

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

1. Gupta, A., & Mishra, R. (2024). *A Comprehensive Study of Stock Market Volatility: Types, Determinants, and Measurement Methods* – Доступно за: https://www.researchgate.net/publication/387223502_A_Comprehensive_Study_of_Stock_Market_Volatility_Types_Determinants_and_Measurement_Methods
2. Cont, R. (2001). Empirical properties of asset returns: stylized facts and statistical issues. *Quantitative Finance*, 1(2), 223–236. – Доступно за: <https://www.tandfonline.com/doi/abs/10.1080/713665670>
3. Tsay, R. S. (2010). *Analysis of Financial Time Series* (3rd ed.). John Wiley & Sons. – Доступно за: <https://www.wiley.com/en-us/Analysis+of+Financial+Time+Series%2C+3rd+Edition-p-9780470414354>
4. Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31(3), 307–327. – Доступно за: <https://ideas.repec.org/a/eee/econom/v31y1986i3p307-327.html>
5. Mandelbrot, B. (1963). The Variation of Certain Speculative Prices. *The Journal of Business*, 36(4), 394–419. – Доступно за: <https://www.jstor.org/stable/2350970>
6. Tang, Y., Arias-Calluari, K., Najafi, M. N., Harré, M. S., & Alonso-Marroquin, F. (2024). Stylized Facts of High-Frequency Bitcoin Time Series. *Fractal and Fractional*, 9(10), 635. – Доступно за: <https://www.mdpi.com/2504-3110/9/10/635>
7. Black, F. (1976). Studies of stock price volatility changes. *Proceedings of the 1976 Meeting of the Business and Economic Statistics Section, American Statistical Association*, 177–181. – Доступно за: <https://www.tandfonline.com/doi/full/10.1080/23322039.2017.1318812>
8. Corsi, F. (2009). A Simple Approximate Long-Memory Model of Realized Volatility. *Journal of Financial Econometrics*, 7(2), 174–196. – Доступно за: <https://academic.oup.com/jfec/article/7/2/174/887309>
9. Andersen, T. G., Bollerslev, T., Diebold, F. X., & Labys, P. (2003). Modeling and Forecasting Realized Volatility. *Econometrica*, 71(2), 579–625. – Доступно за: <https://ideas.repec.org/a/ecm/emetrp/v71y2003i2p579-625.html>
10. Box, G. E. P., & Jenkins, G. M. (1970). *Time Series Analysis: Forecasting and Control*. Holden-Day. – Доступно за: <https://archive.org/details/timeseriesanalys0000boxg>

11. Si, Y., Nadarajah, S., Zhang, Z., & Xu, C. (2024). Modeling opening price spread of Shanghai Composite Index based on ARIMA-GRU/LSTM hybrid model. *PLOS ONE*, 19(3), e0299164. – Доступно за: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0299164>
12. J.P. Morgan/Reuters. (1996). RiskMetrics – Technical Document (4th ed.). J.P. Morgan Guaranty Trust Company. – Доступно за: <https://www.msci.com/documents/10199/5915b101-4206-4ba0-ae2-3449d5c7e95a>
13. Engle, R. F. (1982). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*, 50(4), 987–1007. – Доступно за: <https://www.jstor.org/stable/1912773>
14. Breiman, L. (2001). Random Forests. *Machine Learning*, 45(1), 5–32. – Доступно за: <https://link.springer.com/article/10.1023/A:1010933404324>
15. Friedman, J. H. (2001). Greedy function approximation: A gradient boosting machine. *The Annals of Statistics*, 29(5), 1189–1232. – Доступно за: <https://projecteuclid.org/journals/annals-of-statistics/volume-29/issue-5/Greedy-function-approximation-A-gradient-boosting-machine/10.1214/aos/1013203451.full>
16. Chen, T., & Guestrin, C. (2016). XGBoost: A Scalable Tree Boosting System. *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, 785–794. – Доступно за: <https://arxiv.org/abs/1603.02754>
17. Hochreiter, S., & Schmidhuber, J. (1997). Long Short-Term Memory. *Neural Computation*, 9(8), 1735–1780. – Доступно за: <https://direct.mit.edu/neco/article/9/8/1735/6109/Long-Short-Term-Memory>
18. Cho, K., van Merriënboer, B., Bahdanau, D., & Bengio, Y. (2014). On the Properties of Neural Machine Translation: Encoder–Decoder Approaches. *Proceedings of SSST-8*, 103–111. – Доступно за: <https://arxiv.org/abs/1406.1078>
19. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., & Polosukhin, I. (2017). Attention Is All You Need. *Advances in Neural Information Processing Systems*, 30, 5998–6008. – Доступно за: <https://arxiv.org/abs/1706.03762>
20. Petrosino, L., Bacco, L., Salvati, G., Merone, M., & Papi, M. (2025). A GARCH-temporal fusion transformer model for the volatility prediction of exchange traded

funds. *Neural Computing and Applications*, 37, 21435–21458. – Доступно за: <https://link.springer.com/article/10.1007/s00521-025-11468-z>

21. Taneva-Angelova, G., & Granchev, D. (2025). Deep Learning and Transformer Architectures for Volatility Forecasting: Evidence from U.S. Equity Indices. *Journal of Risk and Financial Management*, 18(12), 685. – Доступно за: <https://www.mdpi.com/1911-8074/18/12/685>

22. Chege, C., Kithinji, M., & Gachoki, P. (2025). A Hybrid VAR-LSTM-GARCH Model for Multivariate Volatility Forecasting. *International Journal of Data Science and Analysis*, 11(4), 99–113. – Доступно за: <https://doi.org/10.11648/j.ijdsa.20251104.11>

23. Wei, J., Yang, S., & Cui, Z. (2025). Unified GARCH-Recurrent Neural Networks in Financial Volatility Forecasting. arXiv preprint arXiv:2504.09380. – Доступно за: <https://arxiv.org/abs/2504.09380>

24. Bloomberg Professional Services. (2022). Bloomberg Multi-Asset Risk System (MARS). Overview Brochure – Доступно за: <https://assets.bbhub.io/professional/sites/10/MARS-Overview-Brochure1.pdf>

25. QuantConnect. (2024). LEAN Engine: Radically Open-Source Algorithmic Trading Engine – Доступно за: <https://www.quantconnect.com/docs/v2/lean-engine>

26. Sheppard, K. (2024). arch Documentation, Release 7.2.0: Autoregressive Conditional Heteroskedasticity Models in Python – Доступно за: <https://media.readthedocs.org/pdf/arch/stable/arch.pdf>

27. Clements, A., & Preve, D. P. A. (2021). A Practical Guide to Harnessing the HAR Volatility Model. *Journal of Banking & Finance*, 133, 106285 – Доступно за: <https://doi.org/10.1016/j.jbankfin.2021.106285>

28. Nsengiyumva, E., Mung'atu, J. K., & Ruranga, C. (2025). Hybrid GARCH-LSTM Forecasting for Foreign Exchange Risk. *FinTech*, 4(2), 22 – Доступно за: <https://www.mdpi.com/2674-1032/4/2/22>

29. Araya, H. T. (2024). A Hybrid GARCH and Deep Learning Method for Volatility Prediction. *Journal of Applied Mathematics*, 2024, 6305525 – Доступно за: <https://doi.org/10.1155/2024/6305525>

30. Michańków, J., Kwiatkowski, Ł., & Morajda, J. (2023). Combining Deep Learning and GARCH Models for Financial Volatility and Risk Forecasting – Доступно за: <https://arxiv.org/pdf/2310.01063.pdf>

31. Lemenestrel, T. (2021). LSTM_GARCH: A Python Implementation of a Hybrid LSTM-GARCH Model for Volatility Forecasting – Доступно за: https://github.com/tlemenestrel/LSTM_GARCH