NON-CENTRAL PÓLYA-AEPPLI PROCESS AND RUIN PROBABILITY*

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Abstract

In this paper we introduce a stochastic process which is a sum of Pólya-Aeppli process and homogeneous Poisson process and call it a Non-central Pólya-Aeppli process (NPAP). The probability mass function, recursion formulas and some properties are derived. As application we consider a risk model with NPAP counting process. The joint distribution of the time to ruin and deficit at the time of ruin is derived. The differential equation of the ruin probability is given. As example we consider the case of exponentially distributed claims.

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1 Introduction

In this paper we consider a process which is a sum of two independent stochastic counting processes. The first one is the Pólya-Aeppli process (PAP) which is introduced by Minkova (2004), [3] and characterized by Chukova and Minkova (2013), [1]. It is a compound Poisson process with geometric compounding distribution and has the following probability mass function (PMF)

$$
P(N_1(t) = i) = \begin{cases} e^{-\lambda_1 t}, & i = 0 \\ e^{-\lambda_1 t} \sum_{j=1}^{i} \binom{i-1}{j-1} \dfrac{[\lambda_1(1-\rho)t]^j}{j!} \rho^{i-j}, & i = 1, 2, \ldots, \end{cases}
$$

(1)