# ON THE DISTRIBUTION OF THE TOTAL NUMBER OF RUN LENGTHS

## D. L. Antzoulakos, S. Bersimis* and M. V. Koutras*

*Department of Statistics and Insurance Science, University of Piraeus, Karaoli & Dimitriou 80, Piraeus 18534, Greece*

**Abstract.**   In the present paper, we study the distribution of a statistic utilizing the runs length of "reasonably long" series of alike elements (success runs) in a sequence of binary trials. More specifically, we are looking at the sum of exact lengths of subsequences (strings) consisting of $k$ or more consecutive successes ($k$ is a given positive integer). The investigation of the statistic of interest is accomplished by exploiting an appropriate generalization of the Markov chain embedding technique introduced by Fu and Koutras (1994, *J. Amer. Statist. Assoc.*, **89**, 1050–1058) and Koutras and Alexandrou (1995, *Ann. Inst. Statist. Math.*, **47**, 743–766). In addition, we explore the conditional distribution of the same statistic, given the number of successes and establish statistical tests for the detection of the null hypothesis of randomness versus the alternative hypothesis of systematic clustering of successes in a sequence of binary outcomes.

*Key words and phrases*:   Success runs, run lengths, Markov chains, Markov chain embeddable variable of polynomial type, randomness tests.

---