

# ASYMPTOTIC INDEPENDENCE OF THREE STATISTICS OF THE MAXIMAL INCREMENTS OF RANDOM WALKS AND LÉVY PROCESSES

MARTIJN PISTORIUS (JOINT WORK WITH ALEKSANDAR MIJATOVIĆ)

Let  $H(x) = \inf\{n : \exists k < n : S_n - S_k > x\}$

$$R_n = \max_{m \in \{0, \dots, n\}} \{S_n - S_m\}, \quad R_n^* = \max_{m, k \in \{0, \dots, n\}, m \leq k} \{S_k - S_m\}$$

and  $O_x = R_{H(x)} - x$ . In this talk we show that under Cramér's condition on the step-size distribution of  $S$ , the statistics  $R_n$ ,  $R_n^* - y$  and  $O_{x+y}$  are asymptotically independent as  $\min\{n, y, x\} \uparrow \infty$ . Furthermore, we establish a novel Spitzer-type identity characterising the limit law  $O_\infty$  in terms of the one-dimensional marginals of  $S$ . If  $y = \gamma^{-1} \log n$ , where  $\gamma$  is the Cramér coefficient, our results together with the classical theorem of Iglehart [1] imply the existence of a joint weak limit of the three statistics and identify its law. As corollary we obtain a new factorization of the exponential distribution. We prove analogous results for the corresponding statistics of a Lévy process.

## REFERENCES

- [1] D.L. Iglehart. Extreme values in the GI/G/1 queue. *Ann. Math. Statist.*, 43:627-635, 1972.
- [2] A. Mijatovic, M. Pistorius. Asymptotic independence of three statistics of the maximal increments of random walks and Lévy processes *Preprint*, 2012.