

DAFTAR PUSTAKA

- Adams, G. (2020). Black-Scholes and Neural Networks. *All Graduate Plan B and other Reports Utah State University*.
- Aguilar, J. P. (2019). On expansions for the Black-Scholes prices and hedge parameters. *Journal of Mathematical Analysis and Applications*, 478(2), 973–989. <https://doi.org/10.1016/j.jmaa.2019.06.001>
- Arifin, Z. (1998). Beberapa aspek tentang black-scholes option pricing model. *JAAI*, 2(2).
- Ashari, M. L., & Sadikin, M. (2020). Prediksi Data Transaksi Penjualan Time Series Menggunakan Regresi Lstm. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, 9(1), 1. <https://doi.org/10.23887/janapati.v9i1.19140>
- Assaf, O., Di Fatta, G., & Nicosia, G. (2022). Multivariate LSTM for Stock Market Volatility Prediction. *Machine Learning, Optimization, and Data Science*, 531–544. https://doi.org/10.1007/978-3-030-95470-3_40
- Attrapadung, N., Hamada, K., Ikarashi, D., Kikuchi, R., Matsuda, T., Mishina, I., Morita, H., & Schuldt, J. C. N. (2022). Adam in Private: Secure and Fast Training of Deep Neural Networks with Adaptive Moment Estimation. *Proceedings on Privacy Enhancing Technologies*, 2022(4), 746–767. <https://doi.org/10.56553/popets-2022-0131>
- Balaji, S. A., & Baskaran, K. (2013). Design and Development of Artificial Neural Networking (ANN) System Using Sigmoid Activation Function to Predict Annual Rice Production in Tamilnadu. *International Journal of Computer Science, Engineering and Information Technology*, 3(1), 13–31. <https://doi.org/10.5121/ijcseit.2013.3102>
- Bell, S. (2016). *Quantitative Finance*. Jhon Wiley & Sons, Ltd., The Atrium, Southern Gate, Chichester.
- Bishwal, J. P. N. (2022). Parameter estimation in stochastic volatility models. In I. Applicable (Ed.), *Parameter Estimation in Stochastic Volatility Models*. Springer Nature Switzerland AG. <https://doi.org/10.1007/978-3-031-03861-7>
- Black, F., & Scholes, M. (1973). The pricing of options and corporate liabilities.

- Journal of Political Economy*, 81(3), 637–657. <https://doi.org/10.1086/260062>
- Chandriah, K. K., & Naraganahalli, R. V. (2021). RNN / LSTM with modified Adam optimizer in deep learning approach for automobile spare parts demand forecasting. *Multimedia Tools and Applications*, 80(17), 26145–26159. <https://doi.org/10.1007/s11042-021-10913-0>
- Chen, Y., Yu, H., Meng, X., Xie, X., Hou, M., & Chevallier, J. (2021). Numerical solving of the generalized Black-Scholes differential equation using Laguerre neural network. *Digital Signal Processing: A Review Journal*, 112, 103003. <https://doi.org/10.1016/j.dsp.2021.103003>
- Chowdhury, R., Mahdy, M. R. C., Alam, T. N., Al Quaderi, G. D., & Arifur Rahman, M. (2020). Predicting the stock price of frontier markets using machine learning and modified Black–Scholes Option pricing model. *Physica A: Statistical Mechanics and its Applications*, 555, 124444. <https://doi.org/10.1016/j.physa.2020.124444>
- Crack, T. F. (2009). *Basic Black-Scholes : Option Pricing and Trading* (Edition 2).
- de Amorim, L. B. V., Cavalcanti, G. D. C., & Cruz, R. M. O. (2023). The choice of scaling technique matters for classification performance. *Applied Soft Computing*, 133, 109924. <https://doi.org/10.1016/j.asoc.2022.109924>
- Dewi, S., & Ramli, I. (2019). Opsi Saham Pada Pasar Modal Di Indonesia (Studi Pasar Opsi Saat Pasar Opsi Masih Berlangsung Di Bursa Efek Indonesia). *Jurnal Muara Ilmu Ekonomi dan Bisnis*, 2(2), 300. <https://doi.org/10.24912/jmieb.v2i2.1001>
- Di Persio, L., Garbelli, M., Mottaghi, F., & Wallbaum, K. (2023). Volatility forecasting with hybrid neural networks methods for Risk Parity investment strategies. *Expert Systems with Applications*, 229, 120418. <https://doi.org/10.1016/j.eswa.2023.120418>
- El Filali, A., Lahmer, E. H. Ben, El Filali, S., Kasbouya, M., Ajouary, M. A., & Akantous, S. (2022). Machine Learning Applications in Supply Chain Management: A Deep Learning Model Using an Optimized LSTM Network for Demand Forecasting. *International Journal of Intelligent Engineering and Systems*, 15(2), 464–478. <https://doi.org/10.22266/ijies2022.0430.42>
- Engle, B. R. (2004). *Risk and Volatility : Econometric Models and Financial*

- Practice. *American Economic Association*, 94(3), 405–420.
- Faiq Rian Dani, M., & Syauqi, A. (2023). Pemrograman Finansial Untuk Memprediksi Volatilitas Nilai Mata Uang Kripto Berbasis Deep Learning Melalui Implementasi Metode LSTM (Studi Kasus: Bitcoin, Ethereum, Tether Dan Binance Coin). *Jurnal Sistem Informasi dan Teknologi Peradaban (JSITP)*, 4(1), 16–23.
- Ghatak, A. (2017). Introduction to Machine Learning. In *Machine Learning with R* (hal. 57–78). Springer. https://doi.org/10.1007/978-981-10-6808-9_3
- Golshanrad, P., & Faghieh, F. (2024). DeepCover: Advancing RNN test coverage and online error prediction using state machine extraction. *Journal of Systems and Software*, 211(January). <https://doi.org/10.1016/j.jss.2024.111987>
- Hamzar, R. A., Setyaningsih, F. A., Rekayasa, J., & Komputer, S. (2023). Dampak Ukuran Dataset Pelatihan Terhadap Performa LSTM Network dalam Konteks Harga Saham. *Jurnal Komputer dan Aplikasi*, 11(02), 238–247.
- Hu, Y., Ni, J., & Wen, L. (2020). A hybrid deep learning approach by integrating LSTM-ANN networks with GARCH model for copper price volatility prediction. *Physica A: Statistical Mechanics and its Applications*, 557, 124907. <https://doi.org/10.1016/j.physa.2020.124907>
- Huang, Y. C., & Chen, S. C. (2002). Warrants pricing: Stochastic volatility vs. black-scholes. *Pacific Basin Finance Journal*, 10(4), 393–409. [https://doi.org/10.1016/S0927-538X\(02\)00066-5](https://doi.org/10.1016/S0927-538X(02)00066-5)
- Hull, J. C. (2012). Options, Futures, and Other Derivatives. In D. Battista (Ed.), *AMBER – ABBS Management Business and Entrepreneurship Review* (Eighth Edi, Vol. 7, Nomor 1). Prentice Hall. <https://doi.org/10.23874/amber/2016/v7/i1/121351>
- İltüzer, Z. (2022). Option pricing with neural networks vs. Black-Scholes under different volatility forecasting approaches for BIST 30 index options. *Borsa Istanbul Review*, 22(4), 725–742. <https://doi.org/10.1016/j.bir.2021.12.001>
- Kazmi, K. (2023). A second order numerical method for the time-fractional Black–Scholes European option pricing model. *Journal of Computational and Applied Mathematics*, 418, 114647. <https://doi.org/10.1016/j.cam.2022.114647>

- Khan, F. S., Sultana, M., Khalid, M., Zaidi, F., & Nonlaopon, K. (2023). Forecasting the behaviour of fractional Black-Scholes option pricing equation by laplace perturbation iteration algorithm. *Alexandria Engineering Journal*, 62, 85–97. <https://doi.org/10.1016/j.aej.2022.07.009>
- Khofifahturizqi, A., Farikhin, F., Herdiana, R., & Sihombing, Y. U. (2024). Prediction of Stock Price Volatility Using the Long Short Term Memory (LSTM) Model for Investment Portfolio Selection Strategy. *International Journal of Current Science Research and Review*, 07(05), 3259–3267. <https://doi.org/10.47191/ijcsrr/v7-i5-84>
- Kim, H. Y., & Won, C. H. (2018). Forecasting the volatility of stock price index: A hybrid model integrating LSTM with multiple GARCH-type models. *Expert Systems with Applications*, 103, 25–37. <https://doi.org/10.1016/j.eswa.2018.03.002>
- Kingma, D. P., & Ba, J. L. (2015). Adam: A method for stochastic optimization. *3rd International Conference on Learning Representations, ICLR 2015 - Conference Track Proceedings*, 1–15. <https://doi.org/https://doi.org/10.48550/arXiv.1412.6980>
- Kumar P, H., & Patil, S. B. (2018). Forecasting Volatility with LSTM Techniques. *International Journal of Science and Research (IJSR)*, 7(10), 840–844. <https://doi.org/10.21275/ART20191920>
- Kunita, H. (2010). Itô's stochastic calculus: Its surprising power for applications. *Stochastic Processes and their Applications*, 120(5), 622–652. <https://doi.org/10.1016/j.spa.2010.01.013>
- Kurniawan, K., Ceasaro, B., & Sucipto. (2024). Perbandingan Fungsi Aktivasi Untuk Meningkatkan Kinerja Model LSTM Dalam Prediksi Ketinggian Air Sungai. *JEPIN (Jurnal Edukasi dan Penelitian Informatika)*, 10(1), 134–143.
- Lawler, G. F. (2023). *Stochastic Calculus: An Introduction with Applications*. In *American Mathematical Society*.
- Li, Z., Shen, J., & Xiao, W. (2024). Volatility risk premium, good volatility and bad volatility: Evidence from SSE 50 ETF options. *North American Journal of Economics and Finance*, 74(September 2023), 102206. <https://doi.org/10.1016/j.najef.2024.102206>

- Lin, X., Wang, M., & Lai, C.-H. (2021). A modification term for Black-Scholes model based on discrepancy calibrated with real market data. *Data Science in Finance and Economics*, 1(4), 313–326. <https://doi.org/10.3934/dsfe.2021017>
- Liu, Y., & Zhang, X. (2023). Option Pricing Using LSTM: A Perspective of Realized Skewness. *Mathematics*, 11(2), 314. <https://doi.org/10.3390/math11020314>
- Luenberger, D. G. (1998). *Investment Science*. Oxford University Press.
- Lui, H. W., & Chow, K. L. (2018). Multiclass classification of myocardial infarction with convolutional and recurrent neural networks for portable ECG devices. *Informatics in Medicine Unlocked*, 13(June), 26–33. <https://doi.org/10.1016/j.imu.2018.08.002>
- Mahajan, V., Thakan, S., & Malik, A. (2022). Modeling and Forecasting the Volatility of NIFTY 50 Using GARCH and RNN Models. *Economies*, 10(5), 1–20. <https://doi.org/10.3390/economies10050102>
- Merdiansah, R., Wulandari, K., Hasibuan, M., Umaidah, Y., Singaperbangsa Karawang Alamat, U., HSRonggo Waluyo, J., Timur, T., & Barat, J. (2024). Perbandingan Kinerja Model RNN, LSTM, dan BLSTM dalam Memprediksi Jumlah Gempa Bulanan di Indonesia. *Jurnal Penelitian Rumpun Ilmu Teknik (JUPRIT)*, 3(1), 262–277.
- Modisett, M. C., & Powell, J. A. (2012). Black-Scholes Option Pricing Model Modified to Admit a Miniscule Drift Can Reproduce the Volatility Smile. *Applied Mathematics*, 03(06), 597–605. <https://doi.org/10.4236/am.2012.36093>
- Mooy, M. N., Rusgiyono, A., & Rahmawati, R. (2017). Penentuan Harga Opsi Put Dan Call Tipe Eropa Terhadap Saham Menggunakan Model Black-Scholes. *Jurnal Gaussian*, 6(3), 407–417.
- Nourbakhsh, Z., & Habibi, N. (2023). Combining LSTM and CNN methods and fundamental analysis for stock price trend prediction. *Multimedia Tools and Applications*, 82(12), 17769–17799. <https://doi.org/10.1007/s11042-022-13963-0>
- Nwankpa, C., Ijomah, W., Gachagan, A., & Marshall, S. (2018). *Activation Functions: Comparison of trends in Practice and Research for Deep Learning*.

1–20.

- Øksendal, B. (2000). *Stochastic Differential Equations An Introduction with Applications Fifth Edition, Corrected Printing Springer-Verlag Heidelberg New York* (Fifth Edit, Nomor January 2000). <https://doi.org/10.1007/978-3-662-03185-8>
- Prahmana, R. C. I., & Sumardi. (2008). Penentuan Harga Opsi untuk Model Black-Scholes menggunakan Metode Beda Hingga Crank-Nicolson. *Universitas Gadjah Mada*, 1–6.
- Ruppert, D., & Matteson, D. . (2015). Statistics and Data Analysis for Financial Engineering. In *A Computational Approach to Statistical Learning* (Second Edi). Springer Texts in Statistics. <https://doi.org/10.1201/9781315171401-4>
- Sahoo, P. (2013). *Probability and Mathematical Statistics*. University of Louisville.
- Shumway, R. H., & Stoffer, D. S. (2010). Time Series Analysis and Its Applications. In G. Casella, S. Fienberg, & I. Olkin (Ed.), *North-Holland Mathematics Studies* (Third Edit, Vol. 74, Nomor C). Springer Texts in Statistics. [https://doi.org/10.1016/S0304-0208\(08\)70413-4](https://doi.org/10.1016/S0304-0208(08)70413-4)
- Sudriyanto, Mochammad Faid, Kamil Malik, A. S. (2024). Evaluasi Model Jaringan Saraf Tiruan Berbasis LSTM dalam Memprediksi Fluktuasi Harga Bitcoin. *Jurnal Advance Research Informatika*, 2(2), 15–22.
- Taghipour, M., & Aminikhah, H. (2022). A spectral collocation method based on fractional Pell functions for solving time–fractional Black–Scholes option pricing model. *Chaos, Solitons and Fractals*, 163. <https://doi.org/10.1016/j.chaos.2022.112571>
- Wijaya, A. R. (2023). Model Prediksi Data Harga Minyak Mentah Dunia Dengan Metode Exponential Smoothing. *Buletin Ilmiah Math. Stat. dan Terapannya (Bimaster)*, 12(1), 21–28.
- Wiranda, L., & Sadikin, M. (2019). Penerapan Long Short Term Memory Pada Data Time Series Untuk Memprediksi Penjualan Produk Pt. Metiska Farma. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, 8(3), 184–196.
- Xu, Y., Liu, T., & Du, P. (2024). Volatility forecasting of crude oil futures based on Bi-LSTM-Attention model: The dynamic role of the COVID-19 pandemic and the Russian-Ukrainian conflict. *Resources Policy*, 88(November 2023),

104319. <https://doi.org/10.1016/j.resourpol.2023.104319>

- Yadav, S., Hashmi, H., Vekariya, D., N, Z. A. K., & J, V. F. (2024). Mitigation of attacks via improved network security in IOT network environment using RNN. *Measurement: Sensors*, 32(January), 101046. <https://doi.org/10.1016/j.measen.2024.101046>
- Zhang, W., Niu, L., Zhang, D., Wang, G., Farrukh, F. U. D., & Zhang, C. (2023). HW-ADAM: FPGA-Based Accelerator for Adaptive Moment Estimation. *Electronics (Switzerland)*, 12(2), 1–17. <https://doi.org/10.3390/electronics12020263>
- Zouaoui, H., & Naas, M.-N. (2023). Option pricing using deep learning approach based on LSTM-GRU neural networks: Case of London stock exchange. *Data Science in Finance and Economics*, 3(3), 267–284. <https://doi.org/10.3934/dsfe.2023016>