Task:

1. Generate distribution of 0.01 quantile (1% percentile) of 10--days overlapping proportional returns obtained from the 3--years timeseries (750 observations) of 1--day returns. Original timeseries is generated using stable distribution with the following parameters: $\alpha = 1.7$, $\beta = 0.0$, $\gamma = 1.0$, $\delta = 1.0$.

Solution:

1. Generate a price distribution using a stable distribution function defined parametrically: $\alpha = 1.7$, $\beta = 0.0$, $\gamma = 1.0$, $\delta = 1.0$.
2. Based on this distribution, determine the returns distribution using the formula: $r_i = (P_{i+1} - P_i)/P_i$.
3. Generate overlapping data with a 10–day period $\sum_{i=0}^{9} r_{i+j}$.
4. Plot the distribution function of overlapping data for 10 days and determine values with probabilities less than 1% for further analysis.

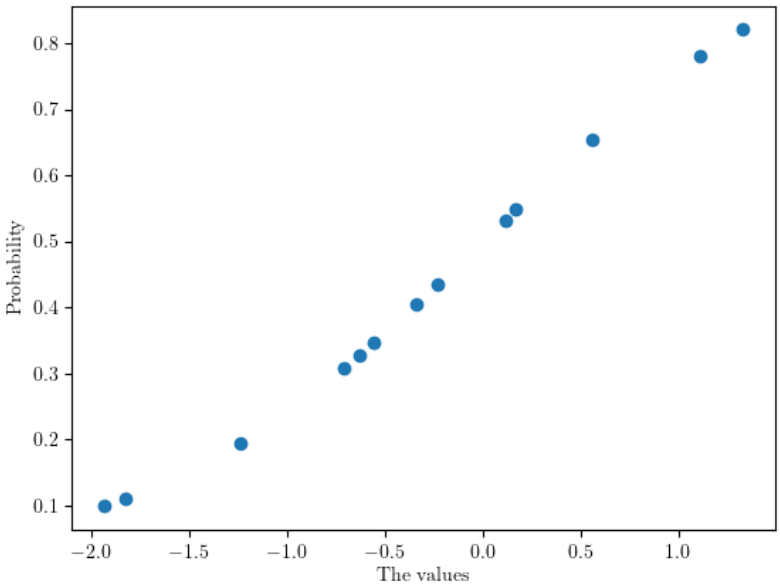

Figure 1: 1 % percentage distribution of 10-day overlapping returns based on 750 observations

Figure: 1 contains the distribution based on 750 observations, and no points are placed below the $y = 0.01$ line. Thus, this number of Monte – Carlo trials is not enough.

For Monte – Carlo trials number equals to 2000 the first value appears in range of interest (see Fig. 2).

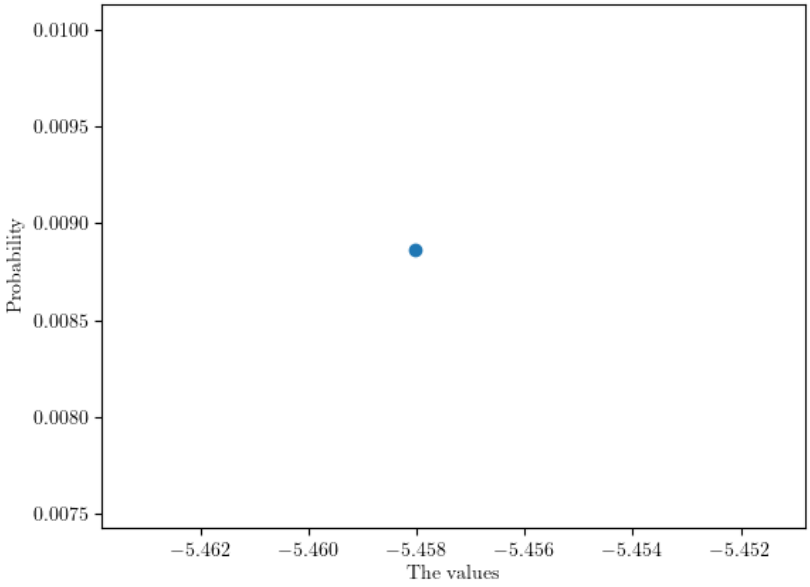

Figure 2: 1 % percentage distribution of 10-day overlapping returns based on 2000 observations