological neural network. In financial services, NN is required to automate complex processes and massive amounts of data and judgment, and it has added good yield. It is applicable in banking, insurance, and capital markets in cases such as prediction, detection and extracting information, and automation. (Heaton, Polson & Witte 2016.)

### **3.4 Financial markets and investing**

Financial Markets, one of the most intricate human beings, are being affected by technology expansion and growth. Technology is easing human's access to trade on stock markets in many ways. People can trade any amount of money using only a mobile phone and an application in its simplest form. There has been much progress in how trades and investments happen, but the idea behind it remains the same; means that the markets have not ever been beaten or overtaken by only one individual, sector, or company. Thus, technology development and mostly artificial intelligence are effective approaches that many financial companies and experts in finance sectors focus on to benefit the utmost.

According to Corporate Finance Institute (CFI) (2015), financial markets are where the sale and purchase of assets, securities like bonds, foreign exchange, stocks, and derivatives occur (CFI 2015).

The first marketplace was the coffeehouse in London, which stock traders gathered there to exchange shares. In 1773 the coffeehouse became London Stock Exchange, which was the first one founded. In 1792 a market known as Wall Street opened, and in 1817 it changed its name to New York Stock and Exchange Board. (Bramble 2020).

An increase in share volume caused the need for an organized marketplace, and when businesses and companies need more funds to run or expand to grow, they can raise funds required from internal employees, their families and ask banks for loans. Once they need more capital than is available, or an investor wants to sell their holdings for cash. Here is when buyers invest. For example, at the start of the 17th Century, the Dutch raised money by collecting funds and receiving ownership. The receipt determined the ownership of a part of a share of the company or business. (Becket 2002.)

The stock market is a platform where hundreds and thousands of buyers and sellers trade various securities, and the stock market ensures that all the trades execute with fair prices and transparent transactions. The stock market is where activities such as buying, selling, and issuance of public-held companies happen, and there are multiple markets and exchanges included in the stock market. Financial activities are conducted over the counter or institutionalized formal exchanges under a defined set of regulations at the stock market. (Bramble 2020.)

Stock markets exist in many countries with different sizes. In the next figure, some of them are shown according to their share in percentage. The United States is on the top of the list containing 54.5% of the world's stock markets.

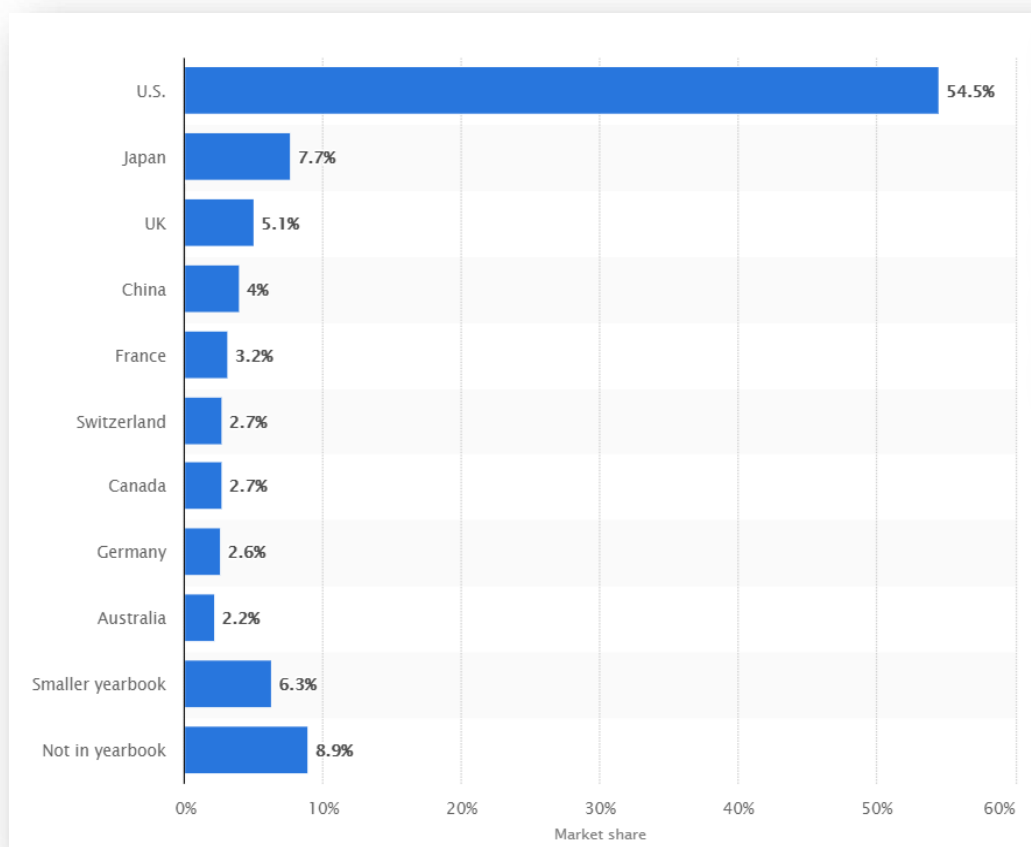


FIGURE 2. Distribution of countries with the largest stock markets worldwide. (Statista.com)

### 3.4.1 Investment types

It could be argued that investing and trading in stock markets are the reasons for writing this thesis; after investing in US stock markets and losing and profiting some amount, the idea of how trading in stock markets works arose and made the author select the topic related to AI and trading in stock markets. At this part of the thesis, investment styles, types, stages, and where AI is considered in investments are elaborated.

Investing is buying assets such as stocks, bonds, mutual funds or real estate with the expectation that your investment will make money for you. Investments usually are selected to achieve long-term goals. In short, investing is seeding resources to generate profit. Investing could be used in assets like purchasing

real estate to resell at a higher price and profit or to run a new business. Expecting a return is the main idea of investing, and Investing is a considerable part of economies and companies. The most common investment types are investing in stocks, bonds, funds, investment trusts, alternative investments, options and derivatives, and commodities. There are different investment types as tools that can help to achieve financial goals. From stocks and bonds to mutual funds and real estate, each investment type has various features and risk factors that investors can use.

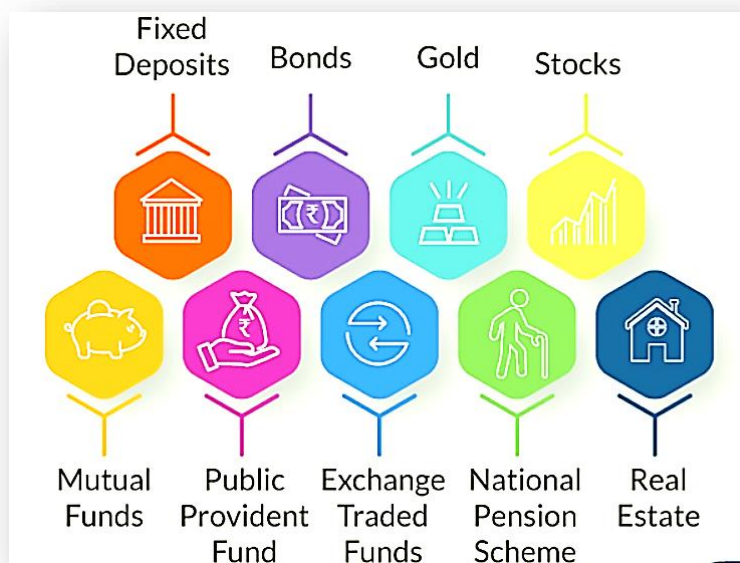


FIGURE 3. Types of investment. (Paisabazaar.com)

Investing has three main stages, which are data identification, asset valuation, and risk management. AI has mostly been used for asset valuation and identifying the preferred data and risk management. In financial investing, two types of data, technical, and fundamentals are used. Technical data is measurements of the price according to the time it is technical data. It produces much information like moving average, Relative Strength Index (RSI), Exponential Moving Average (EMA), or standard deviation. Fundamental data is about evaluating the value of an asset according to its price. There are many data streams considered in fundamental data analysis, like corporate earnings and corporate debt. Various non-AI tools are used to identify what kind of data is preferably useful and what is not. That kind of computational technique can be combined with AI techniques

with various combinations of data to determine what sort of data to use in asset valuation. (Rada & Wimmer 2015.)

Numerous factors influence an investment's positive outcome, and one is picking the right stock, exchange-traded funds (ETF), or option before investing. Different approaches have different results, and each has its own merits. With the use of AI, there are more opportunities. The AI application provides new tools that bring other possibilities to the market. AI can analyze big data in real-time and predict the stock dynamics against the theory of investment. (Chishti et al. 2020.)

### **3.5 Working methods and data**

The primary data will be collected from a pre-existed interview with Sebastian Dobrinu. He is a freelancer and software engineer, a presentation by Zhuang Marshall Chang, founder, and AI CIO. Capital Management on How AI Traders Will Dominate Hedge Fund Industry, and trading using AI-enabled platform on ALGORIZ AI platform.

This thesis's secondary data is gathered from various books, reports, journals, platforms, interviews, scientific publications, and additional trusted online sources.

### **3.6 Thesis process**

The thesis starts with an inclusive introduction reviewing the thesis topic, followed by the second chapter. The thesis plan chapter describes the thesis objective, purpose, and research questions. Chapter three is an understanding of the concepts, theories, and background information. Moreover, chapter four focuses on AI-based trading with practical examples and modeling a company to understand the topic better. Chapter five compares AI trading compared to traditional trading, and chapter six mainly focuses on SWOT analysis.



## **4 AI-BASED TRADING**

AI is one of the most discussed topics related to trading and investing in financial markets. AI is cited and considered in various stages and processes of finance. AI, which can learn, mimic, and develop itself, has recently grown in finance.

AI mimics and applies the capabilities or intelligence of humans to the software. The first applications of artificial intelligence would then be used in games like Chess and Go. Today, video game AI is routine and commonplace, and the principles of artificial intelligence have expanded to the financial, medical, and robotics industries. (Horvath 2019.)

AI is used in a vast range, from digital marketing to user experience enhancement and investing. AI is used in tax departments to turn the losses into tax deductions. Stock trading is evolving, and the trading process with AI is getting more lenient. AI is used in many kinds of investments or stock trading. With the help of AI, portfolios could expand into a broader range, such as real state, debt investments, reputation management, biotech startups, and investing in the stock market. There are three main ways AI has been applied in discovering patterns, predictive trading based on sentiment and speed trading. (Baluch 2019.)

### **4.1 The predictability of stock price fluctuations**

Predicting the market can be one main reason that there is so much focus on the technology side, especially AI in financial institutions and hedge fund companies. Using AI, many simple and routine tasks that are more time-consuming are processed, taking less time and cost less, and give the employees more time to focus on the more critical tasks and decisions.

Stock prices follow an unpredictable and random sequence. In a market, price fluctuations are due to notable inconsistent changes. Predicting the news that affects the stock prices is what is meant to look for instead of predicting the price itself.

Market dynamics are caused by the decision of thousands of investor decisions and human bias in trading parallels and the market changes in case of any crash or chaos. That randomizes the fluctuation and price sequence, especially when comparing a daily or weekly chart where widespread tops and downs and a yearly chart show that prices are constantly fluctuating. It tells that there is a pattern to this constant stability, and those patterns are where AI shines. (Chishti et al. 2020, 50-51.)

Prediction of fluctuations in the market could bring considerable amounts of wealth. Many people in various fields are working hard to develop such models and tools to predict the next market moves. Frequent aspects can affect the market's predictability, like how fast the market's there digest publicly available information and information efficiency. Delay in releasing new information can cause mispricing, which brings more possibilities for investors. As research on predictability for more than five decades, despite its complications, is the backtesting of investment strategies that give hope. Investment strategies are tested by a sample of past returns and expected future performance. The ends create confidence in the approach is successful, although it is a past scenario. (Seiler 2020.)

Investment strategies driven by AI are apt to overfitting because of their algorithms' large number of parameters. Many parameters can overanalyze data that causes perplexity. Once the algorithm is set for simple and basic data, it cannot be transferred to new data sets. Therefore, investment using AI strategies need to be cautious. AI can create value in two ways: more and better bets. Investor sentiment could be found online on social media or print media, and if a machine scans all those data, investor sentiment could be detectable from that. Humans are slow to monitor that colossal amount of data, and processing the data to detect an outcome takes enough time. AI can collect data to aggregate and evaluate to learn from it and produce actionable investment insights before investor sentiment affects the market. Forecasting investor sentiment could be profitable. An upswing usually follows Sentiment-induced price drops in price. (Seiler 2020.)

### 4.1.1 Discovering patterns

Incredibly powerful computers can crunch almost countless data points in minutes. It means they can also detect historical and replicating patterns for smart trading that are often hidden from human investors. AI can assess hundreds and thousands of stocks in flashes. Humans are not capable of processing that amount of data or seeing these patterns at the same rate as technology. For example, using AI technology, some hedge funds evaluate more than a hundred million data points in the first hour when markets open. (Baluch 2019.)

### 4.1.2 Predictive trading based on sentiment

Using sentiment analysis, AI analyses headlines, social media comments, blogs, articles, and more data to find the direction of the stocks and performance or move of other traders.

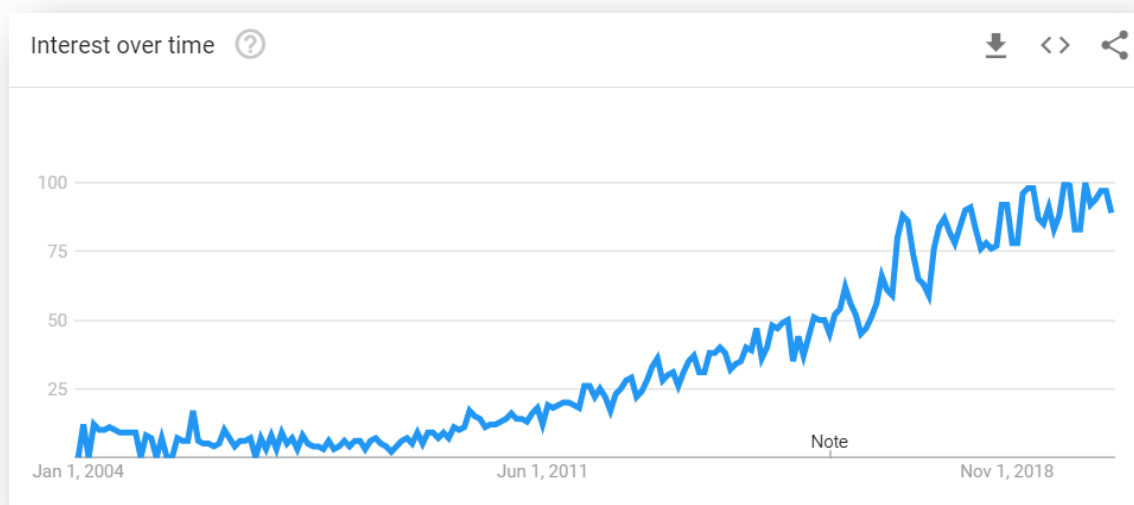


FIGURE 4. Sentiment analysis trend over time (2004 – 2018) (Google Trends)

According to Google Trends, the word “sentiment analysis” has gained steady traction over the past five years. In trading, the sentiment is used to show whether a trade should go long or short. Sentiment analyses are often used in long stocks

when there is good or positive news about a company and short stocks if there is negative information about the company. (Aroomoogan 2015.)

### 4.1.3 Speed trading

High-speed trading is unnerving financial markets. Algorithmic trading allows financial firms to detect and utilize market movements and patterns at lightning speeds that bring huge profits. The graphs below show the difference in trading activity in the year 2008 compared to 2011. In 2011 the activity got frantic and erratic. (Knight 2012.)

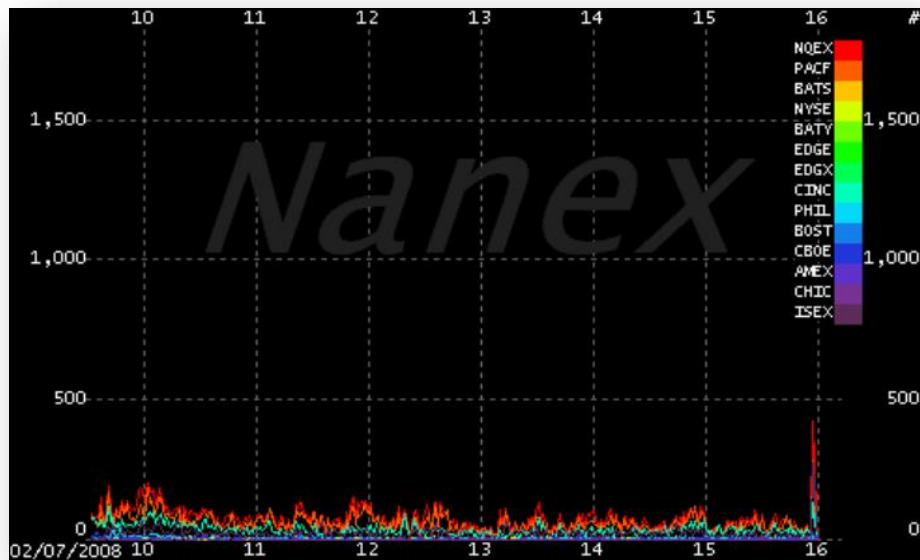


FIGURE 5. High-frequency trading in 2008 (Nanex)

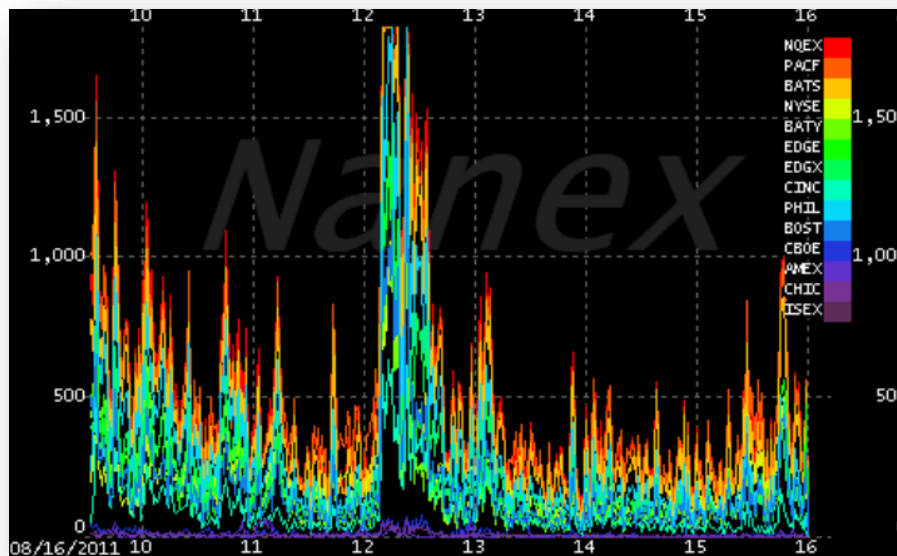


FIGURE 6. High-frequency trading in 2011 (Nanex)

#### 4.2 Investing using AI-driven decision enhancement tools

AI technology is advanced statistics backed with the potent raw computational power of the top-level hardware components. AI mostly depends on deep learning and natural language processing, which interprets human language to computers. Deep learning and natural language processing technologies train the machines to execute human-like or several other complex tasks by processing large amounts of data and pattern recognition within the data. AI is a result of intelligent algorithms, iterative processing, and large amounts of data. (Chishti et al. 2020.)

AI is learning from experiences and is set to get updated with data to perform human-like tasks. Developers feed data to the algorithms to look for patterns. With every mathematical function, “neuron” neural networks work almost like neurons of the human brain. Each neuron is responsible for a particular part of the data, and layer by layer processes the data to predict the process it quantifies.

In investing, AI is used to predict stock prices; thus, algorithms are supposed to be trained in a set of historical trading data, such as ten or fifteen years of trading

data. “I Know the first,” which is an AI project, utilizes reinforcement learning techniques. In this technique, the algorithm recalibrates its current findings to avoid relying on prior results with the possibility of another emerging pattern.

The AI in investing predicts the price data fluctuations based on both old and current data. In the first phase, it accounts for all the given data related to stock prices. The difference in doing it better or different than humans is it is not being affected by emotions but exact numbers of highs and lows of both up and downtrends. The next step is setting benchmark predictability. (Golgher et al. 2020, 250.)

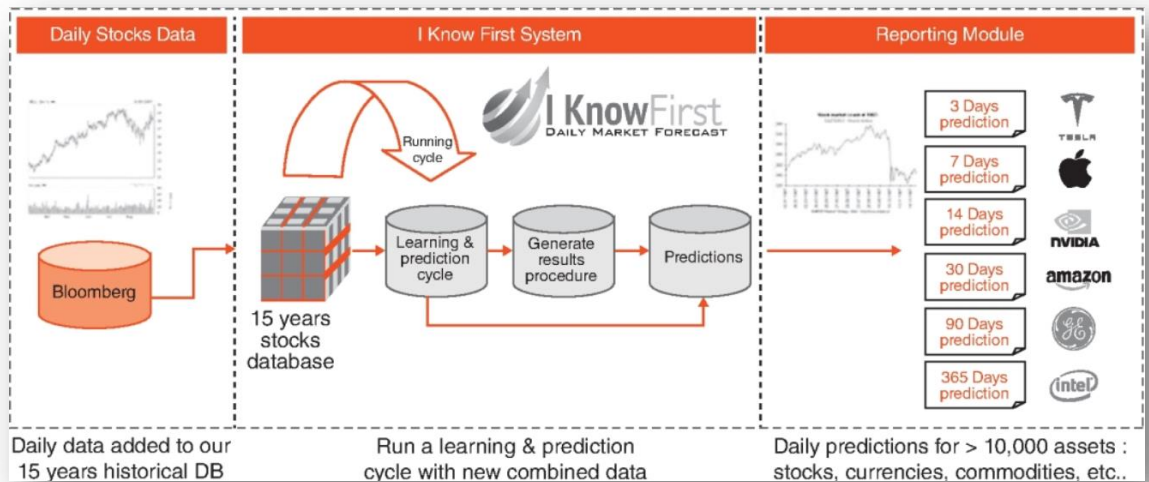


FIGURE 7. The cycle of an AI project algorithm uses both updated market data and historical trading (Golgher et al. 2020, 250).

### 4.3 Technical indicators and patterns

In the markets, technical analysis indicators are used for spotting the change in prices regarding volume and different time frames. There are more than a hundred indicators could be found. Some indicators are used more than the others because they are different according to the markets, whether it is stocks or FOREX, or because of simplicity contrasted with complexity. The three most used indicators are RSI, Moving Average Convergence and Divergence (MACD),

and Williams ratio (%R). Relative Strength Index (RSI) is a technical momentum indicator. Moving Average Convergence and Divergence (MACD) demonstrates the stock price movement, and Williams (%R) is also a momentum-based, which shows whether a ticker is overbought or oversold. (Bramble 2020.)

In a video published on the YouTube channel “How AI Traders Will Dominate Hedge Fund Industry?”, CIO of AI Capital Management reflects on the application of AI in trading in financial markets.

The hedge fund industry manages \$3.5 Trillion, and AI has been used in the industry, but the outcome is not that overwhelming compared to its application in the other sectors. There are different markets and a ton of data in the financial industry.

At Wall Street, people worked hard to replace various tasks with AI and AI-driven tools. The attempt is that AI brings better changes and do better than humans. The computers do about 90% of trades in the financial markets, and the human behind it hardly codes the robust algorithms.

According to Chang (2018), they teach their agent or system to trade at the worlds’ largest trading financial market, and for that, their built model is first given 2017’s whole year data.



FIGURE 8. Model performance with no pre-given data

In figure 8, the green line shows where the trades are executed. In this stage, the model has no idea what “buy and sell” is because there is not sufficient data for analysis, and trading neither shows the results. In this case, it trades randomly, and after a few days of giving more data, it learns where to buy and where to sell. According to this trade, the profit is \$11, and the total reward is  $\{-138\}$ .





FIGURE 9. Trading EUR USD

Figure 9 shows the result of trading EUR USD (rates are according to 2018). In this next step, the model starts trading the EUR and the US dollar. The model turns \$100 to \$354.

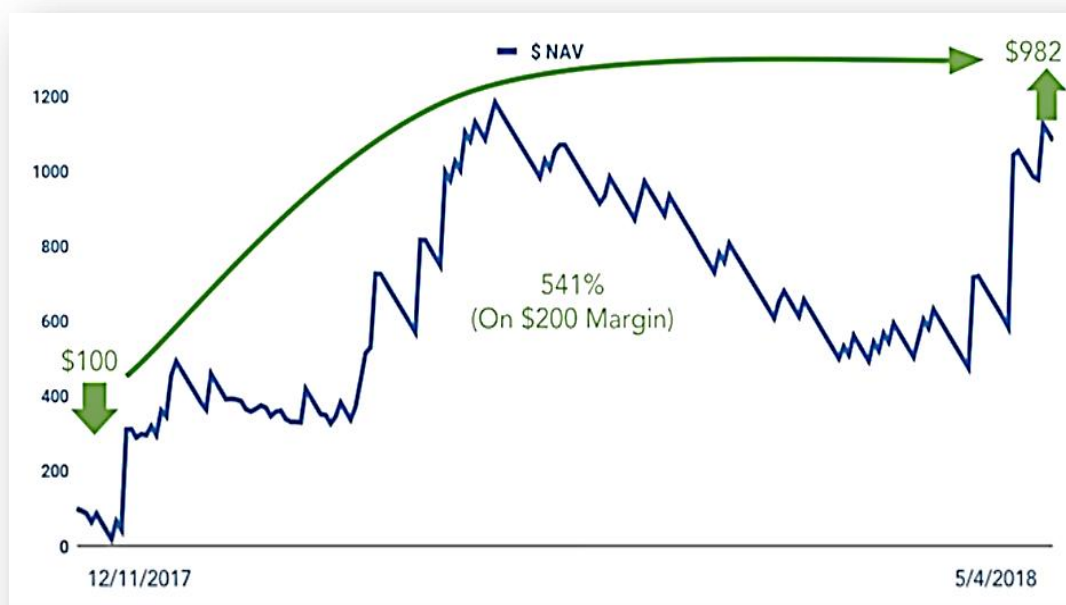


FIGURE 10. Trading GBP USD

It makes it sure that the result is no coincidence, the model put into trading, and it turned a \$100 to \$ 982 a margin of 441 %. As a result, the model proved to execute the given technical data in the trading, and the model made one million trades in a single night (Marshall 2018).

#### **4.4 AI performance and creating a signal in the ALGORIZ platform**

An AI-based trading platform enables users to use the platform by building trading algorithms. For making a signal, it is possible to type the strategy directly in the text box or use the widgets to create one. (ALGORIZ 2020).

Three types of data could be used in building the signal:

- Market data and technical indicator
- Fundamental data
- Alternative data

To get familiar with how the process works, the author has examined how this AI platform for trading works by creating a signal:

In the first step, a signal that triggers is entered as to when the 15-day moving average crosses above the 80-day moving average, and market sentiment is positive. First, the moving average is selected from a drop-down list. Next, it opens a widget to enter a 15-day moving average. After closing the window, some options appear automatically. Crosses above are picked in the next step and followed by adding an 80-day moving average. Thus, the first condition is completed.

As the second condition, positive sentiment is added from a drop-down list, and the signal is completed and looks as follow:

Signal\* [? Samples](#)

If 10 day moving average crosses above 50 day moving average AND RSI is less than 75

+ - \* / days months

Trade:\* Buy 100 shares at open

Tickers: [?](#) Ticker lists: [?](#)

AAPL

Add Cover Trade

Frequency:\* Every day

Take profit: [?](#)  %

Stop loss: [?](#)  %

FIGURE 11. Strategy input (ALGORIZ)

In this test, If the 10-day moving average crosses above 50 days moving average AND RSI is less than 75. A hundred shares are bought in this demo example. The ticker is selected from a list in the next box. In this example Apple INC. (AAPL) is selected, which is listed on the National Association of Securities Dealers Automated (NASDAQ). For getting the positions closed, there are different options to enter amounts as Taking profit and stop loss. In this example, the Take profit is set four percent, and stop-loss is set to two percent.

Performance %	Total Pnl	Winning rate	Losing rate	<a href="#">Transactions details</a>	
34.64%	\$3316.83	57.65%	42.35%	<a href="#">Metrics details</a>	
<a href="#">Download CSV</a>		<a href="#">Download XLSX</a>		<input type="text" value="Search"/>	
Date	Ticker	Transaction	Amount	Price	
2016-07-14	AAPL	Buy	100.00	92.69	
2016-09-15	AAPL	Sell	-100.0	108.95	
2016-12-16	AAPL	Buy	100.00	112.02	
2017-02-14	AAPL	Sell	-100.0	128.92	

Figure 12. Total profit and loss (P&L). ALGORIZ AI trading platform

The backtest runs in the past. The start date is 1.5.2016, and the end date is 2.27.2017. The capital amounts to \$9,576. In this process, ALGORIZ shows the performance, winning rate, and losing rate, respectively, 34.64%, 57,65%, and 42.35%. The total P&L is \$3316.83.

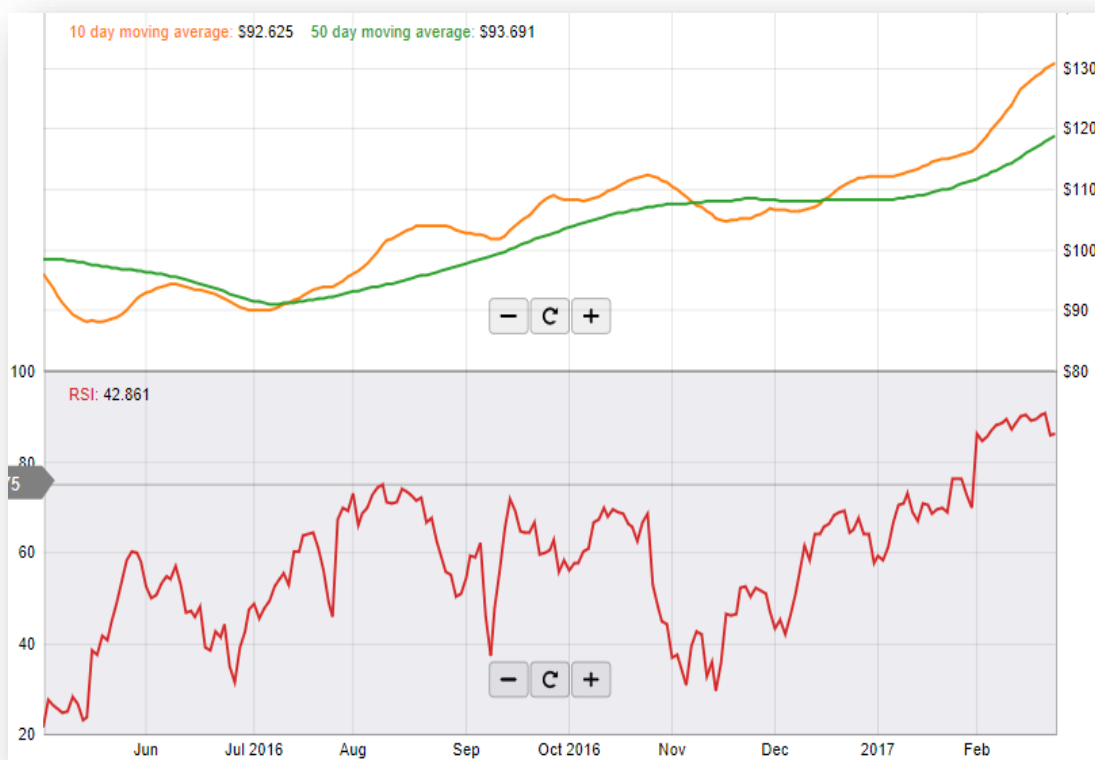


Figure 13. Total P&L (ALGORIZ AI trading platform)

According to the strategy input, the trade triggers buy order when the 10-day moving average crosses over a 50-day moving average. RSI is less than 75. The sell order automatically triggers according to the input strategy, when the 10-day average crosses the 50-day moving average. The same as the first trade orders are executed as the given strategy between the selected dates.

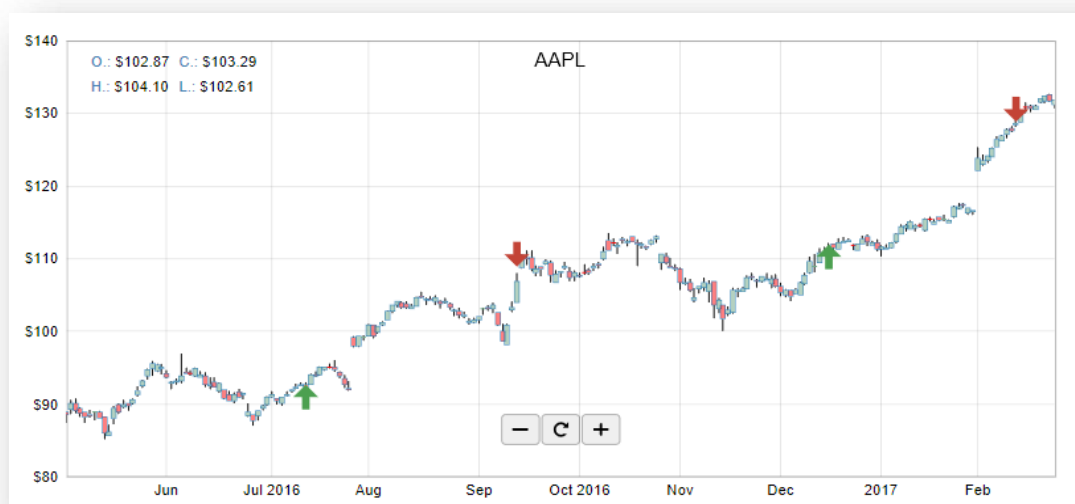


Figure 14. Total P&L. ALGORIZ AI trading platform

In this figure, the graph is shown in candlesticks. The first order is bought at \$92.69 and sold at \$108.95, which increases to \$626.

TABLE 1. P&L of buying and selling AAPL orders between 7.2016 – 2.2017

Date	Ticker	Transaction	Amount	Price
2016-07-14T09:30:00-04:00	AAPL	Buy	100	92.69
2016-09-15T09:30:00-04:00	AAPL	Sell	-100	108.95
2016-12-16T09:30:00-05:00	AAPL	Buy	100	112.02
2017-02-14T09:30:00-05:00	AAPL	Sell	-100	128.92

#### 4.5 AI functionality – Neural Net for Trading

In an interview with Sebastian Dobrinu, a freelancer and software engineer who has built a stock trading bot using machine learning approaches to efficiently predict and automate selling and buying in the stock market.

According to Sebastian Dobrinu, “In five months, the revenue of \$3,500/month was gained with a maintenance cost of \$90/month. The bot strategy is so that it holds the positions starting from seconds to minutes or sometimes even hours.” (Courtland 2016).

Sebastian recommends Kite in trading. The trading application Kite is a powerful web and mobile trading application for trading because of its stability to connect APIs and low bandwidth. Their limitation is three requests per second, which has worked well for the strategy he uses.

According to Sebastian Dobrinu, “Getting historical financial is not cheap. In this regard, Intrinio is a data provider for real-time stock quotes at fair prices. Accessing in-depth data would yield better results. The strategy for him worked around 95% of the time, but many factors can affect it. For example, if there was not a stop loss put, the bot could have made huge losses.” (Courtland 2016.)

#### **4.6 Man Group and AI**

Independently buying and selling was once the human brain could never hope to accomplish. In this part of the thesis Man Group which is an investment hedge fund company, is discussed. Man Group runs about \$43 billion in assets through quantitative trading, using algorithms that are doing most of the work. Algorithms do most of the work, with people writing the code to build them and monitor for any anomalies after the fact. The machines are trading around twenty-one hours per day, from the open of the Asian markets until the closing of US markets. (Julianne & Leslie 2017.)

While humans remain better at data interpretation, machines are learning to take care of multiple earnings calls at a time rather than humans that could take care of only one at a time. Unlike traditional quant that was told to do the task, the new technology is trading on its own, using its thirty-year-old strategy by finding the patterns and executing orders. Hedge fund companies need to be competitive to survive because of the technology booming in every other field and primarily

finance. It is possible to get easily absorbed by the other big companies if one does not advance with better AI and other computing technologies. Man Group has worked on a system that made money using such strategies that humans have missed, and the results are positive. Man Group is leaning on testing and trading real money within weeks. The creation of the Man Group's strategies amazed even its creators that they could not wholly understand its work. It shows the complexity of the technology, coding, AI, and finally, the algorithms used behind it.

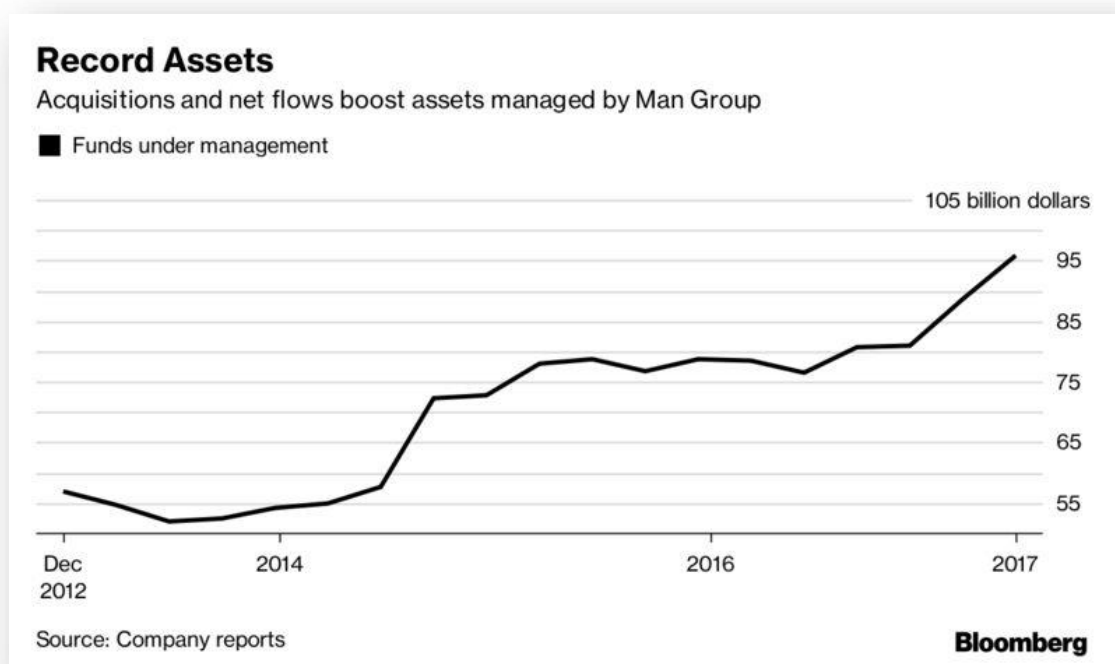


Figure 14. Record Assets. Assets managed by Man Group (2012-2017)

Man Group's assets had a seventy-seven percent increase since 2014, and the company has gained much attention for bringing a significant change reshaping global finance and its self-altering algorithms with self-made decisions. Two interrelated aspects are making Man Group do well in its work; one is the advancements in technology and computing power, and the other one is the utter availability of data. One can be called AI's engine, while the other is the fuel. (Kumar & Satariano 2017.)

## 5 AI TRADING VERSUS TRADITIONAL TRADING METHODS

Traditional investors collect daily data from the news or other sources. They read charts, analyze past data, and use various kinds of strategies. In contrast, a Robo-analyst uses computer programs with applications that can analyze a massive amount of data, generate more objectives, and recommend more stock pickings than traditional or human investors. The considerable difference between the two appears in the cost of each approach. A human investor may charge or get less salary regularly since a programmed Robo-analyst is expensive to build and program at the beginning. Later it just needs scaling and setting or feeding proper inputs. Compared to AI trading, traditional trading methods or human trading methods differs in several ways, considering different time frames such as short-term and long-term investing. Computers and AI have some distinct plusses, mostly seen in short-term investing rather than long-term investing in various companies. (Risk Research Inc 2017.)

In AI, automated trading algorithm systems have developed quicker than expected, and AI-driven investment platforms are considerably growing. That makes the traders and investors believe that AI is the future of trading. (Shah 2018.)



## 6 SWOT ANALYSIS

In this chapter, AI in trading is analyzed using SWOT analysis, finding out the differences, how it has developed over the years, and its future. SWOT analysis produces a brief and complete context of the topic and makes it easy to understand AI in trading as a whole or its parts in various areas and fields.

### Strengths

AI affects trading and its processes in various ways, from automation to detecting the trends. Automation fastens the algorithms which are possible to automate for trading strategies, and AI-enabled systems make it easy to respond quickly to market fluctuations with monitoring and analyzing data.

AI has recently brought many possibilities, and it is considered in many other industries rather than finance. The most common benefits it is known for are cutting the high costs and saving time for the people in the field to focus on creativities and tasks that are not that routine and time-consuming.

AI software is mostly adopted in the financial sector for its time-saving benefits. Finance people are no longer working for days on spreadsheets, processing data, and reporting. Most of the routine tasks are automized using automation tools. Since its emergence, AI has noticeably impacted the financial industry and has enhanced productivity. (Doug 2018.)

According to investment AI and machine trading, AI already leads the way, and here are some examples which prove the argument:

- “Just 10% of trading is regular stock picking,” JP Morgan, 6.13.2017
- “The U.S. Stock Market Belongs to Bots,” Bloomberg, 6.15.2017
- “The Quants Run Wall Street Now,” Wall Street Journal, 5.21.2017
- “Machines are driving Wall Street’s wild ride, not humans,” CNN Money, 2.6.2018

- “Computerized trading ‘definitely’ helped drive this week’s big market swings,” Treasury Secretary Mnuchin, 2.6.2018 (presenting the Financial Stability Oversight Report)
- “Market volatility: Fake news spooks trading algorithms,” ZDNet.com, December 10.2018
- “Sell-offs could be down to machines that control 80% of the US stock market fund manager says,” CNBC, Wed, 12.5.2018.

(Shepherd, 2019.)

AI can play a significant role in different trading parts in financial markets, from cryptocurrency to blockchain and fundamental analyses. Cryptocurrency and AI are making the right combination resulting in more manageable, countless transactions and much diversified. AI will make the finance industry interdependent and interconnected and make the market’s volatility being analyzed by machines more efficiently and predict more accurately. (Zamagna 2018.)

### **Weaknesses**

AI can only concentrate on parts and segments, but to have control over a system or process, it is only humans capable of doing that. It concludes that in many aspects, AI is dependent on human intervention.

In finance, AI is used in different fields such as investing, asset management, credit scoring - underwriting, and market research. Besides all the efficiency AI has brought to the finance industry, there are challenges as well.

The prediction work of algorithms is highly dependent on the quality of input data, and in finance, rapprochement of the data is already problematic; furthermore, this can profoundly affect the outcome. The result cannot be trusted wholly; therefore, it creates doubts, or the result could have hidden biases challenging to recognize. Diagnosing and correcting errors in algorithms to prevent distractions is significantly complicated. AI-related tools and algorithms lack emotional

intelligence. They can be well designed for specific problems and tasks. (Sébastien 2018.)

## **Opportunities**

AI has been promising by sifting colossal amounts of data and learn from it. AI is expected to show its strengths by comparing it with traditional methods and discovering good patterns that traditional methods cannot detect. Using historical data AI has been able to be 40 % more profitable on an annualized basis, which no other approach has been this beneficial.

Using AI in investing, the first thing that comes to thought is the return and the capital it brings with lesser cost and much faster. Like every other new idea or concept coming to the market, AI would also take its time. Especially in trading in stock markets sustaining the feelings and emotions has not been easy. The trader wants to engage and be part of the process, and that gives security. Trusting machines and robots with a significant amount of money is not easy for individuals and neither for institutions.

AI has recently gained more attention, although the topic has been since 1956 connected to a workshop at Dartmouth College, New Hampshire, US. For some time, the matter remained a scholarly study in science-fiction, but recently, it has been implemented in the fundamental processes in different fields and sectors, including finance. The recent attention to AI is due to the time and development of other tools and enablers that make AI adapt well. The digital world data is increasing like never, which comes in different structured and unstructured formats like databases, files, images, and videos. The computing power is backed up with enough efficient processor analysis a vast amount of data in lesser time. The breakthrough in algorithm efficiency has improved, which recently has been reached to the human accuracy level. (Sébastien 2018.)

Since 2010 stock markets are using automation and machine learning, but still, machines are not being left to dominate or run the stock market. Human

intervention has always been required, and it will continue like that. (Barlow 2019.)

## **Threats**

The risks and threats increase when AI is put into work in different areas and industries, particularly in economies, which plays a significant role worldwide. In trading, when AI is involved, higher risks become more notable as human involvement decreases. Therefore, there is always risks while AI is used, and the chaos theory applies well in this regard.

Predicting the share market using AI might not end in the right way, causing faulty or incomplete evaluation. According to Seth Weingram, director of the client advisory at \$US97 billion Acadian Asset Management, “people chasing the market with AI might end up gaining nothing, and the risk is that there is not enough data to train the algorithms.” (Galouchko 2019).

One of the many impacts of artificial intelligence on finance is changing the job roles in the sector. Many positions will be changed as AI overtakes. At the same time, more new positions will be open to new opportunities. The hustle should be preparing employees to adapt and change together with the trend and technology. (Doug 2018).

One of the risks known regarding AI and Algo-trading is the shocking flash crash of 2010 that caused the stock market to plunge around one trillion-dollar and made some companies stocks fall as much as 37% (Joshi 2019).

## 7 CONCLUSION AND RECOMMENDATIONS

Even though AI has been around for a long time, it is still called an emerging topic. That is due to its steady and surprising development in every industry, including finance.

As mentioned in the first chapter, artificial intelligence is defined as a technology suite that incorporates computers and algorithms to augment and simulate human intelligence. AI has been different in different finance processes, especially when it comes to investing and trading. Trading and investing in assets in stock markets is a big part of finance. Many individuals and small or big finance companies are competing to benefit using AI in their strategies. Competency and seeing opportunity in AI and its capability shows different aspects of the topic. First, humans who have started trading hundreds of years ago, and then there comes AI, machine learning, algorithms, which are overtaking humans at some points.

With the main thesis question, “What are advantages and disadvantages of using AI in trading in stock markets?” and the sub thesis question “How effective or risky AI-based trading compared to traditional approaches is, considering the expenses and maintenances?” This thesis aimed to study and identify the influence of AI on trading and investing in financial markets. The thesis’s main question and sub thesis question are discussed in both the fifth and sixth chapters.

In this thesis, investing and trading in the financial markets considering AI-advancements, investing in financial markets, and trading in financial markets were discussed.

With the difference that trading is taking profits from quick buy or sell orders by identifying market trends, investing is about buying shares of a legitimate company. In investing, AI has mostly been used for asset valuation, and it is also used for identifying the preferred data and risk management. AI helps to grow portfolios into a broader range, including trading in stock markets. In trading, AI

is used to discover patterns in predictive trading based on sentiment and speed trading, in which all three ways are explained in the fourth chapter.

Many factors influence an investment or trade's positive outcome, and one of them is picking the right stock. AI plays a significant role in this regard, and it is much expected from machine learning and other enablers and parts of AI to bring to the market. The next crucial section that AI can be efficient is the predictability of stock price fluctuations. Stock prices fluctuate in an unpredictable and random sequence, the most focused and essential point for trading. Reaching a moment to predict the price fluctuations can bring a considerable profit, and several aspects affect market predictability. In this regard, AI is used to predict market changes using historical data. However, at the same time, AI-driven strategies are apt to overfitting because there are possibilities that algorithms can over-analyze sometimes that causes uncertainty, therefore investing using AI strategies need to be cautious.

Compared to traditional methods, comparing AI-based trading gave some striking differences, such as cost and maintenance, speed, and emotion. In traditional methods, humans can make quick decisions and have control over the running strategy. AI also has some significant capabilities when it comes to speed and short-term plans. In conclusion, traditional based trading takes much time to collect data and make strategies by analyzing it, which is time-consuming. The AI trading arrangement is expensive to build, and once it is created, it can explore a vast amount of data and generate more outcomes, which makes it quickly pick stocks, and in the end, it just needs to scale.

From the author's trading experience and thesis's result, the main differences and challenges between the two traditional based and AI-based methods are consuming energy and time, preciseness of the outcomes, controlling the running strategy, quick decision-making, and managing emotions.

Meeting some professionals from a related field of AI and trading from an official source, like a hedge fund company, could make the thesis's outcome more valid and the objectivity more achieved. The material gathered in this thesis is rich and reliable.

Collaborative teamwork of finance and IT people working on a project like this might achieve much precious outcome, covering most aspects of the topic and developing small but achievable project work. Collecting data from this kind of project is complicated and needs much attention to the details. In continuation of working on this thesis, developing it step by step makes it possible to generate good results.

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