STANFORD PROBABILITY SEMINAR

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Thursday, 26 May 2005
4:15pm (Refreshments at 4pm in the 1st Floor Lounge)
Sequoia Hall, Room 200

Exponential functionals of Lévy processes

Abstract. In recent studies it has been shown that the throughput of a TCP connection is strongly related to the random variable $Z = \int_0^\infty e^{-X(t)}dt$, with $X(t)$ a compound Poisson process. Z also appears in the probabilistic analysis of other algorithms, in mathematical finance (where Z is called a perpetuity), in mathematical physics, and the analysis of self-similar Markov processes. In all these cases, $X(t)$ is a (special case of a) Lévy process.

In this talk we first review the TCP application, and then investigate various properties of the distribution of Z. In particular, we give an expression for the Mellin transform of Z, and derive the tail behavior of Z. We show that a large variety of tail asymptotics (depending on $X(\cdot)$) are possible, ranging from extremely heavy tails ($P(Z > x) \sim (\log x)^{-a}$) to extremely light tails ($P(Z > x) \sim e^{-x^p}$).