

Stock Price Prediction

The stock market is known for being volatile, dynamic, and nonlinear. Accurate stock price prediction is extremely challenging because of multiple (macro and micro) factors, such as politics, global economic conditions, unexpected events, a company's financial performance, and so on.

But all of this also means that there's a lot of data to find patterns in. So, financial analysts, researchers, and data scientists keep exploring analytics techniques to detect stock market trends. This gave rise to the concept of algorithmic trading, which uses automated, pre-programmed trading strategies to execute orders.

In this article, we'll be using both traditional quantitative finance methodology and machine learning algorithms to predict stock movements. We'll go through the following topics:

Stock analysis: fundamental vs. technical analysis

Stock prices as time-series data and related concepts

Predicting stock prices with Moving Average techniques

Introduction to LSTMs

Predicting stock prices with an LSTM model

Final thoughts on new methodologies, such as ESN

Disclaimer: this project/article is not intended to provide financial, trading, and investment advice. No warranties are made regarding the accuracy of the models. Audiences should conduct their due diligence before making any investment decisions using the methods or code presented in this article.

Stock analysis: fundamental analysis vs. technical analysis

When it comes to stocks, fundamental and technical analyses are at opposite ends of the market analysis spectrum.

Fundamental analysis (you can read more about it [here](#)):

Evaluates a company's stock by examining its intrinsic value, including but not limited to tangible assets, financial statements, management effectiveness, strategic initiatives, and consumer behaviors; essentially all the basics of a company.

Being a relevant indicator for long-term investment, the fundamental analysis relies on both historical and present data to measure revenues, assets, costs, liabilities, and so on.

Generally speaking, the results from fundamental analysis don't change with short-term news.

Technical analysis (you can read more about it [here](#)):

Analyzes measurable data from stock market activities, such as stock prices, historical returns, and volume of historical trades; i.e. quantitative information that could identify trading signals and capture the movement patterns of the stock market.

Technical analysis focuses on historical data and current data just like fundamental analysis, but it's mainly used for short-term trading purposes.

Due to its short-term nature, technical analysis results are easily influenced by news.

Popular technical analysis methodologies include moving average (MA), support and resistance levels, as well as trend lines and channels.

For our exercise, we'll be looking at technical analysis solely and focusing on the Simple MA and Exponential MA techniques to predict stock prices. Additionally, we'll utilize LSTM (Long Short-Term Memory), a deep learning framework for time-series, to build a predictive model and compare its performance against our technical analysis.

As stated in the disclaimer, stock trading strategy is not in the scope of this article. I'll be using trading/investment terms only to help you better understand the analysis, but this is not financial advice. We'll be using terms like:

trend indicators: statistics that represent the trend of stock prices,

medium-term movements: the 50-day movement trend of stock prices.

Stock prices as time-series data

Despite the volatility, stock prices aren't just randomly generated numbers. So, they can be analyzed as a sequence of discrete-time data; in other words, time-series observations taken at successive points in time (usually on a daily basis). Time series forecasting (predicting future values based on historical values) applies well to stock forecasting.

Because of the sequential nature of time-series data, we need a way to aggregate this sequence of information. From all the potential techniques, the most intuitive one is MA with the ability to smooth out short-term fluctuations. We'll discuss more details in the next section.