Burn-Mitchell Framework

Overview
This Project analyzes German macroeconomic dynamics using a simplified Burns-Mitchell framework to identify and characterize business cycle patterns. The analysis examines quarterly GDP growth rates, fits statistical distributions to determine extreme events and uses bootstrapping to assess the statistical significance of deviations at business cycle peaks.

Motivation
Understanding how economies behave across different market regimes, which are characterized by upward or downward business cycles, is fundamental to macroeconomic analysis which has to be properly evaluated to make efficient financial decisions. This project was primarily motivated by understanding the connection between macroeconomic indicators and financial market behavior by applying the Burns-Mitchell Framework to quantify business cycles in Germany. Investigate if the GDP Growth rates exhibit fat-tailed distributions and assess through bootstrapping the statistical significance of the results

Features
-   Data Retrieval: Adjusted German GDP data from FRED API starting 01.01.1991
-   Growth rate Calculation: Converts absolute GDP values to growth rates using logarithmic approximation
-   Burns-Mitchell Peak Detection: Growth rate at time t I a peak if t-1 and t are positive, while t+1 and t+2 are negative
-   Average Business Cycle Construction: Creates 21 quarter windows (10 before to 10 after Peak)
-   Peak Visualization
-   Distribution Fitting: Fits both Normal and Lévy stable distributions for visual comparison
-   Bootstrap analysis: Estimates confidence intervals for peak deviations using Student's t-test and bootstrap resampling

Installation
pip install pandas numpy matplotlib scipy fredapi
Python 3.8+

Expected Visual Outputs

Fitted Normal Distribution vs. Data

Fitted Lévy-Distribution vs. Data

Empirical Distribution of the Bootstrap Estimates