

## FOREWORD

This special issue of *Revstat — Statistical Journal* presents selected papers on Risk Analysis, discussing recent developments, challenges and applications in several areas. For the development of Risk Analysis the year 1983 deserves a special notation as it was published that particular year the (i) British Royal Society Risk Assessment: Report of a Royal Society Study Group, Royal Society, London, and (ii) National Research Council, Risk assessment in the Federal Government: Managing the Process, National Academy Press, Washington, DC. At the first stage of Risk Assessment development, it was the typical way to work and study mainly human cancer risk (see Edler L., Kitsos, C.P (2005) for more than 1000 references listed mainly for Human Risk on Cancer). Still there are some particular differences between the Risk Assessment as it is developed in the European Union and the way United States defines it. The U.S Environmental Protection Agency (E.P.A) has published a number of valuable Guidelines for Carcinogen Risk Assessment since 1985. From that time until currently, the topic of Risk Analysis has been assisting an increasing popularity, offering many challenges in prudent Risk Assessment. The management of Risks to Human Health is based on two principles:

1. A Risk is accepted if it is sufficiently small to be considered in some way null or negligible known as the “de minimis principle”.
2. The Risk benefit balance principle: which implies that a Risk is accepted if the obtained benefit largely justifies its acceptance.

The terms *Risk and Hazard* need to be clarified, sometimes, before their use. Certainly are different and are adopted for different qualitative methods. Needless to say, Risk Analysis comprises a number of Life Sciences, as well as Chemistry (and therefore Environmental and Food Science Problems, and Industry). Recently Globalization is based to the rapid development of economics and communication. Therefore Management and Economics need a particular approach through Risk Analysis. But, it is clear to us that, all lines of thought under Risk Analysis need a strong Statistical background. We tried to serve this line of thought in this special issue of *Revstat — Statistical Journal* entitled “*Risk Analysis: Challenges and Applications*” and we hope it will stimulate and provide a huge interaction between researchers in several fields, once is clear that providing for minimizing risks is of general utmost importance.

In the first chapter, the Michaelis–Menten model (MM) is explored and this model is very well known for playing a very important role in pharmacokinetics. An analytical method for the nonlinear least squares estimation of the MM is introduced and it is proved that the MM model has not a unique parameter estimation, there is not a unique optimal experimental design and it might not have a unique D-optimal design. In chapter two, the authors study the impact of skewness on risk analysis by considering the product of two normally distributed variables. The moment generating function was obtained and several simulations were performed using software R. The paper focus an interesting topic that may have significant applications in several areas. Due to its prevalence and mortality,

a cancer diagnosis is one of the main fears of the general public. The discrimination of tissue for mammary cancer is an important topic, so the recent advances in this area are given in chapter three. The authors discuss statistical distributions of fractal dimensions for both mammary cancer and mastopathy and they conduct a multifractal analysis on the basis of a wavelet based approach. An interesting discussion was also provided with focus on alternative cancer therapy and cancer prevention. Credit scoring and credit risk are very important tools of financial risk management. In chapter four, the authors consider three different techniques applicable in the context of credit scoring when the event under study is rare and therefore we have to cope with unbalanced data. Practical application to balance sheets indicators of small and medium-sized enterprises and their legal status is given. Risk is a basic slogan of insurance and there is high importance to know how insurer can/may price a risk for which there is no history. In chapter five, the authors show which main mechanisms are needed to capture the tariff model of a related insurance minimizing the risk involved. Car insurance industry applications are presented. Ecological modelling and in particular water and hydrometric extremes are very important applications of statistical extremes theory. In chapter six authors present a readable survey on several tests and parameter estimation procedures available in recent literature. The application of these methods is provided to daily mean flow discharge rate values in the hydrometric station of Fragas da Torre in the river Paiva. The generalised extreme value (GEV) distribution is currently used to fit to environmental time series of extreme values, such as annual maxima and minima of temperatures. In the last, chapter seven, the authors present GEV distribution on a case study of temperature extremes in a mountainous area of Greece, emphasizing that searching through alternative distributions also adds an extra layer of uncertainty to the model selection procedure.

As it is testified by the articles in this special issue, the Applications are driving force for considering Risk Analysis as an integrated discipline in practically every scientific field. The particular Statistical background, covering the Risk Analysis approach, is that we try to improve in this volume.

We thank the *Revstat* that gave us such an opportunity, to collect selected papers in the Risk Analysis field and publish to an excellent journal. Our special thanks are addressed to Professor Ivette Gomes, editor-in-chief of *Revstat* — *Statistical Journal*, for her support.

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