Tenure Tracker

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Motivation

"How likely is it for me to land a job as a faculty member in the year 2030?"

"Is there an optimal year to apply for faculty positions?"

*"How can I predict where the academic job market is headed?"*

Data Collection

- # of faculty in the US from 1970 to 2022. Data collected from the (NCES). The difference in # of faculty is assumed to be faculty hire in a year.

- The missing # of faculty in a given year was interpolated as the mean of the previous and later year.

- Economic Factors such as GDP and Unemployment rate were collected from (FRED).

Preliminary Data Analysis

- Streamlit API explores different models and relations
  - https://tenure-tracker.streamlit.app/

- Ultimately a single regressor cannot be used to accurately predict the number of faculty positions

- This motivates models with multiple regressors incorporating key insights

Analysis

PCA Loadings Heatmap
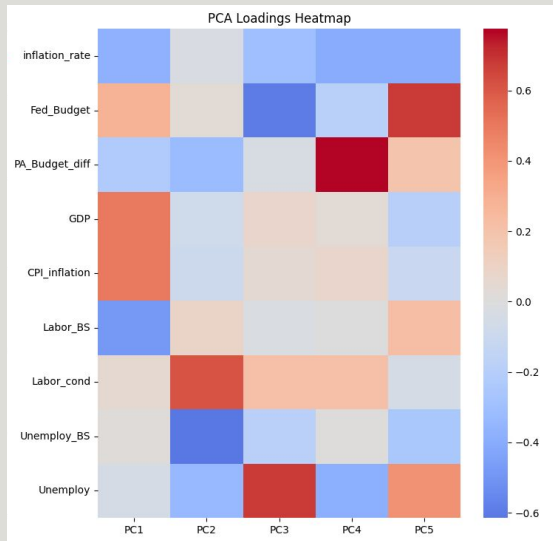
Methods

Time Series Analysis
- LOWESS – Local smoothing to avoid social fluctuations
- ARIMA – Regress on prior faculty numbers and shocks
- Gaussian Process – Mean of sum of factors roughly normal
- Fourier Cyclicality Analysis
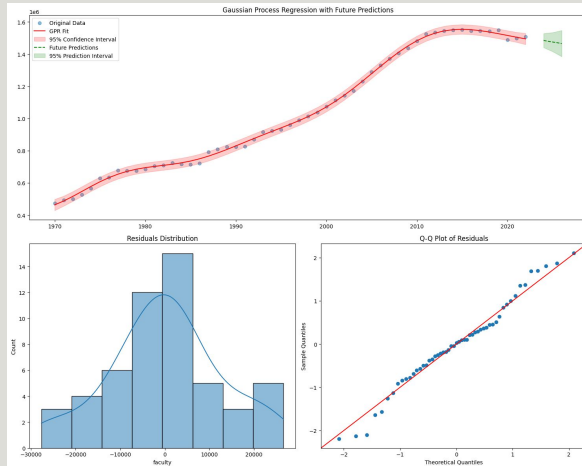
Economic Variable Regression
- Maximal lag correlation computed for each factor and shifted
- PCA feature selection (verified with Mutual Information, LASSO)
- Linear/Polynomial Regression
- Mix of time-series and principal component regression

Scoring
- K-fold Cross Validation
- AIC/BIC scoring for hyperparameter optimization

Analysis

Answer.

- Maximal correlation – GDP, CPI, and Number of Employed Degree holders (PC1 at 45%, corr > 90%)

- Time series projections win, with GPR doing the best with a 5 fold cross validated MAPE of 1.15% and ARIMA(3,3,5) slightly worse at 1.94%

- The answer – both trend and cycle are on the uptick

APPLY! APPLY! APPLY!