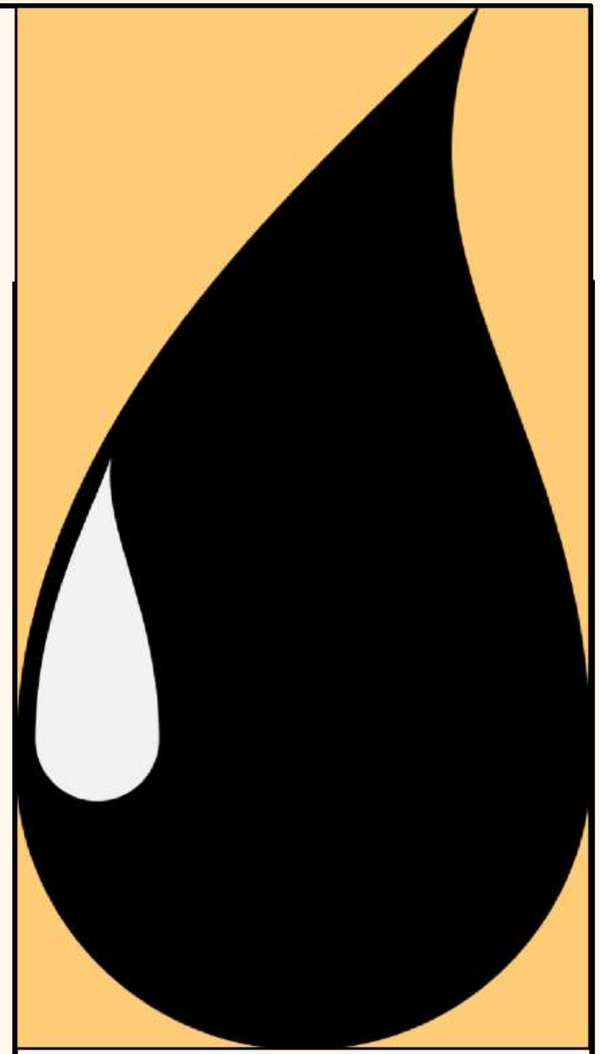
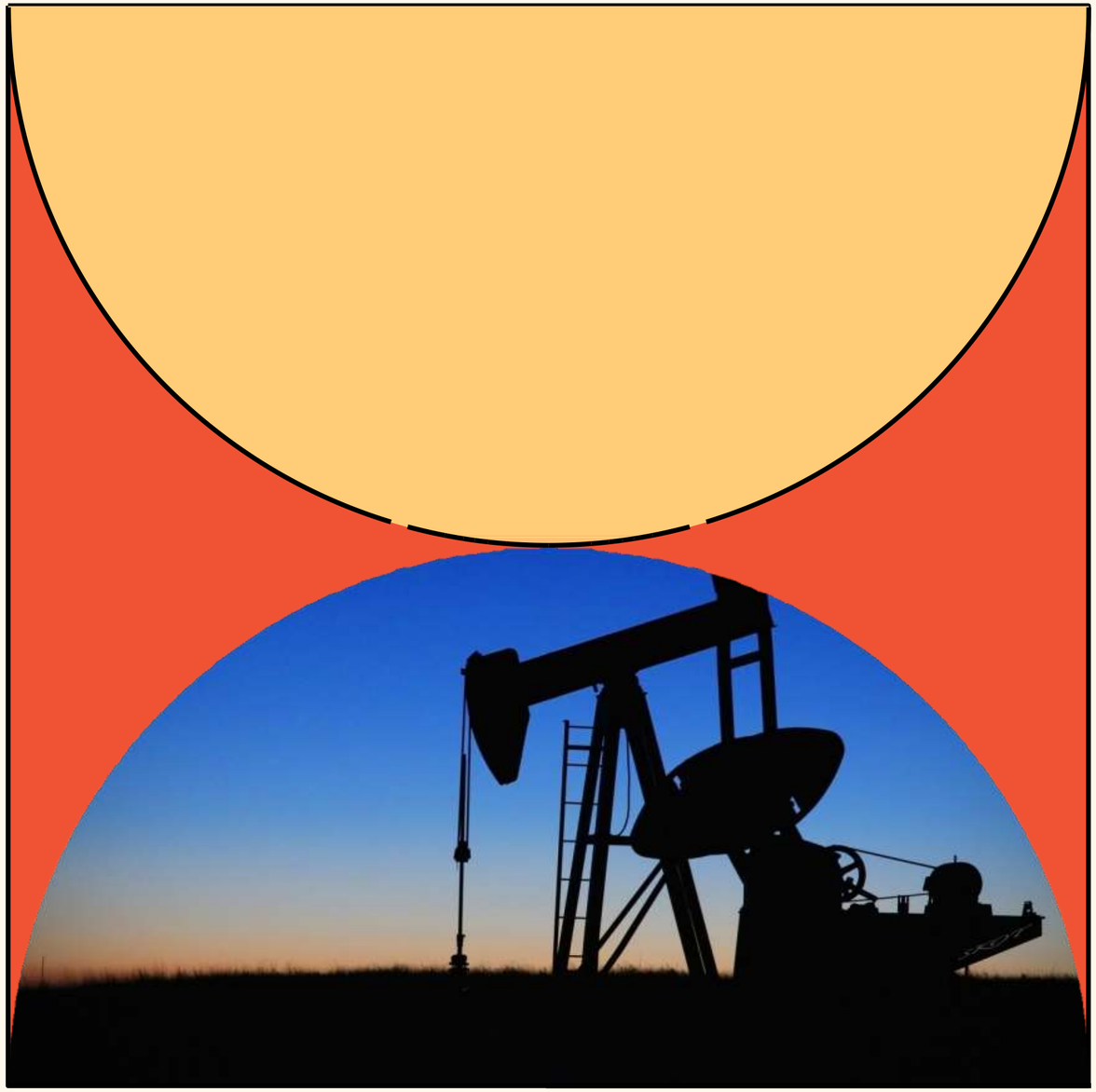
Economy based Multivariate Oil price prediction using LSTM

AI Project





Abstract

Predicting crude oil prices is a valuable task for policymakers, investors, and researchers in the energy sector. Oil prices are influenced by various economic factors such as inflation and exchange rates. Predicting oil prices is a challenging task that requires sophisticated models that can capture the complex and nonlinear relationships among these factors. We use various economic indicators as input features to train our model. Long Short-Term Memory (LSTM) for multivariate time series analysis is used for the prediction of oil price. we also discuss the role of macroeconomic indicators in this context.

Introduction

- Oil is one of the most important commodities in the world, and its price affects the global economy and geopolitics. Oil prices are influenced by various economic factors.
- WTI is one of major standards for crude oil. The historical data of which is readily available.
- Our model will focus on multivariate analysis. Previous researches focused on single variable, i.e WTI only.
- LSTM are some promising models that can handle Time series data for multi variate analysis very well.

About Dataset:
The Data which we will use in this project was collected from the Investing.com site (https://www.investing.com/) and Yahoo Finance (https://finance.yahoo.com/). The data will include values of the below mentioned indices from 2000-2019

West Texas intermediate(WTI):
Includes spot values of West Texas Intermediate which is mix of crude oil traded on NYMEX. (WTI) crude oil is a specific grade of crude oil and one of the main three benchmarks in oil pricing, along with Brent and Dubai Crude.

Gold Futures:
With Increase in Oil price ,inflation increases and in turn GOLD futures also increases. Gold futures is a good indicator of economic situations.

US Dollar Index Futures

US 10-Year Bond Yield
Represents US 10-Year Bond yield. Is a certificate of the loan with the federal government
that matures in 10 years. A great indicator of investor sentiment about the economy.

S&P 500 and Dow Jones Utility Average
a market-capitalization-weighted index of 500 leading publicly traded companies in the U.S. and performance of 15 utility stocks respectively.

Literature Survey

1	Oil price forecasting is a crucial task for policymakers, investors, and energy market participants. Accurately predicting oil prices can help stakeholders make informed decisions and mitigate risks associated with price volatility.
2	Oil prices are influenced by various economic factors inflation, exchange rates, stocks, gold index and more. Predicting oil prices is a challenging task that requires sophisticated models that can capture the complex and nonlinear relationships among these factors.
3	Time series analysis applications like these, including past history of more than one feature, belong to the class of multivariate time series problems and recurrent neural networks (RNN). Long Short Term Memories (LSTM) based RNNs can be used for multivariate time series forecasting
4	LSTM extends that idea of RNN by creating both a short-term and a long-term memory component. The short-term memory component is called the hidden state, which stores the information from the current and previous inputs.
5	The long-term memory component is called the cell state, which stores the information from the distant past inputs.

Proposed Work

Multivariate LSTM model can help better predict oil prices by capturing the nonlinear and dynamic relationships among oil prices and other economic indicators over time. While novel approaches can do it without multiple variables, this approach can be simpler and can discover essential relationships.

1) Data collection

- Identification of the essential economic factor affecting WTI.
- Extracting Historical data of these indices from indexing.com & yahooFinance.
- Combining the collected data into one set.

2) Data cleaning

Removal of outliers and null values

3) Analysis

- Understanding the trend of oil prices.
- Understanding WTI's relationship with one and more variables.

4) Model training

- Data Scaling
- Parameter Tuning
- Training on data

5) Evaluation

- R2score
- MAE
- MSE
- Graph

Expected outcomes

- valuable insights and relationships regarding oil and the economy that helps the energy & finance sectors.
- An efficient and accurate model that predicts future oil prices.