

Data frequency and forecast performance for stock markets: A deep learning approach for DAX index

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Abstract

Due to non-stationary, high volatility, and complex nonlinear patterns of stock market fluctuation, it is demanding to predict the stock price accurately. Nowadays, hybrid and ensemble models based on machine learning and economics replicate several patterns learned from the time series.

This paper analyses the SARIMAX models in a classical approach and using AutoML algorithms from the Darts library. Second, a deep learning procedure predicts the DAX index stock prices. In particular, LSTM (Long Short-Term Memory) and BiLSTM recurrent neural networks (with and without stacking), with optimised hyperparameters architecture by KerasTuner, in the context of different time-frequency data (with and without mixed frequencies) are implemented.

Nowadays great interest in multi-step-ahead stock price index forecasting by using different time frequencies (daily, one-minute, five-minute, and ten-minute granularity), focusing on raising intraday stock market prices.

The results show that the BiLSTM model forecast outperforms the benchmark models –the random walk and SARIMAX - and slightly improves LSTM. More specifically, the average reduction error rate by BiLSTM is 14-17 per cent compared to SARIMAX. According to the scientific literature, we also obtained that high-frequency data improve the forecast accuracy by 3-4% compared with daily data since we have some insights about volatility driving forces.

Keywords: *Time Series Prediction, SARIMAX model, LSTM and BiLSTM model, German stock market.*
