## Project: Daily Returns & Volatility Analysis

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### Objective

Analyze daily return behavior, rolling volatility, Sharpe ratio, and drawdowns for a SPY-like synthetic series. This mirrors standard exploratory risk analysis used in quantitative research.

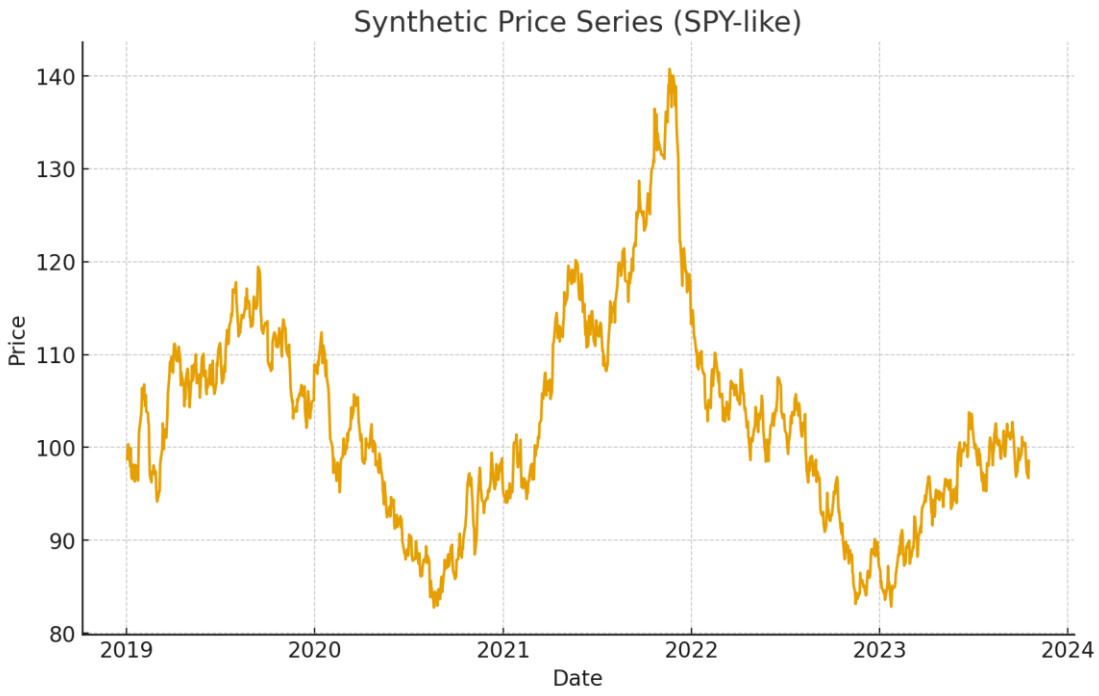
### Methodology

- Generate a synthetic price series using daily log-normal returns.
- Compute daily log returns and summary statistics (annualized return, volatility, Sharpe).
- Evaluate risk via rolling 30-day volatility and rolling Sharpe.
- Measure capital risk using drawdown and report maximum drawdown.

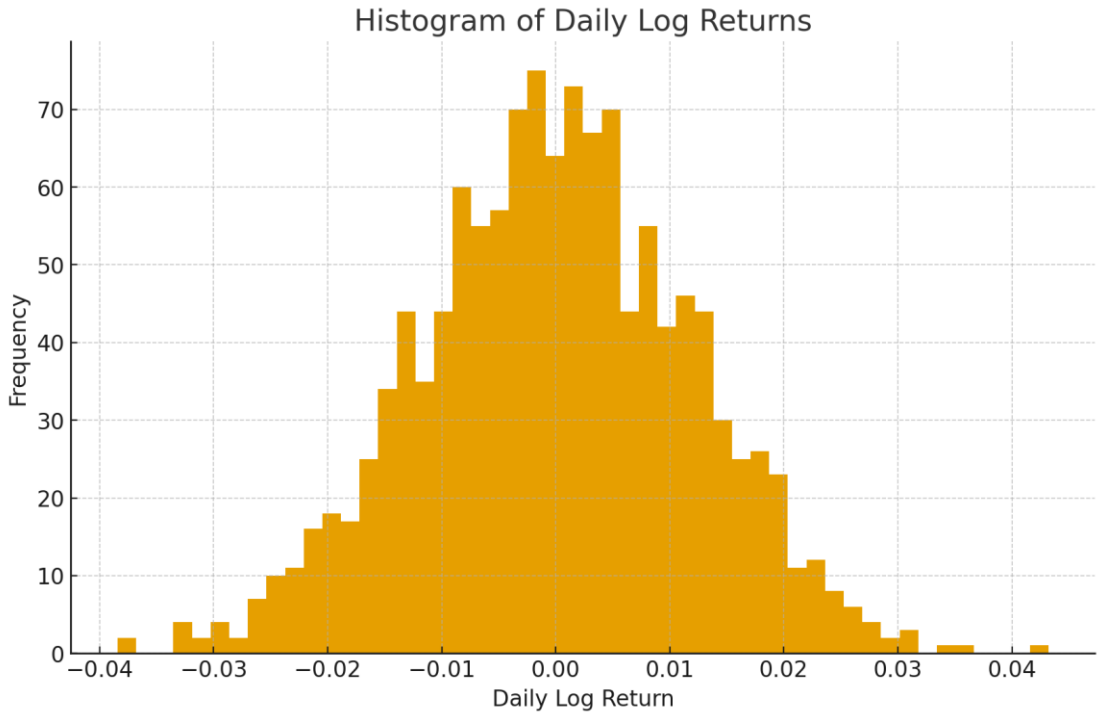
### Results Summary

Annual Return = -0.30%, Annual Volatility = 18.91%, Annual Sharpe = -0.02, Max Drawdown = -42.41%, 95% daily VaR = -0.0201.

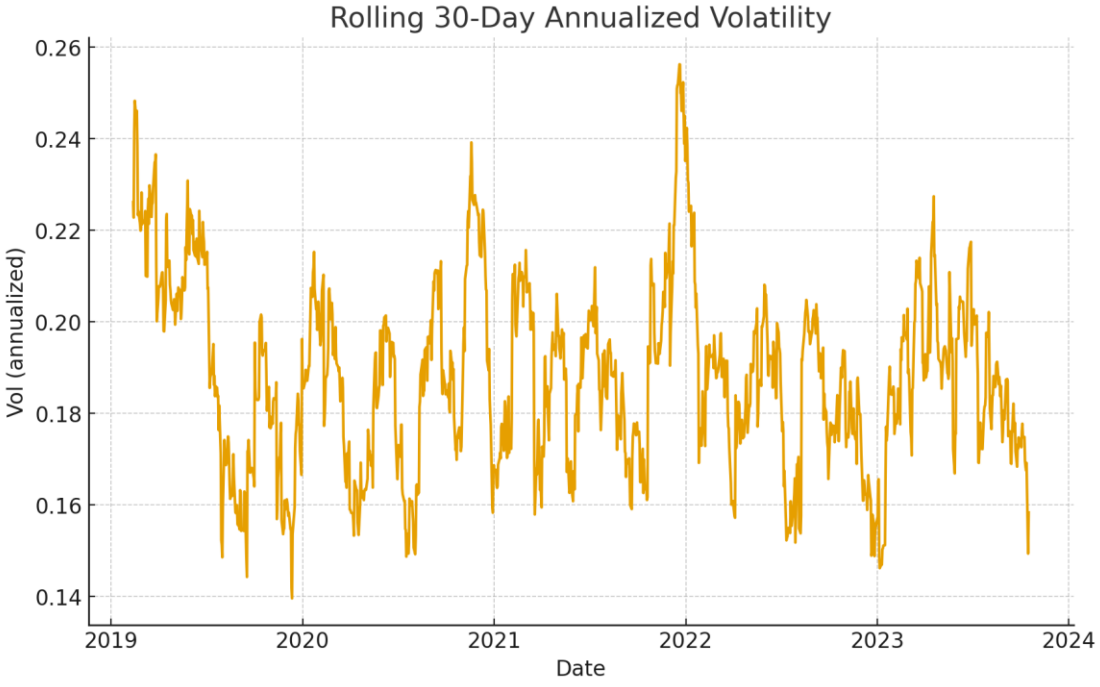
Price series:



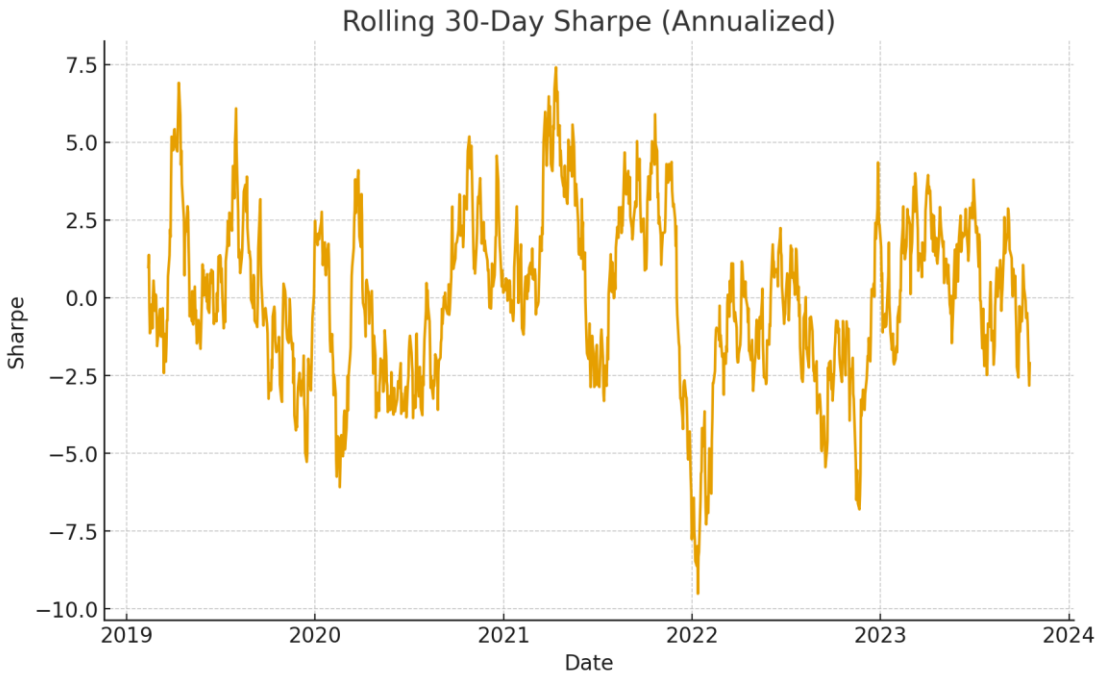

Histogram of daily log returns:



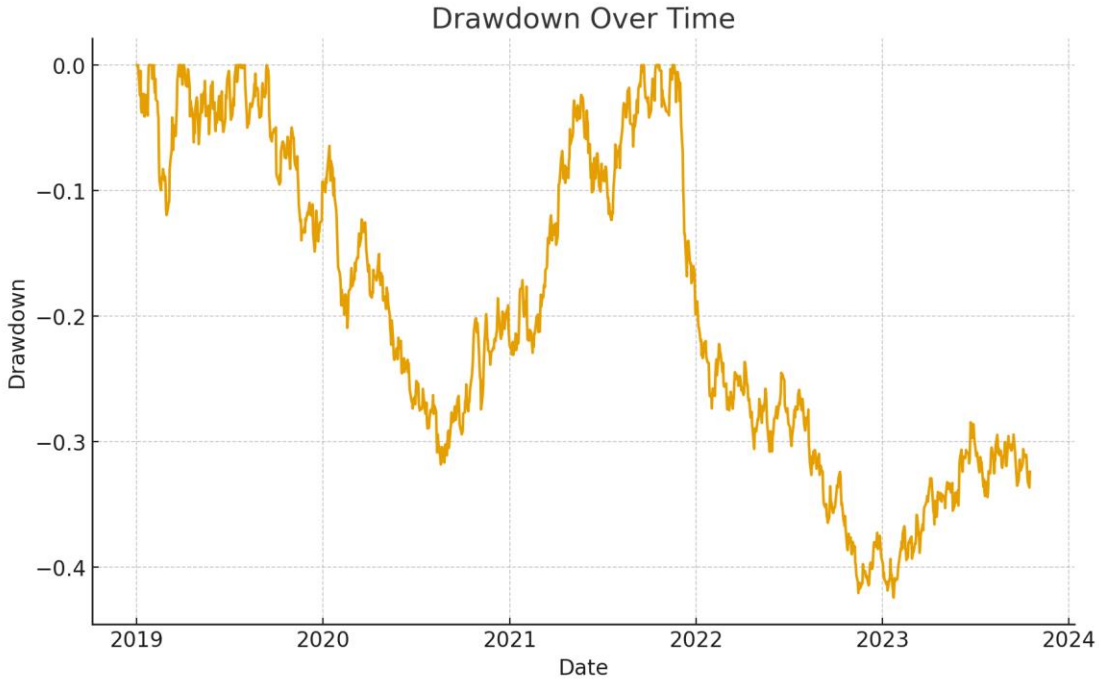

Rolling 30-day annualized volatility:




Rolling 30-day annualized Sharpe ratio:




Drawdown over time:




## Discussion & Next Steps

Volatility and drawdowns vary through time, which affects position sizing and risk limits. Next steps: compare synthetic to real SPY returns, test different windows (21, 63, 126 days), and study volatility clustering with GARCH or realized volatility measures.