Recent Research Developments Affecting Non-Life Insurance - The CAS Risk Premium Project 2016 Update

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Abstract

This article reports the results of the CAS Risk Premium Project 2016 update. It reviews the research conducted in 2016 on non-life insurance risk. The authors of this report (Eling and Schnell) find that research is concentrated in the fields of emerging risks, reserving, new risk measures, and reinsurance. The new risks discussed are cyber risk, climate change, and insurance for self-drifting cars. A longitudinal topic concerning all categories was the distortion risk measures. It is proposed for several applications due to its advantage of describing risk attitude of the decision maker more adequately. For example, several papers derive the optimal reinsurance policy by minimizing a distortion risk measure.

Keywords

Property-Casualty Insurance, Reinsurance, Cyber Risk, Index-based Insurance, Systematic Risk, Climate Change, Distortion Risk Measures

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Background

This paper is the sixth annual update of the Causality Actuarial Society (CAS) Risk Premium Project (RPP), and its accompanying database, the Risk Assessment Database (RAD). RPP's goal is to structure and summarize the theoretical and empirical research developments in non-life risk assessment. RPP was initiated by the CAS Theory of Risk Committee (COTOR) with the RPP I Report that reviewed actuarial and finance literature between 1990 and 1999 (Cummins, Phillips, Butsic, and Derrig, 2000). Then the project continued with the RPP II Report that reviewed actuarial science, risk management, and the insurance literature between 2000 and 2010 (Eling and Schmeiser, 2010). Because the RPP received a lot of attention, the CAS COTOR decided to undertake updates annually. On these grounds five annual updates have been conducted since 2011 (Eling, 2013; Biener and Eling, 2013; Biener, Eling, and Pradhan, 2015; Eling and Jia, 2016; Eling, Jia, and Schnell, 2017). All the update reports and the RPP database containing the references can be found on http://www.casact.org/research/rad/.

The current update was conducted between December 2016 and March 2017. Following the literature search strategy suggested by Eling and Schmeiser (2010) a total of 106 papers were identified. Eling and Schnell focus on research published in academic journals in the fields of actuarial science, risk management, and insurance, but also consider related fields (e.g. finance and economics). Then they use the same categories as specified in the RPP II Report (Eling and Schmeiser, 2010) in order to classify the papers. Finally, they evaluate, consolidate, and summarize the new findings in this update report in order to derive the main research developments in 2016. Comments from CAS and COTOR members were also integrated in this update.

In the following, Eling and Schnell first present some statistics about the reviewed literature and then we highlight the most important research developments in 2016 for each thematic category and subcategory. The structure follows the classical risk management process risk identification, risk valuation, and risk management. The paper concludes by summarizing the findings and deriving suggestions for new research initiatives.

Results

Following the classical risk assessment process, three top-level categories are risk identification, risk valuation, and risk management. These categories are then further subdivided into 11 subcategories. Table 1 provides an overview of the number of papers added for each thematic categories for PRR II, updates for 2011-2015, and in the current update. Note that a paper may cover several aspects simultaneously and thus might qualify for more than one category. In this case we allocate the paper into its closest thematic category.

Table 1 Thematic Categories and Number of Papers Added

Thematic Category	Number of Papers Added		
	2016 Update	2011-2015 Updates	2010 RPP II
Panel A: Risk Identification	34	111	225
Operational Risk	7	24	31
Catastrophe Risk	5	33	102
Other Emerging Risks (e.g. Systemic Risk)	22	54	92
Panel B: Risk Valuation	47	243	547
CAPM / Asset Pricing	4	33	134
Insurance Risk	20	98	44
New Valuation Techniques	8	41	114
New Risk Measures (e.g. Tail Value at Risk)	7	43	217
Behavioral insurance	8	28	38
Panel C: Risk Management	25	113	178
Surplus / Capital Allocation	3	23	71
Risk Control	6	22	60
Reinsurance and Alternative Risk Transfer	17	68	47
Total	106	467	950

Overall, 106 new papers are added during the 2016 update with the risk valuation category receiving the most (47 new papers), followed by identification category (34 new papers) and finally risk management category (25 new papers). The distribution for the main categories did not change much compared to the update 2011-2015 and RPP II. However, the distribution between subcategories has changed over time significantly. The growth of literature in other emerging risk, insurance risk, and reinsurance and alternative risk transfer is disproportionally strong. This distribution can be partly explained by the fact that the journal *Insurance: Mathematic and Economics* contributing most articles to our review, tends to emphasizes those subcategories. The number of contribution per journal for each of the three top-level categories are summarized in the Appendix. They acknowledge that a certain subjectivity when selecting publications is unavoidable although they tried to be as objective as possible. Further recommendations for additions to the list are highly appreciated and can be made on http://www.casact.org/research/rad/.

Risk Identification

The first step of a sound risk management process is usually the identification of the different risk exposures. As in RPP II, Eling and Schnell focus on the new research conducted for operational risk, catastrophe risk, and other emerging risks. The category emerging risk has become the most important one because of the contributions for the topics systemic risk, microinsurance, and especially cyber risk.

Operational risk. Several papers aim at improving the modeling methodology for operational risk also called the loss distribution approach (LDA). This mixes two different distributions for the frequency and severity. A frequently encountered problem with operational risk data is that no data are reported below a certain level. While in general the maximum likelihood estimation (MLE) of a severity distribution on truncated data does not yield a solution, Ergashev, Pavlikov, Uryasev, and Sekeris (2016) analyze and define the necessary conditions for computationally feasible solutions. They model the LDA with a Poisson distribution for the frequency and the lognormal distribution for the severity. Larsen (2016) also looks at the difficulties of MLE estimation for operational risk in the presence of extreme values. Since the MLE asymptotic properties do not hold for the small samples of extreme values, he analyze under what condition asymptotic properties hold and quantifies the estimation error of the distribution parameters. Another approach to build a more sophisticated LDA is proposed by Stahl (2016). He generalizes the LDA in an analytical way by including auto-correlation in the frequency distribution and correlation between the frequency and severity distribution. He conclude that the VaR on a 99.9% would be more than 55% higher when correlation is considered then if it is not. Tursunalieva and Silvapulle (2016) argue that the frequently used extreme value distributions (e.g. Pareto, g, and h) in the POT approach are not suitable for modeling heavy tails and calculating high quantiles. Instead they suggest a method to calculate the operational value at risk (VaR) in a nonparametric fashion that produces more reliable estimates. More specifically, their estimated VaR and capital requirements are in general higher than with the POT approach and empirical quantiles. To conclude, theoretical modeling dominates empirical analysis at the moments.

Catastrophe risk. Some paper contribute to the field of catastrophe risk by improving the modeling. While sophisticated models for property catastrophic risk already exist, D'Arcy (2016) identifies the need for improved approaches for casualty catastrophic risk. Difficulties in modeling, the lack of data, and psychological reasons are the reasons according to the author for the underdeveloped models. D'Arcy (2016) recommends that the regulator should

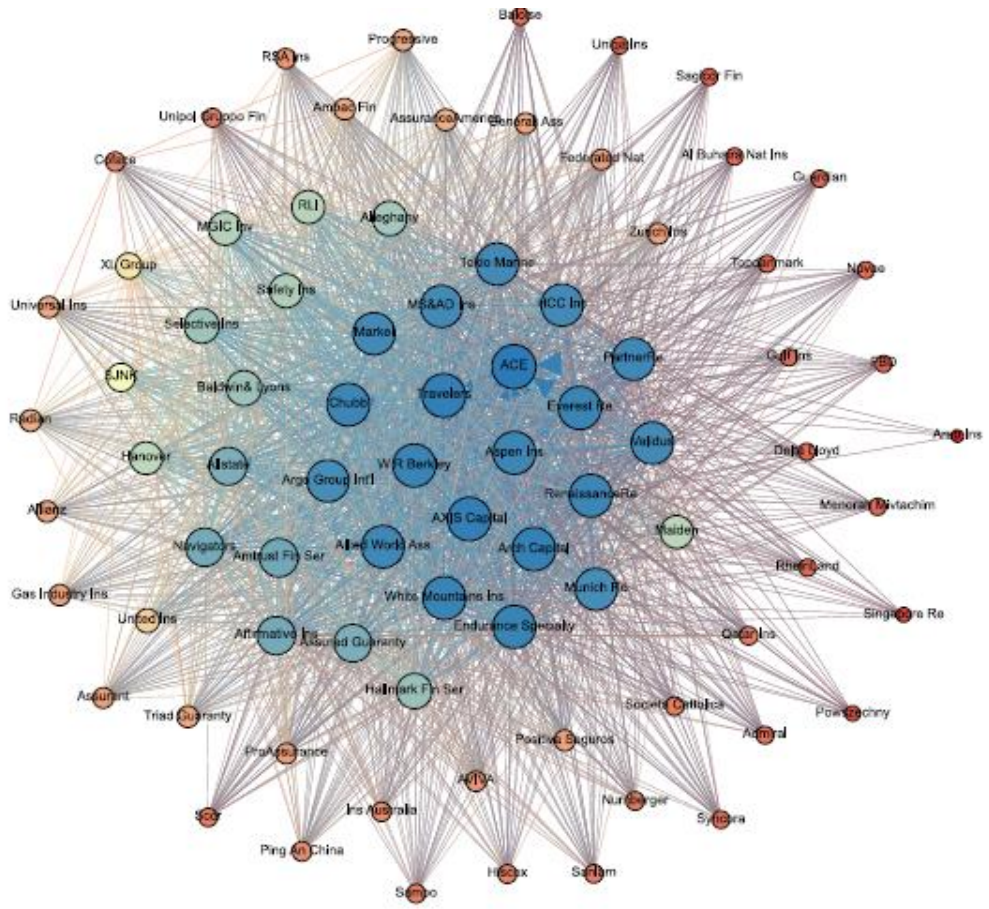
force the insurers to calculate their causality exposure and suggests that the rating agencies put pressure on the insurers. Moreover, reporting requirements might improve the availability of data. A concrete contribution on modelling catastrophic risk is provided by Li, Tang, and Jiang (2016). Usually catastrophe risks are modeled by the peak over threshold approach (POT) that uses a threshold separating between extreme and normal loses. While usually the threshold is fixed a priori, maybe graphically, Li, Tang, and Jiang (2016) propose a procedure that estimates the threshold simultaneously with the other distribution parameters (Bayesian approach). This enables the optimal threshold to be chosen more objectively and provides a better fit. Li et al. (2016) apply their mixture models to earthquake losses of Yunnan and find that their models performs reasonably well.

Other emerging risk. Three types of emerging risk caught our attention: reputational risk insurance, insurance for self-driving cars, and index-based insurance. At first, reputational risk is becoming increasingly important according to Gatzert, Schmit, and Kolb (2016). They see the social media, scrutiny of the regulator, and the reputation's impact on the company value as key drivers for this development. Gatzert et al. (2016) also identify the challenges to be overcome before the market can grow. Secondly, a new, even speculative, type of risk is expected to emerge from the insurance of self-driving cars. Seizing the opportunity, McChristian and Corbett (2016) already took a look at the regulatory aspects of such kind of insurance products. Thirdly, two studies contribute to the field of index-based weather insurance. Jangle, Mehra, and Dror (2016) propose a new nonlinear multivariate index that depends on several climatic and non-climatic parameters. The authors apply their index to data on wheat farmers in India and find that it describes the real losses better than the simpler classical indexes that consider only one parameter. Moreover, due to the index composition, they are also able to distinguish between losses caused by climate change and others. The effects of climate changes on crop yield is also analyzed by Choudhury, Jones, Okine, and Choudhury (2016). They find that much of the variation in crop yield in Ghana is indeed explained by the climate change. This needs to be taken into account when modeling and pricing agriculture insurance.

Due to its importance for the category emerging risks we define a subcategory systematic risk. A comprehensive review on the systemic risk literature for the insurance industry is provided by Eling and Pankoke (2016). They conclude that the classical insurance activity does neither contribute to systemic risk nor increase the insurers' vulnerability to systemic risk. However, some nontraditional activities (e.g. underwriting financial derivatives and providing financial guarantees) could potentially cause systemic risk and vulnerability to systemic risk. Kanno

(2016) comes to a similar conclusion. In his analysis he uses a network model to analyze the systemic risk cause by the reinsurance industry (See Figure 1). He finds that only few reinsurers could be critical due to their centrality and that the global reinsurance market generally does not expose the non-life insurance market to systemic risk. The theoretical number of contagious defaults for the non-life-insurance market is estimated by the author to be one for the period between 2006 and 2013 (compared to 5 for the global banking system).

Figure 1 Reinsurance Network



Note: Global reinsurance network where the diameter of the circle is proportional to the node's interconnectedness (Kanno, 2016).

Microinsurance is another frequently discussed emerging risk and the *Geneva Papers* even published a special issue about that topic in 2016. In this special issue they conclude that the research in microinsurance is in transition from a descriptive to an analytical approach that relies more heavily on modeling techniques (Dror, 2016). A lot of research has been aimed to tackle the puzzling observation that the microinsurance market does not develop as expected. Liu and Myers (2016) provide a possible explanation. They show that including in a model the possibility of an insurer's default and agents with liquidity constraints no microinsurance is bought. However, the authors also provide a solution and show that when the agents were

given the opportunity to postpone the premium payment to the end of the insured period the demand for microinsurance would raise.

Another frequently discussed emerging risk is cyber risk. The recent contribution and findings are summarized in Eling and Schnell (2016). The authors emphasize the challenges associated with cyber risk and cyber insurance such as the lack of data and difficulties in modeling of cyber risk. They also propose measures aimed at fostering the development of a cyber insurance market. Improving the modeling of cyber risk is where Wheatley, Maillart, and Sornette (2016) contribute. In analyzing data breaches, they find that the losses are orchestrated by a heavy tailed distribution (Pareto) meaning that extremely large losses are not an exception (see, also, Edwards, Hofmeyr, and Forrest, 2016). Moreover the authors also project that the number of data breached will double from two to four billion items in the next five years and warn that the accumulation of breached data in the hands of criminals will erode people's privacy.

Risk Valuation

In the category risk valuation the authors summarize papers quantifying and modeling the risks faced by insurers. They classify the papers in four subcategories that are CAPM / asset pricing, insurance risk, new valuation techniques (e.g. regulatory models), new risk measures, and behavioral insurance.

CAPM / Asset Pricing. Climate change is not only discussed with respect to insurance demand and pricing (see "other emerging risk") but also with respect to possible effect on the insurers' market value. The question whether insurers lose due to higher claims or whether they gain due to an increased insurance demand is analyzed by Hu and McKitrick (2016). They find that temporary climate deviations are likely to have a small beneficial effect on the insurers' market value and extreme weather in the past did not hurt the insurance industry. Other contributions aim at improving the models for asset pricing relevant for the insurer's asset side. For example, Albuquerque, Eichenbaum, Luo, and Rebelo (2016) propose some changes in the classical asset pricing model that are able to improve its performance and to solve the some of the tedious asset pricing puzzles (e.g. equity premium, bond term, and correlation puzzle). Dependency structures between assets and their effect on the risk models are analyzed by Li and Li (2016).

Insurance risk. In non-life insurance the total clams are frequently modeled as a mixture of severity and frequency called the loss distribution approach (LDA). Garrido, Genest, and Schulz (2016) extend the classical LDA where they allow the frequency and severity

parameters not only to depend on rating variables but also to influence each other. They apply the model to Canadian car insurance and recommend their model for data with strongly correlated claim counts and amounts. Models for the frequency are analyzed by Asamoah (2016). A lion's share of insurance risk valuation literature focuses on modeling the loss distribution. One issues of interest is the uncertainty in estimating parameters of distributions. Bignozzi and Tsanakas (2016) analyze how the parameter uncertainty in the estimated distributions can affect the risk measures, such as VaR and TVaR, and their distributions. They propose that the regulator should charge the insurers an additional capital buffer for parameter uncertainty calculated according to their alternative estimation procedure (based on Bayesian predictor and parametric bootstrapping estimation).

Besides modeling distributions, claims reserving also attracted quit a lot of attention. Improving the classical deterministic chain-ladder method, Diers, Linde, and Hahn (2016) extend the chain-ladder method to the multi-year case and derive an analytical solution. An alternative reserving approach is provided by Badescu, Lin, and Tang (2016). The authors set out to predict stochastic claim arrival process more accurately and therefore facilitate the reserving for incurred but not reported (IBNR) claims. Using a Cox process that includes additional factors like autocorrelation in the claims occurrence, and environmental variations, they greatly improves the model's accuracy and prediction performance. Bohnert, Gatzert, and Kolb (2016) also suggests an improvement of the classical chain-ladder approach by analyzing the effect inflation has on claim reserving. Using a non-life claim data (car insurance) they analyze the effect inflation has on the claim reserving especially for long-tail business.

New valuation techniques. In this category the authors also look at regulatory models such as Solvency II. An evaluation of the efficiency of the current Solvency II framework (as of 2016) is conducted by Doff (2016). He comes to the conclusion that while Solvency II fulfills the overall goals of efficient regulations, there is still room for improvement. The author recommends to complement the current framework with stress testing that could potentially contain risk factors not included so far. Such neglected risk are government bonds, inflation risk, and liquidity risk. In a more specific way Solvency II is analyzed by Cerchiara and Demarco (2016). Besides using the standard and internal model, Solvency II also allows for a way in between called the standard formula with undertaking specified parameters (USP). Cerchiara and Demarco (2016) describe the data and methodologies required to adapt those parameters to the company specific risk profile. Moreover, their empirical analysis indicates opting for USP could reduce capital requirements.

New risk measures. A class of risk measures frequently discussed and appreciated are the broad class of distortion risk measures (VaR, TVaR, and GlueVaR are special cases). A rather theoretical contribution on distortion risk measures is provided by Belles-Sampera, Guillen, and Santolino, (2016). They analyze and describe the risk attitude implicitly contained in risk measures. Their characterization of the risk attitude implied in distortion measures facilitates the selection of more adequate risk measures. Moreover, it is suggest that GlueVaR should be preferred to the VaR since it can incorporate more complex risk attitudes. Also aiming to incorporate more complex and realistic risk attitudes Sordo, Castaño-Martínez, and Pigueiras (2016) apply the same distortion risk measure to the calculation of premiums (distortion premium principle). This allows that the calculated premiums reflect different risk aversion. A completely new risk measure is defined by Pitselis (2016). The author suggests that instead of calculating risk measures for each individual risk independently, credibility theory that combines individual with collective risk experience should be applied. In this manner he defines new measures such as credible (Cr) VaR, CrTVaR, and others.

Behavioral insurance. The special issue about behavioral insurance published by the *Journal of Risk and Insurance* emphasizes the importance of this topic. The first two papers taken from this special issue build on the currently most prominent behavioral model the prospect theory. It tries to describe puzzles in insurance markets that cannot be described by the classical expected utility theory. Schmidt (2016) for example use the prospect theory to explain the phenomenon that people tend to underinsure low probability high loss events (e.g. disaster insurance) and overinsure moderate risks. Put it differently, people are known not to buy subsidized (premium below fair value) insurance for low probability but buy overpriced insurance for moderate risks. This finding indeed is confirmed by another contribution in 2016 by Hansen, Jacobsen, and Lau (2016). They provide empirical evidence that for car and house insurance in Denmark people are willing to pay higher premium than suggested by the expected utility theory. As Schmidt (2016) shows the interplay of loss aversion and risk aversion is relevant for such observations. A thorough analysis of the loss aversion is conducted by Abdellaoui, Bleichrodt, L'haridon, and Van Dolder (2016). However, while most results for the prospect theory has been obtained assuming decisions under risk (known probabilities), they set out to validate the prospect theory in an empirical setting under ambiguity (probabilities of outcomes are unknown). Quite similar than for decision under risks, they find that the utility function is concave for gains, convex for losses, and the loss aversion is substantial.

Risk Management

In the following, Eling and Schnell discuss three subcategories of risk management that are capital allocation, risk control, and reinsurance as well as alternative risk transfer (ART).

Capital allocation. The numbers of capital allocation rules have been extended by some new approaches. Xu (2015) for example proposes a new capital allocation principle for multivariate risks (such as different line of business) that is based on the tail mean-variance. He emphasizes the intriguing property such a risk measure has as it captures both the magnitude and variability of the tail losses. Moreover, this capital allocation rule penalizes large losses and positive dependence and reflects tail risk levels.

Risk control. In contrast to the 2015 report Eling and Schnell do not register any paper about asymmetric information in this category. But several measures have been discussed for mitigating the risks insurers face. One such approach is to reduce insurance fraud by thoroughly auditing the incoming claims. Müller, Schmeiser, and Wagner (2016) analyze the tradeoff between the costs of claim verification and the savings from detecting fraud. The optimal auditing strategy is described as an auditing range that selects mid-sized claim amounts. The authors assume that below the lower bound the auditing costs exceeds the benefit of detecting fraud and above the upper bound there should be no fraudulence claims because exaggerating claims to much would increase the probability for the policyholder of getting caught. Indeed preventing insurance fraud and therefore reducing claim amounts is according to the survey conducted by Mahlow and Wagner (2016) among Swiss and German insurers of highest priority. Even if it means neglecting other important measures in claim management such as reducing claim administration costs. Another approach for managing insurance risk has been proposed by Porth, Boyd, and Pai (2016). Since crop insurance tends to be highly correlated in the same local regions due to similar weather conditions, they suggest to use insurance pools with broader geographical diversification. Additionally they show in a simulation that combining this broad risk pool with selective reinsurance increase the diversification efficiency.

Reinsurance and alternative risk transfer (ART). Similar to last year this category received a lot of attention. Several papers take a closer look at reinsurances as a means for managing underwriting risk. Eight contributions analyse the optimal insurance decision and four optimize some risk measures in order to find the optimal reinsurance policy. For example, Lu, Meng, Wang, and Shen (2016) model the optimal insurance demand as the minimization of the value at risk (VaR) and the tail value at risk (TVaR) of the insurer's position under consideration of coverage limits of the reinsurer. The finding is that under this more realistic

assumptions the optimal excess-of-loss reinsurance contract is a robust result (risk measures are always lower for excess-of-loss than proportional contracts). Extending the optimal insurance strategy under VaR and conditional value at risk (CVaR) criteria to a dynamic setting is presented by Zhang, Jin, Li, and Chen (2016). Their model allows the regulator or the insurer's risk management to reevaluate the risk exposure and the reinsurance strategy at any time for any time interval (years, month, weeks or even days). The authors also shows that if the insurer adapts its reinsurance strategy more frequently, its default probability decreases. This results for the optimal reinsurance policy by minimizing VaR and CVaR are generalized for the very broader class of distortion risk measures by Zhuang, Weng, Tan, and Assa (2016). Moreover, Cai, Lemieux, and Liu (2016) extend the analysis by minimizing the VaR for the insurer and reinsurer simultaneously and thus find a reinsurance contract that is beneficial for both the insurer and reinsurer.

Reinsurance is also analyzed from an empirical point of view. For example, Shiu (2016)'s empirical analysis of a U.K. non-life insurer data reveals that buying reinsurance and derivatives are to some extend substitutes. Meaning that the manager is concerned about the insurer's overall risk exposure and, therefore, hedging can either be done with derivative for the investment risk or with reinsurance for the underwriting risk. In a similar manner, empirical analysis of data on U.S. non-life insurers shows that capital holding and reinsurance serve also substitutes (Mankaï and Belgacem, 2016).

In the category alternative risk transfer (ART) the catastrophic (CAT) bonds receive most attention. Gürtler, Hibbeln, and Winkelvos (2016) find evidence that premiums for CAT bonds are affected by the financial crisis and Hurricane Katrina. Since the premiums increase significantly after the hurricane the author concludes that the perceived likelihood for such an invent increases posterior. The positive correlation of CAT bond premiums and the financial crises does suggest that CAT bonds do not provide the diversification opportunity for financial investments hoped for after all. Moreover, they even find evidence that the correlation of CAT bonds and financial market increased after financial crises and that the diversification gets even worse when needed most. Another type of ART frequently discussed in the resent literature are weather derivatives. Ito, Ai, and Ozawa (2016) are to our knowledge the first ones to investigate the potential of hedging the weather risk eminent in the sport industry (low attendance, loss of sponsorship) with weather derivatives. They find that hedging with weather derivatives can increase the sport team's value and therefore, they suggest to foster the development of weather derivatives markets.

Conclusions

Eling and Schnell's review on the risk in non-life insurance business literature in 2016 showed the full scope of research effort in this area. Note that they tried to be as objective as possible and seek a good balance between the weight of actuarial science works and risk management and insurance works.

In general this year's review was dominated by rather theoretical contributions then empirical analysis. They find that research is concentrated in the fields of risk emerging risks, reserving, and reinsurance. In comparison to the 2015 update they did not register any paper on adverse selection or moral hazard and the contribution in this area has been exceptionally low. New risks discussed are cyber risk, climate change, and self-drifting cars. Climate change is frequently discussed in association with microinsurance because it seems that farmers in poor countries suffer the most. While cyber risk seems to be an important topic, the topic has been analyzed mainly from a computer science perspective and results applicable in insurance theory remain rare. For reserving several improvements to the classical chain ladder approach have been put forward such as more dynamic models. Then the optimal reinsurance policy has been a major topic in this year's report. For example, several papers derive the optimal reinsurance policy when minimizing a distortion risk measure. Anyway, distortion risk measures have been a longitudinal topic concerning a lot of subcategories. For example, other contributions suggest to use distortion measure in risk management and in the behavior insurance models. This new risk measures is aimed at describing the risk attitude of the decision maker more adequately since they allow to include risk preferences.

This review also shows new area of research that deserves further attention. For example it remains still a question why the market for alternative risk transfer products has not developed as expected. Moreover, the effectiveness and consequences of the new regulatory frameworks such as Solvency II and RBC need to be evaluated even further. New initiatives should also be aimed at improving the understanding of emerging risks like cyber risk, reputational risk, and climate change and on how to model and price such kind of risks. However, for understanding new kind of risk the limiting factor is usually the quality and availability of data. Cooperation on data exchange would frequently facilitate the researcher's job significantly. In general some theoretical models reviewed should be empirically validated and bridged to the actuarial practice in future research.

Appendix Source Journals by Topic Categories[1]

Panel A: Risk Identification	34
Insurance: Mathematics and Economics	4
The Geneva Papers on Risk and Insurance - Issues and Practice	4
Journal of Risk and Insurance	4
Journal of Operational Risk	3
Journal of Insurance Issues	2
Journal of Cybersecurity	2
Journal of Insurance Regulation	2
Risk Management	1
The Geneva Risk and Insurance Review	1
I-VW HSG Schriftenreihe	1
Risk Management and Insurance Review	1
The European Physical Journal B	1
The Geneva Association	1
International Journal of Critical Infrastructure Protection	1
The North American Actuarial Journal	1
The Journal of Risk Finance	1
Variance	1
Risk Management	1
ASTIN Bulletin: The Journal of the IAA	1
Risk Management	1
Panel B: Risk Valuation	47
Insurance: Mathematics and Economics	17
ASTIN Bulletin: The Journal of the IAA	5
Journal of Risk and Insurance	4
Scandinavian Actuarial Journal	4
European Actuarial Journal	3
Journal of Insurance Issues	2
The North American Actuarial Journal	2
Journal of Risk and Uncertainty	2
The Review of Economics and Statistics	1
Asia-Pacific Journal of Risk and Insurance	1
The Geneva Papers on Risk and Insurance - Issues and Practice	1
Variance	2
The Geneva Risk and Insurance Review	1
European Journal of Operational Research	1
The Journal of Finance	1
Panel C: Risk Management	25
Insurance: Mathematics and Economics	10
Journal of Risk and Insurance	3
European Actuarial Journal	2
The Geneva Papers on Risk and Insurance - Issues and Practice	2
Risk Management and Insurance Review	2
The Geneva Risk and Insurance Review	1
Variance	1
The Journal of Risk Finance	1
ASTIN Bulletin: The Journal of the IAA	1
Asia-Pacific Journal of Risk and Insurance	1
Journal of Insurance Issues	1
Total	**106**

[1] Not all papers updated in the database are discussed in this report. Therefore, the journals' frequencies in this table and in this paper's reference list might be different.

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