Relationship between Commodity Prices and Stock Prices

Exploring the relationship between automobile market forces, stocks, and ETFs

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Objectives

Research Questions

Is there a direct relationship between raw materials, auto manufacturers, and the automobile market as a whole?

Do certain companies' stocks, like TSLA, behave differently compared to traditional gas car companies, like F or TM?

Are there stronger relationships between stock prices of traditional gas car companies and the price of oil than those with TSLA?

Datasets

Commodities

Source: [Economic Research Federal Reserve Bank of Saint Louis](#)

- [Steel](#)
- [Rubber Tires](#)
- [Glass](#)
- [Aluminum](#)

All commodity data was selected as a Producer Price Index by Commodity

Stocks and ETFs

Source: [Yahoo Finance](#)
Stocks

- [Tesla (TSLA)](#)
- [General Motors (GM)](#)
- [Ford (F)](#)
- [Honda (HMC)](#)
- [Ferrari (RACE)](#)

Indexes

- [Global Auto Index (CARZ)](#)
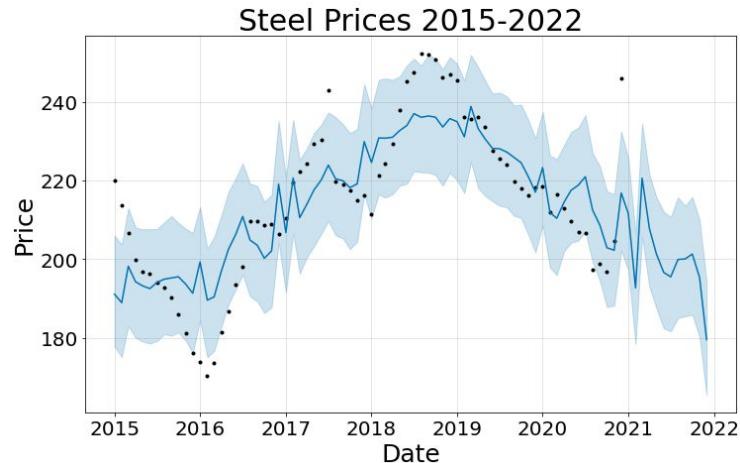
All data ranges are from 1/1/2015 to 10/1/2021 to encompass at least a full five years of data (RACE went public in 10/2015). Data was recorded on a monthly basis on the first day of each month.

Dataset

|	date	price	id	type
0	2015-01-01	40.720001	Tesla (TSLA)	Stock
1	2015-02-01	40.667999	Tesla (TSLA)	Stock
2	2015-03-01	37.754002	Tesla (TSLA)	Stock
3	2015-04-01	45.209999	Tesla (TSLA)	Stock
4	2015-05-01	50.160000	Tesla (TSLA)	Stock
5	2015-06-01	53.652000	Tesla (TSLA)	Stock
6	2015-07-01	53.230000	Tesla (TSLA)	Stock
7	2015-08-01	49.812000	Tesla (TSLA)	Stock
8	2015-09-01	49.680000	Tesla (TSLA)	Stock
9	2015-10-01	41.386002	Tesla (TSLA)	Stock

Analysis Process
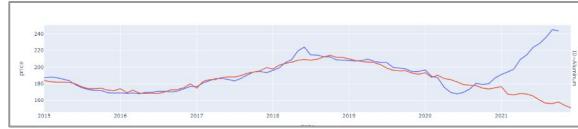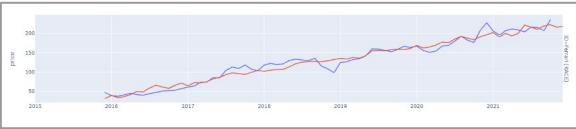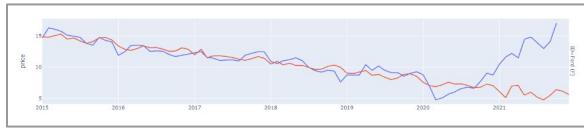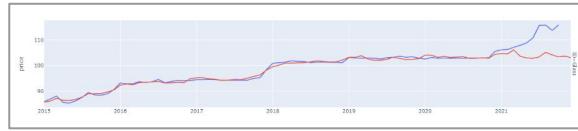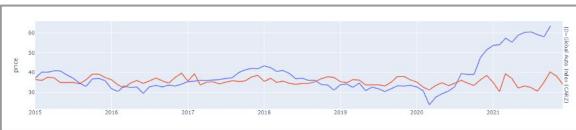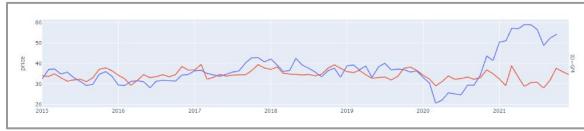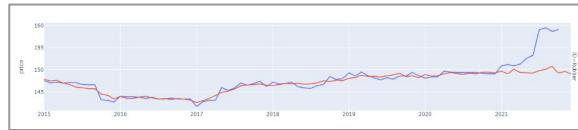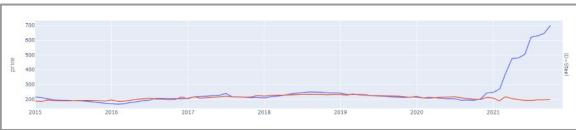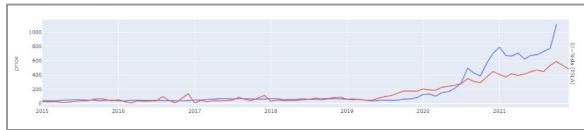
1. Read, clean, and combine datasets
2. Plot all data to for quick visual analysis
3. Fit Meta's Prophet machine learning package to data through 2020
   a. Prophet uses historical time series data to predict future trends
   b. Prophet will re-fit on historical data, smoothing and controlling for volatility
4. Use Prophet to predict 2021 prices for commodities, stocks, and indices
5. Plot and compare predictions with actual 2021 data (through October)

Steel Prices 2015-2022

Example of Prophet's fitting:
- Black Dots = Actual data points
- Blue Line = Predicted value
- Light Blue Area = Range of error
- Note: Predicted value begins where black dots end (beginning in 2021)

Results

Limitations and Future Analysis

Limitations
- While Prophet is able to predict the general trend and of stock prices, it is not able to account for unique market forces:
  - Covid supply chain impacts
  - Atypical earnings reports
  - Positive/negative publicity
  - New or increased market competition
  - Broader economic trends

Future Analysis
- Add additional data: more historical data and more-frequent intervals (weekly rather than monthly)
- Incorporate 2021 data and predict where stocks will go in the future