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Report on the CAS COTOR Risk Premium Project Update

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THE RISK PREMIUM PROJECT (RPP) REPRESENTS AN EXTENSIVE ANALYSIS OF THE THEORY AND EMPIRICS OF RISK ASSESSMENT IN PROPERTY-CASUALTY INSURANCE.

The project was initiated by the Committee on Theory of Risk (COTOR) of the Casualty Actuarial Society (CAS) and began in 2000 with RPP I, a review of the actuarial and finance research done to that date. Given the vast development of research both in finance and actu-

arial science, the aim of RPP II was to extend the findings from RPP I with research done in the last decade.

Furthermore, challenges for future research shall be identified. The research on RPP II was undertaken from June to November 2010 and CAS members were involved in the process via an online questionnaire. The following article provides some background on the Risk Premium Project and highlights some key results. We also list

some references to further information, especially a database available at <http://www.casact.org/rpp2/>.

The findings from this research are also of interest for members of the Society of Actuaries and the Canadian Institute of Actuaries. A number of new research topics are addressed that are of relevance both in the life and the non-life sector. Among these topics are operational risk, new emerging risks, insurance pricing, new risk measures, capital allocation, risk control and alternative risk transfer, among others. This article also represents an update article of an older article published in this newsletter (see Cummins, Derrig, and Phillips, 2007).

BACKGROUND AND DEVELOPMENT OF THE RISK PREMIUM PROJECT

The RPP was initiated in 1999 with a call for research by COTOR. During that time the appropriate procedure to account for risk in discounted loss reserves has been subject of much research and discussion in the actuarial profession. COTOR's intention was to develop a document integrating the various approaches presented in literature in order to provide guidance, e.g., for actuaries and regulators. Furthermore, COTOR wanted to advance the state of the art in risk assessment by identifying and working on open empirical research questions on the discounting of loss reserves.

A first document summarizing the state of research on risk adjustments for discounting liabilities in property-liability insurance was published in 2000 (see Cummins et al., 2000; the RPP I report). This report widened the original focus on risk adjustments for discounting liabilities to other advances in risk assessment and capital allocation techniques. Based upon the presented findings, two empirical research papers were sponsored by COTOR: Cummins and Phillips (2005) analyze the costs of equity capital for insurers by line of insurance and Cummins, Lin, and Phillips (2009) regress insurance price variables on capital allocations by line, measures of insurer insolvency risk, and other risk and control variables.

The results of these two empirical studies and other recent articles (see, e.g., Cummins, Derrig, and Phillips, 2007) made it clear that literature on risk assessment for property-casualty insurance is evolving rapidly. In fact, the modeling and management of risk has seen significant new developments over the last ten years, with a substantial number of academic research papers published on topics such as risk mitigation, risk and solvency measurement, capital allocation, risk management tools, or valuation techniques. Noteworthy is as well the development of behavioral insurance, new valuation techniques (e.g., market consistent embedded value), new regulatory models (e.g., Solvency II, Swiss Solvency Test), and analysis of emerging risks, especially in the field of operational risks. Furthermore, enterprise risk management, an integrated and holistic



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view on risk and risk management, has become an accepted and widespread concept in the profession.

AIMS OF THE RPP UPDATE

All these developments motivated COTOR in 2010 to renew its call for research. The goals of the Risk Premium Project Update (RPP II) is thus to revise the findings of the first Risk Premium Project. Specifically, three goals were defined by COTOR:

An update of the bibliography from Phase I of RPP I with additional papers and research done since 2000, incorporating literature from reinsurance, risk management, and catastrophe sources.

A revision of the key conclusions included in Phase II of RPP I in light of additional literature and results of the two empirical studies funded by COTOR (Cummins and Phillips, 2005; Cummins, Lin, and Phillips, 2009). The recommendation of additional empirical studies to enhance the understanding of the current theories and to quantify particular aspects, update, and provide alternatives to recent models.

For RPP II it was important to recognize that the literature has seen an impressive increase in the number of topics, papers, and journals. In addition, strategies for literature search as well as means of communication among researchers have completely changed over the last decade. The search and evaluation strategy used for RPP II incorporates these changes. For example, an online questionnaire to collect feedback on recent developments from interested colleagues in academia and practice was included.

KEY RESULTS

The RPP II literature review covers 961 references. The opinions of 51 colleagues from academia and practice were incorporated into the review. As a brief summary of the main results, we find that actuarial and financial views of how to price risk are still converging, but additional factors have incorporated into the discussion such as new risk measures, new valuation techniques, behavioral aspects, or emerging risks. In the aftermath of the financial crisis, systemic risk, liquidity risks, and

implications from the crisis are discussed. Throughout RPP II five conclusions from RPP I are revised and five new conclusions are added. Furthermore, five areas for future research are identified.

REVISION OF KEY CONCLUSIONS FROM RPP I

1. Financial vs. actuarial approaches: There is an ongoing consolidation between financial and actuarial literature with regard to pricing of insurance contracts. Both fields acknowledge the role of systematic and non-systematic risk in the pricing of insurance contracts.
2. Fair value of the insurance premium: Theoretical models and empirical tests have confirmed that given the real-world market imperfections, the price of insurance should be a function of the (1) expected cash flow with adjustments for systematic risk, (2) production costs (i.e. expenses), (3) default risk, and (4) frictional capital costs. By-line adjustments should be integrated depending on the cash flow pattern of the liabilities.
3. General finance: The single beta CAPM cannot adequately price financial contracts. Asset pricing models were systematically expanded to account for new aspects (e.g., liquidity risk or behavioral aspects). Empirical validation is ongoing. All these aspects are of high relevance for the insurance industry, but have not yet been investigated in an insurance context.
4. Capital allocation: Capital allocation is still controversial in the literature. More than 20 new approaches have been proposed in the recent literature and critically reviewed in light of economic and mathematical principles. Some authors consider the Myers and Read (2001) model as a benchmark, while others believe that it is inaccurate. Capital allocation remains a topic of active discussion in academia and practice.
5. Risk transfer: Numerous papers have theoretically and empirically confirmed the assertion that default risk is recognized in pricing risk transfer to the policyholder.

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EXTENSION OF KEY CONCLUSIONS FROM RPP I

6. Use of market consistent valuation techniques: Practitioners are increasingly using market consistent valuation techniques, for example in the context of regulation (Solvency II, Swiss Solvency Test) and public disclosure (IFRS, MCEV). The new valuation techniques reflect the theoretical conclusions on the price of insurance (see, e.g., conclusion 2).
7. Increasing importance of enterprise risk management involving classical techniques as well as new product categories: Market consistent valuation reveals the volatility of the insurer's business model and calls for holistic risk management. In this context we see an increasing role of both classical risk management techniques (e.g., risk mitigation) as well as new means (e.g., reinsurance and alternative risk transfer) to manage risk in a world of market-consistent values.
8. New risk measures and new risk categories: The last decade has seen the success story of quantile-based risk measures (value at risk, expected shortfall) and generalizations of these (spectral, distortion). New risk categories (operational risk, systemic risk) have been introduced in academic literature and their limitations are discussed.
9. Emergence of behavioral insurance: First steps have been taken towards behavioral insurance, a new area of literature that may bridge the gap between theoretical models and real world outcomes. Many researchers have discussed default risk and complement findings of theoretical models.
10. Reinsurance and alternative risk transfer: The convergence of (re-) insurance and capital markets through alternative risk transfer (ART) has been one of the most important economic developments of the past decade. The market for ART is, however, still below the expected capacity and has suffered several setbacks. Recent literature has analyzed the reasons for market failures (e.g., diversification trap) and alternative product innovations (e.g. hybrid cat bonds) to increase volume of the ART market.

FIVE AREAS FOR FUTURE RESEARCH

1. Pricing and cost of capital: Classical CAPM is insufficient to estimate costs of capital; Fama/French, and Rubinstein-Leland are better models for this purpose. However, more research has been done on financial economics in recent years, with unclear implications for pricing of insurance. Are there other factors that we need to take into consideration, such as liquidity risk, credit risk, operational risk, or behavioral aspects such as time varying risk aversion? A systematic analysis of asset pricing theories in an insurance context could thus constitute a major empirical research agenda.
2. Capital Allocation: Dozens of capital allocation approaches are discussed in literature and adding another one will be of very limited value. It might be more helpful to empirically validate the usefulness of different capital allocation approaches. Some authors see the Myers and Read (2001) approach as a best practice; others think that this model is inaccurate. Which model is the best one?
3. ERM, modeling of risk, and dependencies: Several empirical questions surrounding ERM need to be answered. First, the value added by ERM is an empirical but still unanswered question. Second, there are many models for the depiction of dependencies, but no empirical evidence for their validity. Third, the robustness of risk measures should be tackled empirically. Finally, the consistency in risk management must be addressed.
4. Financial crisis and systemic risk: The recent financial crisis has raised important questions. Do regulations accelerate a crisis? What is the role of insurers in the highly connected financial services industry? Is an insurance run possible or not?
5. Analysis of new insurance markets and products: In theory the market for ART products should have a huge potential, but in reality the market is rather small. How can we eliminate the market failure in ART? What is the capacity of the ART market? Finally, emerging insurance markets are future growth markets, but we still do not know enough about insurance business in these markets.

A searchable website with all review results is provided at www.casact.org/rpp2. The webpage is structured along four categories (About RPP II; Questionnaire; RPP II Results; RPP II Database) and contains most of the results presented in this document. The central element is the searchable RPP II database with 961 references and all future research topics that might encourage future research on risk assessment for property-casualty insurers. The selection of thematic categories and literature is subjective, but by incorporating the opinions of interested colleagues from academia and practice, we hope to make the survey as objective as possible.

For further details we also refer to the RPP II report, a 58 page pdf-document with detailed analysis of the conclusions and future research areas outlined above (also available at www.casact.org/rpp2). We hope that the results encourage future research on the theory and empirics of property-casualty insurance. We also hope that it will serve as an interesting reference for members of the Society of Actuaries and the Canadian Institute of Actuaries, e.g., with respect to new topics such as operational risk, new emerging risks, or alternative risk transfer. ■



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