

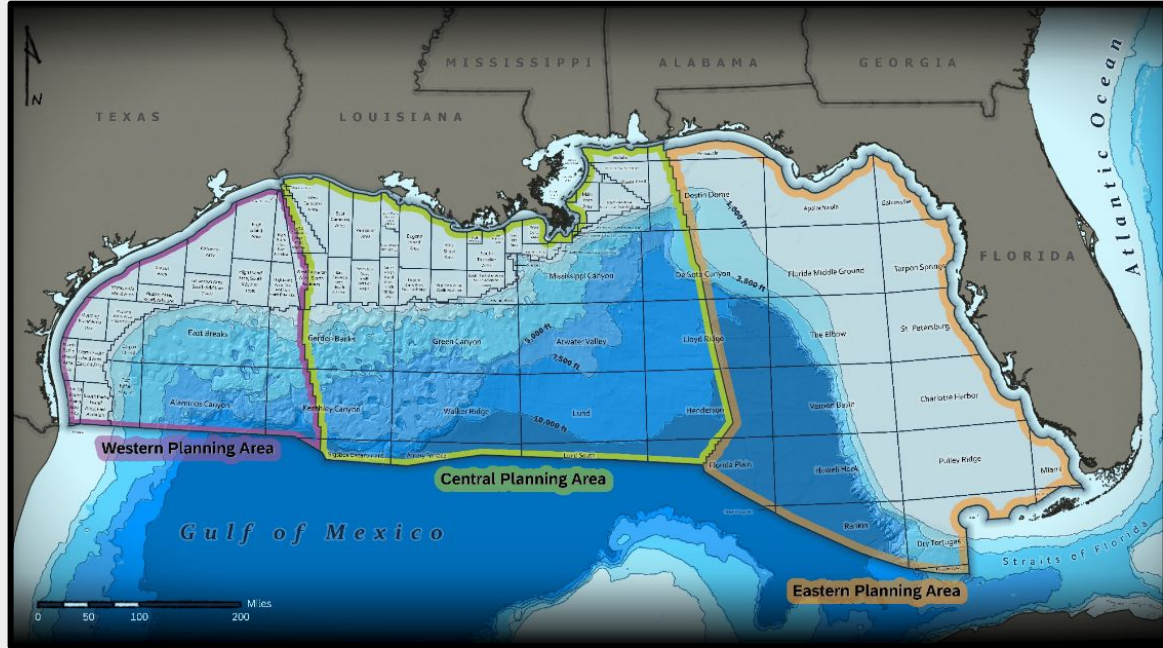
Analysis of Lease Sale Bids in the Gulf of Mexico from 2014-2020

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Introduction

- **Question:** Is using mean lease sale bids per year a good indicator of a company's commitment to exploration?
- **Key audience:** Subsurface staff (geoscientists and reservoir engineers), middle management, and executives.
- **Why should you care?** One of the jobs of subsurface staff is to monitor competitor leasing activity. Management frequently asks questions about a specific companies leasing behavior and regional leasing trends.

Gulf of Mexico Protraction Area Distribution



Credit : BOEM OCS Report 2021-005

Hypothesis

Purpose of analysis: To compare the changes in the average lease bids for each company participating in the lease sales between 2014-2020.

- Ho: There is no significant difference in the average net lease bid per company between 2014-2020
- Ha: There is a significant difference in the the average net lease bid per company between 2014-2020

Data analyzed

- Publicly available lease sale data from BOEM website
- Used GOMSmart to create .csv for data
- Raw dataset contains 1708 records and 17 variables
- Also pulled average oil price per year from EIA website

Methods for Analysis

Data Visualization

- Pivot tables for mean lease bids
- Histograms for mean and median distributions
- Plot mean and median bids per company between 2014-2020 using Seaborn

Normality Check

- Tested mean and median lease bid
- Skew and kurtosis indicate data is not normal

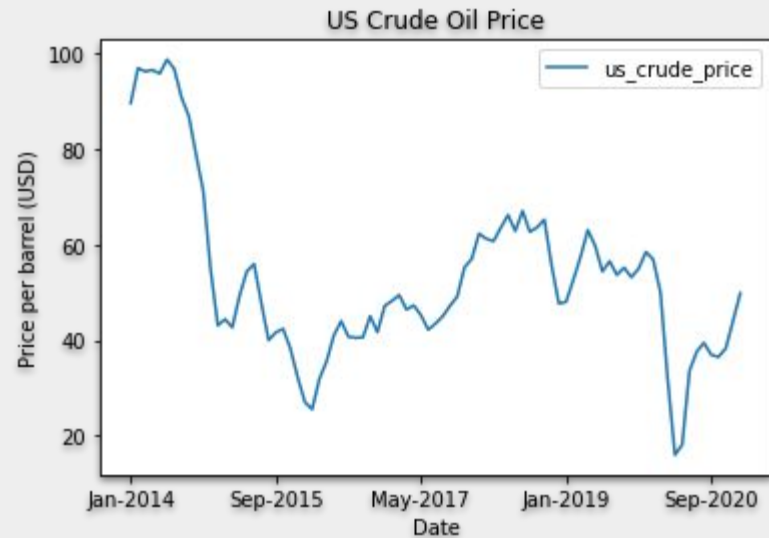
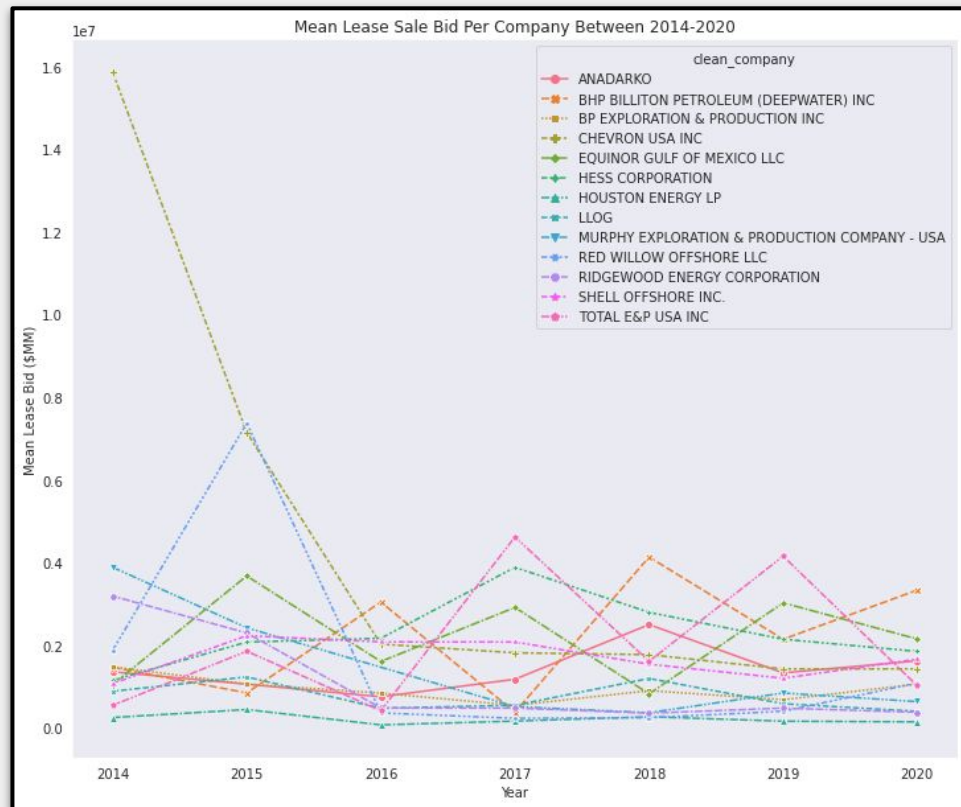
Kruskal-Wallis

- Test statistic > 1.96 for both mean and median lease bids
- Reject null hypothesis

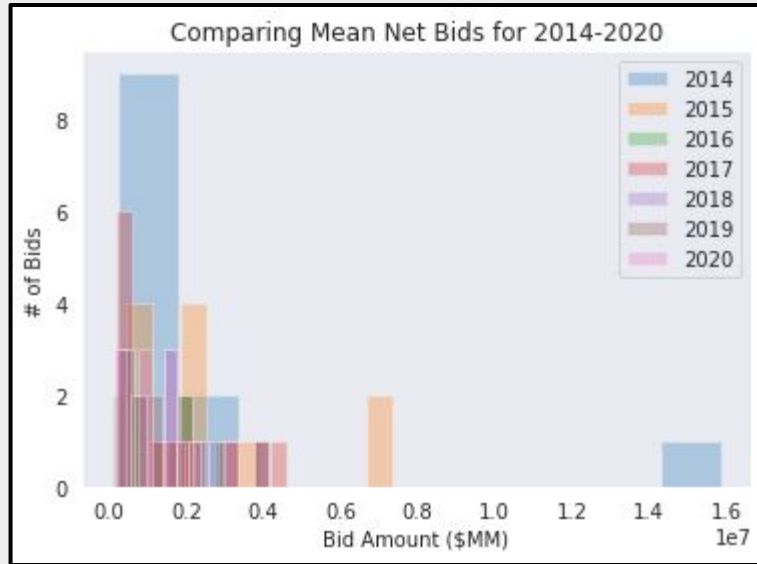
Pairwise Tukey HSD

- Pairwise comparison for companies

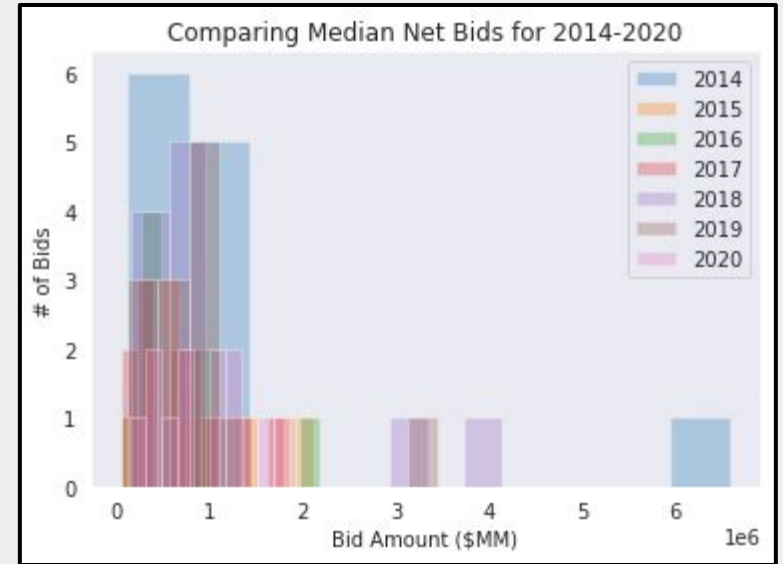
Visualizing mean bids over time



Normality Check



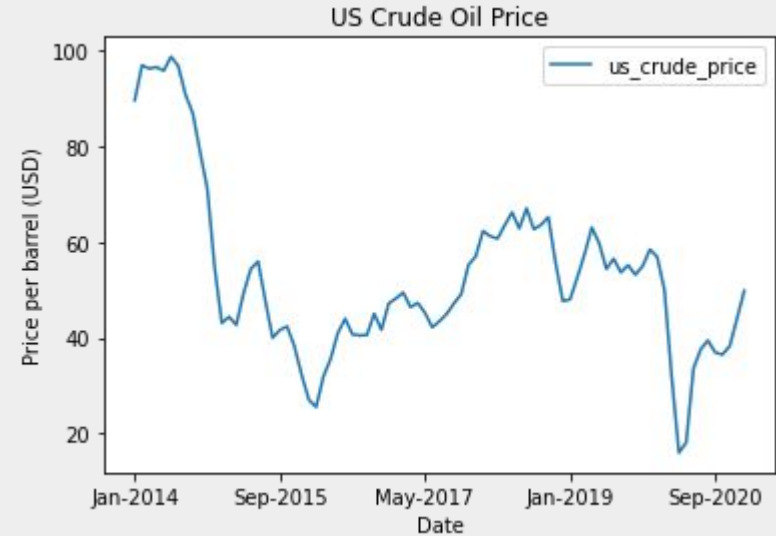
Not Normal



Not Normal

Recommendations

- Comparing medians instead of means
- Major oil price crashes (2016, 2020) likely cause for large difference over 7 year span.
- Majors remain committed to exploration despite low oil prices.
- Recommendation: With mean bids decreasing during an oil price decline, companies that maintain a strong balance sheet should focus more budget on lease bids.
- Areas of possible bias:
 - Companies that did not participate in the lease sale each year were not include in the analysis (sampling bias)
 - Lease availability each year (contextual bias)



Additional Analysis

- Comparing median net bid price over time
- Comparing mean/median net bid price per protraction areas over time
- Number of bids per company per year
- Incorporate average oil price
- Number of exploration well permits filed per company per year
- Total volumes produced per company per year
- Lease availability vs. lease bids submitted
- Type or size of company (major vs private equity)
- Stock price for publicly traded companies

References

- Raw lease sale data:
https://github.com/mmcintire00/tf_exp_design/blob/main/gom_ls_high_bids_2014-2020.csv
- BOEM Gulf of Mexico 2019 Annual Report:
<https://www.boem.gov/sites/default/files/documents/about-boem/Deepwater-Gulf-of-Mexico-Report-2019.pdf>
- Oil price data:
https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=F000000_3&f=A