Elements of Economics, Finance, and Computational Mathematics

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Contents

Abstract

We examine an emerging pedagogical realm in which the importance of three major disciplines are considered in synchronicity. The aim is to understand the coherence of an interdisciplinary science formed around modern Economics, Finance, and Computational Mathematics. We recognize the rapidly evolving progress in data encoding techniques and contemplate Economic, Financial and Societal risks that can arise from technology evolving at increasing rates.

1   Intentions

I often find myself bogged down in a plethora of contemplative thoughts that leave me unproductive and depressed. I am uncertain around the bounds and validity of my knowledge and feel the need to somehow organize the most relevant areas of expertise that are possibly within reasonable grasp. Therefore, I decided to start archiving my thoughts in the form of prose accompanied by scrutinized literature to build my understanding of the world. I believe that all learning is a collective matter and cordially invite those who are interested in the topic to join this discussion.

2   Introduction

Throughout this paper, we intend to collect all relevant literature in attempting the justification of every argument made, especially those where objectivity is not feasible. Naturally, there will be conflicting opinions in the matter, but it is these very conflicts that allow for constructive debate when governed correctly by every individual involved. We draw from René Descartes' *Discourse on the Method* [5] in saying *governed*. Specifically, we impose the rationalization of any uncertain context in the most objective manner available, invariably *seeking truth in the sciences* while scrupulously ensuring the veracity of our reasoning in matters which may appear either objective or subjective.

References

[1] Shahla Atapoor et al. "VSS from Distributed ZK Proofs and Applications". In: *Lecture notes in computer science* (Jan. 2023), pp. 405–440. DOI: 10.1007/978-981-99-8721-4_13. (Visited on 12/05/2024).

[2] Fischer Black and Myron Scholes. "The Pricing of Options and Corporate Liabilities". In: *Journal of Political Economy* 81 (May 1973), pp. 637–654.

[3] Robert Callan. *The essence of neural networks*. Prentice Hall Europe, 1999.

[4] Aleš Černý. *Mathematical Techniques In Finance*. 1st ed. Princeton University Press, 2004.

[5] René Descartes and Ian W F Maclean. *A discourse on the method of correctly conducting one's reason and seeking truth in the sciences*. Oxford University Press, 2008.

[6] Jens Ernstberger et al. *Do You Need a Zero Knowledge Proof?* 2024. URL: https://eprint.iacr.org/2024/050.pdf.

[7] Gianluca Fusai, Andrea Roncoroni, and Mark Cummins. *Handbook of Multi-Commodity Markets and Products*. John Wiley and Sons, Feb. 2015.

[8] Paul Glasserman. *Monte Carlo Methods in Financial Engineering*. Springer Science and Business Media, Mar. 2013.

[9] Steven L. Heston. "A Closed-Form Solution for Options with Stochastic Volatility with Applications to Bond and Currency Options". In: *Review of Financial Studies* 6 (Apr. 1993), pp. 327–343. DOI: 10.1093/rfs/6.2.327. (Visited on 08/09/2019).

[10] Philippe Jorion. *Value at risk : the new benchmark for managing financial risk*. Mcgraw-Hill, 2007.

[11] Oleksandr Kuznetsov et al. "Enhanced Security and Efficiency in Blockchain with Aggregated Zero-Knowledge Proof Mechanisms". In: *IEEE Access* (2024), pp. 1–1. DOI: 10.1109/ACCESS.2024.3384705. URL: https://arxiv.org/abs/2402.03834.

[12] LL.D Mackay Charles. *Memoirs of Extraordinary Popular Delusions and the Madness*. Vol. 1, 2. Alpha Editions, 1841.

[13] Conor McBride. "Turing-Completeness Totally Free". In: *Lecture Notes in Computer Science* (Jan. 2015), pp. 257–275. DOI: 10.1007/978-3-319-19797-5_13.

[14] Matthias Nadler and Fabian Schär. *Tornado Cash and Blockchain Privacy: A Primer for Economists and Policymakers.* Ssrn.com, 2023. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4352337.

[15] Alexey Pertsev, Roman Semenov, and Roman Storm. *Tornado Cash Privacy Solution Version 1.4.* 2019. URL: https://berkeley-defi.github.io/assets/material/Tornado%20Cash%20Whitepaper.pdf.

[16] Robert R Reitano. *Introduction to quantitative finance : a math tool kit.* Mit Press, 2010.

[17] Adam Smith. *The Wealth of Nations.* Seven Treasures Publications, Mar. 1776.

[18] Alesia Zhuk. "Applying blockchain to the modern legal system: Kleros as a decentralised dispute resolution system". In: *International Cybersecurity Law Review* 4 (Apr. 2023). DOI: 10.1365/s43439-023-00086-x.