WIM 2024 final program

Supported by QUANTACT

Venue: Concordia University 9th floor, John Molson (MB) Building 1600 Blvd. De Maisonneuve Ouest, Montreal, QC H3H 1J5

URL: https://wim2024.weebly.com

Session 1 (risk measure) Room/Salle 9AB
Session chair/Président de session: Yunran Wei (Carleton)

9h00-9h30

Fangda Liu (University of Waterloo)

Robust risk measure and model uncertainty

Abstract: The model uncertainty is of crucial importance when market participants are making risk management strategies. From a conservative consideration, decision makers seek the worst-case scenario among all conceivable models for a given risk measure. In this work, we use the likelihood ratio to quantify discrepancies between models, and study the optimal reinsurance strategy for an insurance company in the worst-case scenario. We establish a link between the insurer's optimal strategies in scenarios with and without the model uncertainty. If the insurer's optimal reinsurance is known under the reference model, applying our method, our approach facilitates the direct determination of the insurer's optimal strategy, accounting for the likelihood ratio model uncertainty.

9h30-10h00

Silvana Pesanti (University of Toronto)

"Optimal Transport Divergences induced by Scoring Functions"

Abstract: We employ scoring functions, used in statistics for eliciting risk functionals, as cost functions in the Monge-Kantorovich (MK) optimal transport problem. This gives raise to a rich variety of novel asymmetric MK divergences, which subsume the family of Bregman-Wasserstein divergences. We show that for distributions on the real line, the comonotonic coupling is optimal for the majority the new divergences. Specifically, we derive the optimal coupling of the MK divergences induced by functionals including the mean, generalised quantiles, expectiles, and shortfall measures. Furthermore, we show that while any elicitable law-invariant convex risk measure gives raise to infinitely many MK divergences, the comonotonic coupling is simultaneously optimal. The novel MK divergences, which can be efficiently calculated, open an array of applications in robust stochastic optimisation. We derive sharp bounds on distortion risk measures under a Bregman-Wasserstein divergence constraint, and solve for cost-efficient portfolio strategies under benchmark constraints.

This is joint work with Steven Vanduffel

Section 2 (finance), Room/Salle 9AB Session chair / Président de session: Frédéric Godin (Concordia)

10h40-11h10

Chengguo Weng (University of Waterloo)

Would a two-benchmark regime be better?

Abstract: After the manipulation scandal during the global financial crisis, LIBOR was phased out, and regulators around the world have since transitioned to risk-free reference rates (RFRs). In the United States, the secured overnight financing rate (SOFR), which is an RFR based on overnight repo transactions, has been designated as the sole replacement for LIBOR. Meanwhile, Europe and Japan have chosen to establish a two-benchmark regime consisting of an RFR and a LIBOR-like credit sensitive reference rate (CSR). In this paper, we consider a two-agent model with one representative firm and one representative bank in the economy, and use a tractable model to compare the single RFR regime against the two-benchmark regime with an RFR and a CSR. It turns out that adding a new credit-sensitive benchmark in addition to the existing risk-free benchmark always improves total welfare but not necessarily for both the bank and the firm in some scenarios. Our study also indicates that credit supply is higher and borrowing cost is lower in the two-benchmark system than would be the case for the single RFR system. Furthermore, RFR could be driven out of the market when the CSR and the bank's funding cost have a strong enough correlation. The impacts from fixed rate lending and interest rate swap trading are also discussed.

Joint work with Xipeng Huang.

11h10-11h40

Georges Dionnne (HEC Montreal)

Insurers' M&A in the United States during the 1990-2022 period: is the FED monetary policy a causal factor?

11h40-12h10

Thai Nguyen (Universite Laval)

"Pareto-Optimal Investments and Contracting for Non-linear Payoffs"

Abstract : We explore financial and insurance contracts with non-linear payoffs by combining optimal contract design and dynamic portfolio planning. Our approach avoids upfront parameter fixation, seeking to simultaneously optimize contract parameters and investment strategies in a

Pareto-optimal manner. The results shed light on the implications of dynamic investment strategies, especially in contracts with non-linear elements like caps or investment guarantees, aiming to enhance their design and potential for Pareto improvements.

This a joint work with An Chen and Peter Hieber.

Session 3 (risk and control). Room/salle 9AB Session chair / Président de session: Thai Nguyen (Laval)

13h40-14h10

Jean-Francois Renaud (UQAM)

"An optimization dichotomy for capital injections and absolutely continuous dividend strategies"

Abstract: How can we maximize dividend payments made to shareholders from a cash/surplus process? Should they inject capital to avoid ruin and hope for more dividends later? To answer these questions, we formulate a control problem in which the rate of dividends is limited by a level-dependent bound. We prove that the optimal strategy, depending on the parameters of the model/problem, is subject to the following dichotomy: dividends are paid at the maximum dividend rate when the cash process is above an optimal threshold while capital injections must be made each time this process reaches the level of ruin, so the firm is never ruined; or, dividends are paid at the maximum rate above another optimal threshold and no injection of capital is ever made until ruin is declared. No in-between strategy is optimal.

14h10-14h40

Mata Lopez Dante (UQAM, and CRM)

On an optimal control problem with a concave bound

Abstract: We study a version of De Finetti's optimal dividend problem driven by a diffusion, where the control strategies are assumed to be absolutely continuous strategies which are bounded above by an increasing, concave function.

We provide sufficient conditions to show that an optimal strategy exists and lies within the set of generalized refraction strategies. In addition, we are able to characterize the optimal refraction threshold in our setting.

This is ongoing joint work with Hélène Guérin, Jean-François Renaud and Alexandre Roch.

Session 4 (insurance statistics). Room/salle 9AB Session chair / Présidente de session: Juliana Schulz (HEC Montreal)

15h10-15h40

Klaus Hermann (Universite de Sherbrooke)

"Distortions of stable tail dependence functions and their impact on multivariate risk measures"

Stable tail dependence functions play a central role in multivariate extreme value theory as they are linked to the possible dependence structures for multivariate generalized extreme value distributions. Given their importance, it is natural to consider transformations from the set of stable tail dependence functions into itself. One natural candidate for such a transformation is a pre/post-composition construction, where a function is applied to each argument of the stable tail dependence function. To preserve the necessary homogeneity of stable tail dependence functions, an appropriate inverse function is applied as a post-composition to give the final result. A negative result concerning such transformations is discussed by showing that only transformations based on power functions result again in bona fide stable tail dependence functions. This starkly contrasts similar constructions in a copula context studied by a past study. In this case, any n-absolutely monotone surjection from the unit interval into itself is admissible, leaving a wide range of possibilities. The impact of the result is discussed and connections to the more general question of transforming generalized extreme value distributions into generalized extreme value distributions are provided. Finally, risk measures for multivariate generalized extreme value distributions under power transformations of the associated stable tail dependence function are discussed.

15h40-16h10

Karim Barigou (Universite Laval)

" Bayesian mortality modelling with pandemics: a vanishing jump approach"

Abstract: This paper proposes an extension of the Lee-Carter model to incorporate pandemic jump effects of vanishing kind, allowing for a more comprehensive and accurate representation of the dynamics of mortality rates during pandemics. While the Lee-Carter model has shown to be effective in capturing mortality trends, it may not be able to account for large, unexpected jumps in mortality rates caused e.g. by pandemics or wars. Previous models either allow for transient jumps with an effect on one period only or persistent jumps. However, there is no literature on estimating and forecasting mortality time series with jumps having a vanishing effect over a small number of periods as typically observed in pandemics. To estimate these effects, the proposed model uses Bayesian inference, providing a flexible and rigorous approach for parameter estimation. Empirical data from the COVID-19 pandemic is used to demonstrate the outperformance of the proposed model, compared to models with a transitory shock effect.

Joint work with Julius Goes and Anne Leucht, University of Bamberg, Germany.

16h10-16h40

Marie-Pier Côté (Universite Laval)

"A Fair price to pay: exploiting directed acyclic graphs for fairness in insurance"

Abstract: Many jurisdictions have laws or guidelines stipulating that insurance companies must not discriminate on some specified policyholder characteristics. Omission of the prohibited variables from the models removes direct discrimination, but does not prevent proxy discrimination – a phenomenon especially prevalent when powerful predictive algorithms are fed with an abundance of allowed covariates. In the actuarial literature, there remains some confusion on the definition of indirect discrimination: this impedes the understanding of the goals of the different fairness methodologies and their comparison. We exploit directed acyclic graphs (DAGs), a tool from causal inference, to formally define direct and indirect discrimination, to discuss potential sources of bias, and to understand the properties of different fairness methodologies. This is joint work with Olivier Côté and Arthur Charpentier.

Poster presentations

Morning session 10h00-10h40 (40 minutes). Session chair/Président de session: Emmanuel Osei Miredu (Concordia)

- Dominik Chevalier (Laval) "Comparative Analysis of Recent Implementations of Gradient Boosting for Decision Trees"
- Olivier Côté (Laval) "The Fairness in Insurance Enigma: Exploring the Maze of Regulation"
- Agathe Fernandes Machado (UQAM), EquiPy : a Python Package for Sequential Fairness using Optimal Transport with Applications in Insurance
- Samuel Perreaul (Toronto) Hypothesis tests for overparametrized HACs

Noon session 12h10-13h40 (90 minutes). Session chair/Présidente de session: Samaneh Sami (Concordia)

- Emmanuel Osei-Mireku (Concordia) "Semi-robust risk-minimizing hedging strategies"
- Tak Wa Ng (Laval) "Efficient Collective Investment with Limited Expected Loss: Pareto-optimal Wealth Sharing and Risk Allocation"
- Kathleen Miao (Toronto) Robustifying elicitable functionals under Kullback-Leibler misspecification
- Ismael Assani (Montreal). "Quadratic hedging with basis risk under Q-affine GARCH models"

Programme

For abstracts, please go to:

URL: https://wim2024.weebly.com

8h55-9h00 opening

Session 1 (risk measure). Chair: Yunran Wei (Carleton)

9h00-9h30 Fangda Liu (Waterloo): " Robust risk measure and model uncertainty"

9h30-10h00 Silvana Pesanti (Toronto): "Optimal Transport Divergences induced by Scoring Functions"

10h00-10h40 **Coffee Break+ poster.** Chair: Emmanuel Osei Miredu (Concordia)

Dominik Chevalier (Laval) "Comparative Analysis of Recent Implementations of Gradient Boosting for Decision Trees"

Agathe Fernandes Machado (UQAM): a Python Package for Sequential Fairness using Optimal Transport with Applications in Insurance

Samuel Perreaul (Toronto): Hypothesis tests for overparametrized HACs

Olivier Côté (Laval) "The Fairness in Insurance Enigma: Exploring the Maze of Regulation"

Section 2 (finance). Chair: Frédéric Godin (Concordia)

10h40-11h10 Chengguo Weng (Waterloo):"Would a two-benchmark regime be better?"

11h10-11h40 Georges Dionnne (HEC Montreal): "Insurers' MA in the United States during the 1990-2022 period: is the FED monetary policy a causal factor?"

11h40-12h10 Thai Nguyen (Laval): "Pareto-Optimal Investments and Contracting for Non-linear Payoffs"

12h10-13h40 **Lunch+ poster.** Chair: Samaneh Sami (Concordia)

Emmanuel Osei-Mireku (Concordia) "Semi-robust risk-minimizing hedging strategies"

Tak Wa Ng (Laval) "Efficient Collective Investment with Limited Expected Loss: Pareto-optimal Wealth Sharing and Risk Allocation"

Kathleen Miao (Toronto) Robustifying elicitable functionals under Kullback-Leibler misspecification

Ismael Assani (Montreal). "Quadratic hedging with basis risk under Q-affine GARCH models"

Session 3 (risk and control). Chair: Thai Nguyen (Laval)

13h40-14h10 Jean-Francois Renaud (UQAM): “An optimization dichotomy for capital injections and absolutely continuous dividend strategies”

14h10-14h40 Mata Lopez Dante (UQAM, and CRM) “On an optimal control problem with a concave bound”

14h40- 15h10 Coffee break

Session 4 (insurance statistics). Chair: Juliana Schulz (HEC Montreal)

15h10-15h40 Klaus Hermann (Sherbrooke): “Distortions of stable tail dependence functions and their impact on multivariate risk measures”

15h40-16h10 Karim Barigou (Laval): “ Bayesian mortality modelling with pandemics: a vanishing jump approach“

16h10-16h40 Marie-Pier Côté (Laval): “A Fair price to pay: exploiting directed acyclic graphs for fairness in insurance”.