



KATHOLIEKE UNIVERSITEIT LEUVEN

Statistics Seminar

Joint organization statistics research groups Faculty of Science and Faculty of Economics and Applied Economics
Leuven Statistics Research Centre (LSTAT)

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“Two-sided exit problems for several classes of stochastic processes”

Thursday October 1, 2009

12:00—13:00

Location: Room B00.05, Department of Mathematics, Celestijnenlaan 200B, Heverlee.
Supporting research project: GOA-project 2007/04

Abstract:

Stochastic processes serve as mathematical models of random phenomena in time evolution. Lévy processes are stochastic processes with stationary independent increments. They constitute a fundamental class of stochastic processes which possess nice properties and, thus, proved to find a wide range of applications in different areas such as risk theory and finance, physics, biosciences and telecommunications, queueing theory, fragmentation theory etc. For instance, Lévy processes are an excellent tool for modelling price processes in mathematical finance.

On the other hand, the Lévy processes are important from a theoretical point of view, since other classes of stochastic processes, such as semi-Markov processes, semi-martingales are obtained as generalizations of Lévy processes.

This work deals with the so called boundary problems (one- and two-sided exit problems and others). These are problems of determining the law of the first passage of a level (first exit time from a fixed interval) by the process and other characteristics such as position of the process at this instant, the value of the overshoot through the level, the sojourn time inside the interval, the number of intersections of the interval, etc.

Motivated by needs of applied sciences, first passage problems and exit problems became a topic of many researchers since they are directly connected with determining the distribution of buffer overflow, bankruptcy of a firm, price of a two-barrier option, etc.

In another part of the work we apply the results obtained in the context of queueing theory.

One of the crucial performance issues of the single-server queue with finite buffer is losses, namely, customers (packets, cells, jobs) that were not allowed to enter the system due to the buffer overflow. This issue is especially important in the analysis of telecommunication networks.

Therefore, our target was to determine the most important performance measures of queueing systems with batch arrivals and finite buffer such as the busy period, the time of the first loss, the number of lost customers.