Building models to predict stock prices

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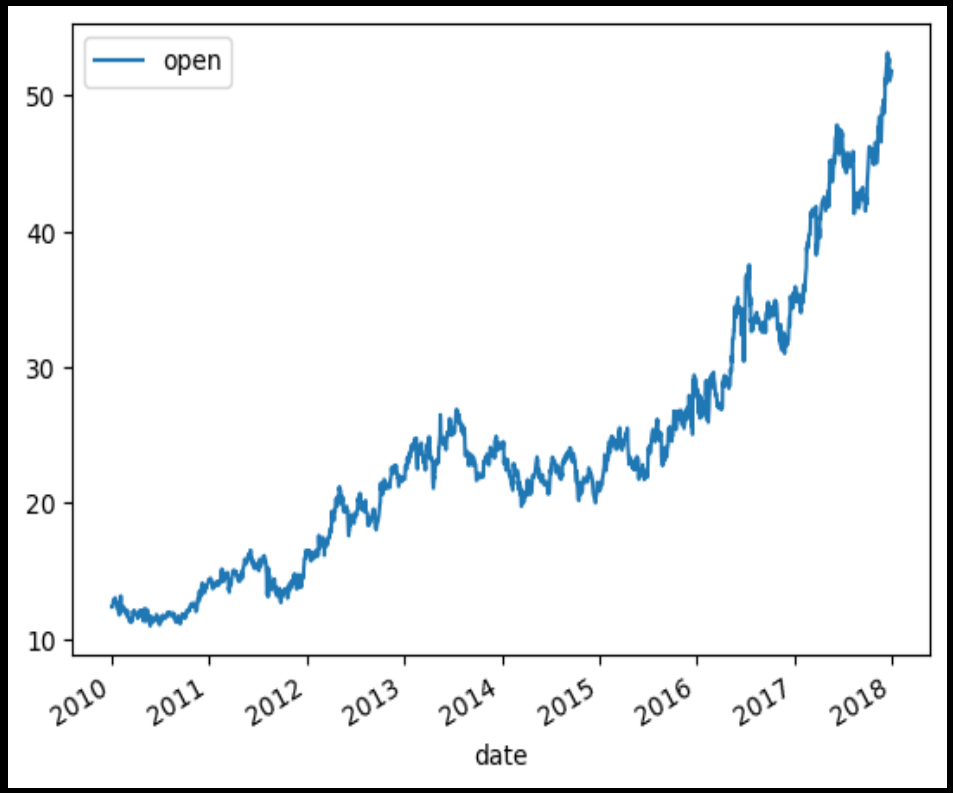
June 2023

- Predicting the price of stocks is an important but difficult problem.
- Stock markets are affected by socio-political events which are hard to predict.
- We built models based on time series analysis.
- We aimed for MAPE score better than 20 percent.

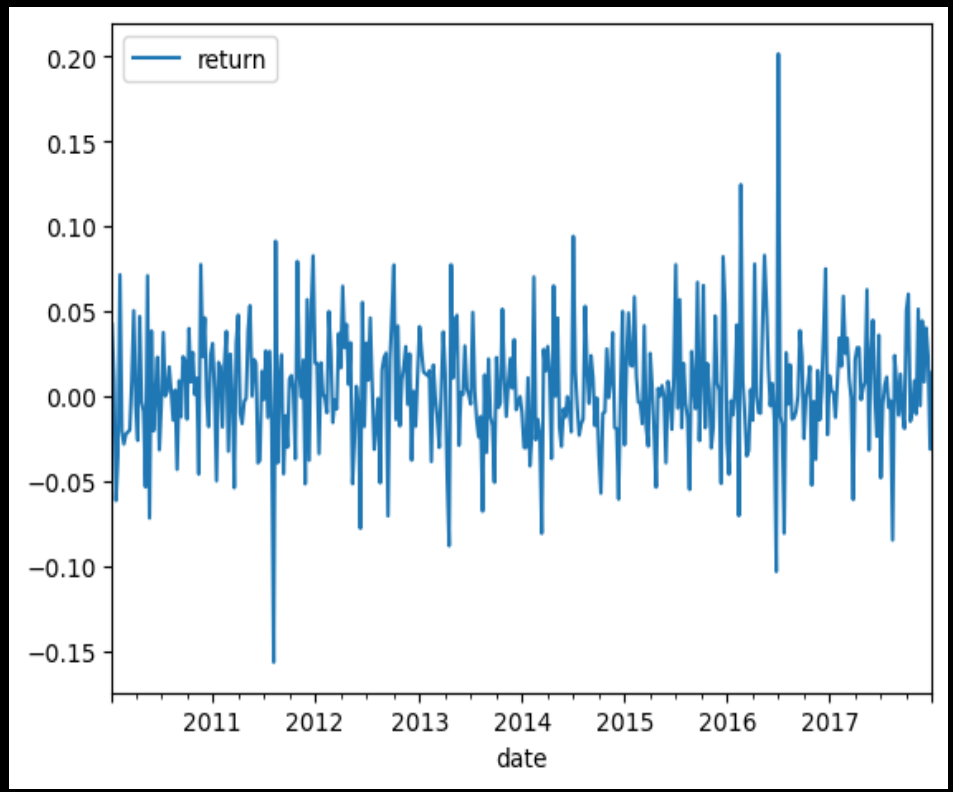
- We built 3 models:
  - ARIMA
  - Exponential smoothing
  - Facebook Prophet
- The Prophet one is the best (MAPE around 10 percent).

- Data comes from Nasdaq API, specifically Frankfurt Stock Exchange (FSE) data.

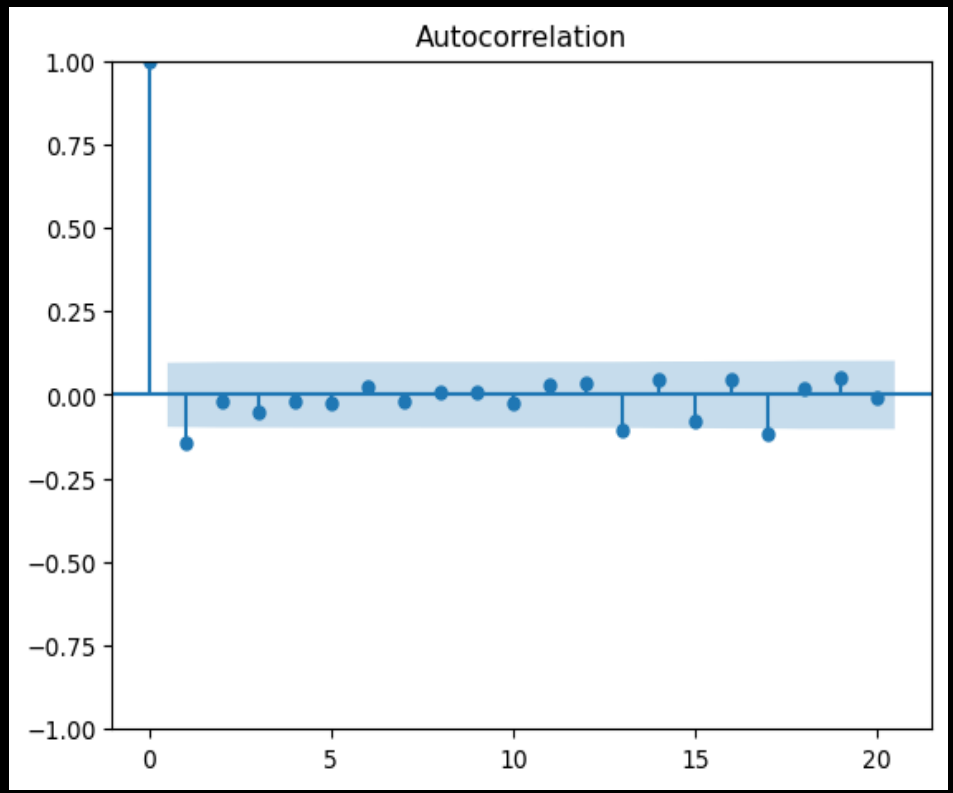


- Missing data were imputed with backfill method.

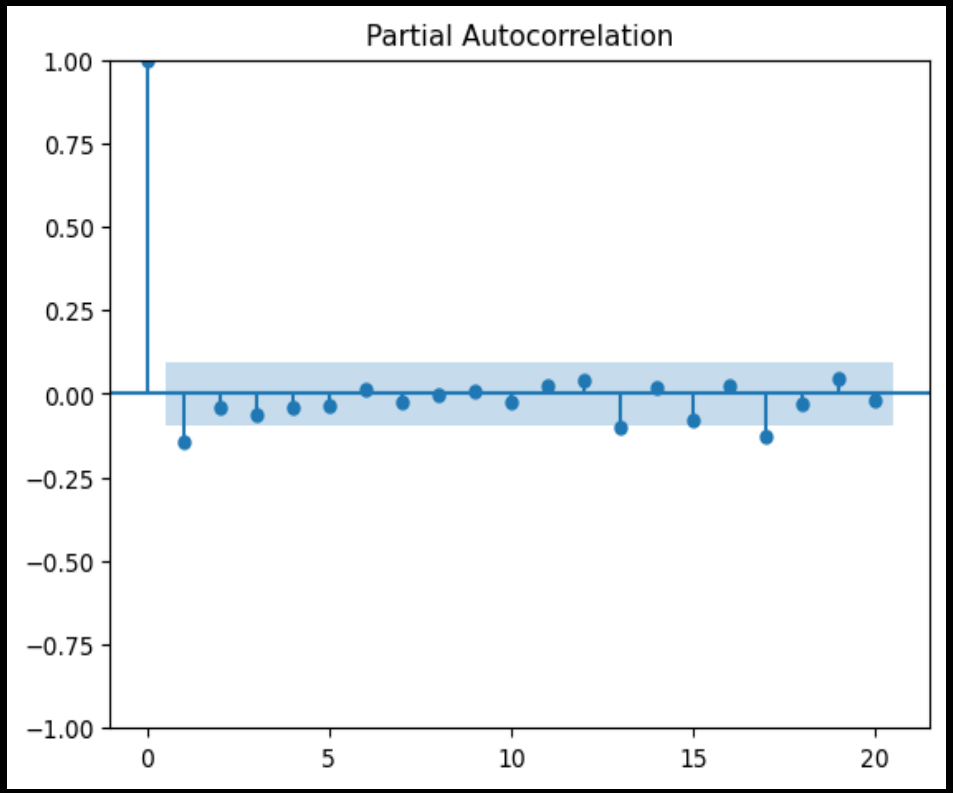
- Using Dickey-Fuller test, we confirmed that the stock prices is not a random walk.
- Using KPSS test, we saw that the returns are stationary.



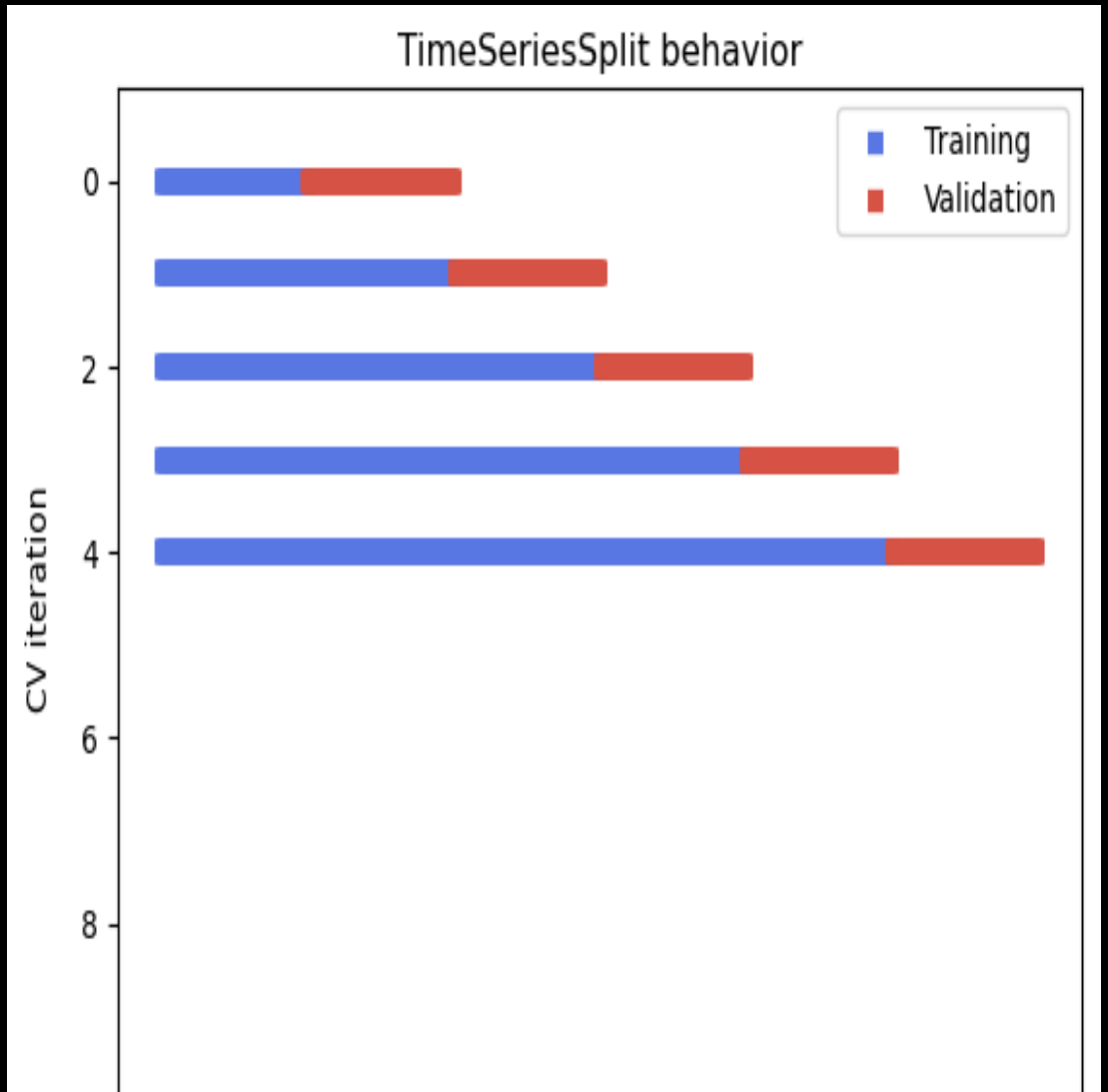
- ACF of returns shows negative lag-1 autocorrelation.
- It's statistically significant, so the time series can be forecast.



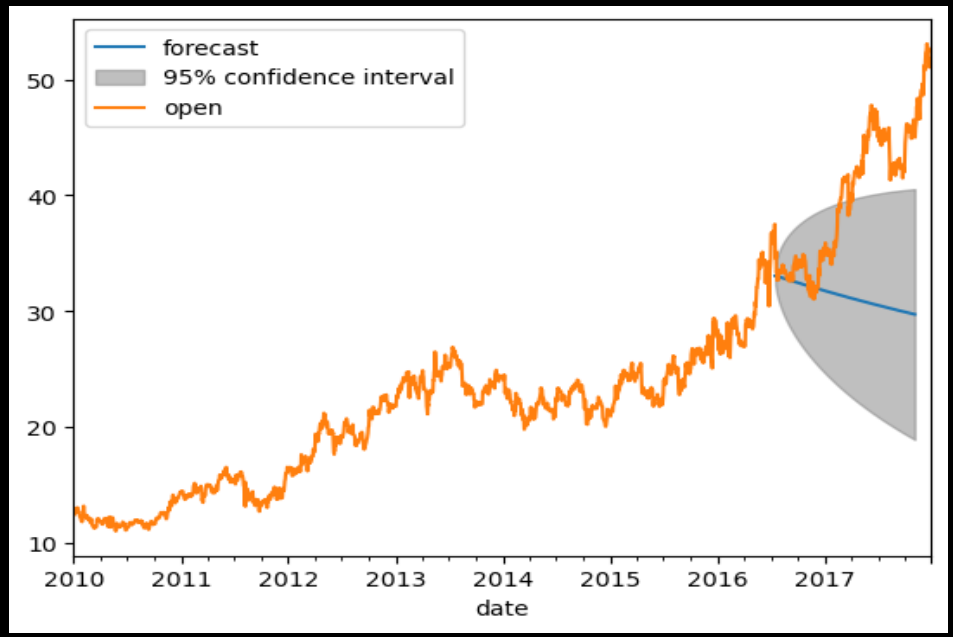
PACF is quite similar to ACF.



Cross-validation should respect the time ordering of the data.



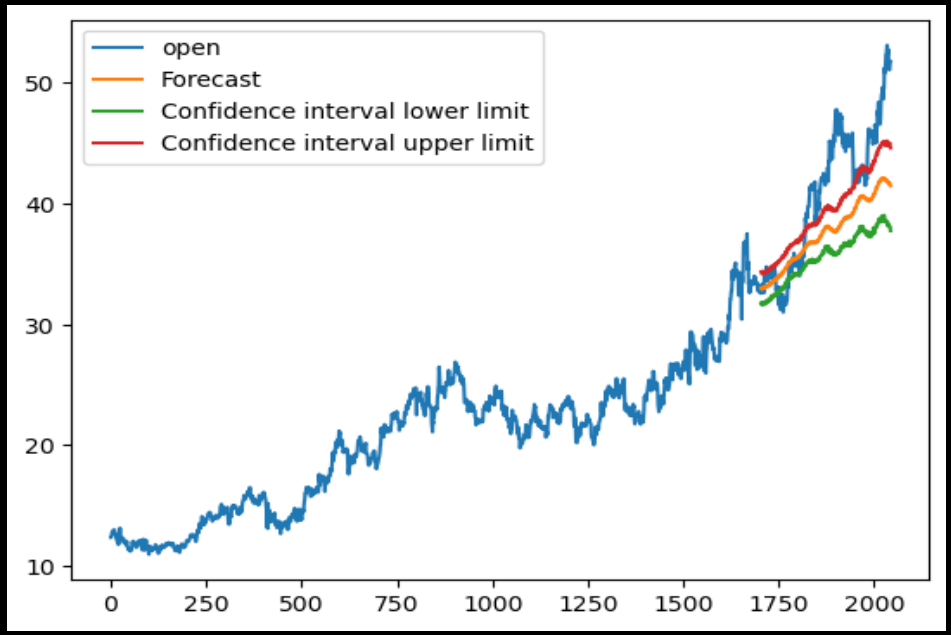
We did a hyperparameter search over (p,d=1,q), and found best (p,q)=(2,2).



ARIMA model didn't do a very good job.
MAPE: 0.15

We chose multiplicative trend.

Did a better job than ARIMA.
Also, better MAPE: 0.13.
No confidence interval for this model.



The best MAPE: 0.10.

Conclusion

The Facebook Prophet model is the best one.