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Editorial

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Risk has expanded rapidly over the last 10 to 20 years as an academic field, as an operational imperative of business and commerce and as one of the defining characteristics of modern society. It can be divided vertically into sectors: health, environment, finance, geopolitical, and many more, and it can be divided horizontally by the methodologies, from the softer methodologies of risk management to the hard mathematics of martingales and extreme value theory. The rise of risk research has rejuvenated several areas which have a claim to be have been first in risk studies particularly reliability, insurance and medical statistics. A “sociological” feature, common to emerging fields is that scientists with different methodological skills bring them to the kitchen: statisticians (of course), pure and applied mathematicians, control theorists, computer scientists, decision scientists, economists and so on. But, it is harder and harder, and probably patronising, to continue use such categories, given the rate at which the barriers between different fields are being dismantled. Risk is a team activity and one needs many kinds of experts. Moreover the reverse impact on those methodological fields is notably the prime example of which is the impact of financial risk on probability theory. A useful separation which is familiar from a number of the contributing disciplines is between “off-line” risk assessment and on-line, and therefore dynamic, risk monitoring and control. The later is very close to quality control and control engineering. Another familiar distinction is between multivariate and univariate processes.

A prime example of a successful methodology arises is Bayesian decision theory. It is as if the area was ideally designed for risk studies, when in fact its roots lie in the statistical decision theory and mathematical economics of the second half of the last century. It is ideal in two ways, it allows a combination of real data and subjective judgement and it has a

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coherent way of defining risk metrics based on expected loss and more recently stochastic orderings.

Two additional motivators must be added to the modern risk mix. First is the advent of, or at least a greater awareness of, large scale risks such as those from global warming and financial instability. Second is the expansion of regulation from the Basel II accord to the activities of the US Food and drug administration. Basel has rightly placed emphasis on *operational risk*, but it is useful to take a wide definition which includes both all aspects of risk and all sectors.

If this short analysis of the landscape of risk is accurate we can see where to place the papers in this volume and to have in mind the cross-fertilization between the applications area and the methodology. Cornalba is able to take the operational risk into a dynamic framework and follows a recent tradition of decision analysis applied to disease management. It is of growing importance to attach univariate and multivariate risk metrics to proper modelling of the multivariate distributions and dependence structure. Dalla Valle combines such an approach via copulas and Bayesian theory. Survival analysis, one the most successful areas of medical statistics has increasingly been used in reliability and finance and Fantazzini and Figini compares a classical logit regression approach to a nonparametric approach, with a flavour of modern statistical learning which has proved useful in data-mining. The role of risk metrics is played by various “financial ratios”.

Many studies rely on a mixture of mathematical analysis and simulation. This becomes important when the distributions and/or estimators are non-standard. Extreme value theory (EVT) covers some but not all of the theory and Ferrari and Paterlini show how to extend the analysis using simulation to study “tail-related” risk measures. Manzi and Mecatti, in using bootstrap methods are also essentially using a form of simulation which they consider necessary for complex survey data. Risk metrics take have reached something of a standard when based on the loss distribution approach (LDA) and can be seen as deriving from the classical risk=expected loss approach, but are versatile enough to cover tail losses and probabilities. The paper of Politou and Giudici employs Bayes nets and Markov random field and copulas and follows very much the data-modelling-decision paradigm which is a major contribution of modern statistics to risk theory.

In summary, we see that (1) several of the papers are driven by regulations which have a bearing on the risk metrics used and that these metrics are subject specific (2) the modelling favours Bayesian modelling and decision theory but there is scope for classical and non-parametric methods (3) the driving force is to understand and enhance operational risk (4) statistical modelling as opposed to probability theory is emphasised (5) there is pressure from the complex multi-valued nature of risk to concentrate more on multivariate dependences than univariate.