

SOME MAXIMAL TYPE INEQUALITIES FOR N-DEMIMARTINGALES AND RELATED RESULTS

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Abstract. In this paper, we go on to investigate the concave Young function inequalities for N-demimartingales and obtain some maximal type inequalities for these stochastic process. As some specific concave Young functions, some related inequalities for N-demimartingales are presented. Meanwhile, some convex function inequalities for nonnegative N-demimartingales are also obtained, including the classical Doob type inequalities. In addition, the Marshall type inequalities and other maximal type inequalities for N-demimartingales are studied too.

Mathematics subject classification (2010): 60E15, 60F15.

Keywords and phrases: Concave Young function, convex function, N-demimartingales, Marshall type inequalities.

REFERENCES

- [1] N. K. AGBEKO, *Concave function inequalities for sub-(super-)martingales*, Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös Nominatae Sectio Mathematica, **29** (1986), 9–17.
- [2] A. V. BULINSKI, AND A. SHASKIN, *Limit Theorems for Associated Random Fields and Related Systems*, World Scientific, Singapore, 2007.
- [3] T. C. CHRISTOFIDES, *Maximal inequalities for demimartingales and a strong law of large numbers*, Statistics & Probability Letters, **50** (2000), 357–363.
- [4] T. C. CHRISTOFIDES, *Maximal inequalities for N-demimartingales*, Archives of Inequalities and Applications, **50** (1), 397–408.
- [5] T. C. CHRISTOFIDES, *U-statistics on associated random variables*, Journal of Statistical Planning and Inference, **119** (2004), 1–15.
- [6] T. C. CHRISTOFIDES, AND M. HADJIKYRIAKOU, *Exponential inequalities for N-demimartingales and negatively associated random variables*, Statistics & Probability Letters, **79** (2009), 2060–2065.
- [7] T. C. CHRISTOFIDES, AND M. HADJIKYRIAKOU, *Maximal and moment inequalities for demimartingales and N-demimartingales*, Statistics & Probability Letters, **82** (2012), 683–691.
- [8] T. C. CHRISTOFIDES, AND M. HADJIKYRIAKOU, *Conditional demimartingales and related results*, Journal of Mathematical Analysis and Applications, **398** (2013), 380–391.
- [9] A. M. GARSIA, *On a convex function inequality for martingales*, The Annals of Probability, **1** (1973), 171–174.
- [10] M. HADJIKYRIAKOU, *Probability and moment inequalities for demimartingales and associated random variables*, Ph. D. Dissertation, Department of Mathematics and Statistics, University of Cyprus, Nicosia, 2010.
- [11] M. HADJIKYRIAKOU, *Marcinkiewicz-Zygmund inequality for nonnegative N-demimartingales and related results*, Statistics & Probability Letters, **81** (2011), 678–684.
- [12] P. HARREMOËS, *Some new maximal inequalities*, Statistics & Probability Letters, **78** (2008), 2776–2780.
- [13] S. H. HU, X. H. WANG, W. Z. YANG, AND X. J. WANG, *Some inequalities for demimartingales and N-demimartingales*, Statistics & Probability Letters, **82** (2012), 232–239.
- [14] A. IKSANOV, AND A. MARYNYCH, *A note on non-regular martingales*, Statistics & Probability Letters, **78** (2008), 3014–3017.

- [15] M. A. KRASNOSELSKII, AND YA. B. BUTICKII, *Convex functions and Orlicz Spaces*, translated by Leo. F. Boron, Noordhoff Ltd, Groningen, 1961.
- [16] R. L. LONG, *H_p Martingales*, Peking University Press, Beijing, 1985.
- [17] A. W. MARSHALL, *A one-sided analog of Kolmogorov's inequality*, The Annals of Mathematical Statistics, **31** (1960), 483–487.
- [18] J. Y. MU, AND Y. MIAO, *Generalizing the Marshall's inequality*, Communications in Statistics-Theory and Methods, **40** (2011), 2809–2817.
- [19] C. M. NEWMAN, AND A. L. WRIGHT, *Associated random variables and martingale inequalities*, Zeitschrift für Wahrscheinlichkeitstheorie und verwandte Gebiete, **59** (1982), 361–371.
- [20] A. OSĘKOWSKI, *A maximal inequality for nonnegative sub- and supermartingales*, Mathematical Inequalities & Application, **14** (2011), 595–604.
- [21] A. G. PAKES, *Remarks on the maxima of a martingale sequence with application to the simple critical branching process*, Journal of Applied Probability, **24** (1987), 768–772.
- [22] B. L. S. PRAKASA RAO, *On some inequalities for N -demimartingales*, Journal of the Indian Society of Agricultural Statistics, **57** (2004), 208–216.
- [23] B. L. S. PRAKASA RAO, *On some maximal inequalities for demisubmartingales and N -demisupermartingales*, Journal of inequalities in pure and applied mathematics **8** (2007), Article 112, 17 pp.
- [24] B. L. S. PRAKASA RAO, *Associated Sequences, Demimartingales and Nonparametric Inference*, Birkhäuser, Springer, Basel, 2012.
- [25] J. V. USPENSKY, *Introduction to Mathematical Probability*, New York, McGraw Hill, 1937.
- [26] J. F. WANG, *Maximal inequalities for associated random variables and demimartingales*, Statistics & Probability Letters, **66** (2004), 347–354.
- [27] X. J. WANG, S. H. HU, T. ZHAO, AND W. Z. YANG, *Doob's type inequality and strong law of large numbers for demimartingales*, Journal of Inequalities and Applications, **2010**, Article ID 838301, 11 pages.
- [28] X. J. WANG, S. H. HU, B. L. S. PRAKASA RAO, AND W. Z. YANG, *Maximal inequalities for N -demimartingale and strong law of large numbers*, Statistics & Probability Letters, **81** (2011), 1348–1353.
- [29] X. J. WANG, S. H. HU, W. Z. YANG, AND Y. SHEN, *Some new results for demimartingales*, Applied Mathematics-A Journal of Chinese Universities, **26B** (2011), 14–22.
- [30] X. J. WANG, S. H. HU, W. Z. YANG, AND Y. SHEN, *Hájek-Rényi-type inequalities and laws of large numbers for L_q -mixingale array*, Mathematical Inequalities & Application, **14** (2011), 621–632.
- [31] X. J. WANG, B. L. S. PRAKASA RAO, S. H. HU, AND W. Z. YANG, *On some maximal inequalities for demimartingales and N -demimartingales based on concave Young functions*, Journal of Mathematical Analysis and Applications, **396** (2012), 434–440.
- [32] T. E. WOOD, *Sample paths of demimartingales*, Probability Theory on Vector space III, Lecture notes in Mathematics, Volume 1080/1984, 365–373, DOI: 10.1007/BFb0099807. Springer-Verlag, New York, 1984.
- [33] T. E. WOOD, Ph. D. Thesis, University of Virginia, 1984.