

From runs to weak runs: Generalizations of distributions of order k and applications

Spiros D. Dafnis

Department of Statistics and Actuarial – Financial Mathematics, University of the Aegean, Samos, Greece

During the last decades, a wide range of problems in several research areas has been modelled by classifying the experimental trials in two exclusive categories, considering sequences of binary trials (with values 0 or 1) and studying the sequences of outcomes. This study usually involves searching for great concentration of outcomes of a specific type. Such a concentration is traditionally measured by the enumeration of runs, i.e. uninterrupted sequences of k (k is a fixed positive integer) outcomes of one kind, say 1s (successes), a procedure which gives birth to 1-runs (success runs) of length k . Therefore, it is not surprising that run-related distributions, which are known as distributions of order k , have been extensively studied in the literature. However, the investigation of flexible tools capable of modelling real-life problems reveals that there are cases when a *success run* is of interest, even if any two consecutive successes can split with a maximum distance allowed between them (the metric of distance will be properly adapted to a sequence of binary trials). This idea gives rise to the concept of "weak runs", which has recently been introduced and generalizes the concept of runs. Discrete distributions related to weak runs are of interest both from a theoretical and a practical perspective.