

Time series analysis on the stock price of Tesla Inc.

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1 Abstract

2 Introduction

3 Data Description

4 Exploratory Data Analysis

To obtain a comprehensive understanding of the data, we conduct explanatory data analysis (EDA) first. Figure 1(a) is the time series plot of all the given time points. We observe that the average price of Tesla before 2020 is considerably lower than that after 2020. Also, the stock price before 2020 seems to have a constant trend and no seasonality. Moreover, due to the excessive number of time points, it is difficult to visually examine the trend and seasonality pattern for data after 2020. Therefore, for the sake of interest and convenience, we decide to only analyze the last 300 time points, which cover the period from 2020-08-26 to 2021-11-02 excluding weekends.

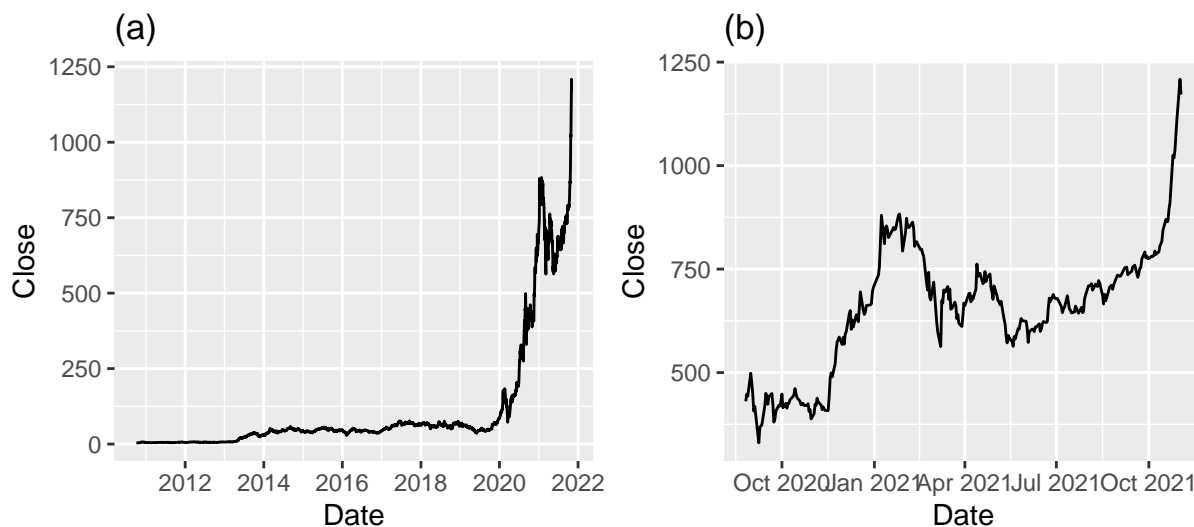


Figure 1: (a) Time series plot of all available trading days. (b) Time series plot of last 300 trading days

Figure 1(b) is the time series plot of the close prices of Tesla in last three hundred trading days before and including 2021-11-02. We first observe slight heteroskedasticity in Figure 1(b), so we experiment with square root and natural log transformation.

Intuitively, the (transformed) data is not stationary since there exists a nonlinear trend and possible seasonality. To be more concrete, we plot the sample ACF and PACF of the (transformed) data.

5 Model Construction

6 Model Comparison and Selection

7 Final Model

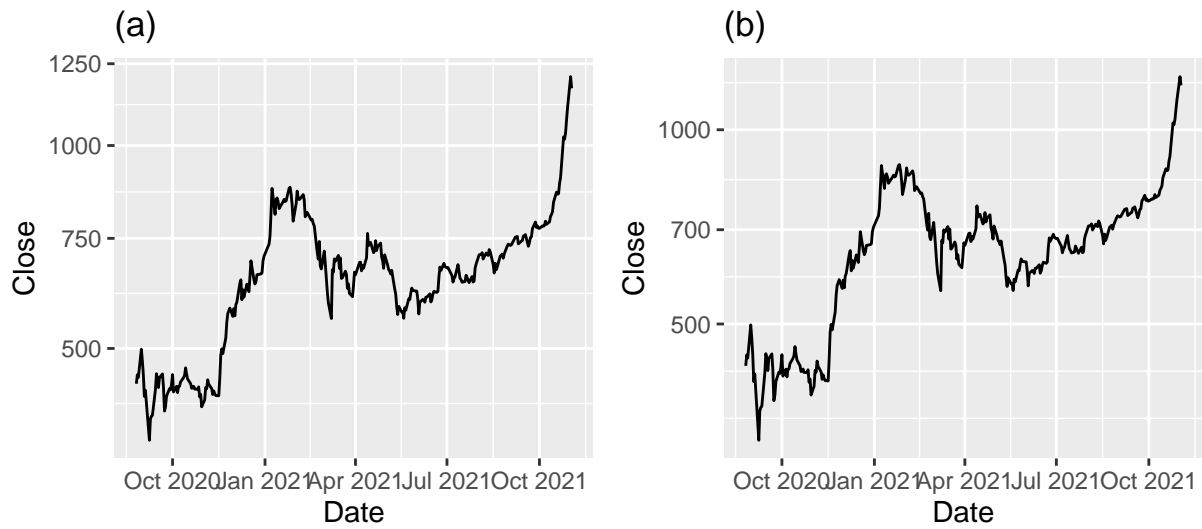


Figure 2: (a) Time series plot of all available trading days. (b) Time series plot of last 300 trading days

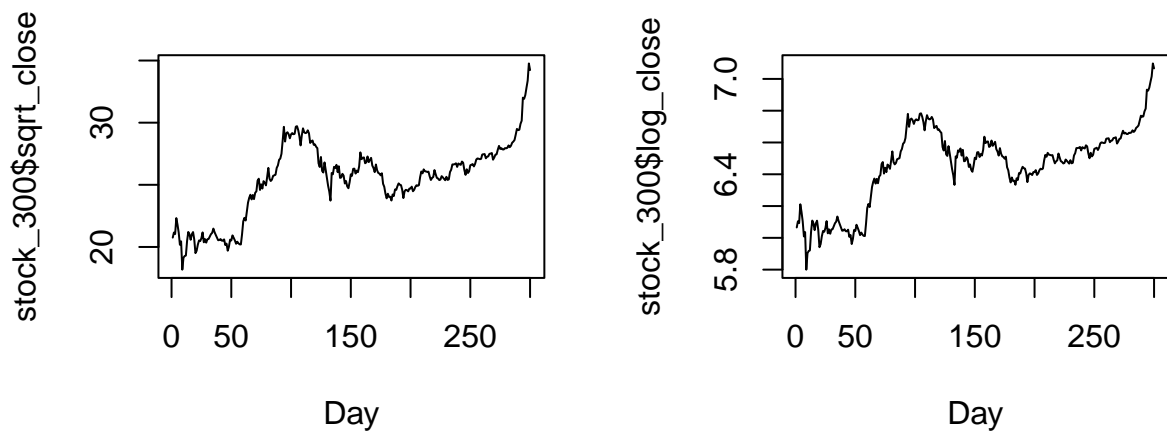


Figure 3: (a) Time series plot of all available trading days. (b) Time series plot of last 300 trading days

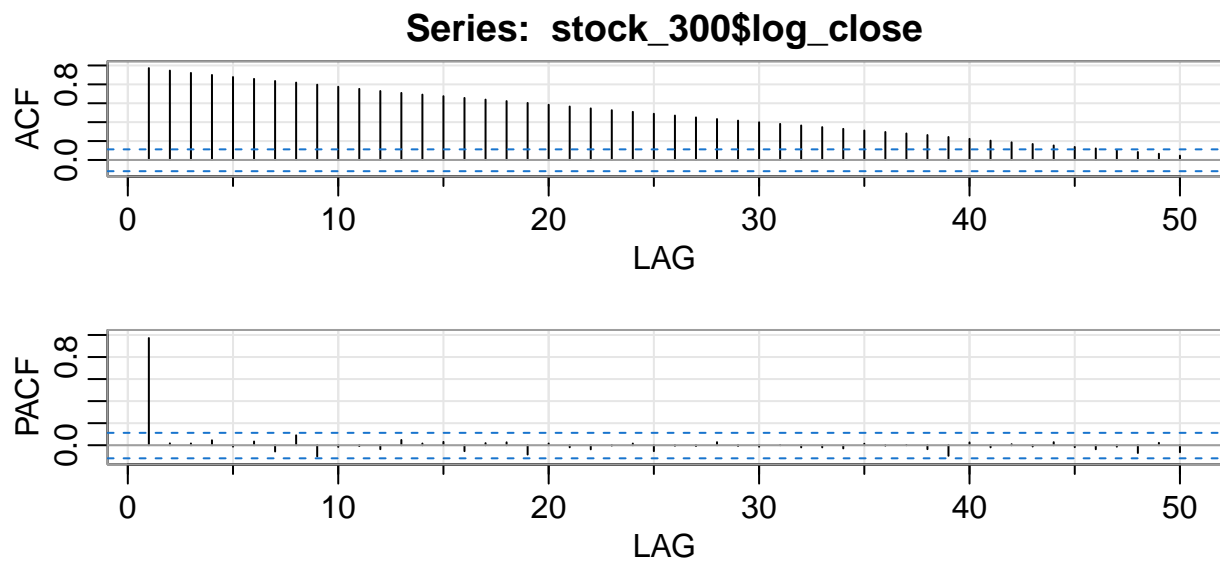


Figure 4: TODO

7.1 Model interpretation

7.2 Prediction

8 Conclusion