Lévy Stable Distribution Fitting for S&P 500 Returns:

Overview

This project analyzes S&P 500 log returns by fitting Lévy stable distribution and comparing the results with the traditional assumptions of normal distribution. The analysis clearly captures that financial returns exhibit heavy tails, which are better captured by Lévy Stable distributions than by normal distributions.

Motivation

This project was intended as a personal research project to access whether classical assumptions used in a variety of applications in finance, hold true with empirical returns of the S&P 500.

Features

- Fetches 10 years of S&P 500 historical data via yfinance
- Calculates log returns and descriptive statistics
- Fits normal and Lévy stable distributions on return data
- Generates visualizations:
    - PDF comparison (Lévy vs. Normal) with empirical data
    - Heavy tails analysis using log scale
    - QQ-Plot for normality cross check
    - CDF comparison (Lévy vs. Normal) with empirical data
- Saves fitted parameters for both distributions for further analysis

Installation

Requirements: pip install numpy matplotlib yfinance scipy pandas
Python 3.7 or higher

Expected Output