Inflation - Using Time Series Analysis to Understand and Predict US Inflation
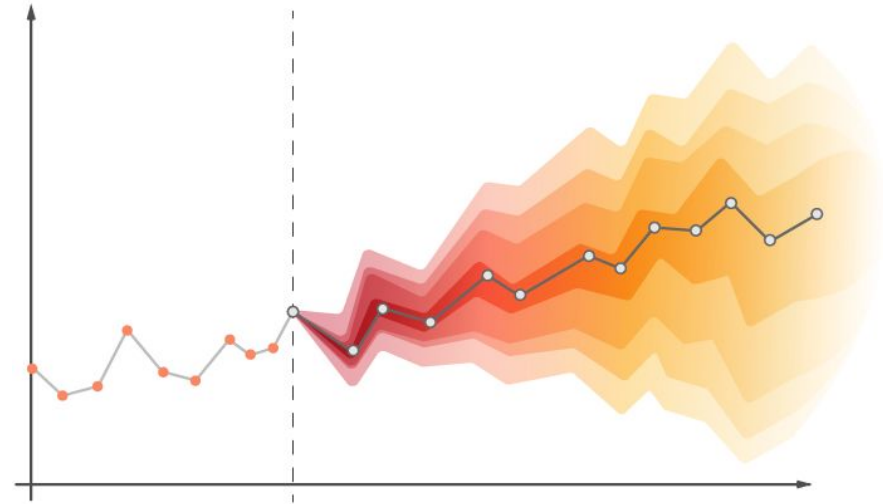
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Fall 1 2023

Problem Statement

- Build Time Series Forecasting models to predict US inflation through the consumer price index (CPI) and explore potential dependent variables

Related Work

- Much work has been done on understanding time series forecasting (1)
- Much work has also been done on understanding inflation (2)
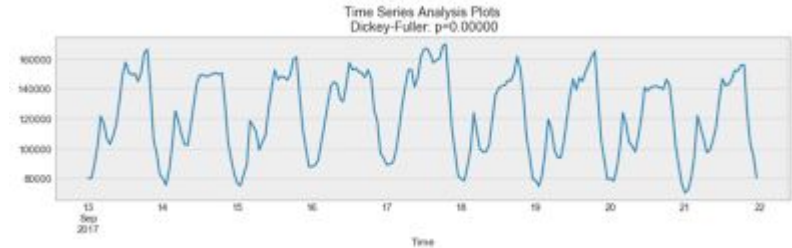- This project will seek to use and build upon both sets of resources

Project Plan

1. Subject Matter Research
2. Exploratory Data Analysis
3. Model Building
4. Model Evaluation
5. FInal Visualizations and Outputs

Potential Models

- Simple
  - Simple AVG and Simple Moving AVG
- Exponentially Smoothed
  - Variations of Holt's method
- Auto Regressive
  - ARIMA and SARIMA
- Multivariate
  - Vector Auto Regressors
- Deep Learning
  - RNN and Transformer based models

Time Series Analysis Plots
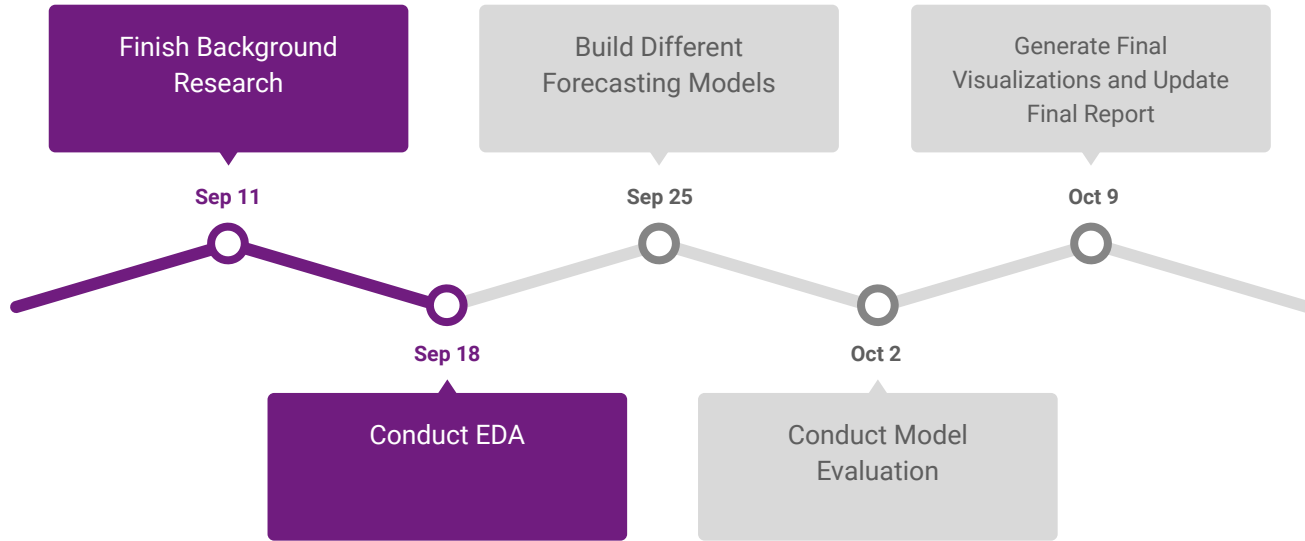Dickey-Fuller: p=0.00000

Evaluation

- Will use popular time series forecasting metrics to compare models
  - Root Mean Square Error (RMSE)
  - Mean Absolute Percentage Error (MAPE)
- Project will be a success if I gain real world experience building time series forecasting models

$$RMSE = \sqrt{\sum_{i=1}^{n} \frac{(\hat{y}_i - y_i)^2}{n}}$$

$$MAPE = \frac{1}{N}\sum_{t=1}^{N} \left| \frac{E_t - A_t}{A_t} \right|$$

Timeline

Finish Background Research

Build Different Forecasting Models

Generate Final Visualizations and Update Final Report

Sep 11

Sep 25

Oct 9

Sep 18

Oct 2

Conduct EDA

Conduct Model Evaluation

References

- (1)
  - https://medium.com/analytics-vidhya/time-series-forecasting-a-complete-guide-d963142da33f
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- (2)
  - https://www.rba.gov.au/education/resources/explainers/causes-of-inflation.html#:~:text=More%20jobs%20and%20higher%20wages,to%20an%20increase%20in%20inflation.
    - https://hbr.org/2022/12/what-causes-inflation
    - https://www.bls.gov/opub/mlr/2023/beyond-bls/what-caused-inflation-to-spike-after-2020.htm