

## SÉMINAIRE DE MATHÉMATIQUES ACTUARIELLES ET FINANCIÈRES

organisé par Quantact, le Laboratoire de mathématiques actuarielles et financières du CRM

CMT-2106

2425, rue de l'Agriculture, Québec  
Pavillon Paul-Comtois, Université Laval

31 Mars 2017, 14:00-16:30

### **Ruodu Wang**

University of Waterloo

#### **An axiomatic theory for measures of tail risk**

The notion of “tail risk” has been a crucial consideration in modern risk management. To achieve a comprehensive understanding of the tail risk, we carry out an axiomatic study for risk measures which quantify the tail risk, that is, the behavior of a risk beyond a certain quantile. Such risk measures are referred to as tail risk measures in this talk. The two popular classes of regulatory risk measures in banking and insurance, the Value-at-Risk (VaR) and the Expected Shortfall (ES), are prominent, yet elementary, examples of tail risk measures. We establish a connection between a tail risk measure and a corresponding law-invariant risk measure, called its generator, and investigate their joint properties. A tail risk measure inherits many properties from its generator, but not subadditivity or convexity; nevertheless, a tail risk measure is coherent if and only if its generator is coherent. We explore further relevant issues on tail risk measures, such as bounds, distortion risk measures, risk aggregation, elicibility, and dual representations. In particular, there is no elicitable tail convex risk measure other than the essential supremum, and under a continuity condition, the only elicitable and positively homogeneous monetary tail risk measures are the VaRs. The study on tail risk measures brings in new tools and insights for prudent risk management as highlighted in the recent Basel documents on financial regulation. This talk focuses on mathematical developments of the theory.

### **Qihe Tang**

University of Iowa

#### **Mitigating Extreme Risks through Securitization**

Due to great concerns caused by losses from catastrophes, insurers have been seeking solutions to mitigating catastrophe risks. Traditional reinsurance, despite being a commonly used solution, does not have enough capacity to digest the catastrophe risks. Alternative risk transfer to the capital market through securitization has emerged as another solution. In this talk we discuss securitized (re)insurance products, that is, insurance linked securities (ILSs), such as catastrophe (CAT) bonds and industry loss warranties (ILWs). Our focus is on the pricing of ILSs, as well as possible issues with using them as hedging tools, such as hedging effectiveness and basis risk. We establish a general pricing theory using CAT bonds as an example, and we establish a framework for quantifying the basis risk of hedging using ILWs as an example. In doing so, we propose to use extreme value theory to characterize the catastrophe risks involved. This talk is based on a technical report for the Society of Actuaries (SOA) joint with Jose Blanchet (Columbia University), Henry Lam (University of Michigan), and Zhongyi Yuan (Pennsylvania State University); see <https://www.soa.org/research-reports/2017/mitigating-risks-through-securitization/1>.

## SEMINAR OF ACTUARIAL AND FINANCIAL MATHEMATICS

organized by *Quantact, the CRM Laboratory of Actuarial and Financial Mathematics*

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