

**Woo, Jae-Kyung; Liu, Haibo**

**Discounted aggregate claim costs until ruin in the discrete-time renewal risk model.** (English)

Zbl 1411.91324

Methodol. Comput. Appl. Probab. 20, No. 4, 1285-1318 (2018).

**Summary:** In this paper, we focus on analyzing the relationship between the discounted aggregate claim costs until ruin and ruin-related quantities including the time of ruin. To facilitate the evaluation of quantities of our interest as an approximation to the ones in the continuous case, discrete-time renewal risk model with certain dependent structure between interclaim times and claim amounts is considered. Furthermore, to provide explicit expressions for various moment-based joint probabilities, a fairly general class of distributions, namely the discrete Coxian distribution, is used for the interclaim times. Also, we assume a combination of geometrics claim size with arbitrary interclaim time distribution to derive a nice expression for the Gerber-Shiu type function involving the discounted aggregate claims until ruin. Consequently, the results are applied to evaluate some interesting quantities including the covariance between the discounted aggregate claim costs until ruin and the discounted claim causing ruin given that ruin occurs.

**MSC:**

91B30 Risk theory, insurance (MSC2010)

60K10 Applications of renewal theory (reliability, demand theory, etc.)

Cited in **2** Documents

**Keywords:**

discounted aggregate claims until ruin; discrete sparre Andersen renewal risk process; discounted moment-based joint distribution; higher moments; covariance; discrete Coxian ( $K_n$ ) distribution; claim causing ruin

**Full Text:** [DOI](#)

**References:**

- [1] Albrecher, H.; Boxma, OJ, A ruin model with dependence between claim sizes and claim intervals, *Insur Math Econ*, 35, 245-254, (2004) · [Zbl 1079.91048](#)
- [2] Cai, J.; Feng, R.; Willmot, GE, On the total discounted operating costs up to default and its applications, *Adv Appl Probab*, 41, 495-522, (2009) · [Zbl 1173.91023](#)
- [3] Cheng, S.; Gerber, HU; Shiu, ESW, Discounted probabilities and ruin theory in the compound binomial model, *Insur Math Econ*, 26, 239-250, (2000) · [Zbl 1013.91063](#)
- [4] Cheung, ECK, Moments of discounted aggregate claim costs until ruin in a Sparre Andersen risk model with general interclaim times, *Insur Math Econ*, 53, 343-354, (2013) · [Zbl 1304.91095](#)
- [5] Cheung, ECK; Feng, R., A unified analysis of claim costs up to ruin in a Markovian arrival risk process, *Insur Math Econ*, 53, 98-109, (2013) · [Zbl 1284.91214](#)
- [6] Cheung, ECK; Landriault, D.; Willmot, GE; Woo, J-K, Gerber-Shiu analysis with a generalized penalty function, *Scand Actuar J*, 3, 185-199, (2010) · [Zbl 1226.60123](#)
- [7] Cheung, ECK; Liu, H.; Woo, J-K, On the joint analysis of the total discounted payments to policyholders and shareholders: dividend barrier strategy, *Risks*, 3, 491-514, (2015)
- [8] Cheung, ECK; Woo, J-K, On the discounted aggregate claim costs until ruin in dependent Sparre Andersen risk processes, *Scand Actuar J*, 1, 63-91, (2016) · [Zbl 1401.91109](#)
- [9] De Vylder FE (1996) *Advanced risk theory: a self-contained introduction*. Editions de l'Universite de Bruxelles, Brussels
- [10] De Vylder FE, Marceau E (1996) Classical numerical ruin probabilities. *Scand Actuar J*, 109-123 · [Zbl 0880.62108](#)
- [11] Dickson, DCM, Some comments on the compound binomial model, *ASTIN Bull*, 24, 33-45, (1994)
- [12] Dickson, DCM; Hipp, C., On the time to ruin for Erlang(2) risk processes, *Insur Math Econ*, 29, 333-344, (2001) · [Zbl 1074.91549](#)
- [13] Feng, Runhuan, On the total operating costs up to default in a renewal risk model, *Insurance: Mathematics and Economics*, 45, 305-314, (2009) · [Zbl 1231.91183](#)

- [14] Feng R (2009b) A matrix operator approach to the analysis of ruin-related quantities in the phase-type renewal risk model. *Bull Swiss Assoc Actuar* 1&2:71-87 · [Zbl 1333.91025](#)
- [15] Genest, C.; Nešlehová, J., A primer on copulas for count data, *ASTIN Bull*, 37, 475-515, (2007) · [Zbl 1274.62398](#)
- [16] Gerber, HU, Mathematical fun with compound binomial process, *ASTIN Bull*, 18, 161-168, (1988)
- [17] Gerber, HU; Shiu, ESW, On the time value of ruin, *North Amer Actuar J*, 2, 48-78, (1998) · [Zbl 1081.60550](#)
- [18] Klugman SA, Panjer HH, Willmot GE (2008) *Loss models: from data to decisions*, 3rd edn. Wiley, New York · [Zbl 1159.62070](#)
- [19] Krishna, H.; Pundir, PS, A bivariate geometric distribution with applications to reliability, *J Commun Stat Theory Methods*, 38, 1079-1093, (2009) · [Zbl 1162.62005](#)
- [20] Landriault, D.; Lee, WY; Willmot, GE; Woo, J-K, A note on deficit analysis in dependency models involving Coxian claim amounts, *Scand Actuar J*, 5, 405-423, (2014) · [Zbl 1401.91157](#)
- [21] Lévêillé, Ghislain; Garrido, José, Moments of compound renewal sums with discounted claims, *Insurance: Mathematics and Economics*, 28, 217-231, (2001) · [Zbl 0988.91045](#)
- [22] Lévêillé, Ghislain; Garrido, José, Recursive Moments of Compound Renewal Sums with Discounted Claims, *Scandinavian Actuarial Journal*, 2001, 98-110, (2001) · [Zbl 0979.91048](#)
- [23] Li S (2005a) On a class of discrete time renewal risk models. *Scand Actuar J* 4:241-260 · [Zbl 1142.91043](#)
- [24] Li S (2005b) Distributions of the surplus before ruin, the deficit at ruin and the claim causing ruin in a class of discrete time renewal risk models. *Scand Actuar J* 4:271-284 · [Zbl 1143.91033](#)
- [25] Lindsay, BG; Pilla, RS; Basak, P., Moment-based approximations of distributions using mixtures: theory and applications, *Ann Institut Statist Math*, 52, 215-230, (2000) · [Zbl 0959.62016](#)
- [26] Marceau, E., On the discrete-time compound renewal risk model with dependence, *Insur Math Econ*, 44, 245-259, (2009) · [Zbl 1167.91013](#)
- [27] Nikoloulopoulos, AK; Karlis, D., Fitting copulas to bivariate earthquake data: the seismic gap hypothesis revisited, *Environmetrics*, 19, 251269, (2008)
- [28] Panjer, HH, Recursive evaluation of a family of compound distributions, *ASTIN Bull*, 12, 22-26, (1981)
- [29] Shiu, ESW, The probability of eventual ruin in the compound binomial model, *ASTIN Bull*, 19, 179-190, (1989)
- [30] Sparre Andersen E (1957) On the collective theory of risk in the case of contagion between claims. In: *Proceedings of the Transactions of the XVth international congress on actuaries*, vol II. New York, pp 219-229
- [31] Willmot, GE, Ruin probabilities in the compound binomial model, *Insur Math Econ*, 12, 133-142, (1993) · [Zbl 0778.62099](#)
- [32] Willmot, GE, On the discounted penalty function in the renewal risk model with general interclaim times, *Insur Math Econ*, 41, 17-31, (2007) · [Zbl 1119.91058](#)
- [33] Willmot, GE; Woo, J-K, On the analysis of a general class of dependent risk processes, *Insur Math Econ*, 51, 134-141, (2012) · [Zbl 1284.91277](#)
- [34] Woo, J-K, A generalized penalty function for a class of discrete renewal processes, *Scand Actuar J*, 2, 130-152, (2012) · [Zbl 1277.60146](#)
- [35] Wu, X.; Li, S., On the discounted penalty function in a discrete time renewal risk model with general interclaim times, *Scand Actuar J*, 1, 1-14, (2008)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.