Effect of Economic Factors on Forecasting US Auto Sales

Samy Palaniappan
Chicago, Il
Jan 24, 2020

METIS

Intro - The Problem

How does a company:

1. Estimate the budget for the number of cars it is going to make for a coming year ?
2. Decide what type of cars does it want to make, to sell more ?

Intro - Background

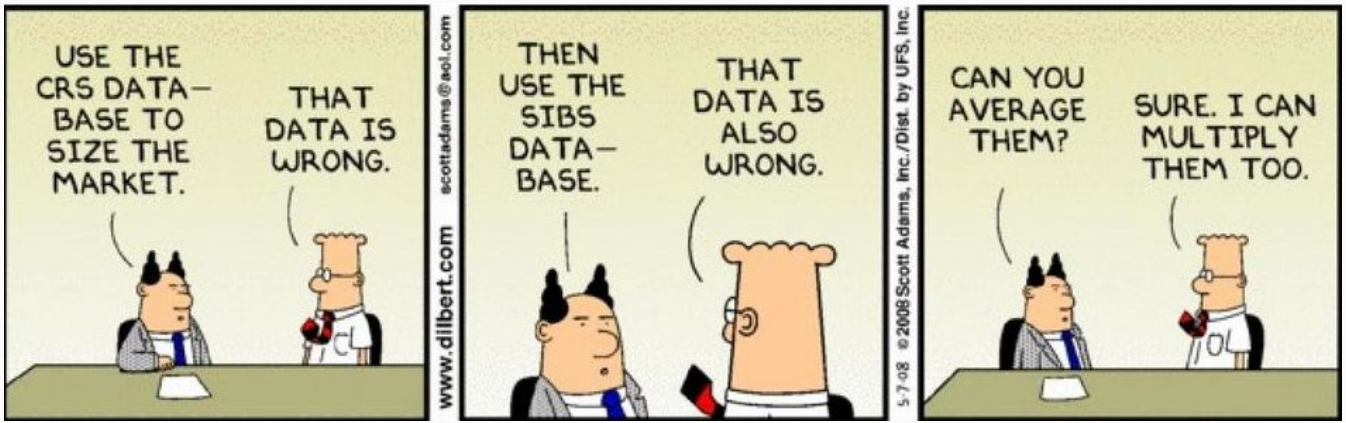
Macroeconomic Factors: How many cars do people buy ?

Population, Unemployment rate, GDP, Consumer Confidence, WTI, gold price

Microeconomic Factors: What kind of cars people buy ?

Gasoline price (conventional vs Electric / Hybrid), Family size distribution (Small car vs Minivan), Target market, etc.

Methodology - Importance of Data Source



FRED ECONOMIC DATA | ST. LOUIS FED

ECONOMIC RESEARCH
FEDERAL RESERVE BANK OF ST. LOUIS

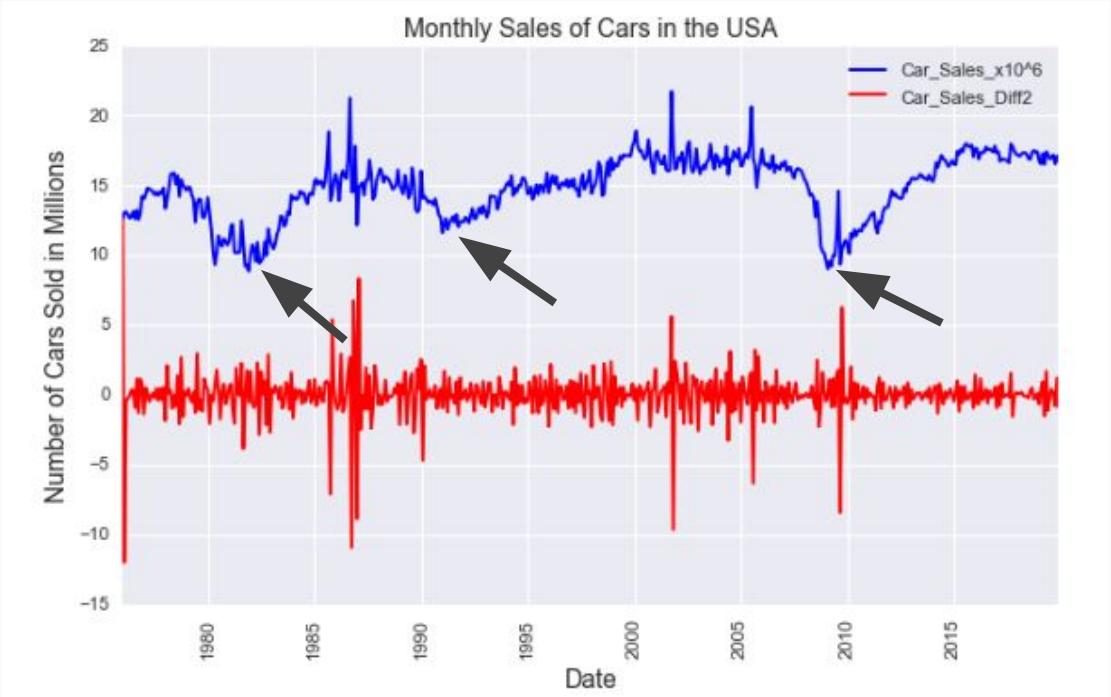
Methodology - Features Evaluated

1. Population
2. Unemployment Rate
3. Auto Loan Interest Rate
4. Consumer Confidence Index
5. GDP
6. DJIA
7. Crude Oil
8. Houses sold
9. Gold price index

Results - EDA

Data differencing

1. Population
2. Unemployment Rate
3. Auto Loan Interest Rate
4. Consumer Confidence Index
5. GDP
6. DJIA
7. Crude Oil
8. Houses sold
9. Gold price index

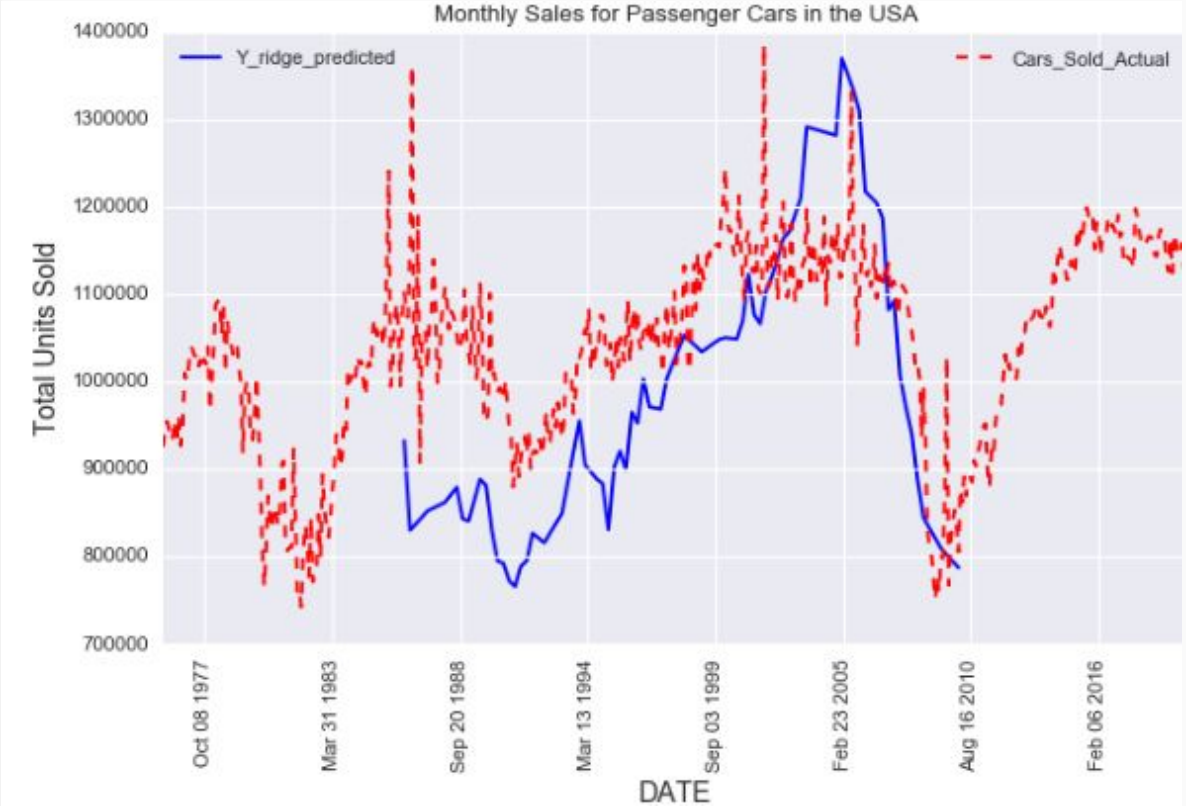


Data was differenced to remove the effect of time on the data.

So now each row in my dataset will represent an independent datapoint.

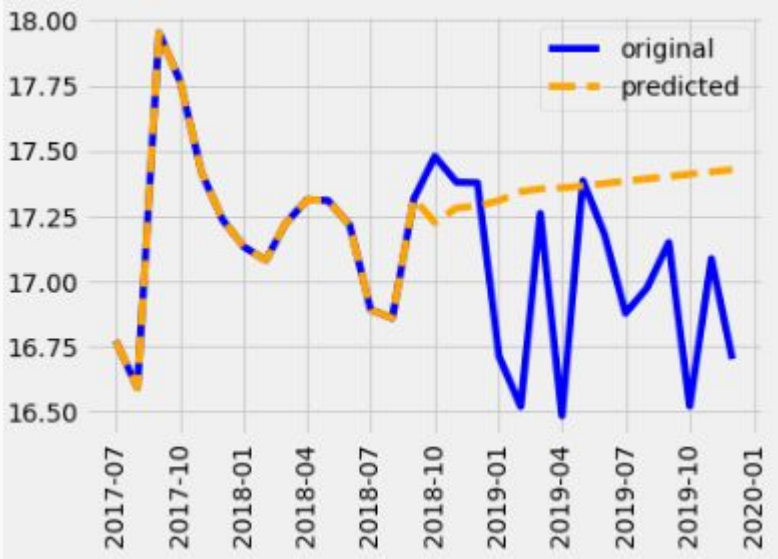
Results - Linear Model on Cars Sold

Monthly Sales for Passenger Cars in the USA

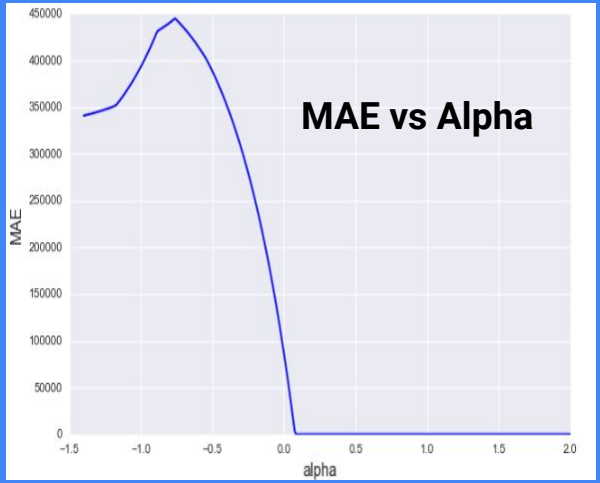


Results - ARIMA Model with no features.

Monthly Sales for Passenger Cars in the USA in Thousands



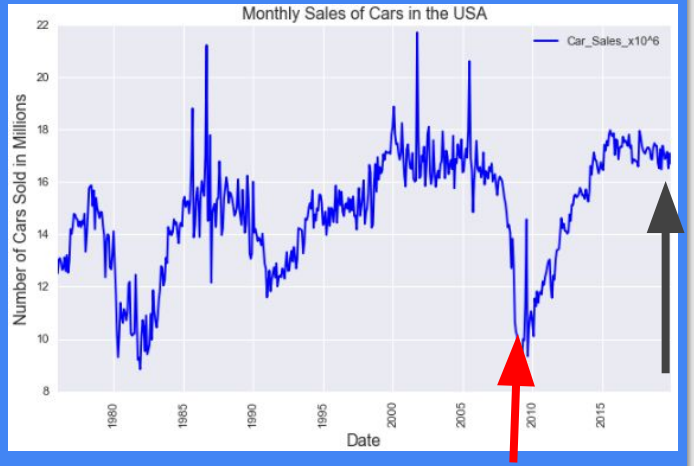
Linear Optimized Model Metrics



Feature	Coefficient (B)
Population	1.64
Unemployment Rate	-1.31
Interest Rate	-0.66
Consumer Confidence	0.03

Model	R-squared	RMSE
Lin_reg	0.5954	1.0286
Ridge	0.6053	1.0156
Lasso	0.6062	1.0126

Results - Top Selling Cars 2014, 2019



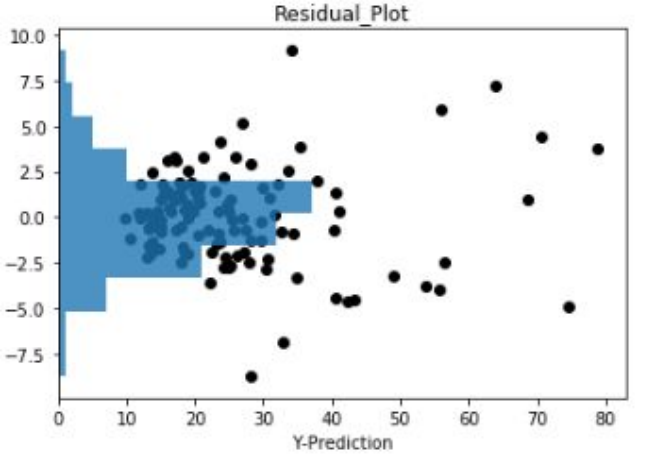
Data Scraped from **Goodcarbadcar.com** and **cars.com**

2010	**2018**
Honda Accord	Ford F-series
Toyota Camry	Dodge RAM Pickup
Honda Civic	Chevy Silverado
Toyota Corolla	Toyoda RAV4
Ford Fusion	Honda CR-V

On a bad year: Consumers are drawn to the inexpensive cars that gave the best mileage.

On a good year: The data tells us that, consumers are drawn towards the cheapest pickups and SUVs + do NOT care about Mileage

Linear Optimized Model Metrics for Car Price



Feature	Coefficient (B)
Intercept	0
Weight x Resale Value	11.9274
Fuel Efficiency	1.26
Horsepower	3.26

Model	R-squared	RMSE
Lin_reg	0.95760	2.7132
Ridge	0.9570	2.7137
Lasso	0.9570	2.7137

Conclusion - Major Features

Total Monthly Car Sales

1. Unemployment
2. Interest Rate
3. Consumer Confidence

Price of Car

1. Weight x Resale Value
2. Fuel Efficiency
3. Horsepower

Conclusion - Lessons Learned

1. Linear model is able to predict the features in a time-series data. However, accuracy has suffered.

2. Model says: On a good year, the data tells us that, consumers are drawn towards the **cheaper** pickups and SUVs. However, they were ***not*** *necessarily concerned about the* ***gas mileage***.

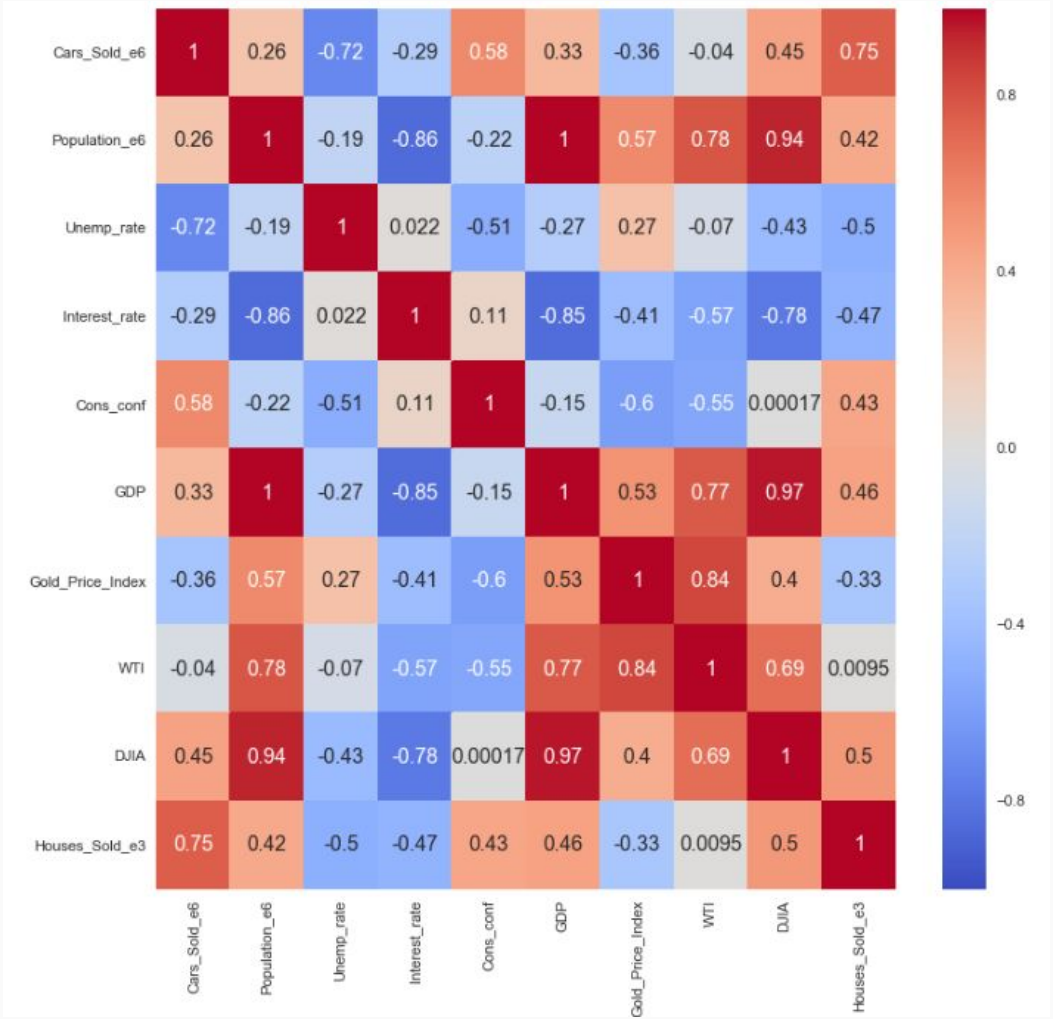
3. Model says: On a bad year, total car sales suffered. Customers preferred **higher gas mileage** cars.

Thanks!

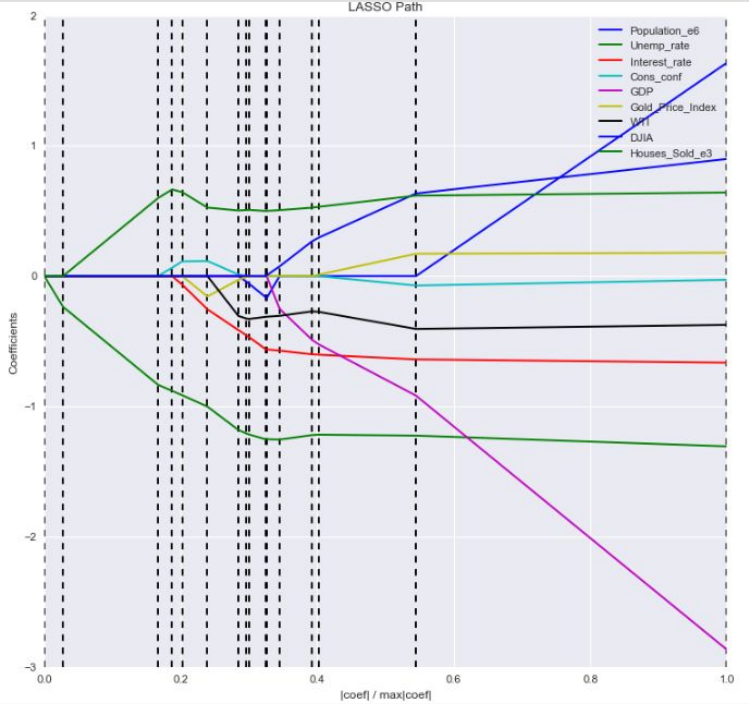
Questions ?

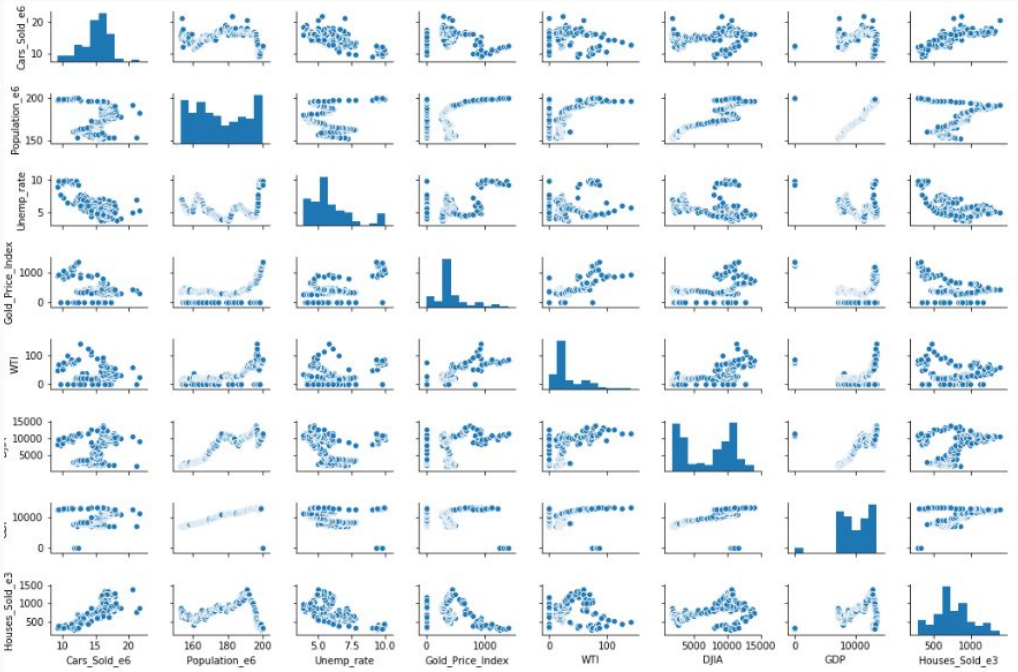
Appendix

Heat Map, to check for effect and multicollinearity



Appendix


LASSO Path
Population_e6
Unemp_rate
Interest_rate
Cons_conf
GDP
Gold_Price_Index
WTI
DJIA
Houses_Sold_e3
Coefficients
|coef| / max|coef|


Cars_Sold_e6
Population_e6
Unemp_rate
Gold_Price_Index
WTI
DJIA
GDP
Houses_Sold_e3