1. INTRODUCTION

Starting as a small oil company in Pennsylvania in 1890, Sunoco LP has since grown to be one of the largest independent fuel distributors in the United States. Though they have many departments, the Supply and Trading (S&T) team is integral to generating the steady supply of gasoline distributed to customers and determining the proper price in which to sell their inventory. In order to drive the company's profitability and maintain a steady inventory, traders in the S&T team need to be able to anticipate market changes. Much of the trading process and decision making rely on understanding supply and demand. In the case of Sunoco, it is integral that members of the team are aware of gasoline demand so they can time their buying and selling in a way that is profitable.

However, gasoline prediction is difficult as it changes based on many different factors. In addition to the normal variability, there have been drastic fluctuations in the fuel industry environment with the COVID-19 pandemic and multiple wars breaking out. Finding a way to anticipate the market based on identified significant variables would help Sunoco's trading team optimize their decisions and help the overall profitability and performance of the company. With this in mind, we developed a model to answer the core problem: What are the main drivers with the highest correlation and predictive power over U.S. consumer gasoline demand?

2. METHODOLOGY

2.1. Data Acquisition

The target variable for this analysis is *U.S. Product Supplied of Finished Motor Gasoline*, which represents gasoline demand. This variable was obtained from the U.S. Energy Information Administration (EIA). It was selected as the target because it directly measures gasoline consumption in the United States.

In order to model and predict gasoline demand, we decided to acquire 39 predictors spanning energy markets, macroeconomic indicators, transportation metrics, manufacturing data, and other relevant categories. The full list of aspects we consider is as follows:

	Predictors
Energy Market Indicators	US Spot Market Prices of Crude Regular (87 Octane) Gasoline Prices Europe Spot Market Prices of Crude Refinery Utilization Rig Count U.S. Gross Inputs to Refineries Operable Crude Oil Distillation Capacity
Macroeconomic Metrics	US GDP Inflation Expectations Housing Market Expectations

	Employee Earnings Population Consumer Loans Military Expenditure (% of GDP) Trade (% of GDP) Deposits of All Commercial Banks Money Supply
Transportation Statistics	EV Sales Public Transport Ridership Automobile Sales Vehicles Miles Traveled (VMT) Rail Passenger Miles Truck Tonnage Index
Manufacturing & Construction Data	Machinery and Transport Equipment (% of value added in manufacturing) Total Construction Spending
Trade Flows	Fuel Imports (% of merchandise imports) Fuel Exports (% of merchandise exports)
Consumer Personal Activity	Personal Consumption Expenditures Consumer Credit Data Deposits All Commercial Banks
Market Indicators	S&P 500 Index U.S. Dollar Index
Policy/Regulation	EV Regulation
Industrial Production	Cereal Production (metric tons)
Travel Industry	TSA Passenger Throughput Air Transport, Passengers Carried
Freight Transport	Pipeline Petroleum Movement Cass Freight Index
Labor Market	Jobless Claims

These predictors were selected based on economic theories about factors influencing gasoline demand as well as data availability. For example, energy market benchmarks like crude oil and gasoline prices can directly impact production scales and fuel affordability, thus influencing both industrial and retail consumption levels. Macroeconomic metrics, such as GDP, unemployment, wages, and inflation were included given that they capture the overall economic health, which might be key determinants of energy appetite and usage. Consumer personal

activity indicators such as personal spending and credit availability were also considered, as we think those gauge discretionary income impacts on automobile purchases and trips requiring gasoline, which provides a look at the discretionary demand side. One more aspect that we considered was transportation, which include vehicle sales, miles traveled, freight transport, and public transit ridership that might reveal direct insight into automobile reliance and thus gasoline needs. Additionally, we also think that manufacturing metrics connect to industrial energy utilization while construction data tracks commercial real estate projects. On the policy side, EV regulations might tie to long-term supply/demand balances influencing domestic gasoline consumption. The full list of our initial hypotheses can be found here.

Most of the predictor data was retrieved from publicly available government sources, including the Energy Information Administration (EIA) for gasoline demand, Bureau of Labor Statistics (BLS) for employment figures, Federal Reserve Economic Data (FRED) database for various economic metrics, Department of Transportation (DOT) for transportation metrics, and Census Bureau for population demographics. Additional sources include the Transportation Security Administration (TSA) for travel throughput, American Public Transportation Association for transit ridership, state & federal agencies for electric vehicle data, World Bank for global development indicators, and S&P Dow Jones Indices for financial market indices. This diverse range of standardized, reputable public data sources ensures us reliable inputs for modeling gasoline demand trends, while supplemental financial market trackers provide forward-looking signals from housing, stocks and inflation expectations.

By assembling this diverse collection of economic indicators related to key drivers of gasoline demand, we aimed to train a predictive model for projecting trends in U.S. gasoline demand. The breadth of variables we chose captures distinct but interrelated aspects of consumer behavior, industry activity, and macroeconomic conditions. In the next phase of our methodology, we processed and analyzed relationships within our dataset using Python.

2.2. Data Processing

2.2.1. Time Frame

The analysis time frame was set from 2000-01-07 to 2023-09-29, covering over 24 years of historical data. A weekly frequency was selected for the full dataset to match the cadence of the target variable.

2.2.2. Frequency Standardization

We performed frequency standardization to ensure that our variables have the consistent weekly frequency. Variables natively provided on a weekly basis were shifted to align the start of each week to Friday based on target variable conventions. Meanwhile, monthly predictors were divided by 4 to estimate weekly figures, using averages to fill NA gaps. Similarly, quarterly and annual predictors went through the same process, divided by 13 and 52 respectively, to create weekly data points.

2.2.3. Missing Data Imputation

Several predictor time series had historical gaps pre-2000 due to unavailable source data. In addition, some predictors have publication delays, leading to missing trailing periods through September 2023.

To address these temporal gaps, we used Facebook Prophet's forecasting capabilities. For those predictors missing historical or trailing periods:

- Correlation analysis was performed between the incomplete predictor and other predictors for the time range available. Most highly correlated variables were identified.
- Top correlated predictors to the incomplete predictor were selected.
- The incomplete predictor and those chosen correlated signals were loaded into Prophet.
- Prophet automatically detected intrinsic seasonality patterns along with overall trends.
- Missing past gaps were filled using the detected seasonal cycle and trend directions.
- Recent missing future weeks were forecasted based on projecting existing patterns.
- The resultant predictor signal rebuilt by Prophet was verified to have no further missing values in the 2000-2023 modeling time frame.

This process allowed us to leverage relationships between predictor dynamics to logically fill unavailable weeks with estimates resembling historically observed data behaviors. Applying forecasting models rather than simple imputation helps us retain intricacies within each reconstructed time series.

2.3. Data Model Validation

We split the 2000-2023 data into training sets and a test set. The test set consisted of the most recent period from September 2022 through September 2023. This represents a full contiguous year of recent data that models would not get exposed to for training. The remaining January 2000 to August 2022 weekly data points were allocated into the training set. By separating the evaluation period rather than just using a random split, we tried to avoid potential data leakage between the train and test datasets.

In addition, a Month column was created and underwent one-hot encoding transformation to capture seasonal effects.

Models we built include:

- Prediction & NA imputation: Prophet
- Feature Importance: Random Forest, Boosting (with and without yhat from Prophet)
- Linear Relationship: Ridge, Lasso

To optimize model performance, hyperparameter tuning was performed on Random Forest and Boosting using RandomizedSearch. Different combinations of parameters like

maximum depth, learning rate, boosting type, minimum child weight and more were systematically evaluated.

To evaluate the models' performance, the metrics we looked at are Mean Absolute Error (MAE) and R-squared. MAE tells us the average absolute error between predictions and actual weekly consumption, and R-squared conveys the proportion of variance within historical gasoline usage that the model is able to explain.

XGBoost with yhat became our best model. It achieved a R-squared score of 0.3107 on the test set of data from September 2022 to September 2023. Because R-squared represents the the proportion of variance explained, a value of 0.31 signifies the model is accounting for 31% of the fluctuations and changes within weekly gasoline demand. It is able to rationalize 31% of the ups and downs in the demand.

XGBoost with yhat's reported metrics	
Training MAE	~ 198.5
Validation MAE	~ 328.8
Training R-squared	~ 0.730
Validation R-squared	~ 0.314

2.4. Predictions & Insights

We decided to perform feature importance analysis to identify the top predictors on gasoline demand in the U.S. Rather than assessing importance solely on the full span of data, we divided the timeline into rolling decade blocks: 2000-2010, 2010-2020, 2021-2023. Examining variable relevancy within these periods provides more dynamic insights versus static overall importance rankings. It enables us to find the answers for questions like:

What factors fueled demand growth in the 2000s before recessions and oil price spikes?

How did determinants shift in the 2010s?

What are current key drivers as the 2020s sees the significant disruptions caused by events like the COVID-19 pandemic?

Comparing variable contributions over these phases offers richer contextual perspectives. In other words, we think that our rolling time window analysis illuminates distinct demand cycles tied to recessions, oil supply shocks, changing demographics, and more.

In the next section, we provide some visualizations on our results.

3. DATA VISUALIZATION

Generating graphs and visualizations is crucial to explore the variables and verify the accuracy of our models in determining the important variables and how they change as fuel demand changes.

3.1. Data Visualization for Exploration

By creating a plot to visually present Gasoline Demand over time helps our team understand the general trend of this variable. From the plot, Gasoline Demand seems to have a additive trend pattern, which leads to our choice of the Prophet model for predictive analysis.

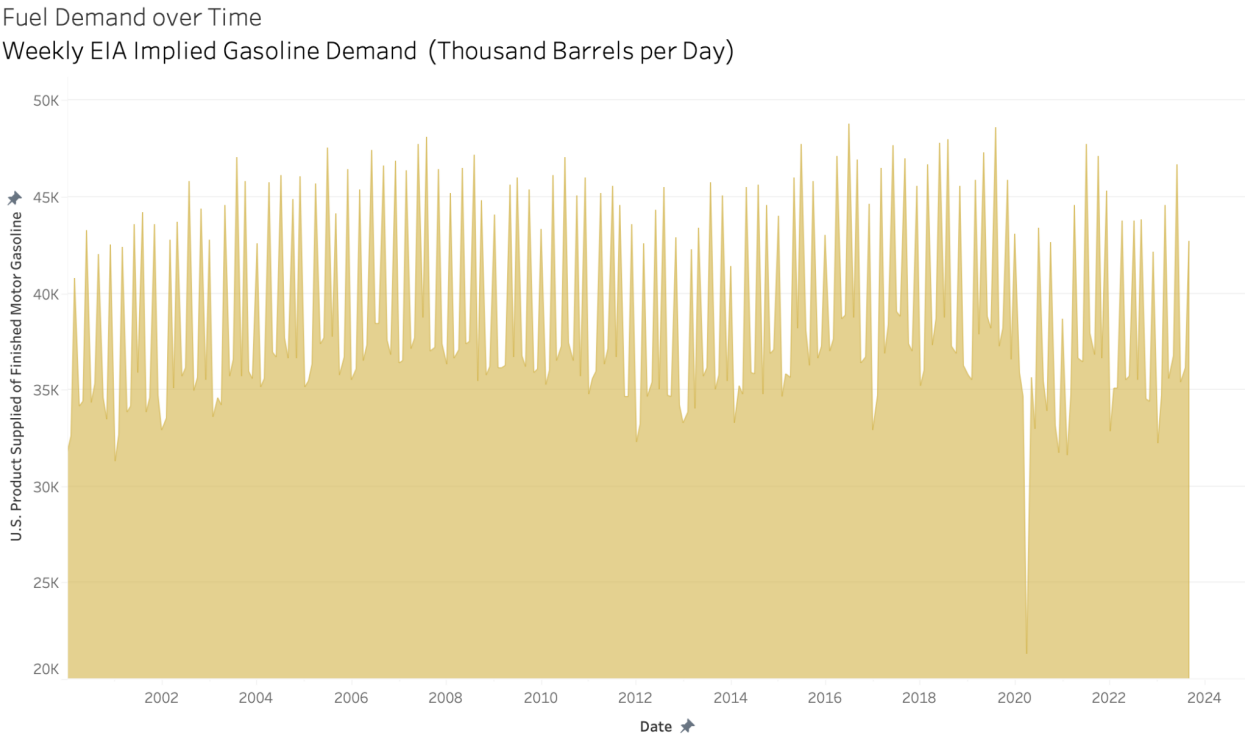

Figure 3.1.a. The Weekly EIA Implied Gasoline Demand over the period of 2000-2023

We also noticed Gasoline Demand has been relatively static over the years, with the exception of a low point during 2020 (effect of COVID-19).

In addition, data visualization helps our team to pre-assess our hypotheses. For example, plotting the Gasoline Demand along with TSA Passengers Throughput and noticing that there is a close interaction with them reinforces our hypothesis that these two are positively correlated.

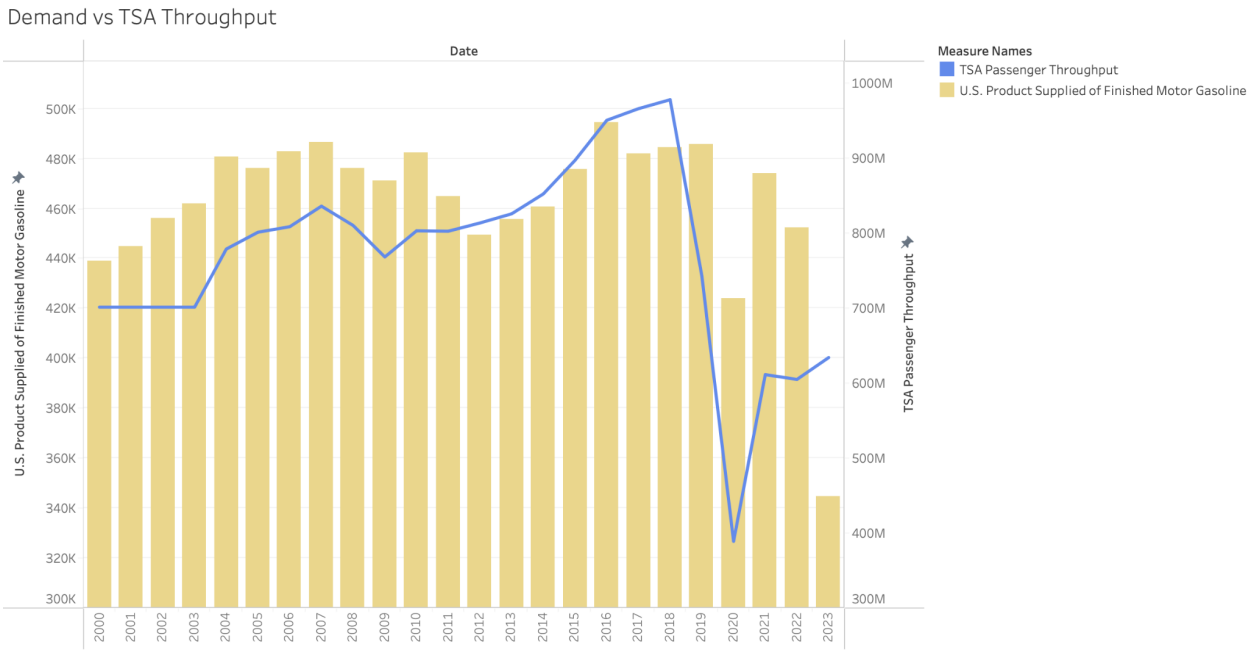

Figure 3.1.a. The Weekly EIA Implied Gasoline Demand over the period of 2000-2023

3.2. Data Visualization for Data Models

Plotting the relationship between the predicted and target variables is an effective way to validate the performance of our models compared to what the data implies. For example, hte table below shows that Jobless Claims has a negative corelation with Gasoline Demand.

Variable	Overall Importance	Correlation	Coeffient Lasso
Jobless Claims	0.45	-0.52	-0.0005
Money Supply	0.36	-0.16	-0.04
Fuel imports (% of merchandise imports)	0.30	0.14	0.00
Month_January	0.28	-0.29	192.36
S&P 500	0.22	0.00	0.02
Weekly U.S. Regular All Formulations Retail Gasoline Prices (Dollars per Gallon)	0.22	0.13	-119.29
GDP	0.21	0.05	3.10
Fuel exports (% of merchandise exports)	0.21	-0.03	-750.14
Month_February	0.14	-0.16	382.25
FHFA House Price Index for U.S.	0.07	0.03	2.08

Figure 3.2.a. Top 10 important variables from 2000 to 2023

An effective way to validate this is to have a scatter plot to visually represent the interaction between these two variables.

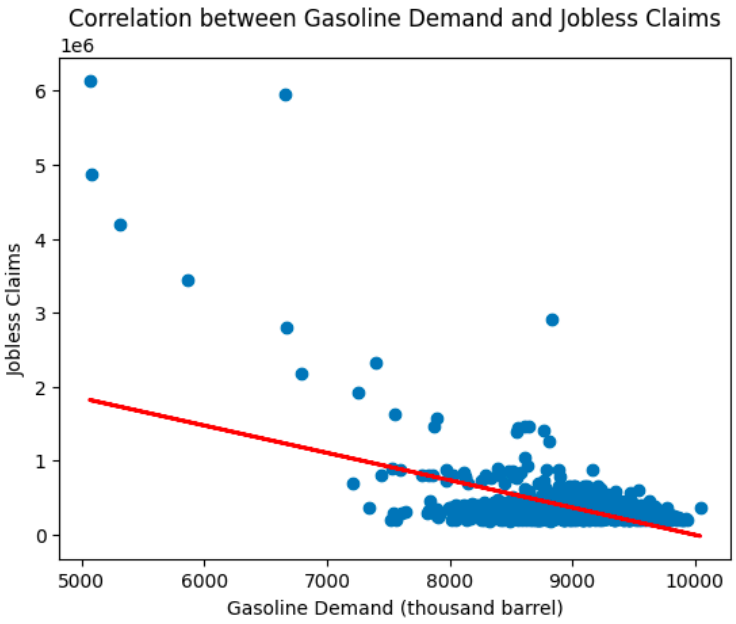

Figure 3.2.b. The interaction between Gasoline Demand and Jobless Claims

Another interesting insight that we have from the Boosting model is that the US Dollar Index has become more important in recent years. This insight can be easily backed up by the following graph.

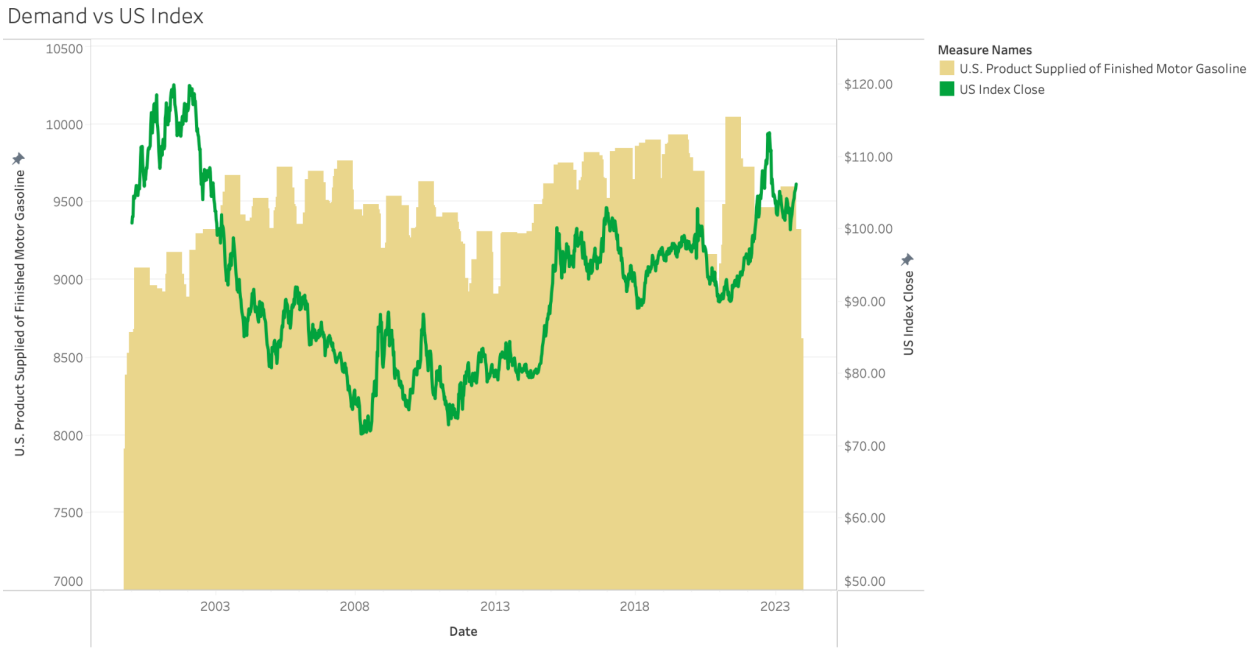

Figure 3.2.c. Gasoline Demand and US Dollar Index

The plot clearly shows that Gasoline Demand changes did not follow closely to the changes in US Dollar Index from 2000 to 2008. However, they fluctuated in a relatively similar manner from 2008 onward. Since US Dollar Index was better correlated with Fuel Demand in the later period, it makes sense that this predicted variable captured better the variation of the target variable after 2008.

4. RESULTS

After gathering, visualizing, and analyzing the data we were able to obtain results in order to share with the Sunoco team. We decided to divide our results by periods. In this way, Sunoco can see what are the most important predictors that affect gasoline demand now and how are they different from previous years. Moreover, the Sunoco team can be on the lookout for those variables that are not as important now, but were important in previous years.

The image seen below illustrates the ten most important predictors for the 2000 - 2010 period.

Variable	Importance 2000-2010	Correlation	Coeffient Lasso
Month_January	0.29	-0.29	192.36
Month_February	0.15	-0.16	382.25
Fuel exports (% of merchandise exports)	0.09	-0.03	-750.14
FHFA House Price Index for U.S.	0.08	0.03	2.08
Month_March	0.06	-0.05	0
Month_August	0.05	0.21	-138.52
Deposits All Commercial Banks	0.05	-0.02	0.05
Jobless Claims	0.05	-0.52	-0.0005
Month_September	0.03	-0.01	60.92
US_Index_Open	0.03	-0.23	17.26

Figure 4.1. Top 10 important variables from 2000 to 2010 (extracted from Boosting model with MAE of 148 and R2 of 0.76)

The months of January, February, and March all have a negative correlation with gasoline demand. The correlation is especially high in January, decreases to about half in February, and is followed by a small negative correlation in March. This is because the gas demand seasonality is low in winter, followed by high demand in summer, and repeat. During winter, people want to stay home because they are cold, they don't want to risk driving on icy roads, and other related reasons. During this time, the demand for gasoline drops, which makes gasoline prices drop as well.

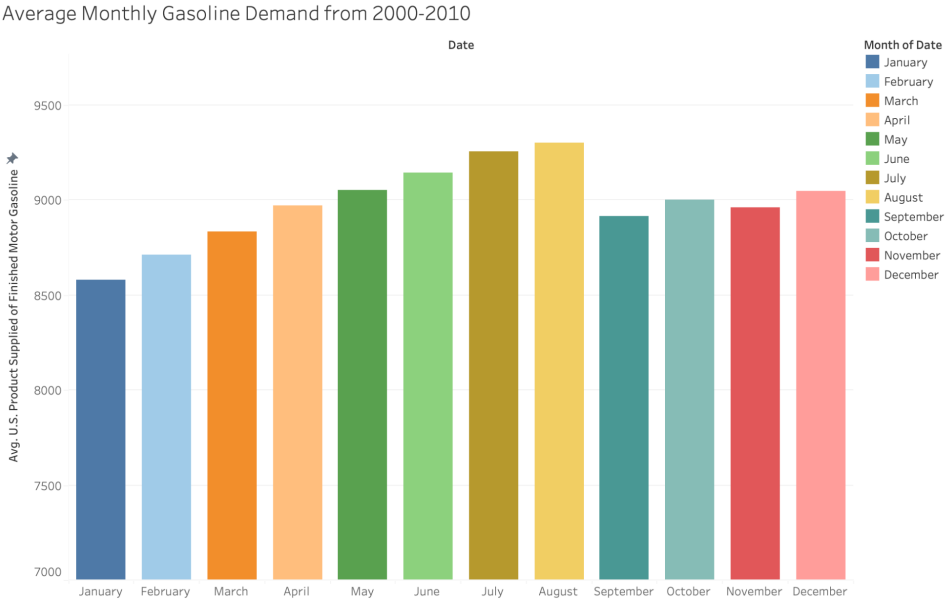

Figure 4.2. Average Monthly Gasoline Demand from 2000 to 2010

The next important predictor is fuel exports. Fuel exports have a negative correlation with gasoline demand. This is because during economic downturns, domestic demand for gasoline will probably decrease. However, the US will still try to export gasoline to meet the demand in other regions with better economic conditions. So, if the domestic demand for gasoline is less, this gasoline is going to be used for exports in order to meet demand in other places.

The last predictor with an importance of 0.0827 is FHFA house price index. This index is a measure of house price trends at various geographic levels. This house price index has a positive correlation with gasoline demand. During periods of economic growth, there tends to be an increase in demand for housing. At the same time, this also results in higher economic activity and increased demand for gasoline. Moreover, a strong housing market can be associated with increased employment opportunities meaning that the economy is growing. If people have more jobs, they need to commute more frequently, leading to an increase in gasoline demand. Also, if people have jobs their consumer confidence increases and they tend to spend more money in travel and use of vehicles leading to an increase in gasoline demand.

The next period shows the five most important predictors for gasoline demand from 2011-2020. The graph to this corresponding period can be seen below.

Variable	Importance 2011-2020	Correlation	Coeffient Lasso
Month_January	0.33	-0.29	192.36
S&P 500	0.14	0.00	0.02
Month_February	0.14	-0.16	382.25
EV Sales	0.11	-0.06	-0.01
Pipeline Petroleum Movement	0.07	0.06	0.00
Month_August	0.07	0.21	-138.52
Weekly Cushing, OK WTI Spot Price FOB (Dollars per Barrel)	0.06	0.14	0.27
Weekly U.S. Regular All Formulations Retail Gasoline Prices (Dollars per Gallon)	0.06	0.13	-119.29
Month_June	0.05	0.13	-55.41
Month_July	0.05	0.17	-140.62

Figure 4.2. Top 10 important variables from 2011 to 2020 (extracted from Boosting model with MAE of 192 and R2 of 0.7)

As we can see from the results, once again, the months of January and February have a negative correlation with gasoline demand because of gas seasonality trends. The second most important predictor that wasn't seen in the previous period is S&P 500. Standard and Poor's 500 is a stock market index that measures the performance of 500 of the largest companies listed on stock exchanges. This variable has a positive correlation with gasoline demand. Typically, when the stock market is performing well it indicates that there are higher levels of economic activity and consumer confidence. Therefore, these factors contribute to a higher gasoline demand. Similarity, when stock prices are rising, consumers might feel wealthier and more confident about their financial status. As a result, consumers spend more money on travel and other activities increasing gasoline demand.

The fourth most important predictor is EV sales. This variable has a negative correlation with gasoline demand. During this period of time, EV cars became popular for many consumers. That's why this variable is important in this period compared to the other periods. Since EV cars

don’t use gasoline, when EV sales rise, less people are going to need fuel for their cars, so the gasoline demand tends to fall.

The last predictor, pipeline petroleum movement has a positive correlation with gasoline demand. The movement of petroleum through pipelines is closely tied to the refining process.Som when gasoline demand increases, there’s going to be higher levels of production indicating higher pipeline petroleum movement.

The last period belonging to 2021 - 2023 is the most important because it demonstrates the most important variables affecting gasoline demand nowadays. The graph below shows the 5 most important predictors for this period.

Variable	Importance 2021-2023	Correlation	Coeffient Lasso
yhat	0.07	0.67	0.88
Jobless Claims	0.02	-0.52	-0.0005
US_Index_Close	0.01	-0.23	9.73
Pipeline Petroleum Movement	0.01	0.06	0.0046
TSA Passenger Throughput	0.00	0.50	0.00
US_Index_High	0.00	-0.23	-5.76
Fuel imports (% of merchandise imports)	0.00	0.14	0.00
Inflation Expectations (1 year ahead)	0.00	0.07	0.00
Deposits All Commercial Banks	0.00	-0.02	0.05
Weekly Cushing, OK WTI Spot Price FOB (Dollars per Barrel)	0.00	0.14	0.27

Figure 4.3. Top 10 important variables from 2021 to 2023 (extracted from Boosting model with MAE of 363 and R2 of 0.2)

The first predictor is yhat. We obtained this variable by using the Prophet package based on a time series model. This predictor helped our model by being representative of seasonality, but did not produce any business insights.

The second most important predictor for this period was jobless claims. This variable has a negative correlation with gasoline demand. When jobless claims increase, that means less people are working, resulting in less people driving to work, indicating a decrease in gasoline demand. During this period of time, because of the effects of Covid 19, many people were laid off and lost their jobs. This can be represented in the jobless claims. Therefore, less people were commuting to work and gasoline demand decreased.

The third most important predictor is US Index Close. This variable has a negative correlation with gasoline demand. There is a negative correlation with the US dollar and gasoline demand. Globally, the US is a big gasoline exporter. When the US dollar is low, there’s going to be a higher global demand for gasoline because it’s cheaper for other countries to buy gasoline from the US. Domestically, similar behavior will take place. When the US dollar is low, gasoline prices are going to be low, so demand will increase.

Pipeline petroleum movement still remained in the top 5 predictors. As mentioned earlier, the correlation is positive. Finally, TSA passenger throughput was the fifth most important predictor for this period. When more people are traveling, there are more planes being used, these

planes need fuel and therefore the gasoline demand will increase. During the pandemic, people could not travel at all, so when airpots reopened, the demand for flights increased. This explains why this variable is part of the five most important ones.

Overall, we believe that the approach we took of showing our results in three different periods lets us give a better overall recommendation and analysis to Sunoco. Moreover, it only makes sense that the top 5 most important predictors are going to change over time since the economy behaves differently spending on different external factors occurring at the same time. The most interesting finding we obtained from our model was being able to obtain the monthly insights for gasoline demand. In this way, we were able to uncover that during the first two months of the year, gasoline demand tends to decrease. Another interesting finding was the correlation with EV sales. Since electric cars are becoming very popular across consumers, we thought that EV sales were going to be one of the top predictors for the last period. With this being said, it's evident that the majority of the people ride fuel cars and that fuel is so popular because it's used for more than just cars.

5. IMPLICATIONS

After understanding the relationship between variables and demand as discussed in the Results section, we are able to use the implications on demand to make suggestions to the Sunoco S&T team for specific variables. If a change in a variable implies an increase in demand, we would suggest buying more gas to stock up Sunoco's inventory at a lower price before price rises in the future. We would also suggest a price increase when selling to customers, as we have found that gas is a necessary good and is not as responsive to price elasticity, so customers will be willing to pay a higher price. Similarly, if a variable implies a decrease in demand, we suggest that Sunoco make an effort to sell the product in order to make more room in the inventory for lower priced fuel from suppliers.

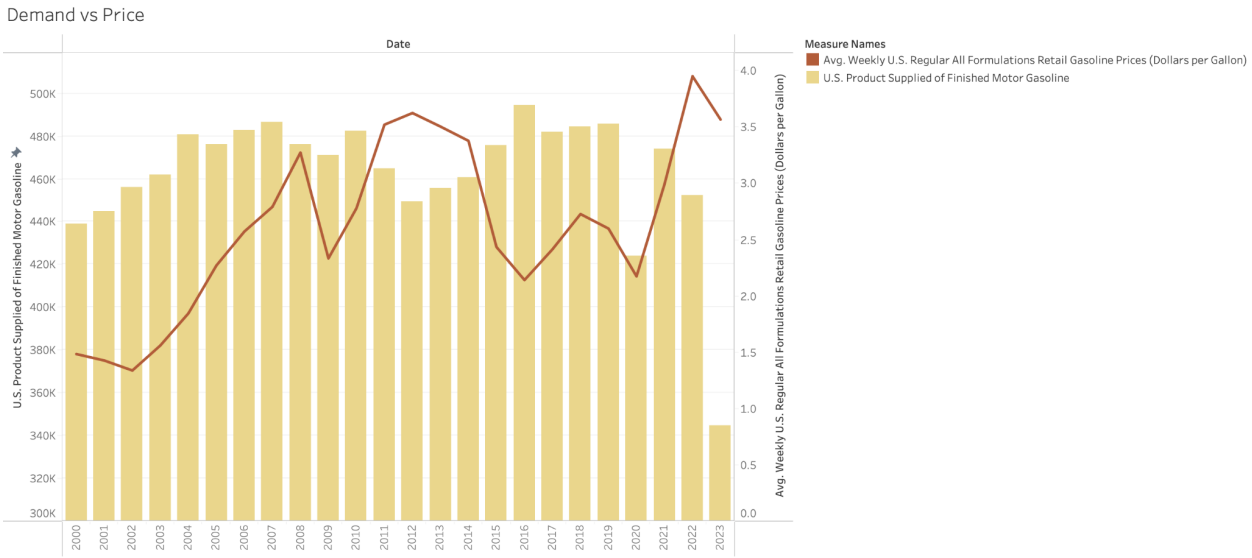

Figure 5.1. Plot of Gasoline Demand and Price over 2000-2023, showing that demand is not strictly following price fluctuations.

The following table displays the top important variables from the 2021 - 2023 model, their implications on demand, and the suggestion and explanation based on our understanding of supply and demand. Directly after that table is a simplified version for clarity.

5.1. 2021 - 2023 Model

Category	Variable	Correlation	Implication and Suggestion
Market Indicators	US Index	Negative	When the US Index price decreases, i.e. the US Dollar weakens, it implies an increase in demand. Therefore, Sunoco should buy more inventory. If the price increases, it implies a decrease in demand, so Sunoco should sell their inventory.
Labor Market	Jobless Claims	Negative	When Jobless Claims decreases, it implies an increase in demand, as more people are in the workforce and able to spend more money. Therefore, Sunoco should buy more inventory. If the price increases, it implies a decrease in demand, so Sunoco should sell.
Freight Transport and Supply	Pipeline Petroleum Movement	Positive	When Pipeline Petroleum movement increases, it means there is more supply available to consumers and companies, which means prices for supply decrease and demand increases. Therefore, Sunoco should buy more inventory. If the movement decreases, it implies a decrease in demand, so Sunoco should sell.
Macroeconomic Metrics	Inflation Expectation	Neutral	Though this does not have a strong directional relationship, it is understood that oil and gas prices help to drive and increase inflation. So Sunoco should monitor its prices to help influence inflation, either positively or negatively. An increase in inflation could mean charging more for the product, but could also mean an increase in supplier prices.
	GDP	Positive	An increase in GDP implies an increase in demand, as consumers have more spending power. Sunoco should buy more inventory if GDP increases, and sell inventory if it decreases.
	Deposits All Commercial Banks	Negative	An increase in Deposits implies a decrease in demand, as people are placing their money into banking institutions rather than spending it on products. Therefore, Sunoco should sell inventory. If there is a decrease in deposits, i.e. people are taking

			out money and spending it, that implies an increase in demand, and Sunoco should buy inventory.
Trade Flows and Supply	Fuel Imports	Positive	An increase in fuel imports implies an increase in demand, as more supply is available and people are willing to import it and pay for it, so Sunoco should buy inventory. If there is a decrease in imports, that implies a decrease in demand, so Sunoco should sell inventory.
Travel Industry	TSA Passenger Throughput	Positive	An increase in TSA Passenger Throughput implies an increase in demand, as more people are using planes, which use more jet fuel. If passengers increase, Sunoco should buy more inventory. If passenger numbers decrease, that implies a decrease in demand, so Sunoco should sell inventory.
Energy Market Indicators	US Spot Market Prices of Crude Oil	Positive	An increase in US Crude Oil prices implies an increase in demand, as oil and gas are a necessary good, so not as responsive to price elasticity. Companies and refineries need a constant supply of oil, despite prices. Therefore, Sunoco should buy more inventory. A decrease in market price indicates a decrease in demand, so Sunoco should sell their inventory. In addition, they should wait for market prices to get low and for an anticipated demand so they can refill their inventory with less expensive supply.

Figure 5.2 Table displaying top important variables from the 2021-2023 model, their relationship with demand, and suggestion of Sunoco's response to an increase or decrease in the variable.

Variable	Relationship with Demand	Suggested Response to Increase of Variable	Suggested Response to Decrease of Variable
US Index	Negative	Sell	Buy
Jobless Claims	Negative	Sell	Buy
Pipeline Petroleum Movement	Positive	Buy	Sell
TSA Passenger Throughput	Positive	Buy	Sell
Fuel Imports	Positive	Buy	Sell

GDP	Positive	Buy	Sell
Deposits All Commercial Banks	Negative	Sell	Buy
Weekly US Spot Price for Crude Oil	Positive	Sell	Buy

Figure 5.3 Simplified Version of Figure 5.1 with the Top 8 indicators

Our findings for the most recent model imply that Macroeconomic Metrics have a big impact on the current decades gas demand, as they make up three out of the Top Ten most important variables. This is also interesting because gas is not as responsive to price changes, but apparently is still heavily influenced by consumers spending power and economic behaviors of the overall nation. This could be more related to the spending power of larger institutions, such as companies and the government, rather than the individual. Variables related to supply, such as Pipeline Petroleum Movement and Fuel Imports also had a large impact. This is something for Sunoco to be careful about, especially as new wars are affecting the supply market, like the war on Ukraine. Though we are analyzing the demand market, Sunoco should try to invest in developing a deeper understanding of the supply side, perhaps with another model.

5.2. Overall Categories to Consider

For seasonality, the winter months showed a strong effect on demand, and appeared in both the 2000 to 2010 model and the 2010 to 2020 model. This implies that seasonality is an important and consistent predictor of demand, and the relationship between the winter months and demand should be noted. Even though the months were not one of the top indicators in the most recent model, Sunoco should still make an effort to make purchasing and trading decisions before the winter months.

Variables related to economic metrics, transportation, and supply consistently appeared within all the models, even if the specific variables were not. Though the important variables within each category may fluctuate based on time, we can conclude that when considering predictors of gasoline demand, each category has an important relationship. This can help with identifying new variables for future model improvement, and focus future market analysis projects.

5.3. Suggestions

Overall, our exploration into the breakdown of different decades has revealed that the primary variables that influence gasoline demand change over time. We believe this could be due to the development of technology and the shift of public opinion regarding the environment, which has fluctuated especially over the last 20 years. A direct example of this is the appearance of Electric Vehicle Sales as an important factor in 2010-2020 after not having a strong influence in the previous decade. The model implies that the influencers of gasoline demand are not static, and as society continues to change, so will demand. This knowledge is extremely important when considering Sunoco's understanding and predicting demand.

We suggest creating a dashboard that tracks a range of variables, including the current important variables as well as unimportant and new variables. This dashboard would allow the trading team to view trends in the current important features in order to make decisions regarding inventory based off of the relationships provided by the model. Tracking the unimportant and new variables would provide insights into possible new emerging markets and variables to add to the model. We also suggest constantly rerunning the model using new variables in order to be aware of new important features. By understanding the variability of gasoline demand, Sunoco can be prepared for future business decisions.

5.4. Other Considerations

Though the model includes a range of variables, there were some things we were unable to standardize. However, we do believe they should be taken into account when considering gasoline demand.

In 2022, the Securities and Exchange Commission (SEC) proposed a rule change in regards to climate-related disclosures on financial statements. This would include a disclosure of a company's greenhouse gas emissions and its goals in terms of environmental risk management, such as how the company plans to decrease its emissions. Though this may not have a big impact on Sunoco's financial statements, it could influence gasoline demand. As companies are required to disclose their exact greenhouse gas emissions and risks associated with it, stockholders and the government may demand an improvement in the company's environmental impact. This could influence companies to start using alternative energy and fuel sources, decreasing the demand for gasoline and customers for Sunoco.

This possible shift away from gasoline is also inline with the standards of ESG. ESG stands for environmental, social, and governance, and considers how companies address environmental issues, social issues, and corporate governance. It is used by investors to measure the sustainability in businesses they plan to invest in, which is why many companies have incorporated ESG into their business models. As the popularity of ESG grows, the demand for gasoline in comparison to alternative fuels may decline. It is important that Sunoco recognizes how social opinion can influence not only gasoline demand, but overall business models and objectives.

Another conclusion we were able to draw and that Sunoco should consider is that the period from 2021 - 2023 can be the effects of Covid 19. The pandemic had a big impact on the US economy. As mentioned earlier, a lot of people lost their jobs. Other events like this, that are not ordinary, also occurred after the pandemic. It's important that Sunoco realizes that the ongoing effects of the pandemic could be altering the overall gasoline demand. With this being said, Sunoco should monitor the top five predictors from past decades in case their importance rises again.