Since 1-day returns and 10-days returns , we can express 10-days returns in terms of 1-day as follows: 1-day returns are given stably distributed values, so after ordering we have variation series for 10-day returns.

For calculating α-quantile of variation series of size n we use following algorithm:

* ⌊α(n – 1)⌋
* if ,
* if ,
* if

For generating distribution of α-quantile we generate N series of 10-days returns and N α-quantiles. And from the obtained series we construct cdf or pdf by following algorithm:

* divide the series into n equal intervals
* calculate the fraction of occurrences of the values of the series in each interval (for pdf) or in interval from minimal value to the end of each interval, obtained earlier

To find sufficient number of Monte-Carlo trials we calculate confidence interval with significance level α for expectation using a known large number of trials by formula where

and is – quantile of standard distribution. Then gradually increasing the number of trials we count the fraction of occurrences of the calculated expectations in confidence interval until the fraction is sufficient.

In my code I calculated confidence interval for 50000 trials and significance level 0.05 and got accuracy 0.922 at nearly 10000 trials. All intermediate values are presented in file test\_output.txt.

Distribution charts are presented in main file.