

Exercise 6

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1.
 - (a) Load the data in the file `sp500.csv` and construct the log returns (in percent). Use a `rolling` object with a window of $m = 250$ days to compute and plot the historical 1% VaR.
 - (b) Determine the Normal VaR for the entire sample, both using Python and manually. Also compute (and plot) the normal VaR with the mean and volatility estimated from a rolling window of length $m = 250$.
 - (c) Determine the VaR based on a GARCH(1, 1) model with normal innovations.
 - (d) Same, but with standardized t innovations.
 - (e) Predict the VaR (manually and using Python) for 10/28/2022 based on the GARCH model with t innovations.
 - (f) Make a plot with your VaR estimates overlaid on the negative log returns.
 - (g) Test your VaR forecasts for correct unconditional coverage, independence, and correct conditional coverage.