Predicting Electric Vehicle Stock Prices

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Goal

Electric Vehicles (EVs) have been gaining widespread popularity on our streets and stock markets. Analysts have been trying to predict security prices for decades, but the automotive industry presents a unique opportunity: it's dependent on fossil fuels. EVs also rely on precious metals in their batteries and electronics. Knowing this, the question is whether one can predict future EV stock prices from its related industries. The motivation would be determining when to trade securities or estimate EV sales and adoption. Thus, we will attempt the following: given historical oil and precious metal data, predict the aggregate price of EV stocks.

Data

We utilized price data from the past two years after the March 2020 market crash. First, price data for 19 EV-related stocks were obtained. Similar price data for crude oil, gold, and lithium were then collected. We used "aggregate EV stock price" as a market-cap-weighted average of all EV-related stocks on a given day. We threw away price data for ~100 days, since it was missing in our Lithium data. After joining all by date, our final dataset has each row being one day, with columns: crude oil price, lithium price, gold price, and aggregate EV stock price.

Model + Evaluation Setup

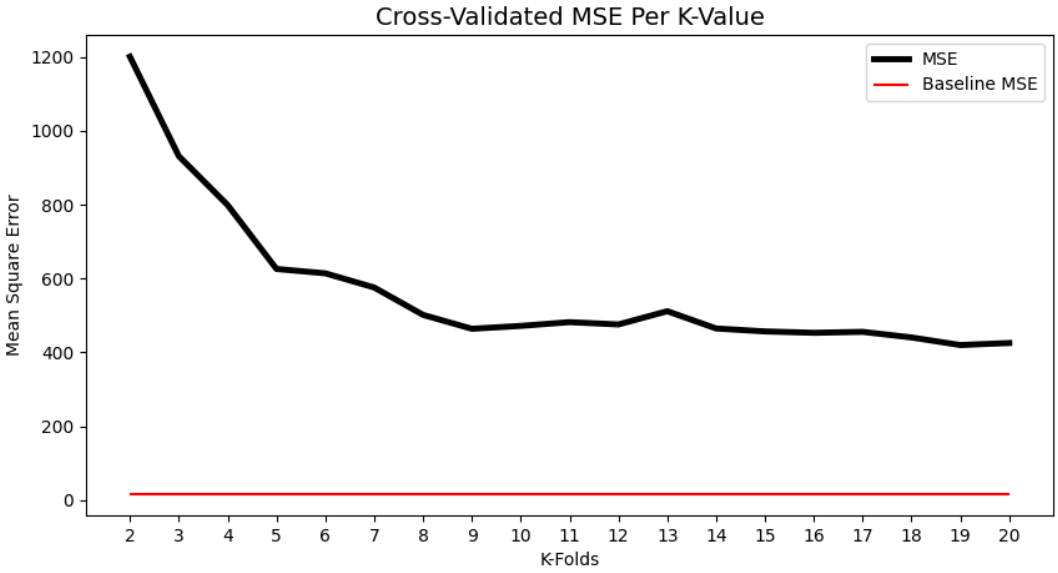
We will be attempting to predict stock prices of EVs in the form of the aggregate EV stock price from on historical oil and precious metal prices. Thus, a multi-linear regression model was trained and validated with K-fold cross validation (K=5) for an 80/20 test split. Other K=2-20 were also tested. We used two metrics to evaluate the accuracy of the model: mean square error to capture precise numerical accuracy, and % of correct price movement direction prediction to capture the model's ability to determine if the aggregate stock price will move up or down.

Results and Analysis

Claim #1: The regression trained with Oil, Gold, and Lithium historical price data, is unable to accurately predict aggregate EV stock prices.

Support for Claim #1: This table shows the accuracy of our model (K=5) compared to a naïve model that predicts no price change (if aggregate price = $100, it will be $100 the next day). The graph shows model's accuracy from K=2→20, yet still performs worse than the naïve model.

Model	*Accuracy (MSE)*
Our Multiple Linear Regression	~620
Naïve Baseline	~17.5



Claim #2: Our model is able to predict aggregate price movement direction at an above average accuracy, however is still quite unreliable.
Support for Claim #2: If we randomly guess stock movement (up or down), we will be correct 50% of the time. This graph shows how for all tested K, the model predicts the movement direction correctly >50%. However, the difference is marginal, and we would not trust such a small improvement in financial decisions.