

Tang, Qihe; Wei, Li

Asymptotic aspects of the Gerber-Shiu function in the renewal risk model using Wiener-Hopf factorization and convolution equivalence. (English) [Zbl 1231.91243](#)

Insur. Math. Econ. 46, No. 1, 19-31 (2010).

Summary: We study the asymptotic behavior of the Gerber-Shiu expected discounted penalty function in the renewal risk model. Under the assumption that the claim-size distribution has a convolution-equivalent density function, which allows both heavy-tailed and light-tailed cases, we establish some asymptotic formulas for the Gerber-Shiu function with a fairly general penalty function. These formulas become completely transparent in the compound Poisson risk model or for certain choices of the penalty function in the renewal risk model. A by-product of this work is an extension of the Wiener-Hopf factorization to include the times of ascending and descending ladders in the continuous-time renewal risk model.

MSC:

91B30 Risk theory, insurance (MSC2010)
60K05 Renewal theory
62E20 Asymptotic distribution theory in statistics

Cited in **1** Review
Cited in **17** Documents

Keywords:

asymptotics; convolution equivalence; duality principle; renewal risk model; Wiener; Hopf factorization

Full Text: [DOI](#)

References:

- [1] Asmussen, S., Ruin probabilities, (2000), World Scientific Publishing Co., Inc River Edge, NJ
- [2] Avram, F.; Usábel, M., Ruin probabilities and deficit for the renewal risk model with phase-type interarrival times, *Astin bulletin*, 34, 2, 315-332, (2004) · [Zbl 1274.91244](#)
- [3] Bingham, N.H.; Goldie, C.M.; Teugels, J.L., Regular variation, (1989), Cambridge University Press Cambridge · [Zbl 0667.26003](#)
- [4] Borovkov, K.A.; Dickson, D.C.M., On the ruin time distribution for a sparre Andersen process with exponential claim sizes, *Insurance: mathematics & economics*, 42, 3, 1104-1108, (2008) · [Zbl 1141.91486](#)
- [5] Cai, J.; Garrido, J., Asymptotic forms and bounds for tails of convolutions of compound geometric distributions, with applications, (), 114-131 · [Zbl 1270.60021](#)
- [6] Cheng, Y.; Tang, Q., Moments of the surplus before ruin and the deficit at ruin in the Erlang(2) risk process, *North American actuarial journal*, 7, 1, 1-12, (2003) · [Zbl 1084.60544](#)
- [7] Chover, J.; Ney, P.; Wainger, S., Functions of probability measures, *Journal d'analyse mathématique*, 26, 255-302, (1973) · [Zbl 0276.60018](#)
- [8] Chover, J.; Ney, P.; Wainger, S., Degeneracy properties of subcritical branching processes, *The annals of probability*, 1, 663-673, (1973) · [Zbl 0387.60097](#)
- [9] Cline, D.B.H., Convolution tails, product tails and domains of attraction, *Probability theory and related fields*, 72, 4, 529-557, (1986) · [Zbl 0577.60019](#)
- [10] Dickson, D.C.M.; Drekić, S., The joint distribution of the surplus prior to ruin and the deficit at ruin in some sparre Andersen models, *Insurance: mathematics & economics*, 34, 1, 97-107, (2004) · [Zbl 1043.60036](#)
- [11] Dickson, D.C.M.; Hughes, B.D.; Zhang, L., The density of the time to ruin for a sparre Andersen process with Erlang arrivals and exponential claims, *Scandinavian actuarial journal*, 5, 358-376, (2005) · [Zbl 1144.91025](#)
- [12] Doney, R.A.; Kyprianou, A.E., Overshoots and undershoots of Lévy processes, *The annals of applied probability*, 16, 1, 91-106, (2006) · [Zbl 1101.60029](#)
- [13] Embrechts, P., A property of the generalized inverse Gaussian distribution with some applications, *Journal of applied probability*, 20, 3, 537-544, (1983) · [Zbl 0536.60022](#)
- [14] Embrechts, P.; Veraverbeke, N., Estimates for the probability of ruin with special emphasis on the possibility of large claims, *Insurance: mathematics & economics*, 1, 1, 55-72, (1982) · [Zbl 0518.62083](#)
- [15] Feller, W., ()
- [16] Garrido, J.; Morales, M., On the expected discounted penalty function for Lévy risk processes, *North American actuarial*

- journal, 10, 4, 196-218, (2006)
- [17] Gerber, H.U.; Shiu, E.S.W., On the time value of ruin, *North American actuarial journal*, 2, 1, 48-78, (1998) · [Zbl 1081.60550](#)
 - [18] Gerber, H.U.; Shiu, E.S.W., The time value of ruin in a sparre Andersen model, *North American actuarial journal*, 9, 2, 49-84, (2005) · [Zbl 1085.62508](#)
 - [19] Klüppelberg, C., Subexponential distributions and characterizations of related classes, *Probability theory and related fields*, 82, 2, 259-269, (1989) · [Zbl 0687.60017](#)
 - [20] Klüppelberg, C., Estimation of ruin probabilities by means of hazard rates, *Insurance: mathematics & economics*, 8, 4, 279-285, (1989) · [Zbl 0686.62093](#)
 - [21] Klüppelberg, C.; Kyprianou, A.E.; Maller, R.A., Ruin probabilities and overshoots for general Lévy insurance risk processes, *The annals of applied probability*, 14, 4, 1766-1801, (2004) · [Zbl 1066.60049](#)
 - [22] Landriault, D.; Willmot, G., On the gerber – shiu discounted penalty function in the sparre Andersen model with an arbitrary interclaim time distribution, *Insurance: mathematics & economics*, 42, 2, 600-608, (2008) · [Zbl 1152.91591](#)
 - [23] Li, S.; Garrido, J., On a class of renewal risk models with a constant dividend barrier, *Insurance: mathematics & economics*, 35, 3, 691-701, (2004) · [Zbl 1122.91345](#)
 - [24] Li, S.; Garrido, J., On a general class of renewal risk process: analysis of the gerber – shiu function, *Advances in applied probability*, 37, 3, 836-856, (2005) · [Zbl 1077.60063](#)
 - [25] Lin, X.S.; Willmot, G.E., Analysis of a defective renewal equation arising in ruin theory, *Insurance: mathematics & economics*, 25, 1, 63-84, (1999) · [Zbl 1028.91556](#)
 - [26] Lin, X.S.; Willmot, G.E., The moments of the time of ruin, the surplus before ruin, and the deficit at ruin, *Insurance: mathematics & economics*, 27, 1, 19-44, (2000) · [Zbl 0971.91031](#)
 - [27] Ng, A.C.Y.; Yang, H., Lundberg-type bounds for the joint distribution of surplus immediately before and at ruin under the sparre Andersen model, *North American actuarial journal*, 9, 2, 85-107, (2005) · [Zbl 1085.60517](#)
 - [28] Pakes, A.G., Convolution equivalence and infinite divisibility, *Journal of applied probability*, 41, 2, 407-424, (2004) · [Zbl 1051.60019](#)
 - [29] Pitts, S.M.; Politis, K., The joint density of the surplus before and after ruin in the sparre Andersen model, *Journal of applied probability*, 44, 3, 695-712, (2007) · [Zbl 1132.60061](#)
 - [30] Psarrakos, G., Tail bounds for the distribution of the deficit in the renewal risk model, *Insurance: mathematics & economics*, 43, 2, 197-202, (2008) · [Zbl 1189.91080](#)
 - [31] Psarrakos, G.; Politis, K., Tail bounds for the joint distribution of the surplus prior to and at ruin, *Insurance: mathematics & economics*, 42, 1, 163-176, (2008) · [Zbl 1141.91544](#)
 - [32] Rogozin, B.A., On the constant in the definition of subexponential distributions, *Theory of probability and its applications*, 44, 2, 409-412, (2000) · [Zbl 0971.60009](#)
 - [33] Rolski, T.; Schmidli, H.; Schmidt, V.; Teugels, J., *Stochastic processes for insurance and finance*, (1999), John Wiley & Sons, Ltd Chichester · [Zbl 0940.60005](#)
 - [34] Šiaulyš, J.; Asanavičiūtė, R., On the gerber – shiu discounted penalty function for subexponential claims, *Lithuanian mathematical journal*, 46, 4, 487-493, (2006) · [Zbl 1131.60080](#)
 - [35] Su, C.; Tang, Q., Characterizations on heavy-tailed distributions by means of hazard rate, *Acta mathematicae applicatae sinica. English series*, 19, 1, 135-142, (2003) · [Zbl 1043.60012](#)
 - [36] Tang, Q., Asymptotics for the finite time ruin probability in the renewal model with consistent variation, *Stochastic models*, 20, 3, 281-297, (2004) · [Zbl 1130.60312](#)
 - [37] Tang, Q., The overshoot of a random walk with negative drift, *Statistics & probability letters*, 77, 2, 158-165, (2007) · [Zbl 1108.60042](#)
 - [38] Tang, Q.; Tsitsiashvili, G., Finite- and infinite-time ruin probabilities in the presence of stochastic returns on investments, *Advances in applied probability*, 36, 4, 1278-1299, (2004) · [Zbl 1095.91040](#)
 - [39] Veraverbeke, N., Asymptotic behaviour of wiener – hopf factors of a random walk, *Stochastic processes and their applications*, 5, 1, 27-37, (1977) · [Zbl 0353.60073](#)
 - [40] Wei, L.; Wu, R., The joint distributions of several important actuarial diagnostics in the classical risk model, *Insurance: mathematics & economics*, 30, 3, 451-462, (2002) · [Zbl 1071.91027](#)
 - [41] Willmot, G.E., On the discounted penalty function in the renewal risk model with general interclaim times, *Insurance: mathematics & economics*, 41, 1, 17-31, (2007) · [Zbl 1119.91058](#)
 - [42] Wu, R.; Wang, G.; Wei, L., Joint distributions of some actuarial random vectors containing the time of ruin, *Insurance: mathematics & economics*, 33, 1, 147-161, (2003) · [Zbl 1024.62045](#)
 - [43] Yin, C.; Zhao, J., Nonexponential asymptotics for the solutions of renewal equations, with applications, *Journal of applied probability*, 43, 3, 815-824, (2006) · [Zbl 1125.60090](#)

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.