**Generative artificial intelligence and investment recommendations**

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Generative AI has created a wave of disruptive innovation that will influence all industries globally. The finance and investment discipline is not immune from this wave. Generative artificial intelligence tools have the potential to revolutionise investments as they can do what investment practitioners should do, namely, making investment recommendations. Their ability to efficiently extract and process a wide range of information makes them suitable to serve as financial and investment advisors. For instance, ChatGPT has been found to be capable of serving as a financial advisor as it exhibits a higher level of financial literacy than human investors who make random guesses. But the question remains: how accurate, specific, relevant, and justified are the recommendations?

*The advent of generative artificial intelligence (AI) models, particularly large language models (LLMs) such as generative pre-trained transformers (GPTs) brought about significant development and disruption in the operations of various industries, academia, and research (Dowling and Lucey, 2023; Biswas et al., 2023; Romanko et al., 2023; Dong et al., 2024). The financial services industry is no exception as application, use, and research on chatbots have significantly increased in the past two years. Several studies have explore use cases and transformative power ChatGPT in the financial services industry (Ali and Aysan, 2023 ; Biswas et al., 2023) with some extending research investigations as far as financial literacy ( Niszczota and Abbas,2023), financial advice (Fieberg et al., 2023; (Li et al., 2024);Oehler and Horn, 2024) crowdfunding, alternative finance and community finance(Wenzlaff and Spaeth, 2022). Broadly examining LLMs and GPTs, Kim et al. (2024) investigates the use of Large Language Models’ ability to learn preferences and provide personalized recommendations. They concluded that GPT’s choices are consistent with utility maximization theory and the GPT align recommendations with people’s risk aversion, by recommending less risky portfolios to more risk-averse decision makers, highlighting GPT’s potential as a personalized decision aid.*

*The adoption of chatbots, for support in investment decision making has become increasingly prevalent. George (2023) reveals that forty percent of retail investors are either open to or actively utilizing AI tools, specifically ChatGPT, to assist them in making investment decisions. As such, there is need for more research exam examining the use of chatbots by novice investors in different contexts and financial markets. Building on, but distinct from these studies, our study differs from the existing research at we focus on a comparative analysis of three different chatbots( ChatGPT 3.5, Bing, and Bard), two different economies and financial markets and validate the responses, by seeking finance and investment practitioners’ perceptions of the recommendations through a questionnaire survey*

We prompted ChatGPT 3.5, Bing, and Bard to generate investment recommendations for two budget levels and two countries (UK - 50 GBP and 1000 GBP, Bulgaria - 100 BGN and 2000 BGN). Answers to the prompts were provided in English for the UK and Bulgarian for Bulgaria. The research aimed to investigate whether ChatGPT's, Bing's and Bard's recommendations would be different depending on the country and the amount of money that novice investors would like to invest.

Additionally, to consider the role time, we asked ChatGPT and Bing twice to generate the same answers - on 9th May 2023 and 18th May 2023 using different accounts. Bard was used only once when it was made available in Bulgaria in July 2023. This resulted in 10 investment recommendations for each country: four for each of the two prompting sessions with ChatGPT and Bing and two answers from Bard. To provide external validation of the recommendations, answers from the prompts were used to develop a questionnaire survey that was sent to two groups of respondents in each country - finance and investments practitioners and lecturers. The sample includes 21 respondents from Bulgaria and 39 from the UK. To understand the diversity and expertise of the participants, we collected data on age, gender, the highest level of completed education, professional background, and duration of working in the participant’s current role. The UK respondents evaluated the responses about the UK investment opportunities for 50 and 1000 GBP, while the Bulgarian respondents did the same for the Bulgarian investment recommendations provided by ChatGPT and Bing. The respondents evaluated the relevance, accuracy, specificity and justification of each of the ten investment recommendations on a 5-point scale.

Our data analysis presents several descriptive and inferential statistics from responses. Preliminary findings shed light on the factors that influence perceptions of AI in financial recommendations. These factors include demographic information such as age, gender, education, and professional experience. A potential outcome is that different demographic and professional groups have different levels of trust and expectations from AI technologies. The conclusion from our survey could evidence the current state and perceptions of AI in financial recommendations, and also potential areas for future research and development in finance and education.

*Informed by Machine Learning and Natural Language Processing and Human-Computer Interaction, this research contributes to the discussion on the interaction between machines and humans as models’ recommendations are validated by practitioners. The research provides valuable insights for both academia and industry as it informs practitioners financial institutions, regulators, and developers about understanding AI chatbot behavior.*

*Conference themes : Economies More Prosperous*

*This research aims to explore how AI technology can contribute to economic prosperity by providing individuals with potentially valuable investment advice. By leveraging AI capabilities, such as natural language processing and machine learning, ChatGPT can analyze market data, financial trends, and investor preferences to generate investment recommendations that have the potential to enhance economic outcomes for individuals and potentially contribute to overall economic growth*

**Keywords – Robo-advisor Chatbots; large language models, investment recommendations, human-machine interaction**

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*References*

*Ali, H., Aysan, A.F., 2023. What will ChatGPT Revolutionize in Financial Industry? Available at SSRN 4403372.*

*Biswas, Joshi, N., Jayanta Nath Mukhopadhyaya, 2023. ChatGPT in Investment Decision Making: An Introductory Discussion.* [*https://doi.org/10.13140/RG.2.2.36417.43369*](https://doi.org/10.13140/RG.2.2.36417.43369)

*Cheng, Y., Tang, K., 2023. GPT’s Idea of Stock Factors. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4560216*](https://doi.org/10.2139/ssrn.4560216)

*Dong, M. (Michael), Stratopoulos, T.C., Wang, V.X., 2024. A Scoping Review of ChatGPT Research in Accounting and Finance. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4680203*](https://doi.org/10.2139/ssrn.4680203)

*Dowling, M., Lucey, B., 2023. ChatGPT for (Finance) research: The Bananarama Conjecture. Finance Research Letters 53, 103662.* [*https://doi.org/10.1016/j.frl.2023.103662*](https://doi.org/10.1016/j.frl.2023.103662)

*Fieberg, C., Hornuf, L., Streich, D., 2023. Using GPT-4 for Financial Advice. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4499485*](https://doi.org/10.2139/ssrn.4499485)

*Kim, J., Kovach, M., Lee, K.-M., Shin, E., Tzavellas, H., 2024. Learning to be Homo Economicus: Can an LLM Learn Preferences from Choice.* [*https://doi.org/10.48550/ARXIV.2401.07345*](https://doi.org/10.48550/ARXIV.2401.07345)

*Ko, H., Lee, J., 2023. Can Chatgpt Improve Investment Decision? From a Portfolio Management Perspective (preprint). SSRN.* [*https://doi.org/10.2139/ssrn.4390529*](https://doi.org/10.2139/ssrn.4390529)

*Li, X., Feng, H., Yang, H., Huang, J., 2024. Can ChatGPT reduce human financial analysts’ optimistic biases? Economic and Political Studies 12, 20–33.* [*https://doi.org/10.1080/20954816.2023.2276965*](https://doi.org/10.1080/20954816.2023.2276965)

*Lu, F., Huang, L., Li, S., 2023. ChatGPT, Generative AI, and Investment Advisory. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4519182*](https://doi.org/10.2139/ssrn.4519182)

*Naveed, M.S., 2023. Quantifying Similarities: Oncology Documents from Google Bard and ChatGPT 5, 773–786.*

*Niszczota, P., Abbas, S., 2023. GPT has become financially literate: Insights from financial literacy tests of GPT and a preliminary test of how people use it as a source of advice. Finance Research Letters 58, 104333.* [*https://doi.org/10.1016/j.frl.2023.104333*](https://doi.org/10.1016/j.frl.2023.104333)

*Oehler, A., Horn, M., 2024. Does ChatGPT provide better advice than robo-advisors? Finance Research Letters 60, 104898.* [*https://doi.org/10.1016/j.frl.2023.104898*](https://doi.org/10.1016/j.frl.2023.104898)

*O’Leary, D.E., 2023. An analysis of Watson vs. BARD vs. ChatGPT: The Jeopardy! Challenge. AI Magazine 44, 282–295.* [*https://doi.org/10.1002/aaai.12118*](https://doi.org/10.1002/aaai.12118)

*Pelster, M., Val, J., 2024. Can ChatGPT assist in picking stocks? Finance Research Letters 59, 104786.* [*https://doi.org/10.1016/j.frl.2023.104786*](https://doi.org/10.1016/j.frl.2023.104786)

*Romanko, O., Narayan, A., Kwon, R., 2023. ChatGPT-based Investment Portfolio Selection. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4538502*](https://doi.org/10.2139/ssrn.4538502)

*Wenzlaff, K., Spaeth, S., 2022. Smarter than Humans? Validating how OpenAI’s ChatGPT Model Explains Crowdfunding, Alternative Finance and Community Finance. SSRN Journal.* [*https://doi.org/10.2139/ssrn.4302443*](https://doi.org/10.2139/ssrn.4302443)