HOW ARTIFICIAL INTELLIGENCE IS CHANGING INVESTMENT MANAGEMENT

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Abstract. Artificial Intelligence (AI) is a key technology that is changing our lives right now. But the predictions are that it will lead to even greater changes in our lives. It is currently used in: marketing and advertising, online shopping, automobiles, personal digital assistants, smart homes, pattern recognition, manufacturing, logistics and many other fields. Despite its use in our everyday life, it should be noted the fears of some people, mostly related to the loss of jobs.

But how is AI changing the world of investing? The introduction of this technology in the field of investment and portfolio management is associated with activities such as: fundamental and technical analysis; Risk Management; portfolio optimization and reduction of management costs. The report will look at how AI is being used in each of these areas of investment management.

Keywords: investment; artificial intelligence; investment opportunities
JEL: G11; G19; G24

Introduction

What is Artificial Intelligence?

The European Union (EU) defines artificial intelligence as the use of digital technologies to create systems capable of performing tasks normally thought to require human intelligence. It is software and/or hardware that can perceive and interpret the environment and take action to achieve predetermined goals.

Another definition by Russell and Norvig (2021) is that AI is the study of agents that receive perceptions from the environment and act.

Turing's (1950) definition back in 1950 is interesting. It offers a way to determine whether a system is intelligent. The test is for three players (a machine and two humans), in which the "interrogator" must communicate via text with the other two. If the interrogator cannot recognize the human, then the system is assumed to be intelligent.

AI is a very broad concept that includes different definitions and characteristics. Several important features can be outlined:

- The system must work independently - without the intervention of human power.
- Ability to perceive and analyze the environment in a way that will allow the achievement of certain goals.

- AI is a self-learning system.
- Ability to make decisions and plan actions.

How AI can be used in investment management?

The main ways to use artificial intelligence in the investment process are presented in figure 1. Combining more than one of them and integrating them into a system would lead to better results than using them sporadically.

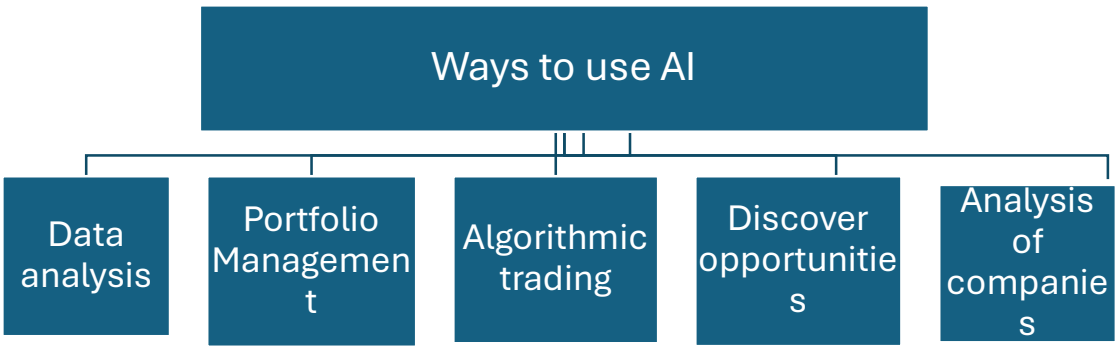

Figure 1. Ways of using AI.

Data analysis is its most natural application. Combining traditional methods with the capabilities of AI and machine learning will lead to better results in terms of the amount of data processed and the discovery of hidden dependencies.

Algorithmic trading is another interesting way to apply AI. Through pre-defined and set algorithms, transactions for purchase or sale of assets are carried out. The criteria for this can be of a different nature: technical analysis, sentiment analysis, market and financial data and others.

What is Robo-Advisors?

Robo-Advisors are an innovation in the world of finance and investments. Essentially, they provide investment advice without human intervention. To protect the interests of consumers, the Bulgarian legislation stipulates in Article 71, paragraph 3 of the Law on Financial Instruments Markets, that the investment intermediary (IP) informs in advance:

- whether the board is independent.
- whether the advice is based on a broad or limited analysis of the different types of financial instruments and, in particular, whether the scope is limited to financial instruments issued or offered by persons related to the

investment intermediary or by persons who are in other legal, economic or contractual relations with the investment intermediary, as a result of which there is a risk that the advice provided is not independent;

• whether the PE will provide the client with a periodic assessment of how well the recommended financial instruments continue to meet their needs.

At their core, robo -advisors provide personalized investment advice to clients. At the beginning, it is necessary to collect information about the profile of the investor through an online questionnaire. The purpose is to determine the risk profile, investment horizon, the purpose of the investment, experience, and other important data. These platforms are gaining immense popularity, but they have both positive and negative characteristics.

Their main advantage is their affordability. They are online platforms and can be used by investors literally 24/7 from anywhere in the world. Another benefit to them is traditionally lower fees and expenses compared to traditional financial advisors. Thanks to the automation of the process and the possibility of many clients being served, investment intermediaries can keep the fees for using robo -advisors low. Another plus is the possibility of personal investment advice. After completing the questionnaire, a profile of the investor is built, and the relevant advice is tailored to the information received and his profile.

We should also note one of their shortcomings related to personalization. Although the platform will model advice against the investor's profile and responses, the volume and type of criteria is limited. This will lead to the impossibility of customizing in specific cases. In this case, the help of a financial advisor and the possibility of using human interaction would be unbeatable. The lack of such an opportunity is another drawback, which will prove to be a serious problem for investors who would not trust their money to "machines" so to speak. Like any innovation, fear and mistrust are a serious obstacle, and overcoming them will determine the development of the technology.

For these reasons, some investment firms are developing "hybrid" robo -advisors. They make it possible to use the services of a real financial advisor and thus aim to achieve better satisfaction and a sense of security for their clients.

Beck and Dammeyer (2024) identifies the following best Robo-Advisors:

- Betterment. Best Robo-Advisor for Everyday Investors
- SoFi Automated Investing. Best Robo-Advisor for Low Fees
- Vanguard Digital Advisor. Best Robo-Advisor for Beginners
- Vanguard Personal Advisor Services. Best Robo-Advisor for High Balances
- Wealthfront . Best Robo-Advisor for DIY Financial Planning

How BlackRock use AI?

One of the biggest investment companies in the world, BlackRock, evaluates the benefits of using AI. They believed that AI is key for transforming investment process into more useful and helpful operation. As the opportunities provided by AI to increase productivity in the investment process are of key importance. This can be achieved by automating processes and using AI to analyze large data sets. The higher productivity of firms should lead to significant competitive advantages, and it can be argued that the implementation of AI in the work process will be essential for the survival of investment firms.

BlackRock believes that the continued development of AI may open new opportunities for its use in ways that are currently incomprehensible. Another point of interest is the power of AI to process data at low cost, with high accuracy, and in huge quantities. This would lead to new potential opportunities for the largest companies that collect and process a lot of data.

Another interesting way to use AI is sentiment analysis. Traditionally, natural language processing techniques have been used to determine positive or negative attitudes in various sources. Despite its wide use, it has its limitations and cannot capture the complex nature of the task. With the capabilities of AI, sentiment analysis becomes much more complex and accurate. Similar technology is used in our phones when they try to guess what word we want to use.

BlackRock (2024) identifies six technological forces that are changing not only the industry, but the world.

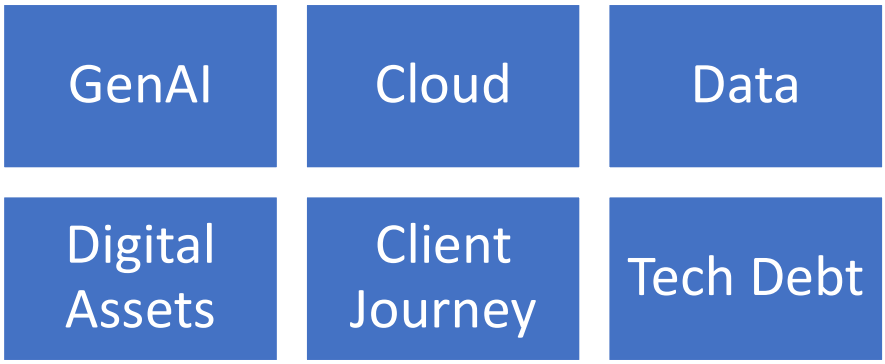

Figure 2. Six technological forces according to BlackRock

The first driving force of change is AI, and it is from a new generation - Generative Artificial Intelligence. For a company to make maximum use of new technologies, it must develop all its technological strengths. Only in their complementary action can technological leadership and competitive advantage be achieved.

BlackRock uses AI on its Aladdin platform. It is an investment network operating system designed for investment managers, corporations, and financial institutions. According to many specialists, the system is of the highest level and combines many of the latest technologies in investment management. Through its services, investors can minimize risk, achieve better diversification, and maximize their returns. One of its distinguishing features is Aladdin 's ability to generate positive risk-adjusted returns for investors.

The importance of AI for the future of investment firms can be summed up by the statement of Jamie Dimon, CEO of JPMorgan Chase. He believes that AI innovations will have as big of an impact on society as the invention of electricity and the internet. JPMorgan 's actions support these words. It has invested over 14 billion in new technologies and is ranked first in the Evident AI Index. The index evaluates the overall process of implementing and using AI in banks.

In his research Azevedo (2023) that these AI models significantly outperform traditional methods. The machine learning models can predict stock returns with remarkable accuracy, achieving an average monthly return of up to 2.71 percent compared to about 1 percent for traditional methods.

Can we use ChatGPT for investment advice?

Used ChatGPT for advice on what to invest in. To better follow his logic and the value of his advice, we defined three different types of investors. The responses are presented in Table 1.

Table 1. ChatGPT portfolio recommendation

Вид Актив	**Дялове**		
	I- група	II - група	III - група
Акции	60,00%	50,00%	40,00%
Облигации	30,00%	40,00%	50,00%
Имотни фондове(REITs)	10,00%	10,00%	
Ликвидни активи			10,00%

Group I is characterized by a 25-year-old investor with an investment horizon of 40 years. The portfolio is supposed to reflect the potential for longer-term investing and the ability to take on riskier assets.

Group II is characterized by an investor aged 45. with an investment horizon of 20 years. In this case, investing in a more balanced portfolio is assumed.

Group III is characterized by an investor aged 65. age. His investment objective is wealth preservation and meeting his cash needs. For the fulfillment of this goal, an additional condition is set - withdrawal of 4% of the value of the portfolio. This is known as the 4% rule or also as Bengen 's rule. He proposed this model in 1994 as an easy rule to follow. The goal is for the investor not to outlive their savings after retirement.

The traditional understanding is that the allocation between stocks and bonds should be tailored to the investor's years and, accordingly, the investment horizon. The share of stocks in the portfolio is calculated using the formula 100- n. Where n will be the age of the investor. This is known as the "100 minus the age" rule. The logic behind this is to increase over time the funds invested in bonds at the expense of those in stocks. The basic principles of this rule should lead in practice to higher returns in the early years of the investor and, conversely, lower risk in the later years of the investor. This should address different risk-return preferences.

We see that ChatGPT does not follow this rule. The comparison between the portfolios is given in the chart.

Table 2. Portfolios comparing

	With the rule	ChatGPT	120 minus the age
I group	75% share of shares	60%	95%
II group	55% share of the shares	50%	80%
III group	35% share of the shares	40%	55%

The table shows the different distributions. The chat bot gives a more secure portfolio, except for the last group of investors. The difference is most significant in the first group, namely 15% less investment in stocks. This is a very conservative option for asset allocation in the portfolio. Stocks have historically produced higher returns than bonds, and the low percentage of the portfolio of the first group of investors would deprive them of a significant return. In the long run, after considering the effect of compound interest, this would result in a significantly lower value final portfolio.

If we look at the criticisms of this rule, we see the inconsistencies even more. Some experts favor changing the rule to "110 minus age" or even "120 minus age." This, they believe, will better meet the new conditions – higher life expectancy and high inflation rates. This implies a much more aggressive way of investing aimed at higher rates of return according by Arnott (2023).

If we look at the asset allocation in the Vanguard (2024) fund with a planned retirement in 2045, the proportion of stocks is 83.65%. The

distribution is mainly in shares of the American market – 50.8 and 32.85% in shares in other markets. We see that one of the world leaders in asset management has a much more aggressive policy. It approaches the 120 minus age rule.

Let's look at the other rule, namely the 4% rule. To begin with, it assumes an asset allocation of at least 50% stocks and 50% bonds. ChatGPD implies a lower level of shares – 40%. The idea behind this is the ability to build a portfolio that will provide the required standard of living after retirement for the investor. The main points are the ability to withdraw 4% of the value of the initial portfolio every year (adjusted with the level of inflation) and ensuring the life of the portfolio over 30 years.

When investing 40% in stocks, there is a high possibility that the return on investments will turn out to be insufficient in the long term and will not meet both criteria. The options are either to use a lower withdrawal rate or to make the life of the portfolio less than 30 years. In his paper Bengen (1994) recommends that the proportion of stocks be between 50% and 75%. The findings are supported by "The Trinity Study" (1998).

Some clarifications need to be made regarding the 4% rule. It should be taken as a starting point, not as a hard and fast rule. Finke, Pfau and Blachett (2013) find that in modern conditions it is safer to use a much lower percentage (about 2.5%). Also, Pfau (2010) characterize the rule's success in the United States as an anomaly rather than the rule.

How then can we rate ChatGPT's advice? If we accept that in the first two cases his advice will most likely give us a smaller return on our investment, then in the last group the result is more serious. His advice is likely to 'bankrupt' our pension portfolio.

We must understand that ChatGPT is not a qualified investment advisor who can give us precise advice specific to us. Using it as a free one carries its own risks, which can cost us more than using an experienced professional.

On the other hand, using it to gain knowledge in the field of investments and financial knowledge would be of great benefit to us. In a study by Yanatma (2024) their levels in Europe only 20% of respondents in Bulgaria have high levels (21st out of 28). From this point of view, using it as a source of knowledge (or pointing to other sources) would be of great benefit to society.

Conclusion

The use of AI in the field of investment is already an integral part of the process. As technology advances, developing more complex systems to integrate the latest technologies will become critical for investment companies. There is no doubt that AI will change not only the investment process, but almost every part of our lives. Many specialists compare its importance with one of the most important innovations for mankind. But let's not forget that

these innovations often change the "rules of the game" and many companies fail to respond to the changes.

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