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Strategic Risk Management for Successful Space & Defence Programmes (4)

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INSURANCE MODEL IN SPACE INDUSTRY

Abstract

In this article, we explore what risk processes might be more appropriate to use for better modeling of insurance in the space industry. For this, we first talk about the insurance risk process in the simplest case and give its mathematical model. Then, by examining the main stochastic component of insurance risk processes, we conduct a comparative analysis of the results available in the scientific literature which may be appropriate for use in the space industry. Since the study of this component is closely related to the classes of distribution functions, we also provide information about the nature of some classes of distributions.

Since the main probabilistic characteristics of stochastic processes are their mathematical expectation and variance, these characteristics of insurance risk processes are especially investigated asymptotically in the scientific literature.

The main issues to be considered when modeling insurance in the space industry are:

1. the time between insurance events (inter-arrival times) can be large;
2. the amount of the insurance payment to be paid in the insurance event (claim) can be high.

Mathematically, this means that the probability of the event that random variable can get big values is not small. Therefore, in probability theory, distributions of the random variables with this property are studied as a separate class which is called as heavy-tailed distributions. Otherwise, the random variable is said to have a light-tailed distribution. Intuitively, the fact that a random variable has a light-tailed distribution means that the probability of that random variable can take large values decreases exponentially (or faster). Thus, the fact that a random variable has a heavy-tailed distribution means that the probability of that random variable can take large values decreases at a slower rate than the exponential rate.

Thus, in order to model insurance in the space industry, it is reasonable that the random variable representing the time between insurance events and/or the amount of insurance payments to have a heavy-tailed distribution.

Note also that the study of random variables with a heavy-tailed distribution is more difficult than the study of random variables with a light-tailed distribution, since light-tailed distributions have any finite moment, while heavy-tailed distributions may not have any finite moment (such as expectation and variance). This means that the use of classical methods in the investigation of random variable with heavy-tailed distribution may fail in many cases and there may appear a need to develop new methods.