

Bristol Bay Drift Permit Price Forecasting

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Bristol Bay Commercial Salmon Drift Permit

Gelfand Investment wants to invest in the Alaska Salmon Industry . We are looking to buy assets that will benefit from the recent strength of Alaskan Salmon.

We have identified Bristol Bay Drift Permits as an asset whose value mirrors the strength of the industry and we believe that the value will continue to rise over the next five years. We also want to know what industry factors contribute to the rise of this asset.

In order to know if this is a good purchase we will model the value of this asset over the next five years. We will use RMSE to evaluate if our model is accurate. We want to know to what certainty we can know whether these permits will hold or rise in value over the next five years.

Data Collection

- Fish counts By River
- Ex Vessel pricing Salmon
- Salmon price/ Area
- Wholesale value Salmon
- Farm Salmon Pricing
- Gross Earnings By Area
- Gross Earnings By Species
- Seafood production and Consumption
- Capture Fishing vs Aquaculture

Modeling

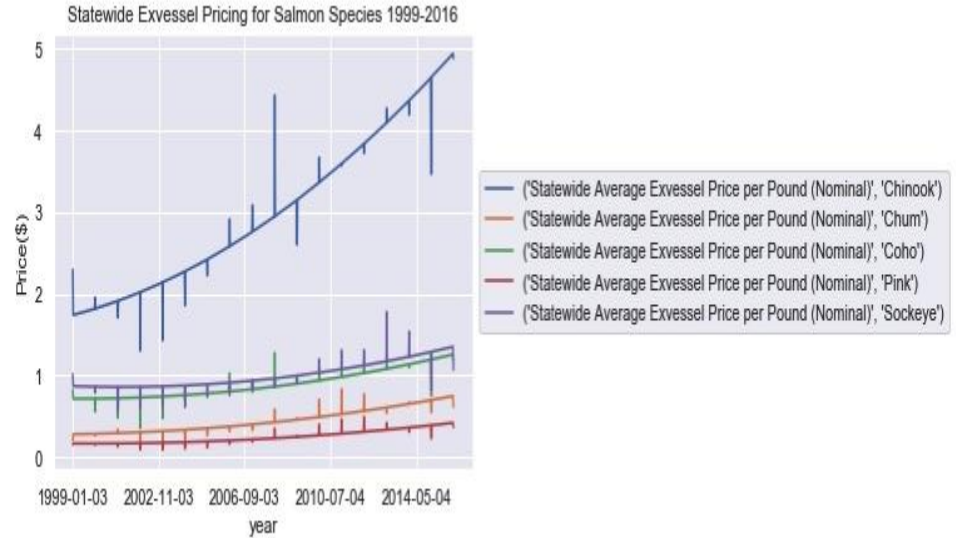
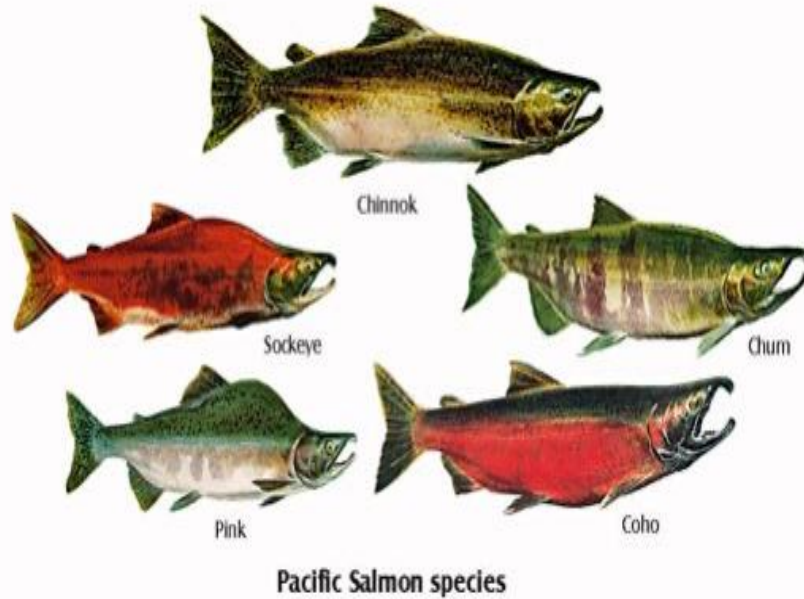
- EDA, make sense of features
- Tried LASSO Regularization
- PCA - 26 Features
- Determine Order
- ARIMAX
- SARIMA
- VAR
- RNN
- SARIMA

Where is Bristol Bay and Why this permit?

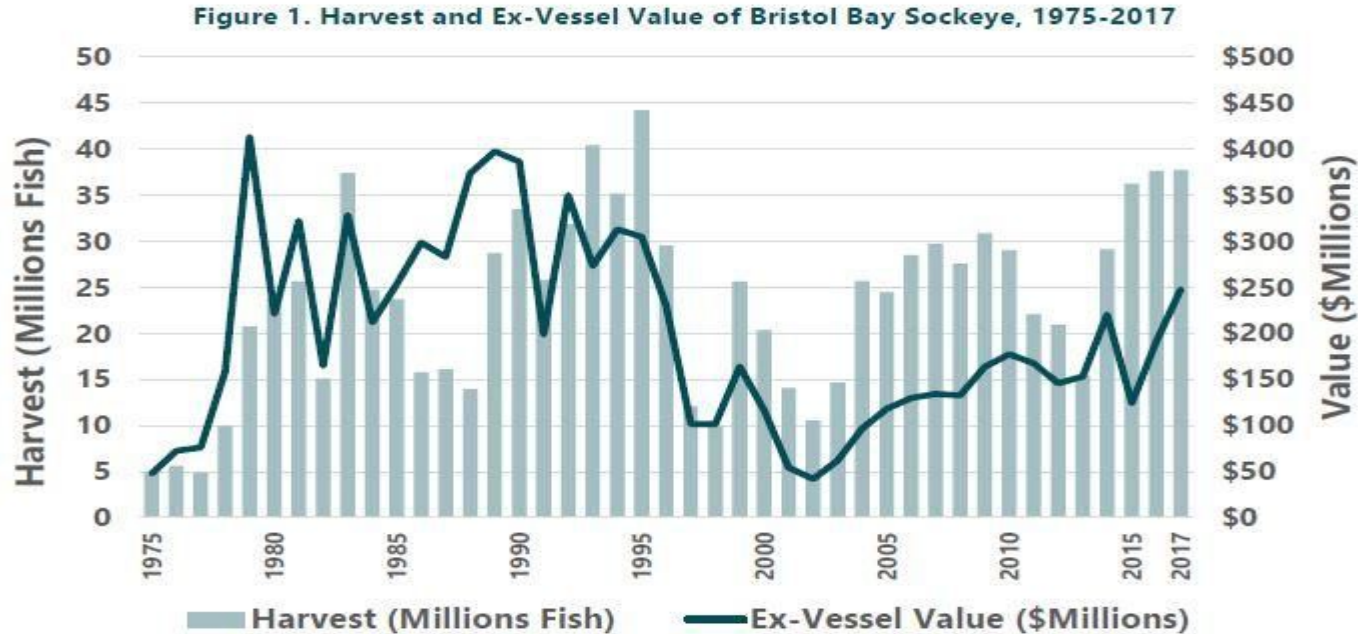


Figure 1.—The 4 ADF&G fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Division of Commercial Fisheries.

Species of Salmon



Last year the Salmon Harvest Was Worth \$250 Million

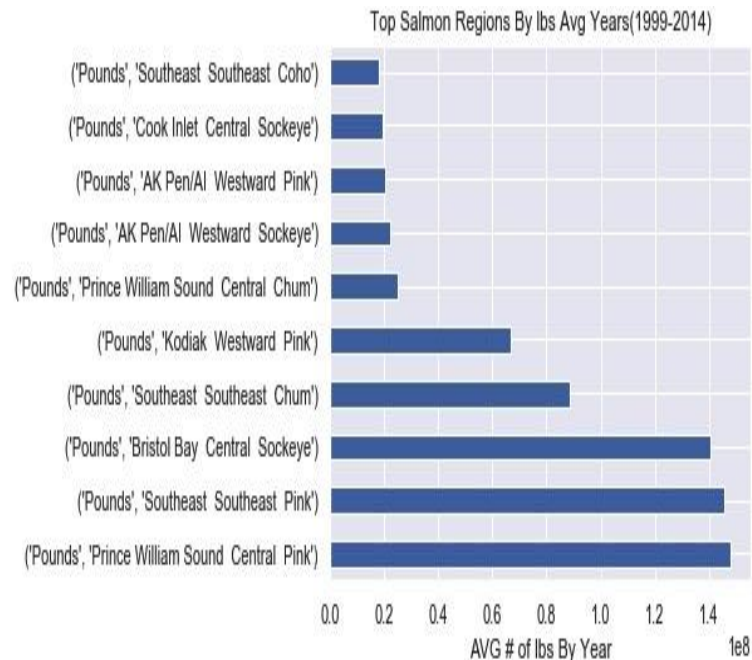
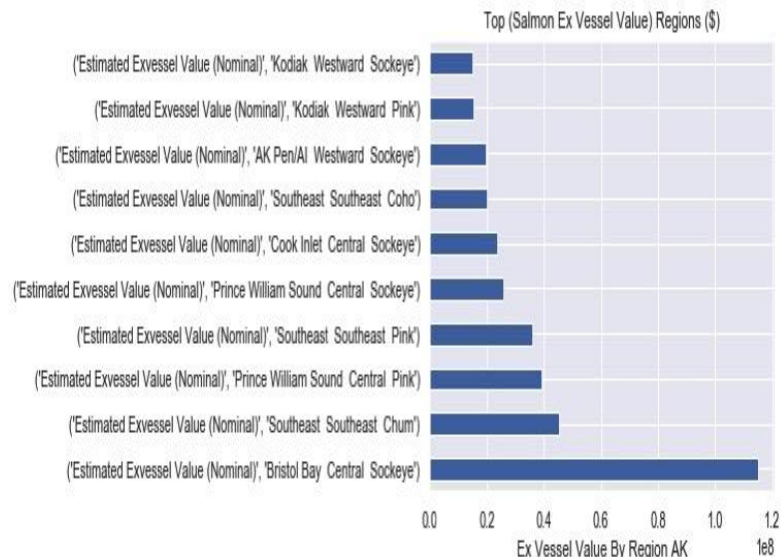


Note: Ex-vessel value adjusted for inflation, final value for 2017 is estimated and subject to change as data becomes available.
Source: ADF&G, compiled by McDowell Group.

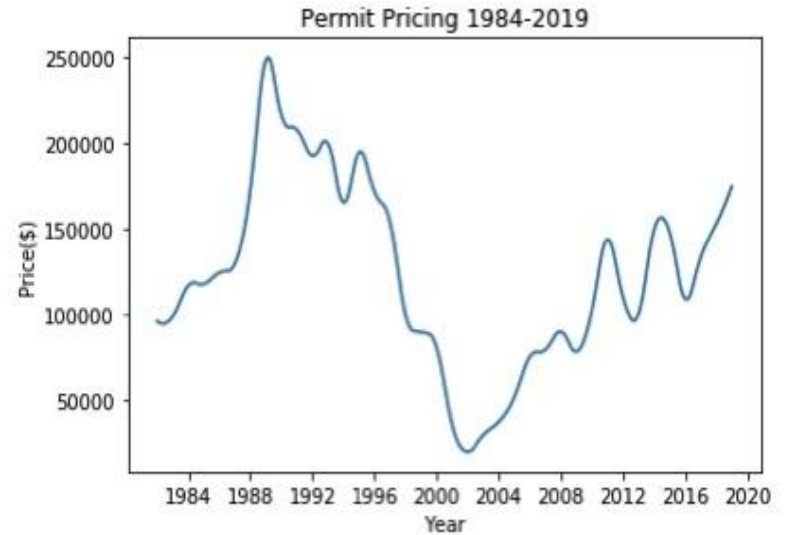
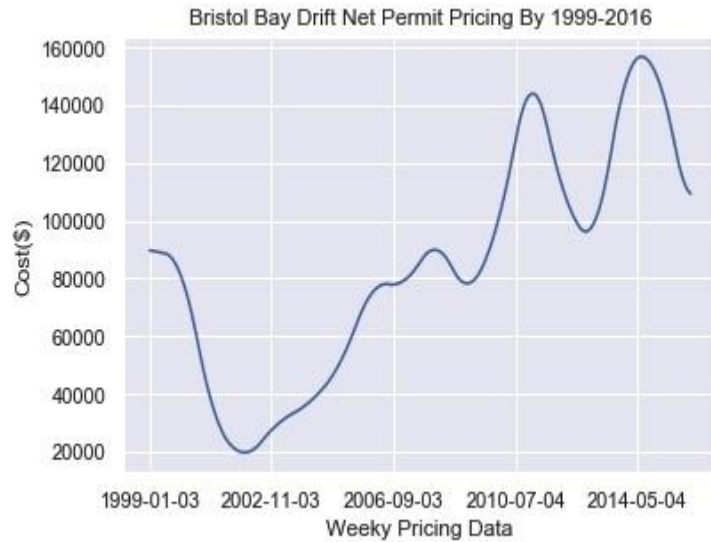
Bristol Bay Salmon Stats



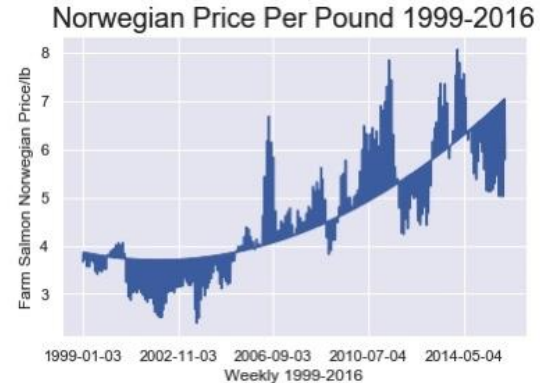
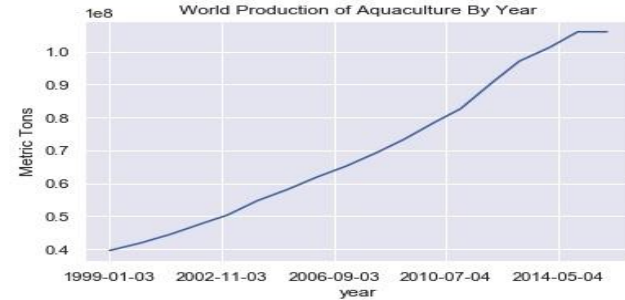
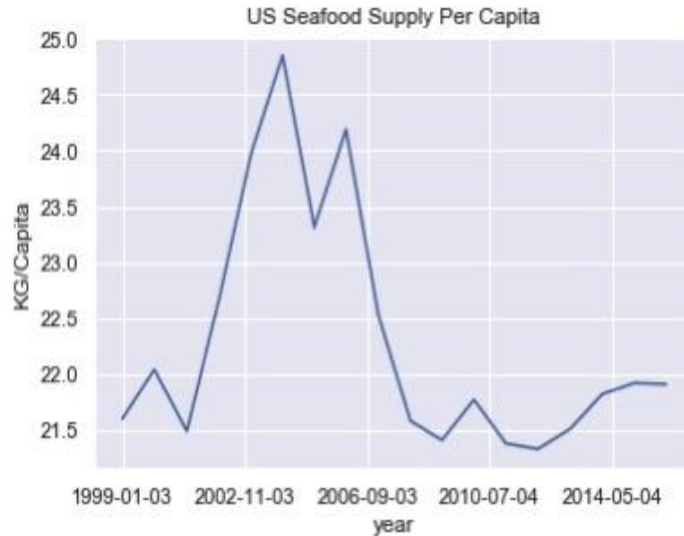
BB Sockeye Southeast Pink Industrie Leaders



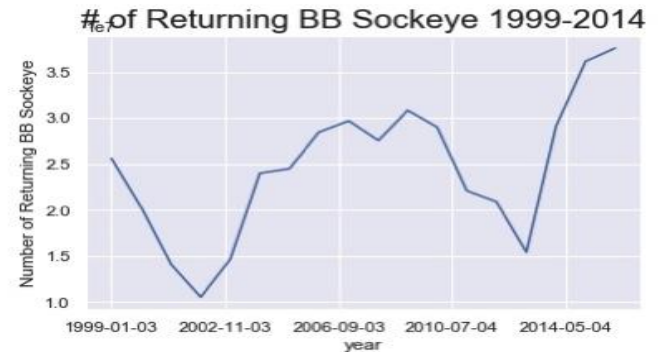
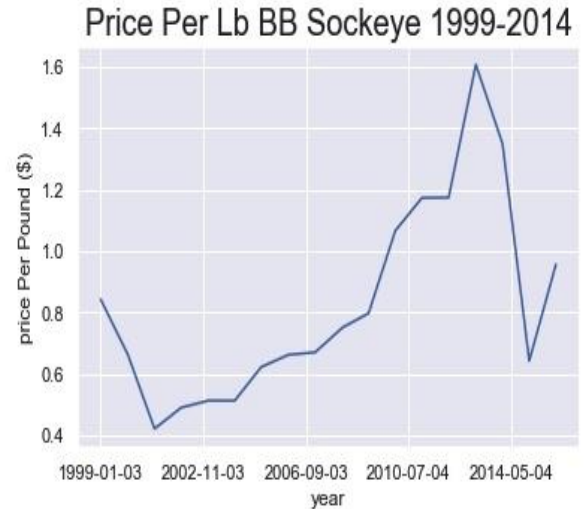
Permit Pricing



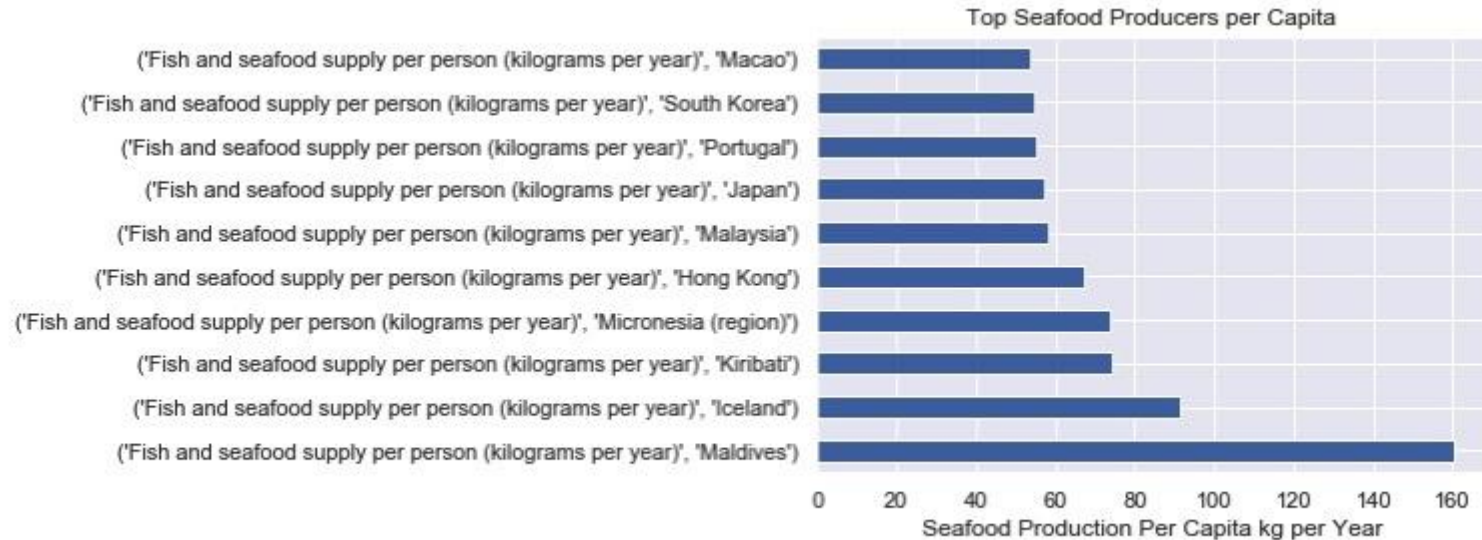
Fish Farming Taking Market Share



Value Of Alaskan Salmon



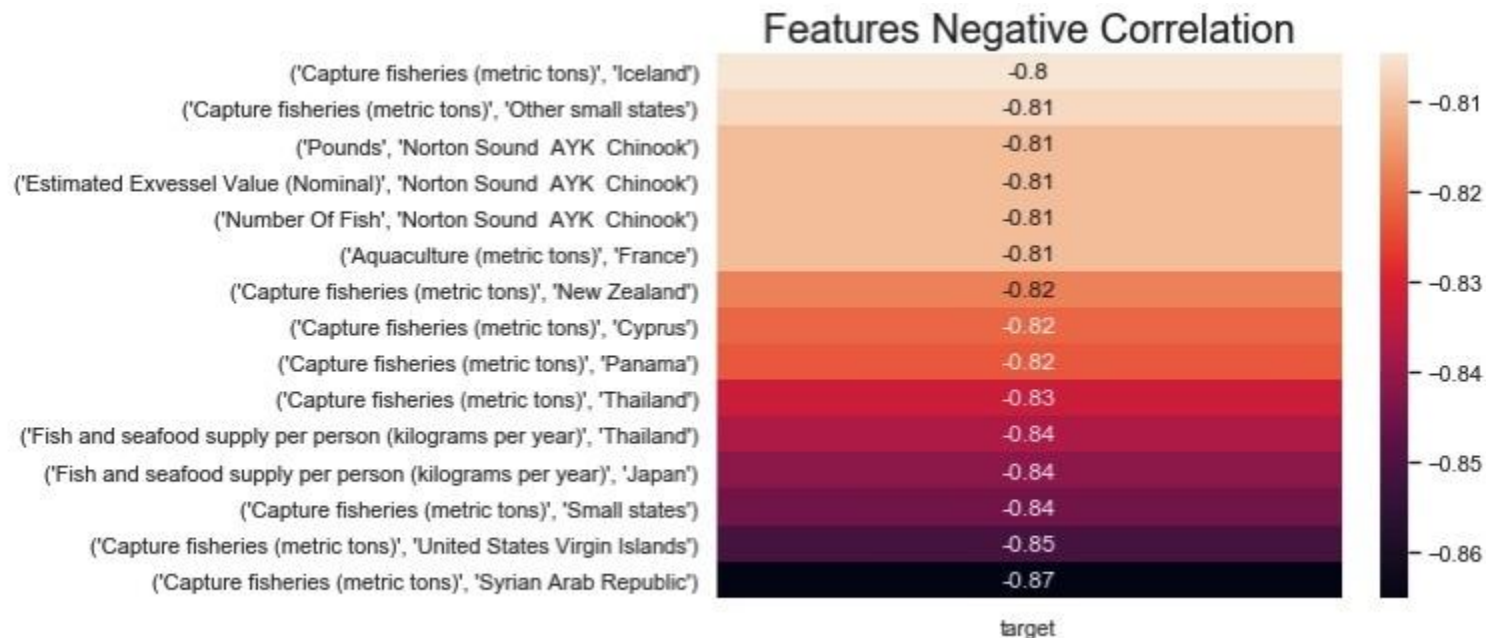
Possible Competition Other Countries



Correlative Features



Negative Correlative Features



PCA Examination

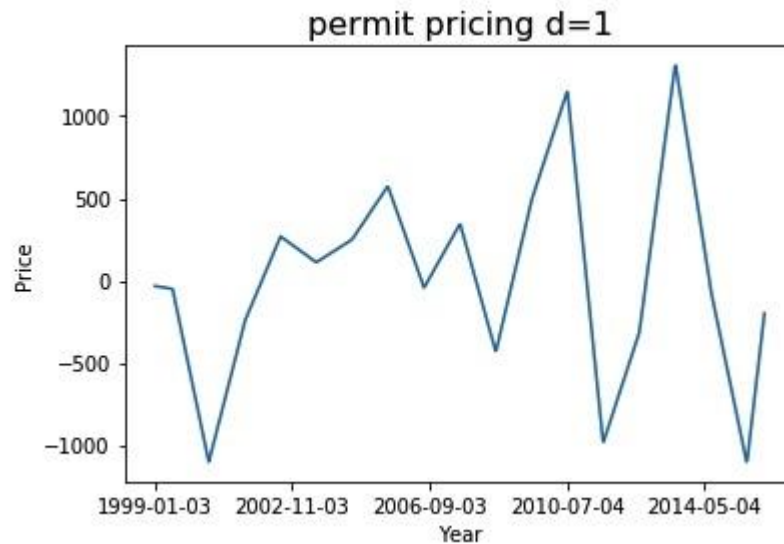
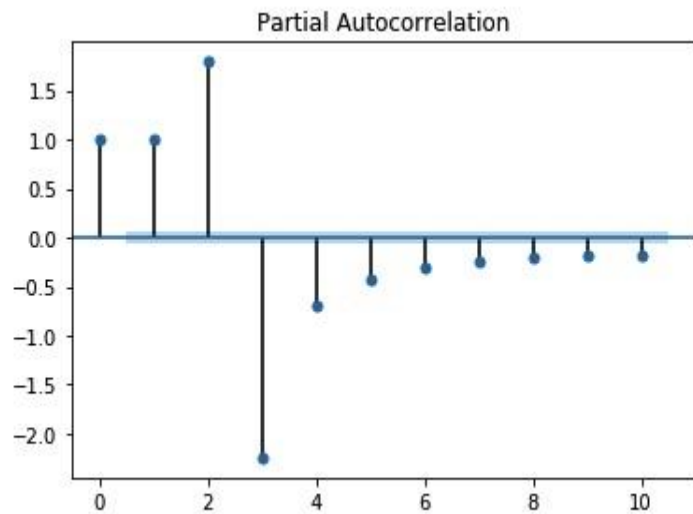
PC1

('Aquaculture (metric tons)', 'Marshall Islands')	27.632069
('Pounds', 'Norton Sound AYK Coho')	10.182972
('Aquaculture (metric tons)', 'Burundi')	10.114997
('Number Of Fish', 'Norton Sound AYK Coho')	7.676036
('Fish and seafood supply per person (kilograms per year)', 'Afghanistan')	6.404615
('Fish and seafood supply per person (kilograms per year)', 'Zambia')	4.818869
('Capture fisheries (metric tons)', 'Laos')	4.731128
('Capture fisheries (metric tons)', 'Armenia')	4.478039
('Wholesale Average Price per Pound', 'Chinook Bristol Bay Fillets with skin & ribs')	4.384386
('Aquaculture (metric tons)', 'Senegal')	3.766764

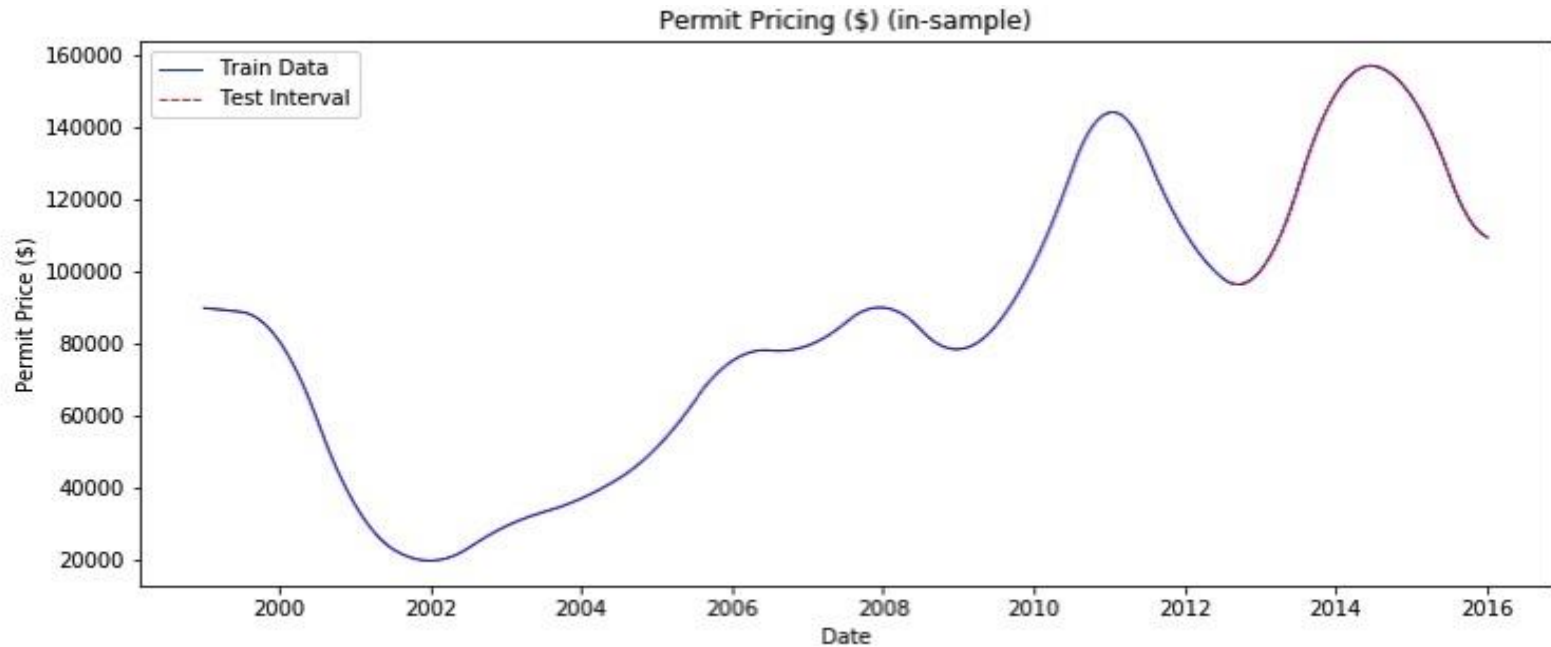
PC2

('Wholesale Average Price per Pound', 'Sockeye Southeast Whole fish/food fish')	-1.055085
('Pounds', 'Norton Sound AYK Chum')	-1.060359
('Estimated Exvessel Value (Nominal)', 'Cook Inlet Central Pink')	-1.061681
('Estimated Exvessel Value (Nominal)', 'Norton Sound AYK Chum')	-1.096064
('Aquaculture (metric tons)', 'Uruguay')	-1.108255
('Estimated Exvessel Value (Nominal)', 'Norton Sound AYK Coho')	-1.118929
('Number Of Fish', 'Norton Sound AYK Coho')	-1.201044
('Estimated Exvessel Value (Nominal)', 'Bristol Bay Central Coho')	-1.305440
('Capture fisheries (metric tons)', 'Botswana')	-1.324899
('Pounds', 'Norton Sound AYK Coho')	-1.407106

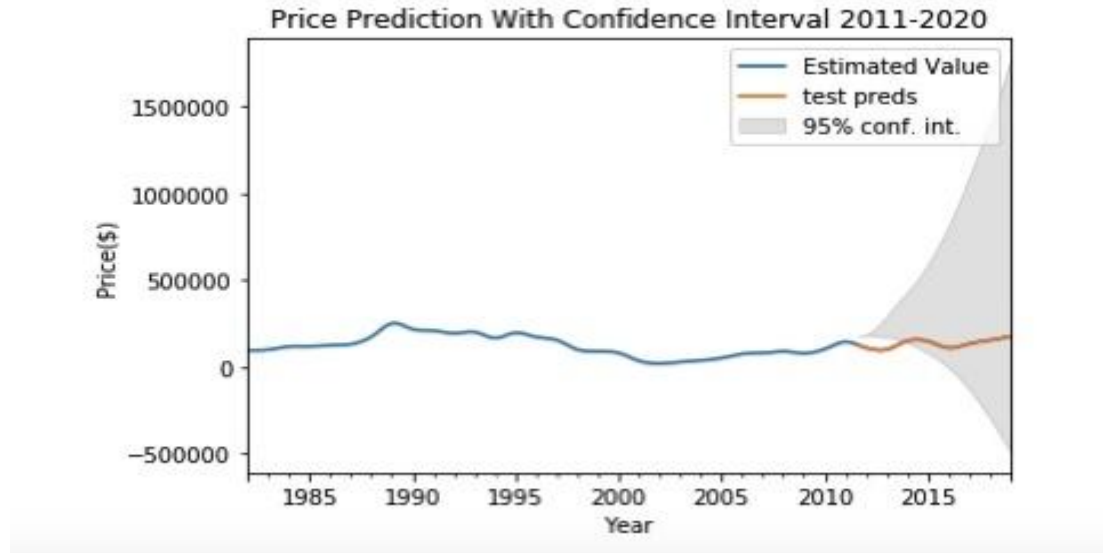
Order (3,1,0)



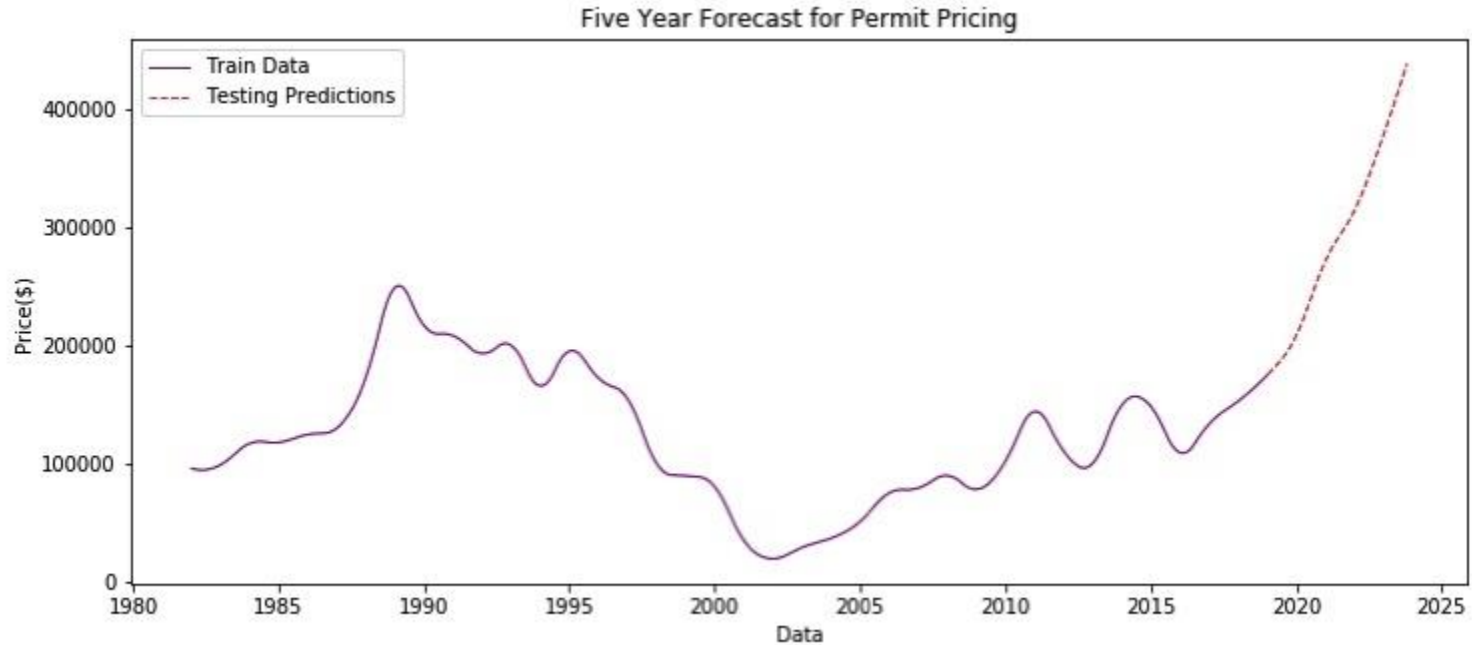
ARIMAX Model



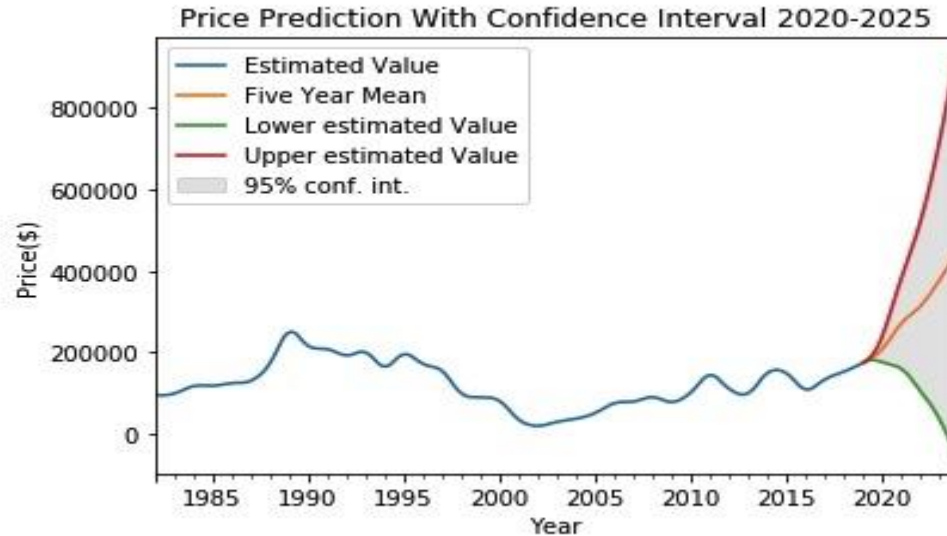
SARIMA Full Data Set In Sample



SARIMA Out of Sample 2020-2025



With Confidence Interval



Conclusions and Recommendations

Although the models we ran had a wide confidence interval, given the strength of the industry as a whole and resiliency we have seen we are comfortable going ahead with the purchase.

The Arimax model handled the exogenous variables the best, but in the end the SARIMA outperformed it. Too many features, added noise to the model and ended up skewing the results.

But we did get a good sense of the features that were correlative for us in making our prediction