Forecasting Homework Assignment

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Original Data

The data offers insights into the global demand for crude oil over the past two decades, with a focus on trends and projections. It reveals fluctuations in oil demand, influenced by various factors such as economic conditions and global events like the coronavirus pandemic. Despite these fluctuations, there is a clear upward trajectory in demand, indicating the continued importance of oil as a primary energy source. The data also highlights the dominant role of the road sector in oil consumption, underscoring the significance of transportation fuels like gasoline and diesel. Additionally, efforts to transition towards cleaner energy alternatives, such as hydrogen, are noted, suggesting a growing awareness of the need for sustainability and reduced carbon emissions in the energy sector. Overall, the data provides valuable insights into the complex dynamics of global oil demand and the ongoing transition towards more sustainable energy sources.

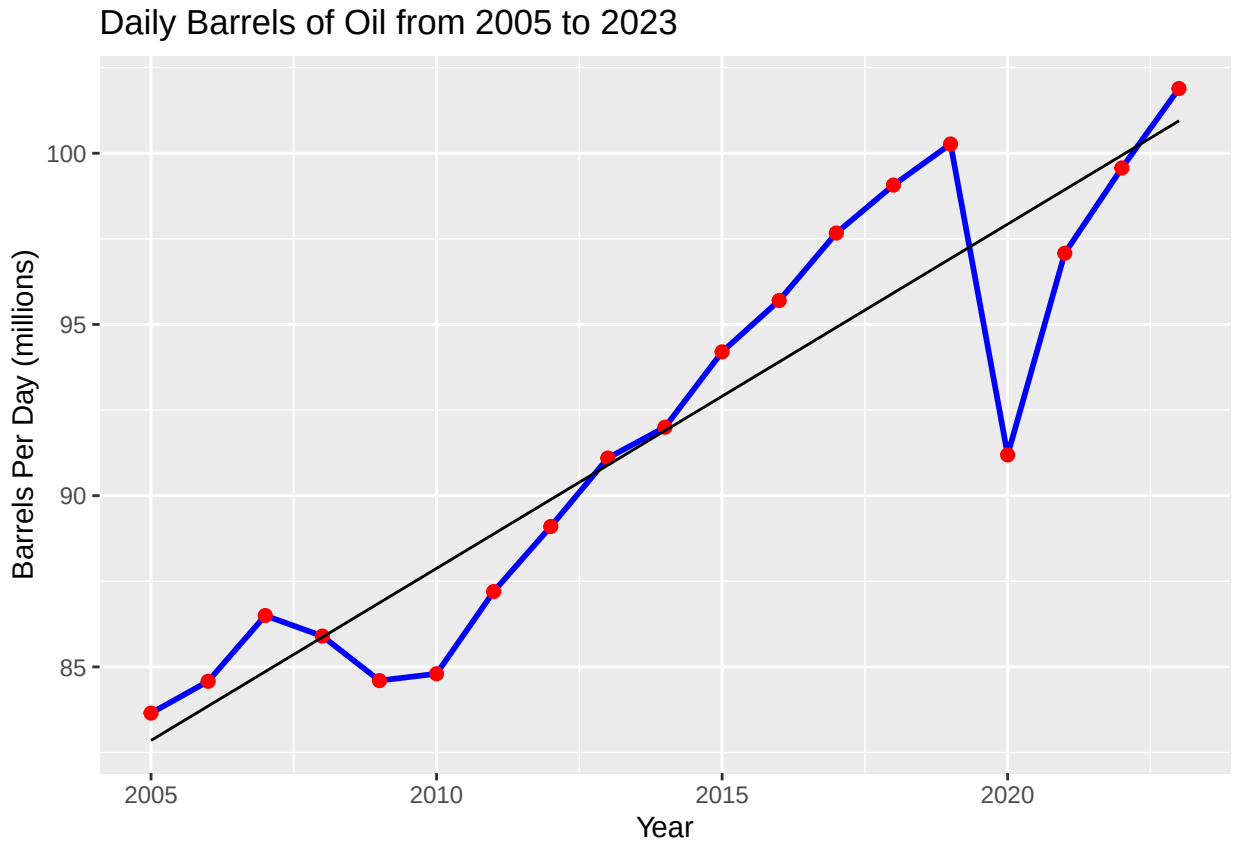
Year	Number of Barrels of Oil
2005	83.65
2006	84.58
2007	86.50
2008	85.90
2009	84.60
2010	84.80
2011	87.20
2012	89.10
2013	91.10
2014	92.00
2015	94.20
2016	95.70
2017	97.67
2018	99.07
2019	100.27
2020	91.19
2021	97.08
2022	99.57
2023	101.89

Graph of the Original Data

The graph illustrates the trend of barrels of oil production from 2005 to 2023. The x-axis denotes the years, while the y-axis indicates the daily barrels of oil in millions. The data showcases a noticeable upward trajectory, signifying a consistent increase in oil production over the years, albeit with some minor fluctuations.

Regression is suitable for this data as it models the relationship between the independent variable (the year) and the dependent variable (number of barrels of oil). With observations spanning from 2005 to 2023, regression captures the overall trend in oil production over time. By fitting a regression model, we estimate how oil production changes with time, enabling predictions for future periods. Regression also provides insights into the trend's direction and magnitude, aiding decision-making in oil production and consumption planning.

Additionally, incorporating exponential smoothing could enhance the forecasting process. Exponential smoothing is adept at mitigating irregular fluctuations in the data while retaining focus on the overarching trend. By smoothing out short-term variations, this method can yield more stable forecasts, particularly when irregular fluctuations do not significantly impact the overall trend.



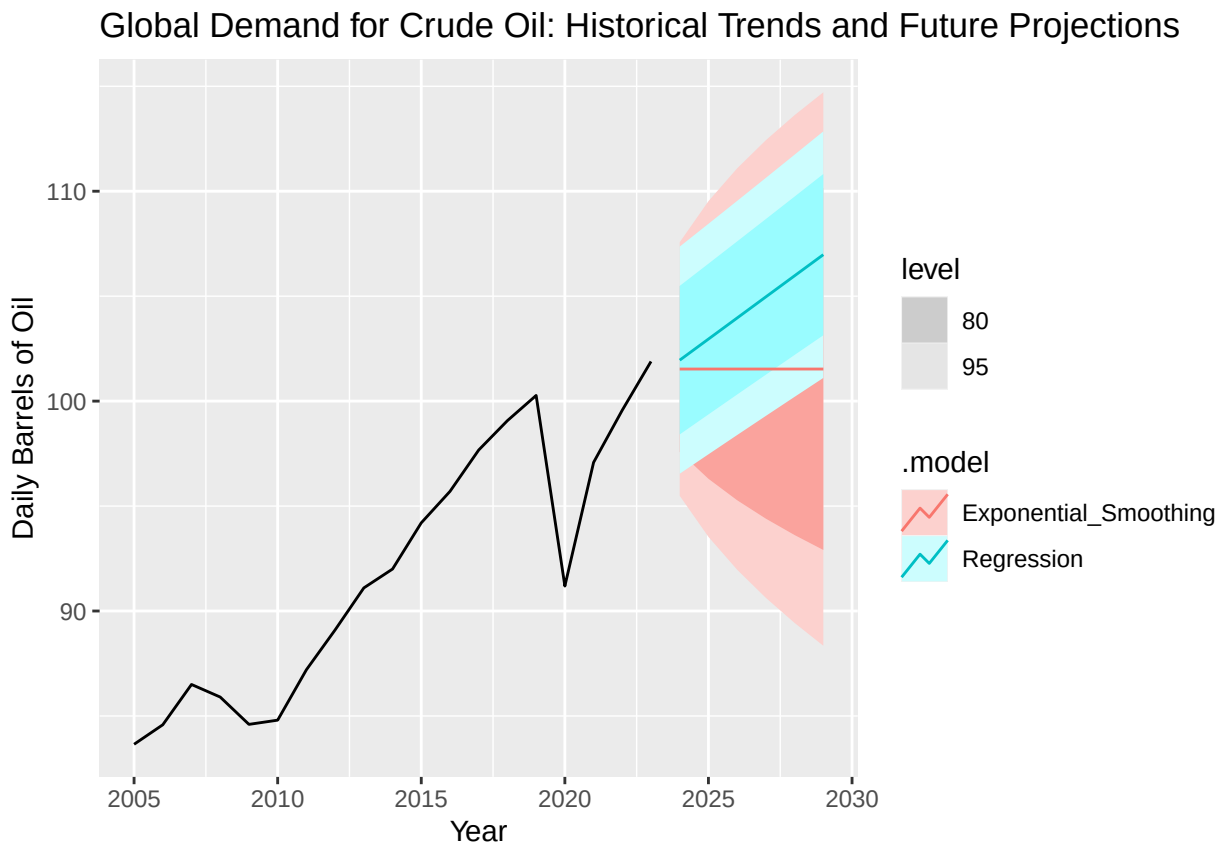
Forecast Accuracy

This is the forecast accuracy using the MASE and MAPE methods.

Model	MASE	MAPE
Exponential_Smoothing	1.929337	2.961704
Regression	2.041329	3.178056

Forecasted Graph

This graph shows the forecast for years 2024-2029 for both Regression as well as Exponential Smoothing.



Regression Data

This is the original data with the forecasted data from 2024-2029 using the Regression method.

Year	Number of Barrels of Oil
2005	83.6500
2006	84.5800
2007	86.5000
2008	85.9000
2009	84.6000
2010	84.8000
2011	87.2000
2012	89.1000
2013	91.1000
2014	92.0000
2015	94.2000
2016	95.7000
2017	97.6700
2018	99.0700
2019	100.2700
2020	91.1900
2021	97.0800
2022	99.5700
2023	101.8900

Year	Number of Barrels of Oil
2024	101.9514
2025	102.9567
2026	103.9620
2027	104.9673
2028	105.9726
2029	106.9779

Exponential Smoothing Data

This is the original data with the forecasted data from 2024-2029 using the Exponential Smoothing method.

Year	Number of Barrels of Oil
2005	83.6500
2006	84.5800
2007	86.5000
2008	85.9000
2009	84.6000
2010	84.8000
2011	87.2000
2012	89.1000
2013	91.1000
2014	92.0000
2015	94.2000
2016	95.7000
2017	97.6700
2018	99.0700
2019	100.2700
2020	91.1900
2021	97.0800
2022	99.5700
2023	101.8900
2024	101.5287
2025	101.5287
2026	101.5287
2027	101.5287
2028	101.5287
2029	101.5287

Results

In analyzing the data alongside the forecasted values for both the Regression and Exponential Smoothing methods from 2024 to 2029, it is evident that the Exponential Smoothing method demonstrates superior accuracy. While both models utilize the original data from 2005 to 2023, the Exponential Smoothing method's forecasted values for the years 2024 to 2029 (ranging from approximately 101.53 to 101.53 million barrels of oil per day) exhibit a consistent projection. Conversely, the Regression method's forecasted values (ranging from approximately 101.95 to 106.98 million barrels of oil per day) display more variability, suggesting potentially less accurate predictions. Therefore, based on the forecasted values and their consistency, the Exponential Smoothing method emerges as the more accurate choice in this scenario.

Citation

OPEC. (April 2023). *Demand for crude oil worldwide from 2005 to 2022, with a forecast for 2023* [Data file]. Retrieved from OPEC Monthly Oil Market Report April 2023, pages 27 and 28 (ID 271823).