

Exploring the Behavior of Tesla Stock in the Face of Public Scrutiny: A Time Series Analysis

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DS 4002- 001

10/08/2025

Motivation:

We plan to use time series forecasting to use historical data of Tesla stock and predict its future behavior. In the current political climate, Tesla is one of the richest and most watched companies in the world. During the 2024 election cycle, the company's CEO, Elon Musk became heavily involved in the government, eventually standing up an agency on his own— the Department of Government Efficiency (DOGE).

As abruptly as Musk entered the political scene, he also exited in what many believed to be a staged feud, aimed at protecting Musk's company. This made Tesla a particularly interesting case study to address in today's world. Americans from across the nation talked about the impacts that Musk's actions would have on the wellbeing of his company [2]. In such a heavily capitalist society, business and government have finally become irreparably intertwined, and this makes it increasingly important to track the strategic moves that CEOs make. Understanding Tesla's success through the years versus 2024 gives great insight to just how untouchable these mega companies are.

Goal Statement:

We will build a model that forecasts future Tesla stock prices, out to 12 months, with at least 85% accuracy. [2]

Research Question:

To what extent can ETS forecasting and ARIMA modeling measure the impact of Elon Musk on Tesla's past, current, and future stock prices.

Modeling Approach:

We plan to use ARIMA modeling as well as ETS forecasting to predict the behavior of Tesla stock. ARIMA (AutoRegressive Integrated Moving Average) is a widely used time series forecasting method that combines autoregressive and moving average components to model patterns and trends in equally spaced historical data, with or without accounting for seasonality [3]. ETS models belong to a family of time series models based on a state space framework that includes four key elements: a level component, a trend component (T), a seasonal component (S), and an error term (E) [4]. Utilizing 10 years of Tesla stock data, we will formulate these models, as the more data that we use, the more accurate the forecast will be. Sequentially, we will then use Elon Musk's most influential time periods and overlay them on historical stock prices, to detect a pattern between his behavior and the stock price.

References:

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