

Editorial

Special Issue “Risk, Ruin and Survival: Decision Making in Insurance and Finance”

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It has been six years since Editor-in-Chief [Steffensen \(2013\)](#) wrote in his editorial that “to *Risks* inclusiveness, inter-disciplinarity, and open-mindedness is the very starting point.” An one-liner of his editorial also stated that “[w]hat is complicated is not necessarily insightful and what is insightful is not necessarily complicated: *Risks* welcomes simple manuscripts that contribute with insight, outlook, understanding and overview.”

This philosophy has contributed immensely to *Risks* becoming one of the most interesting, enlightening, and inspiring journals dealing with various facets of risk. It was, therefore, most humbling and exciting to accept the invitation by *Risks* to organize a special issue, and we decided to cover three inevitable stages of our lives: taking risks, sometimes getting ruined, and hopefully surviving. Success along this path requires well thought out strategy and tactics, which involve measuring and modeling risks, selecting and testing decisions. These tasks benefit greatly from exploratory simulation studies and, needless to say, from well-tested ancient wisdom. As Master Sun ([Sun-tzu 2007](#)) said during the Warring States Period more than 2000 years ago,

He who knows the enemy and himself
Will never in a hundred battles be at risk;
He who does not know the enemy but knows himself
Will sometimes win and sometimes lose;
He who knows neither the enemy nor himself
Will be at risk in every battle. ([Sun-tzu 2007](#), p. 87)

We are blessed to have witnessed the immense interest that the Special Issue has generated, and we thank all the authors whose contributions have, or have not, been selected for this Issue, and we are of course grateful to all the referees for their effective and tireless work during the selection process.

We are indebted to the entire Editorial and Production Teams of *Risks* for making our work on the Issue as easy as one-two-three, but we would nevertheless be remiss if we did not especially mention Managing Editor Janine Li for her constant and frank advice that has guided our work.

We shall next introduce each of the ten papers, in the usual alphabetical order based on authorship, with the intent of generating enough interest among the *Risks* readership to look at the papers in depth and, in turn, to write up their thoughts and suggestions as follow-up contributions to *Risks*. To ensure the accuracy of each of the ten introductions, we have sought and received generous and much appreciated feedback from the authors.

[Dang \(2018\)](#):

Investors from different cultures exhibit different cognitive biases ([Afego 2018](#)). Behavioral pitfalls such as overreaction and herding are related to uncertainty avoidance and collectivism (embeddedness) dimensions, respectively ([Chang and Lin 2015](#); [Hofstede et al. 2010](#)). Empirical studies document the effects of culture values on investor sentiments and market mood, and the latter makes an impact on

credit ratings. President of the European Commission José Manuel Barroso remarked at the European Parliament in May 2010 that credit ratings are “too cyclical, too reliant on the general market mood rather than on fundamentals—regardless of whether market mood is too optimistic or too pessimistic.” The informal constraints that stem from culture have made an extensive impact on daily behavior, and this impact extends far beyond formal laws (North 1990). Culture directly influences managerial decision making, thereby indirectly influencing corporate risk taking (Li et al. 2013), capital structure (Chui et al. 2002), debt maturity (Zhen et al. 2012), cash management (Chang and Noorbakhsh 2009; Ramirez and Tadesse 2009), corporate investment (Shao et al. 2013), dividend policy (Bae et al. 2012; Fidrmuc and Jacob 2010; Shao et al. 2010), financial disclosures, financial report quality (Gray 1988; Hope 2003), and the degree of earnings management (Desender et al. 2011; Han et al. 2010). Guiso et al. (2016) further suggest that cultural differences between Germany and Greece hindered Greece’s negotiations to avoid a default. There is increasing recognition of the role that culture plays in corporate and sovereign credit risk. An interesting question that has not been addressed in the literature is whether and how culture affects changes in credit risk, specifically, in credit ratings. Dang (2018) offers a cross-disciplinary explanation of this phenomenon and establishes a link between culture and corporate rating migration. In particular, Dang (2018) shows that studying culture helps to enrich our understanding of credit rating decisions, which in turn can be helpful in developing predictive models of corporate rating changes across countries.

Greselin et al. (2019):

Quantile, also known as percentile and value-at-risk (VaR), is a fundamental quantity in many areas of research and practice. It is quite often thought to be an easy parameter to estimate, and this is indeed true in the sense that any quantile can easily be calculated from any data set. Deriving its confidence intervals, however, has turned out to be a Herculean task: obtaining limiting distributions require mathematically elegant (e.g., Beirlant et al. 2004; Csörgő 1983; De Haan and Ferreira 2006) but nevertheless practically-formidable assumptions; and resampling techniques (e.g., Shao and Tu 1995) designed to circumvent some of the difficulties quickly run into a host of challenges (e.g., Bickel and Sakov 2008). Yet, regulatory frameworks in insurance and banking require estimating pre-specified quantiles and then use them as risk measures. Attempts to utilize optimal, or nearly optimal, results derived by mathematical statisticians under optimal, or nearly optimal, assumptions quickly become disconcerting, due to the need to explain to the managers and shareholders, among others, why and when the assumptions hold. This is when decision-makers posit the formidable challenge to researchers to come up with practically-appreciable confidence intervals under practically-justifiable conditions. Obviously, “practically appreciable” does not necessarily mean asymptotically accurate—the definition of “practically appreciable” depends on managers, decision-makers, and others involved in making the company profitable, or at least safeguarding it from defaulting. It is this viewpoint that has guided the research of Greselin et al. (2019) on VaR in the context of operational risk (OpRisk) measurement.

Gribkova and Zitikis (2018):

The notion of systemic, also known as background, risk permeates various research areas: insurance, finance, engineering, system security, and so on. It is a multifaceted topic, with various methods and techniques available for detection, analysis, and decision making. Many engineering-related studies employ techniques in the frequency domain, while Gribkova and Zitikis (2018) pursue the task in the time domain. The latter paper is a part of the tetralogy by Gribkova and Zitikis (2018, 2019a, 2019b, 2019c) who develop a comprehensive classification and testing methodology for dealing with potential effects of systemic risk on systems at their input and/or output stages. The importance of such research is due to the fact, among other reasons, that even though the decision maker may be aware of the existence of systemic risk and would thus incorporate it into the statistical model, the decision maker cannot be sure that the resulting model complexity is really justified. Indeed, the effects of systemic risk on the system may be statistically insignificant, and thus a simpler and

more tractable model could be used. The aforementioned tetralogy offers a comprehensive resolution of the problem.

[Koch \(2019\)](#):

An accurate assessment of the risk of extreme environmental events is essential, *inter alia* for the (re)insurance industry, and this is increasingly so in the context of climate change. Although the theory of risk measures has been under development for a long time, the spatial and infinite-dimensional settings have essentially been tackled only since [Koch \(2017\)](#), where the author introduces a notion of spatial risk measure that explicitly considers the spatial region and the cost field generated by a specific hazard over the region. [Koch \(2017\)](#) also proposes a related set of axioms that describes how the spatial risk is expected to evolve with respect to spatial features of the region, such as its location and size. Results of this kind facilitate the quantification of a number of parameters of interest for (re)insurance companies, including the rate of spatial diversification. In the present research, [Koch \(2019\)](#) makes further advances in the development of the concept of spatial risk and corresponding axioms, and supplements them with in-depth explanations of their uses in actuarial science and practice. In the case of a general cost field, [Koch \(2019\)](#) specifies conditions that give the rate of spatial diversification for spatial risk measures linked with expectation, variance, Value-at-Risk (VaR) and Expected Shortfall (ES). These conditions are then refined when the cost field is a function of max-stable random fields, which are well suited for modeling spatial extremes and are thus beneficial in practice. Finally, in [Koch \(2017 2019\)](#), the dependence between the individual risks are fully characterized by means of the spatial dependence structure of the cost field. Note in this regard that the classical actuarial individual and collective risk models lack the localization of risks, thus making their dependence modeling somewhat arbitrary and possibly less reliable from the practical point of view.

[Li and Lu \(2018\)](#):

The aggregate discounted claims for insurance portfolios are the present values of the total amounts to be paid by the company up to a certain time in the future. They depend on the arrival times (frequency) and sizes (severity) of the claims, as well as on the forces of interest for discounting. The aggregate discounted claims may also be influenced by the background or environmental conditions; for example, weather or climate conditions may impact property and casualty insurance claims. Hence, it is important for the insurer to know various distributional characteristics (e.g., the average, variance, distribution, etc.) of the aggregate discounted claims, as they represent the insurer's future liabilities at present time. In light of this, [Li and Lu \(2018\)](#) study the distribution and moments of the aggregate discounted claims occurring in a cluster of states based on a Markovian arrival process in which the claim arrivals, claim amounts, and forces of interest are influenced by an underlying Markov process. They also examine the correlations of the aggregate discounted claims occurring under two different clusters of environmental conditions, or with two different time lengths. To illuminate the results, [Li and Lu \(2018\)](#) provide an illustrative numerical study based on a two-state Markov-modulated model.

[Liu et al. \(2018\)](#):

As illustrated by [Furman et al. \(2015\)](#), existing methods for measuring tail dependence may sometimes underestimate the true interdependence between extreme co-movements of risks. This might be disconcerting from the practical point of view, and has therefore given rise to the notion of maximum tail dependence (MTD). [Liu et al. \(2018\)](#) have adopted this notion in their real data based explorations of a portfolio selection problem initiated by [De Luca and Zuccolotto \(2011\)](#), who have proposed to cluster financial assets by tail dependence. In [Liu et al. \(2018\)](#), the tail dependence coefficient (TDC) used by [De Luca and Zuccolotto \(2011\)](#) is replaced by the MTD coefficient, and the corresponding techniques of clustering are developed and discussed. The obtained results suggest that

MTD-based portfolios outperform TDC-based portfolios on avoiding extremely low rates of return. The importance of this article is at least two-fold: it lends support to the MTD methodology from a practical perspective, and proposes a way to improve the performance of portfolios from the risk management perspective.

[Lkabous and Renaud \(2018\)](#):

In actuarial mathematics, the occupation time of an insurer's surplus process below a given threshold level is particularly critical when assessing the insurer's solvency risk (e.g., [Guérin and Renaud 2017](#); [Landriault et al. 2014](#)). Such problems are closely related to Parisian ruin models, under which insurers are granted a grace period to re-emerge above the threshold level before a ruin is deemed to occur. Naturally, therefore, [Guérin and Renaud \(2017\)](#) introduce the concept of cumulative Parisian ruin, which is based on the "time spent in the red" by the underlying surplus process. The time of the cumulative Parisian ruin is the first time the surplus process stays cumulatively below a critical level longer than the pre-determined grace period. Several dynamic risk measures, which are those based on ruin-theoretic quantities, have been studied by, e.g., [Trufin et al. \(2011\)](#), [Mitric and Trufin \(2016\)](#), and [Loisel and Trufin \(2014\)](#). These results have, in turn, motivated [Lkabous and Renaud \(2018\)](#) to explore a VaR-type risk measure based on the cumulative Parisian ruin for the classical risk model. In particular, they relate their measure to other ones that have appeared in the literature, and they also verify various properties of the measure. Finally, [Lkabous and Renaud \(2018\)](#) perform a sensitivity analysis of their risk measure in the case of a Cramér–Lundberg process with exponential claims.

[Loke and Thomann \(2018\)](#):

The dual risk model exemplifies the surplus process of a company that incurs expenses at a constant rate and earns random positive gains at random times. The model is also known as the "negative claims model" because it can be obtained by negating the signs of premiums and claims in the classical Cramér-Lundberg model. A great variety of applications have been tackled using this model. To illustrate, in life insurance and pensions (e.g., [Grandell 2012](#)), continuous payments are made by the company to the policyholder, and upon the death of the latter, the gross reserve becomes available to the company as a profit. Another example concerns companies that engage in research and discovery, such as petroleum or pharmaceutical companies (e.g., [Avanzi et al. 2007](#)), with random gains corresponding to, e.g., the discoveries of oil or the development of new patents, respectively. In greater generality, many subsequent risk models have also incorporated investments with constant force of interest, which could be, e.g., investments of the entire surplus in bonds, as earlier argued by [Segerdahl \(1942\)](#). These arguments have motivated [Loke and Thomann \(2018\)](#) to further explore the problems in detail, particularly from the view of practical implementation needs, such as speedy decision making for which numerical algorithms become indispensable. Hence, the authors have put forward and examined the performance of a numerical algorithm for tackling the ruin probability in the dual risk model with risk-free investments under arbitrary gain distributions. Crucially for the algorithm, the ruin probability has been shown to satisfy an integro-differential equation, which the authors subsequently discretized and reduced to a linear matrix equation. This has enabled [Loke and Thomann \(2018\)](#) to efficiently compute the ruin probability for any jump distribution. Furthermore, the authors have employed an analogous numerical method to tackle other Gerber–Shiu type functions, such as the Laplace transform of the time of ruin.

[Marri et al. \(2018\)](#):

The problem of risk aggregation for insurance portfolios has been extensively studied from various perspectives. For example, [Léveillé and Garrido \(2001a, 2001b\)](#) employ renewal theory to derive closed-form expressions for the first two moments of the discounted aggregate claims, and [Léveillé and Hamel \(2013\)](#) study aggregate discounted payments and the expense process for medical

malpractice insurance. As is the case with many pioneering studies, they have assumed that the inter-arrival times and the claim amounts are independent. Empirical observations have revealed, however, that a departure from independence would considerably increase the practical appeal of such studies. To illustrate, in non-life insurance, the same catastrophic event (e.g., a flood or an earthquake) may lead to frequent and high losses. Inspired by such observations, [Marri et al. \(2018\)](#) study discounted renewal aggregate claims under full dependence structure: they allow dependence among the inter-claim times, dependence among the claim sizes, and also dependence between the inter-claim times and the claim sizes.

[Semenikhine et al. \(2018\)](#):

Loss distributions have been a staple of actuarial studies for many years. When modeling losses, actuaries are particularly interested in distributions that are supported on the non-negative real half-line, have positive skewness, and allow for varying degrees of heavy-tailness. One of such distributions, arguably the most prominent one in insurance applications, is the gamma distribution. When insurance losses arise from multiple business lines and need to be considered jointly due to their interdependence, multivariate extensions of the gamma distribution are naturally called upon. Although there are numerous multivariate gamma models in the literature, real data-driven applications impose significant constraints on the model choice. In particular, practitioners often wish to work with multivariate distributions that (i) admit meaningful and relevant interpretations, (ii) allow for adequate fits (marginally or jointly) to a wide range of multivariate data, (iii) possess desirable distributional properties for insurance valuation and risk management, and (iv) can be readily implemented. The multivariate gamma family proposed by [Semenikhine et al. \(2018\)](#) is exactly such. Although the family is exceptionally general, the authors have succeeded in thoroughly exploring its properties. In particular, [Semenikhine et al. \(2018\)](#) have linked the family to the multiplicative background risk model, derived an explicit formula for the distribution of the aggregate risk, specified the corresponding copula function, and determined measures of nonlinear correlation, including the index of maximal tail dependence ([Furman et al. 2015](#)).

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