Nie, Ciyu; **Dickson, David C. M.**; **Li, Shuanming**

The finite time ruin probability in a risk model with capital injections. (English)

Zbl 1398.91350
Scand. Actuar. J. 2015, No. 4, 301-318 (2015).

Summary: We consider a risk model with capital injections. We show that in the Sparre Andersen framework the density of the time to ruin for the model with capital injections can be expressed in terms of the density of the time to ruin in an ordinary Sparre Andersen risk process. In the special case of Erlang inter-claim times and exponential claims, we show that there exists a readily computable formula for the density of the time to ruin. When the inter-claim time distribution is exponential, we obtain an explicit solution for the density of the time to ruin when the individual claim amount distribution is Erlang(2), and we explain techniques to find the moments of the time to ruin. In the final section, we consider the related problem of the distribution of the duration of negative surplus in the classical risk model, and we obtain explicit solutions for the (defective) density of the total duration of negative surplus for two individual claim amount distributions.

MSC:

91B30	Risk theory, insurance (MSC2010)
62P05	Applications of statistics to actuarial sciences and financial mathematics
60K10	Applications of renewal theory (reliability, demand theory, etc.)

Keywords:

ruin probability; finite time; capital injection

Full Text: DOI

References:

[1] Borovkov, K. A. & Dickson, D. C. M. (2008). On the ruin time distribution for a Sparre Andersen process with exponential claim sizes. \textit{Insurance: Mathematics & Economics} 42, 1104-1108. · Zbl 1141.91486

[2] Dickson, D. C. M. (2008). Some explicit solutions for the joint density of the time of ruin and the deficit at ruin. \textit{ASTIN Bulletin} 38, 259-276. · Zbl 1169.91386

[3] Dickson, D. C. M. & Egídio dos Reis, A. D. (1996). On the distribution of the duration of negative surplus. \textit{Scandinavian Actuarial Journal} 1996, 148-164. · Zbl 0864.62069

[4] Dickson, D. C. M. & Li, S. (2010). Finite time ruin problems for the Erlang(2) risk model. \textit{Insurance: Mathematics & Economics} 46, 12-18. · Zbl 1231.91176

[5] Dickson, D. C. M. & Waters, H. R. (2004). Some optimal dividends problems. \textit{ASTIN Bulletin} 34, 49-74. · Zbl 1097.91040

[6] Eisenberg, J. & Schmidli, H. (2011). Minimising expected discounted capital injections by reinsurance in a classical risk model. \textit{Scandinavian Actuarial Journal} 2011, 155-176. · Zbl 1277.60145

[7] Gerber, H. U. & Shiu, E. S. W. (1998). On the time value of ruin. \textit{North American Actuarial Journal}2, 1, 48-78. · Zbl 1081.60550

[8] Graham, R. L., Knuth, D. E. & Patashnik, O. (1994). \textit{Concrete mathematics}. 2nd edn. Upper Saddle River, NJ: Addison-Wesley. · Zbl 0836.00001

[9] Landriault, D. & Willmot, G. E. (2009). On the joint distributions of the time to ruin, the surplus prior to ruin, and the deficit at ruin in the classical risk model. \textit{North American Actuarial Journal}13, 2, 252-279.

[10] Li, S. & Garrido, J. (2004). On ruin for the Erlang(\textit{n}) risk process. \textit{Insurance: Mathematics & Economics} 34, 391-408. · Zbl 1188.91089

[11] Lin, X. S. & Willmot, G. E. (2000). The moments of the time of ruin, the surplus before ruin, and the deficit at ruin. \textit{Insurance: Mathematics & Economics} 27, 19-44. · Zbl 0971.91031

[12] Nie, C., Dickson, D. C. M. & Li, S. (2011). Minimizing the ruin probability through capital injections. \textit{Annals of Actuarial Science} 5, 195-209.

[13] Pafumi, G. (1998). On the time value of ruin: Discussion. \textit{North American Actuarial Journal}2, 1, 75.