

BAB 5 Kesimpulan

5.1 Kesimpulan

Penelitian ini memiliki tujuan untuk memprediksi arah pergerakan suatu saham (naik atau turun) pada hari selanjutnya dengan melakukan pendekatan Eksponensial, *Fourier*, *Gaussian*, Polynomial dan Sin dibandingkan dengan harga aslinya yang dievaluasi menggunakan RMSE dan melakukan validasi data asli dengan prediksi yang sudah dilakukan. Penelitian ini menambahkan metode baru yaitu pendekatan menggunakan sin. Penelitian dilakukan dengan menggunakan data dari tahun 2015 hingga 31 Agustus 2022. Penelitian ini menggunakan sampel data perusahaan LQ45 periode Agustus 2022 hingga Januari 2023. Penelitian ini memiliki hasil sebagai berikut :

1. Metode Sin merupakan metode baru dalam melakukan sebuah prediksi pergerakan harga saham. Dalam penelitian yang ada, Metode Sin lebih baik dibandingkan dengan ke 4 metode yang ada.
2. Penggunaan metode matematika dalam melakukan prediksi pergerakan harga saham dapat dilakukan sebelum harga terbentuk

5.2 Saran

Saran dari penulis untuk penelitian selanjutnya adalah

1. Penelitian menggunakan data yang berbeda beda (1 tahun, 2 tahun dan seterusnya)
2. Penelitian dapat menggunakan aplikasi lain yang dapat mempermudah penghitungan data seperti Excel, Scilab, FreeMat atau aplikasi lainnya.
3. Peneliti selanjutnya dapat memasukan faktor dari ketidakpastian lainnya kedalam perhitungan yang ada

DAFTAR PUSTAKA

- Ampomah, E. K., Nyame, G., Qin, Z., Addo, P. C., Gyamfi, E. O., & Gyan, M. (2021). Stock market prediction with *Gaussiannaïve* bayes machine learning algorithm. *Informatica (Slovenia)*, 45(2), 243–256. <https://doi.org/10.31449/inf.v45i2.3407>
- Ballesteros, F., Manila, A. A., Choi, A. E. S., & Lu, M. C. (2019). Electroplating sludge handling by solidification/stabilization process: a comprehensive assessment using kaolinite clay, waste latex paint and calcium chloride cement additives. *Journal of Material Cycles and Waste Management*, 21(6), 1505–1517. <https://doi.org/10.1007/s10163-019-00903-8>
- Berman, S. M. (1991). Central limit theorems for extreme Sojourns of stationary *Gaussian* processes. *Communications on Pure and Applied Mathematics*, 44(8–9), 925–938. <https://doi.org/10.1002/cpa.3160440807>
- Book, R. V. (1974). *Translational Lemmas, Polynomial Time, And (log n)*. 1, 1–23.
- Book, R. V. (1989). A Note On Sparse Sets And The Polynomial-Time Hierarchy. *Information Processing Letters*, 33(November), 141–143.
- Book, R. V. (1994). On collapsing the polynomial-time hierarchy. *Information Processing Letters*, 52(5), 235–237. [https://doi.org/10.1016/0020-0190\(94\)00157-X](https://doi.org/10.1016/0020-0190(94)00157-X)
- Cervelló-Royo, R., Guijarro, F., & Michniuk, K. (2015). Stock market trading rule based on pattern recognition and technical analysis: Forecasting the DJIA index with intraday data. *Expert Systems with Applications*, 42(14), 5963–5975. <https://doi.org/10.1016/j.eswa.2015.03.017>
- Chen, S., & He, H. (2018). Stock Prediction Using Convolutional Neural Network. *IOP Conference Series: Materials Science and Engineering*, 435(1). <https://doi.org/10.1088/1757-899X/435/1/012026>
- Chen, T. L., & Chen, F. Y. (2016). An intelligent pattern recognition model for supporting investment decisions in stock market. *Information Sciences*, 346–347, 261–274. <https://doi.org/10.1016/j.ins.2016.01.079>
- Cooley, J. W., Favin, D. L., Kaenel, R. A., Member, S., Lang, W., Member, S., Mllng, G. C., Ieee, A. B. B. B. E., Nelson, D. E., Rader, C. M., & Welch, P. D. (1967). *What is the Fast Fourier Transform*. 2.
- Crvenkovic, Z. L., & Pilipovic, S. (1994). *Gaussian Generalized Random Processes.pdf*.
- Dash, R. (2018). DECPNN: A hybrid stock predictor model using Differential Evolution and Chebyshev Polynomial neural network. *Intelligent Decision Technologies*, 12(1), 93–104. <https://doi.org/10.3233/IDT-170313>
- de Faria, E. L., Albuquerque, M. P., Gonzalez, J. L., Cavalcante, J. T. P., & Albuquerque, M. P. (2009). Predicting the Brazilian stock market through neural networks and adaptive exponential smoothing methods. *Expert Systems*

- with *Applications*, 36(10), 12506–12509.
<https://doi.org/10.1016/j.eswa.2009.04.032>
- Ding, Q., Wu, S., Sun, H., Guo, J., & Guo, J. (2020). Hierarchical multi-scale Gaussian transformer for stock movement prediction. *IJCAI International Joint Conference on Artificial Intelligence, 2021-January*, 4640–4646. <https://doi.org/10.24963/ijcai.2020/640>
- Gardner, E. S. (2006). Exponential smoothing: The state of the art-Part II. *International Journal of Forecasting*, 22(4), 637–666. <https://doi.org/10.1016/j.ijforecast.2006.03.005>
- Geuss, R., & Skinner, Q. (1996). *The Theory Of The Four Movements.pdf* (pp. 100–281). Cambridge Text In The History Of Political Thought.
- Hamzaçebi, C., Akay, D., & Kutay, F. (2009). Comparison of direct and iterative artificial neural network forecast approaches in multi-periodic time series forecasting. *Expert Systems with Applications*, 36(2 PART 2), 3839–3844. <https://doi.org/10.1016/j.eswa.2008.02.042>
- Horák, J., & Krulický, T. (2019). Comparison of exponential time series alignment and time series alignment using artificial neural networks by example of prediction of future development of stock prices of a specific company. *SHS Web of Conferences*, 61, 01006. <https://doi.org/10.1051/shsconf/20196101006>
- I, S. (2015). An Exponential GARCH Approach to the Effect of Impulsiveness of Euro on Indian Stock Market. *The Journal of Asian Finance, Economics and Business*, 2(3), 17–22. <https://doi.org/10.13106/jafeb.2015.vol2.no3.17>
- Kara, Y., Acar Boyacioglu, M., & Baykan, Ö. K. (2011). Predicting direction of stock price index movement using artificial neural networks and support vector machines: The sample of the Istanbul Stock Exchange. *Expert Systems with Applications*, 38(5), 5311–5319. <https://doi.org/10.1016/j.eswa.2010.10.027>
- Kim, J., & Kim, Y. (2019). Transitory prices, resiliency, and the cross-section of stock returns. *International Review of Financial Analysis*, 63, 243–256. <https://doi.org/10.1016/j.irfa.2018.11.009>
- Kohlrausch, R. (2019). Evolution of Exponential. *Materials Today*, 19(2), 2–5. <https://linkinghub.elsevier.com/retrieve/pii/S1369702116000365>
- Kuo, R. J., Prasetyo, B., & Wibowo, B. S. (2019). Deep Learning-Based Approach for Air Quality Forecasting by Using Recurrent Neural Network with Gaussian Process in Taiwan. *2019 IEEE 6th International Conference on Industrial Engineering and Applications, ICIEA 2019*, 471–474. <https://doi.org/10.1109/IEA.2019.8715113>
- Liu, H., & Long, Z. (2020). An improved deep learning model for predicting stock market price time series. *Digital Signal Processing: A Review Journal*, 102, 102741. <https://doi.org/10.1016/j.dsp.2020.102741>
- Malzahn, D., & Opper, M. (2003). Learning curves and bootstrap estimates for

- inference with *Gaussian* processes: A statistical mechanics study. *Complexity*, 8(4 SPEC. ISS.), 57–63. <https://doi.org/10.1002/cplx.10082>
- Mariani, M. C., Bhuiyan, M. A. M., Tweneboah, O. K., Beccar-Varela, M. P., & Florescu, I. (2020). Analysis of stock market data by using Dynamic *Fourier* and Wavelets techniques. *Physica A: Statistical Mechanics and Its Applications*, 537, 122785. <https://doi.org/10.1016/j.physa.2019.122785>
- Marks II, R. J. (2009). Handbook of *Fourier* Analysis & Its Applications. *Handbook of Fourier Analysis & Its Applications*. <https://doi.org/10.1093/oso/9780195335927.001.0001>
- Mazur, M., Dang, M., & Vega, M. (2021). COVID-19 and the march 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters*, 38(March), 101690. <https://doi.org/10.1016/j.frl.2020.101690>
- Menon, V. K., Vasireddy, N. C., Jami, S. A., Pedamallu, V. T. N., Sureshkumar, V., & Soman, K. (2015). Bulk Price Forecasting Using Spark over over NSE Data Set. *Springer International Publishing Switzerland*, 1, 137–146. <https://doi.org/10.1007/978-3-319-40973-3>
- Mirzaei Talarposhti, F., Javedani Sadaei, H., Enayatifar, R., Gadelha Guimarães, F., Mahmud, M., & Eslami, T. (2016). Stock market forecasting by using a hybrid model of exponential fuzzy time series. *International Journal of Approximate Reasoning*, 70, 79–98. <https://doi.org/10.1016/j.ijar.2015.12.011>
- Nayak, S. C., & Misra, B. B. (2018). Estimating stock closing indices using a GA-weighted condensed polynomial neural network. *Financial Innovation*, 4(1). <https://doi.org/10.1186/s40854-018-0104-2>
- Niaki, S. T. A., & Hoseinzade, S. (2013). Forecasting S&P 500 index using artificial neural networks and design of experiments. *Journal of Industrial Engineering International*, 9(1), 1–9. <https://doi.org/10.1186/2251-712X-9-1>
- Olbrys, J., & Mursztyn, M. (2019a). Estimation of intraday stock market resiliency: Short-Time *Fourier* Transform approach. *Physica A: Statistical Mechanics and Its Applications*, 535, 122413. <https://doi.org/10.1016/j.physa.2019.122413>
- Olbrys, J., & Mursztyn, M. (2019b). Measuring stock market resiliency with Discrete *Fourier* Transform for high frequency data. *Physica A: Statistical Mechanics and Its Applications*, 513, 248–256. <https://doi.org/10.1016/j.physa.2018.09.028>
- Ou, P. H., & Wang, H. (2011). Modeling and forecasting stock market volatility by *Gaussian* processes based on GARCH, EGARCH and GJR models. *Proceedings of the World Congress on Engineering 2011, WCE 2011*, 1(516), 338–342.
- Patel, J., Shah, S., Thakkar, P., & Kotecha, K. (2015). Predicting stock market index using fusion of machine learning techniques. *Expert Systems with Applications*, 42(4), 2162–2172. <https://doi.org/10.1016/j.eswa.2014.10.031>

- Plichko, A., & Zagorodnyuk, A. (1998). On Automatic Continuity and Three Problems of “The Scottish Book” Concerning the Boundedness of Polynomial Functionals. *Journal of Mathematical Analysis and Applications*, 220(2), 477–494. <https://doi.org/10.1006/jmaa.1997.5826>
- Prabhu, K. M. M. (2019). Window Functions and Their Applications In Signal Processing. In *News.Ge*.
- Qiu, M., Song, Y., & Akagi, F. (2016). Application of artificial neural network for the prediction of stock market returns: The case of the Japanese stock market. *Chaos, Solitons and Fractals*, 85, 1–7. <https://doi.org/10.1016/j.chaos.2016.01.004>
- Radojčić, D., & Kredatus, S. (2020). The impact of stock market price *Fourier* transform analysis on the Gated Recurrent Unit classifier model. *Expert Systems with Applications*, 159. <https://doi.org/10.1016/j.eswa.2020.113565>
- Rather, A. M., Agarwal, A., & Sastry, V. N. (2015). Recurrent neural network and a hybrid model for prediction of stock returns. *Expert Systems with Applications*, 42(6), 3234–3241. <https://doi.org/10.1016/j.eswa.2014.12.003>
- Ravikumar, S., & Saraf, P. (2020). Prediction of stock prices using machine learning (regression, classification) Algorithms. 2020 *International Conference for Emerging Technology, INCET 2020*, 1–5. <https://doi.org/10.1109/INCET49848.2020.9154061>
- Rout, A. K., Dash, P. K., Dash, R., & Bisoi, R. (2017). Forecasting financial time series using a low complexity recurrent neural network and evolutionary learning approach. *Journal of King Saud University - Computer and Information Sciences*, 29(4), 536–552. <https://doi.org/10.1016/j.jksuci.2015.06.002>
- Sakhare, N. N., & Sagar Imambi, S. (2019). Performance analysis of regression based machine learning techniques for prediction of stock market movement. *International Journal of Recent Technology and Engineering*, 7(6), 655–662.
- Shukor, S. A., Sufahani, S. F., Khalid, K., Wahab, M. H. A., Idrus, S. Z. S., Ahmad, A., & Subramaniam, T. S. (2021). Forecasting Stock Market Price of Gold, Silver, Crude Oil and Platinum by Using Double Exponential Smoothing, Holt’s Linear Trend and Random Walk. *Journal of Physics: Conference Series*, 1874(1), 0–12. <https://doi.org/10.1088/1742-6596/1874/1/012087>
- Song, D., Chung Baek, A. M., & Kim, N. (2021). Forecasting Stock Market Indices Using Padding-Based *Fourier* Transform Denoising and Time Series Deep Learning Models. *IEEE Access*, 9, 83786–83796. <https://doi.org/10.1109/ACCESS.2021.3086537>
- Tabar, S., Sharma, S., & Volkman, D. (2020). A new method for predicting stock market crashes using classification and artificial neural networks. *International Journal of Business and Data Analytics*, 1(3), 203. <https://doi.org/10.1504/ijbda.2020.108697>
- Trigg, D. W., & Leach, A. G. (1967). Exponential Smoothing with an Adaptive

Response Rate. *Or*, 18(1), 53. <https://doi.org/10.2307/3010768>

- Vlasenko, A., Vlasenko, N., Vynokurova, O., & Peleshko, M. (2018). *A Hybrid Neuro-Fuzzy Model for Stock Market Time-Series Prediction.Pdf* (pp. 21–25). IEEE Second International Conference on Data Stream Mining & Processing.
- Williams, G., & Watts, D. C. (1970). Non-symmetrical dielectric relaxation behaviour arising from a simple empirical decay function. *Transactions of the Faraday Society*, 66(1), 80–85. <https://doi.org/10.1039/TF9706600080>
- Wolff, T. De, Cuevas, A., & Tobar, F. (2020). *GaussianProcess Imputation of Multiple Financial Series. ICASSP, IEEE International Conference on Acoustics, Speech and Signal Processing - Proceedings, 2020-May*, 8444–8448. <https://doi.org/10.1109/ICASSP40776.2020.9054102>
- Yadav, S., & Sharma, K. P. (2018). Statistical Analysis and Forecasting Models for Stock Market. *ICSCCC 2018 - 1st International Conference on Secure Cyber Computing and Communications*, 117–121. <https://doi.org/10.1109/ICSCCC.2018.8703324>
- Zhang, W., Yan, K., & Shen, D. (2021). Can the Baidu Index predict realized volatility in the Chinese stock market? *Financial Innovation*, 7(1). <https://doi.org/10.1186/s40854-020-00216-y>

