

Ruodu Wang, Ph.D.

Curriculum Vitae

Canada Research Chair in Quantitative Risk Management
Professor
Department of Statistics and Actuarial Science
University of Waterloo
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Academic Appointments

University of Waterloo

Canada Research Chair (Tier 1) in Quantitative Risk Management	2023.05 - present
Professor, Department of Statistics and Actuarial Science	2022.07 - present
Associate Chair for Research, Department of Statistics and Actuarial Science	2021.07 - present
Sun Life Fellow	2021.07 - 2023.06
University Research Chair	2018.07 - 2023.06
Associate Professor, Department of Statistics and Actuarial Science	2017.07 - 2022.06
Assistant Professor, Department of Statistics and Actuarial Science	2012.08 - 2017.06

Education

Ph.D. Mathematics, Georgia Institute of Technology. Advisor: Liang Peng	2012.05
M.S. Financial Mathematics, Peking University. Advisor: Jingping Yang	2009.06
B.S. Mathematics, Peking University	2006.06

Research Areas

Probability · Statistics · Actuarial Science · Financial Engineering
Operations Research · Economic Theory · Quantitative Risk Management


Editorial Duties

Co-Editor, <i>ASTIN Bulletin - The Journal of the International Actuarial Association</i>	2018 - present
Co-Editor, <i>European Actuarial Journal</i>	2016 - present
Associate Editor, <i>Finance and Stochastics</i>	2024 - present
Associate Editor, <i>Operations Research</i>	2024 - present
Associate Editor, <i>Mathematics of Operations Research</i>	2023 - present
Associate Editor, <i>Canadian Journal of Statistics</i>	2022 - present
Associate Editor, <i>Journal of Mathematical Economics</i>	2020 - present
Associate Editor, <i>Acta Mathematicae Applicatae Sinica (English Series)</i>	2016 - present
Member of the Editorial Advisory Board, <i>Dependence Modeling</i>	2014 - present

Competitive Research Grants

Ontario Research Fund – Research Infrastructure (ORF-RI)	[sole PI] 2024 - 2026
NSERC Discovery Grant (RGPIN-2024-03728)	[sole PI] 2024 - 2029
John R. Evans Leaders Fund, Canada Foundation for Innovation (#43991)	[sole PI] 2024 - 2026
Tier 1 Canada Research Chair (CRC-2022-00141)	[sole PI] 2023 - 2030
Sun Life Research Fellowship	[sole PI] 2021 - 2023
The Society of Actuaries CAE Research Grant	[Co-PI; PI: Johnny Li] 2018 - 2021
NSERC Discovery Grant (RGPIN-2018-03823)	[sole PI] 2018 - 2024
NSERC Discovery Accelerator Supplement (RGPAS-2018-522590)	[sole PI] 2018 - 2021
International Research Partnership Grant, University of Waterloo	[Co-PI; PI: Tao Chen] 2016 - 2018
NSERC Discovery Grant (RGPIN-435844-2013)	[sole PI] 2013 - 2018

Awards and Honours

Best Paper Award on Financial Engineering (2022) in the Journal <i>Operations Research</i>	INFORMS, 2023
Tier 1 Canada Research Chair in Quantitative Risk Management	NSERC, 2023
Fellow of IMS 	Institute of Mathematical Statistics, 2022
<ul style="list-style-type: none"> ◇ “For significant contributions to statistics and applied probability in operations research, risk management, and actuarial science; and highly influential interdisciplinary research bridging statistics and probability.” 	

SOA Actuarial Science Early Career Research Award ↗	Society of Actuaries, 2021
<ul style="list-style-type: none"> ◊ An international award given annually to one actuarial scholar within 10 years of independent career ◊ The first winner worldwide 	
NSERC Discovery Accelerator Supplement Award ↗	NSERC, 2018
<ul style="list-style-type: none"> ◊ 125 awardees per year in Canada across all scientific and engineering fields 	
University Research Chair	University of Waterloo, 2018
The Faculty of Mathematics Golden Jubilee Research Excellence Award	University of Waterloo, 2017
Annual SAS Department Teaching Award	University of Waterloo, 2017
Laha Travel Award	Institute of Mathematical Statistics, 2012
Bob Price Fellowship	Georgia Institute of Technology, 2011

Academic Visits (≥ 2 weeks)

Carnegie Mellon University (Department of Statistics and Data Science)

Bocconi University (Department of Decision Sciences)

University of Science and Technology of China (School of Management)

Columbia University (Statistics; Industrial Engineering and Operations Research)

Stanford University (Management Science and Engineering)

Chinese Academy of Sciences (Institute of Applied Mathematics)

ETH Zurich (RiskLab, Department of Mathematics)

Peking University (School of Mathematical Sciences)

Media Coverage

An interview with Ruodu Wang, Expanding Horizons, Society of Actuaries, November 2021 [↗](#)

Riskier CLOs get big boost from S&P in 'new ratings shopping', Bloomberg, April 2020 [↗](#)

Academic Advising

Completed Postdoctoral Fellows and PhD Students and their Placement

*Lecturer positions are tenure track and research active in the UK and Australian systems

[Postdoc] Samuel Gyamerah (with A. Schied) 2023 - 2024

Assistant Professor, Department of Mathematics, [Toronto Metropolitan University](#), Canada (2024)

- [Postdoc] Christopher Blier-Wong 2023 - 2024
Assistant Professor, Department of Statistical Sciences, [University of Toronto](#), Canada (2024)
- [Postdoc] Jean-Gabriel Lauzier 2021 - 2024
Assistant Professor, Department of Economics, [Memorial University of Newfoundland](#), Canada (2024)
- [Postdoc] Yang Liu (with A. Schied) 2021 - 2022
Assistant Professor, School of Science & Engineering, [Chinese University of Hong Kong Shenzhen](#), China (2023)
- [Postdoc] Xia Han (with D. Landriault) 2020 - 2022
Assistant Professor, School of Mathematical Sciences, [Nankai University](#), China (2022)
- [Postdoc] Tolulope Fadina 2019 - 2020
Assistant Professor, Department of Mathematics, [University of Illinois Urbana-Champaign](#), USA (2023)
- [Postdoc] Peng Liu (with A. Schied) 2018 - 2020
Lecturer, School of Mathematics, Statistics and Actuarial Science, [University of Essex](#), UK (2020)
- [Postdoc] Daniel Linders (with F. Yang) 2015 (short term)
Assistant Professor, School of Economics, [University of Amsterdam](#), Netherlands (2019)
- [Postdoc] Tiantian Mao (with J. Cai and D. Landriault) 2014 - 2015
Assistant Professor, School of Management, [University of Science and Technology of China](#), China (2015)
- [PhD] Zhanyi Jiao (with J. Cai) 2020 - 2024
Assistant Professor, Department of Mathematics, [Illinois State University](#), USA (2024)
- [PhD] Liyuan Lin (with A. Schied) 2020 - 2024
Senior Lecturer, Monash Business School, [Monash University](#), Australia (2024)
- [PhD] Qiuqi Wang 2019 - 2023
Assistant Professor, Robinson College of Business, [Georgia State University](#), USA (2023)
[Pierre Robillard Award for the best 2023 PhD thesis in Statistics and Probability in Canada]
- [PhD] Yuyu Chen (with K. S. Tan) 2018 - 2022
Lecturer, Department of Economics, [University of Melbourne](#), Australia (2022)
- [PhD] Yunran Wei (with G. Willmot) 2015 - 2019
Assistant Professor, School of Mathematics and Statistics, [Carleton University](#), Canada (2021)
- [PhD] Jie Shen (with Y. Shen) 2014 - 2018
Risk Modelling Researcher, [Canadian Imperial Bank of Commerce](#), Canada (2018)
- [PhD] Haiyan Liu (with J. Cai) 2013 - 2017
Assistant Professor, Department of Mathematics, [Michigan State University](#), USA (2017)

Current Postdoctoral Fellows and PhD Students

[Postdoc] Yinhuan Li	2024 - present
[Postdoc] Xiyue Han (with A. Schied)	2024 - present
[Postdoc] Qinyu Wu	2023 - present
[PhD] Benjamin Côté (with A. Schied)	2024 - present
[PhD] Chenxin Lyu	2024 - present
[PhD] Jingcheng Yu	2024 - present
[PhD] Jisun Choi (with B. Feng)	2023 - present
[PhD] Muqiao Huang	2023 - present
[PhD] Qinghua Ren (with M. Ghossoub)	2022 - present
[PhD] Zachary Van Oosten (with Y. Shen)	2022 - present

Master's and Bachelor's Research Students

Weihua Zhao (2024, UW-MQF); Haoming Shi (2022, UW-MMath); Ziyu Chi (2021, UW-BMath); Zhenyuan Zhang (2020, UW-BMath); Hengxin Li (2019, UW-BMath); Daiwen Dai (2017, UW-MQF); Muqiao Huang (2014, UW-BMath); Yuchen Zhang (2014, UW-MMath); Xiao Jiang (with C. Bernard, 2013, UW-MQF)

Visiting Scholars

Mengqiao Lu (2024-2025, Nankai University); Zhaowen Wang (2023-2024, Fudan University); Yixuan Fan (2023-2024, Jilin University); Yang Liu (2019-2020, Tsinghua University); Linxiao Wei (2018-2019, Wuhan University of Technology)

Publications and Manuscripts

Refereed articles

Forthcoming

- [114] Fan, Y., Jiao, Z. and Wang, R. (forthcoming). Testing mean and variance by e-processes. *Biometrika*. ↗
- [113] Wang, R. and Wu, Q. (forthcoming). Probabilistic risk aversion for generalized rank-dependent functions. *Economic Theory*. ↗
- [112] Blanchet, J., Lam, H., Liu, Y. and Wang, R. (forthcoming). Convolution bounds on quantile aggregation. *Operations Research*. ↗
- [111] Zhang, Z., Ramdas, A., Wang, R. (forthcoming). On the existence of powerful p-values and e-values for composite hypotheses. *Annals of Statistics*.
- [110] Pesenti, S., Wang, Q. and Wang, R. (forthcoming). Optimizing distortion riskmetrics with distributional uncertainty. *Mathematical Programming*. ↗

- [109] Nutz, M., Wang, R. and Zhang, Z. (forthcoming). Martingale transports and Monge maps. *Annals of Applied Probability*.
- [108] Han, X., Lin, L. and Wang, R. (forthcoming). Diversification quotients: Quantifying diversification via risk measures. *Management Science*.
- [107] Chi, Z., Ramdas, A. and Wang, R. (forthcoming). Multiple testing under negative dependence. *Bernoulli*.
- [106] Chen, Y., Embrechts, P. and Wang, R. (forthcoming). An unexpected stochastic dominance: Pareto distributions, dependence, and diversification. *Operations Research*. [↗](#)
- Best Paper Award (First Place) at the 2023 China International Conference on Insurance and Risk Management (CICIRM)
- [105] Guo, N., Kou, S., Wang, B. and Wang, R. (forthcoming). A theory of credit rating criteria. *Management Science*. [↗](#)
- [104] Koike, T., Lin, L. and Wang, R. (forthcoming). Joint mixability and notions of negative dependence. *Mathematics of Operations Research*. [↗](#)
- 2025
- [103] Chen, Y. and Wang, R. (2025). Infinite-mean models in risk management: Discussions and recent advances. *Risk Sciences*, **1**, 100003. [↗](#)
- 2024
- [102] Vovk, V. and Wang, R. (2024). True and false discoveries with independent and sequential e-values. *Canadian Journal of Statistics*, **52**(4), e11833. [↗](#)
- [101] Guan, Y., Huang, M. and Wang, R. (2024). A new characterization of second-order stochastic dominance. *Insurance: Mathematics and Economics*, **119**, 261–267. [↗](#)
- [100] Guan, Y., Jiao, Z. and Wang, R. (2024). A reverse ES (CVaR) optimization formula. *North American Actuarial Journal*, **28**(3), 611–625. [↗](#)
- [99] Koike, T., Lin, L. and Wang, R. (2024). Invariant correlation under marginal transforms. *Journal of Multivariate Analysis*, **204**, 105361. [↗](#)
- [98] Millossovich, P., Tsanakas, A. and Wang, R. (2024). A theory of multivariate stress testing. *European Journal of Operational Research*, **318**(3), 851–866. [↗](#)
- [97] Xu, Z., Wang, R. and Ramdas, A. (2024). Post-selection inference for e-value based confidence intervals. *Electronic Journal of Statistics*, **18**(1), 2292–2338. [↗](#)
- [96] Vovk, V. and Wang, R. (2024). Efficiency of nonparametric e-tests. *New England Journal of Statistics in Data Science*, **2**(2), 261–270. [↗](#)
- [95] Han, X., Wang, B., Wang, R. and Wu, Q. (2024). Risk concentration and the mean-Expected Shortfall criterion. *Mathematical Finance*, **34**(3), 819–846. [↗](#)
- [94] Assa, H., Lin, L. and Wang, R. (2024). Calibrating distribution models from PELVE. *North American Actuarial Journal*, **28**(2), 373–406. [↗](#)

- [93] Ignatiadis, N., Wang, R. and Ramdas, A. (2024). E-values as unnormalized weights in multiple testing. *Biometrika*, **111**(2), 417–439. [↗](#)
- [92] Fadina, T., Liu, Y. and Wang, R. (2024). A framework for measures of risk under uncertainty. *Finance and Stochastics*, **28**(2), 363–390. [↗](#)
- [91] Vovk, V. and Wang, R. (2024). Merging sequential e-values via martingales. *Electronic Journal of Statistics*, **18**(1), 1185–1205. [↗](#)
- [90] Wang, R. (2024). Testing with p*-values: Between p-values, mid p-values, and e-values. *Bernoulli*, **30**(2), 1313–1346. [↗](#)

2023

- [89] Han, X., Wang, R. and Zhou, X. (2023). Choquet regularization for continuous-time reinforcement learning. *SIAM Journal on Control and Optimization*, **61**(5), 2777–2801. [↗](#)
- [88] Han, X., Lin, L. and Wang, R. (2023). Diversification quotients based on VaR and ES. *Insurance: Mathematics and Economics*, **113**, 185–197. [↗](#)
- [87] Lauzier, J.-G., Lin, L. and Wang, R. (2023). Pairwise counter-monotonicity. *Insurance: Mathematics and Economics*, **111**, 279–287. [↗](#)
- [86] Fadina, T., Liu, P. and Wang, R. (2023). One axiom to rule them all: A minimalist axiomatization of quantiles. *SIAM Journal on Financial Mathematics*, **14**(2), 644–662. [↗](#)
- [85] Vovk, V. and Wang, R. (2023). Confidence and discoveries with e-values. *Statistical Science*, **38**(2), 329–354. [↗](#)
- [84] Chen, Y., Liu, P., Tan, K. S. and Wang, R. (2023). Trade-off between validity and efficiency of merging p-values under arbitrary dependence. *Statistica Sinica*, **33**, 851–872. [↗](#)
- [83] Li, H. and Wang, R. (2023). PELVE: Probability equivalent level of VaR and ES. *Journal of Econometrics*, **234**(1), 353–370. [↗](#)
- [82] Guan, Y., Tsanakas, A. and Wang, R. (2023). An impossibility theorem on capital allocation. *Scandinavian Actuarial Journal*, **2023**(3), 290–302 [↗](#)

2022

- [81] Mao, T. and Wang, R. (2022). Fractional stochastic dominance in rank-dependent utility and cumulative prospect theory. *Journal of Mathematical Economics*, **103**, 102766. [↗](#)
- [80] Castagnoli, E., Cattelan, G., Maccheroni, F., Tebaldi, C. and Wang, R. (2022). Star-shaped risk measures. *Operations Research*, **70**(5), 2637–2654. [↗](#)
- [79] Liu, F., Mao, T., Wang, R. and Wei, L. (2022). Inf-convolution, optimal allocations, and model uncertainty for tail risk measures. *Mathematics of Operations Research*, **47**(3), 2494–2519. [↗](#)
- [78] Wang, R. and Ramdas, A. (2022). False discovery rate control with e-values. *Journal of the Royal Statistical Society Series B*, **84**(3), 822–852. [↗](#)
- [77] Bellini, F., Fadina, T., Wang, R. and Wei, Y. (2022). Parametric measures of variability induced by risk measures. *Insurance: Mathematics and Economics*, **106**, 270–284. [↗](#)

- [76] Nutz, M. and Wang, R. (2022). The directional optimal transport. *Annals of Applied Probability*, **32**(2), 1400–1420. [↗](#)
- [75] Vovk, V., Wang, B. and Wang, R. (2022). Admissible ways of merging p-values under arbitrary dependence. *Annals of Statistics*, **50**(1), 351–375. [↗](#)
- [74] Liang, X., Wang, R. and Young, V. (2022). Optimal insurance to maximize RDEU under a distortion-deviation premium principle. *Insurance: Mathematics and Economics*, **104**, 35–59. [↗](#)
- [73] Cui, Z., Liu, Y. and Wang, R. (2022). Variance comparison between Infinitesimal Perturbation Analysis and Likelihood Ratio estimators to stochastic gradient. *Operations Research Letters*, **50**(2), 199–204. [↗](#)
- [72] Embrechts, P., Schied, A. and Wang, R. (2022). Robustness in the optimization of risk measures. *Operations Research*, **70**(1), 95–110. [↗](#)

Best Paper Award on Financial Engineering in the Journal *Operations Research* in 2022

- [71] Wang, Q., Wang, R. and Zitikis, R. (2022). Risk measures induced by efficient insurance contracts. *Insurance: Mathematics and Economics*, **103**, 56–65. [↗](#)
- [70] Chen, Y., Liu, P., Liu, Y. and Wang, R. (2022). Ordering and inequalities for mixtures on risk aggregation. *Mathematical Finance*, **32**(1), 421–451. [↗](#)
- [69] Chen, Y., Lin, L. and Wang, R. (2022). Risk aggregation under dependence uncertainty and an order constraint. *Insurance: Mathematics and Economics*, **102**, 169–187. [↗](#)
- [68] Burzoni, M., Munari, C. and Wang, R. (2022). Adjusted Expected Shortfall. *Journal of Banking and Finance*, **134**, 106297. [↗](#)

2021

- [67] Xu, Z., Wang, R. and Ramdas, A. (2021). A unified framework for bandit multiple testing. *Advances in Neural Information Processing Systems (NeurIPS 2021)*, 16833–16845. [↗](#)
- [66] Liu, P., Schied, A. and Wang, R. (2021). Distributional transforms, probability distortions, and their applications. *Mathematics of Operations Research*, **46**(4), 1490–1512. [↗](#)
- [65] Boonen, T., Liu, F. and Wang, R. (2021). Competitive equilibria in a comonotone market. *Economic Theory*, **72**, 1217–1255. [↗](#)
- [64] Embrechts, P., Mao, T., Wang, Q. and Wang, R. (2021). Bayes risk, elicibility, and the Expected Shortfall. *Mathematical Finance*, **31**(4), 1190–1217. [↗](#)
- [63] Wang, R. and Ziegel, J. (2021). Scenario-based risk evaluation. *Finance and Stochastics*, **25**, 725–756. [↗](#)
- [62] Liu, F. and Wang, R. (2021). A theory for measures of tail risk. *Mathematics of Operations Research*, **46**(3), 1109–1128. [↗](#)
- [61] Vovk, V. and Wang, R. (2021). E-values: Calibration, combination, and applications. *Annals of Statistics*, **49**(3), 1736–1754. [↗](#)
- [60] Mai, J.-F. and Wang, R. (2021). Stochastic decomposition for ℓ_p -norm symmetric survival functions on the positive orthant. *Journal of Multivariate Analysis*, **184**, 104760. [↗](#)

- [59] Wang, R. and Zitikis, R. (2021). An axiomatic foundation for the Expected Shortfall. *Management Science*, **67**(3), 1413–1429. [↗](#)
- 2020
- [58] Vovk, V. and Wang, R. (2020). Combining p-values via averaging. *Biometrika*, **107**(4), 791–808. [↗](#)
- [57] Wang, Q., Wang, R. and Wei, Y. (2020). Distortion riskmetrics on general spaces. *ASTIN Bulletin*, **50**(3), 827–851. [↗](#)
- [56] Wang, R. and Wei, Y. (2020). Risk functionals with convex level sets. *Mathematical Finance*, **30**(4), 1337–1367. [↗](#)
- [55] Wang, R., Wei, Y. and Willmot, G. (2020). Characterization, robustness and aggregation of signed Choquet integrals. *Mathematics of Operations Research*, **45**(3), 993–1015. [↗](#)
- [54] Wang, R. and Wei, Y. (2020). Characterizing optimal allocations in quantile-based risk sharing. *Insurance: Mathematics and Economics*, **93**, 288–300. [↗](#)
- [53] Embrechts, P., Liu, H., Mao, T. and Wang, R. (2020). Quantile-based risk sharing with heterogeneous beliefs. *Mathematical Programming*, **181**(2), 319–347. [↗](#)
- [52] Mao, T. and Wang, R. (2020). Risk aversion in regulatory capital principles. *SIAM Journal on Financial Mathematics*, **11**(1), 169–200. [↗](#)
- [51] Liu, P., Wang, R. and Wei, L. (2020). Is the inf-convolution of law-invariant preferences law-invariant? *Insurance: Mathematics and Economics*, **91**, 144–154. [↗](#)
- [50] Wang, R. and Zitikis, R. (2020). Weak comonotonicity. *European Journal of Operational Research*, **282**, 386–397. [↗](#)
- [49] Liu, F., Cai, J., Lemieux, C. and Wang, R. (2020). Convex risk functionals: Representation and applications. *Insurance: Mathematics and Economics*, **90**, 66–79. [↗](#)
- 2019
- [48] Mao, T., Wang, B. and Wang, R. (2019). Sums of standard uniform random variables. *Journal of Applied Probability*, **56**(3), 918–936. [↗](#)
- [47] Wang, R., Xu, Z. Q. and Zhou, X. (2019). Dual utilities on risk aggregation under dependence uncertainty. *Finance and Stochastics*, **23**(4), 1025–1048. [↗](#)
- [46] Asimit, V., Peng, L., Wang, R. and Yu, A. (2019). An efficient approach to quantile capital allocation and sensitivity analysis. *Mathematical Finance*, **29**(4), 1131–1156. [↗](#)
- [45] Puccetti, G., Rigo, P., Wang, B. and Wang, R. (2019). Centers of probability measures without the mean. *Journal of Theoretical Probability*, **32**, 1482–1501. [↗](#)
- [44] Shen, J., Shen, Y., Wang, B. and Wang, R. (2019). Distributional compatibility for change of measures. *Finance and Stochastics*, **23**(3), 761–794. [↗](#)
- [43] Wang, B., Wang, R. and Wang, Y. (2019). Compatible matrices of Spearman’s rank correlation. *Statistics and Probability Letters*, **151**, 67–72. [↗](#)

- [42] Shen, J., Shen, Y. and Wang, R. (2019). Random locations of periodic stochastic processes. *Stochastic Processes and their Applications*, **129**, 878–901. [↗](#)
- 2018
- [41] Embrechts, P., Liu, H. and Wang, R. (2018). Quantile-based risk sharing. *Operations Research*, **66**(4), 936–949. [↗](#)
- [40] Li, L., Shao, H., Wang, R. and Yang, J. (2018). Worst-case Range Value-at-Risk with partial information. *SIAM Journal on Financial Mathematics*, **9**(1), 190–218. [↗](#)
- [39] Cai, J., Liu, H. and Wang, R. (2018). Asymptotic equivalence of risk measures under dependence uncertainty. *Mathematical Finance*, **28**(1), 29–49. [↗](#)
- 2017
- [38] Jakobsons, E. and Wang, R. (2017). Negative dependence in matrix arrangement problems. *Annals of Operations Research*, online publication, December 2017. [↗](#)
- [37] Cai, J., Liu, H. and Wang, R. (2017). Pareto-optimal reinsurance arrangements under general model settings. *Insurance: Mathematics and Economics*, **77**, 24–37. [↗](#)
- [36] Furman, E., Wang, R. and Zitikis, R. (2017). Gini-type measures of risk and variability: Gini shortfall, capital allocations, and heavy-tailed risks. *Journal of Banking and Finance*, **83**, 70–84. [↗](#)
- [35] Bernard, C., Rüschendorf, L., Vanduffel, S. and Wang, R. (2017). Risk bounds for factor models. *Finance and Stochastics*, **21**(3), 631–659. [↗](#)
- [34] Liu, H. and Wang, R. (2017). Collective risk models with dependence uncertainty. *ASTIN Bulletin*, **47**(2), 361–389. [↗](#)
- 2016
- [33] Wang, B. and Wang, R. (2016). Joint mixability. *Mathematics of Operations Research*, **41**(3), 808–826. [↗](#)
- [32] Embrechts, P., Hofert, M. and Wang, R. (2016). Bernoulli and tail-dependence compatibility. *Annals of Applied Probability*, **26**(3), 1636–1658. [↗](#)
- [31] Bignozzi, V., Mao, T., Wang, B. and Wang, R. (2016). Diversification limit of quantiles under dependence uncertainty. *Extremes*, **19**(2), 143–170. [↗](#)
- [30] Wang, R. (2016). Regulatory arbitrage of risk measures. *Quantitative Finance*, **16**(3), 337–347. [↗](#)
- [29] Han, X. and Wang, R. (2016). Computation of credit portfolio loss distribution by a cross entropy method. *Journal of Applied Mathematics and Computing*, **52**(1), 287–304. [↗](#)
- [28] Jakobsons, E., Han, X. and Wang, R. (2016). General convex order on risk aggregation. *Scandinavian Actuarial Journal*, **2016**(8), 713–740. [↗](#)
- 2015
- [27] Puccetti, G. and Wang, R. (2015). Extremal dependence concepts. *Statistical Science*, **30**(4), 485–517. [↗](#)
- [26] Embrechts, P. and Wang, R. (2015). Seven proofs for the subadditivity of Expected Shortfall. *Dependence Modeling*, **3**, 126–140. [↗](#)

- [25] Embrechts, P., Wang, B. and Wang, R. (2015). Aggregation-robustness and model uncertainty of regulatory risk measures. *Finance and Stochastics*, **19**(4), 763–790. [↗](#)
- [24] Wang, R. (2015). Current open questions in complete mixability. *Probability Surveys*, **12**, 13–32. [↗](#)
- [23] Wang, R., Bignozzi, V. and Tsanakas, A. (2015). How superadditive can a risk measure be? *SIAM Journal on Financial Mathematics*, **6**(1), 776–803. [↗](#)
- [22] Mao, T. and Wang, R. (2015). On aggregation sets and lower-convex sets. *Journal of Multivariate Analysis*, **138**, 170–181. [↗](#)
- [21] Wang, R. and Ziegel, J. (2015). Elicitable distortion risk measures: A concise proof. *Statistics and Probability Letters*, **100**, 172–175. [↗](#)
- [20] Wang, B. and Wang, R. (2015). Extreme negative dependence and risk aggregation. *Journal of Multivariate Analysis*, **136**, 12–25. [↗](#)
- [19] Yang, J., Chen, Z., Wang, F. and Wang, R. (2015). Composite Bernstein copulas. *ASTIN Bulletin*, **45**(2), 445–475. [↗](#)
- [18] Puccetti, G. and Wang, R. (2015). Detecting complete and joint mixability. *Journal of Computational and Applied Mathematics*, **280**, 174–187. [↗](#)
- [17] Wang, R., Peng, L. and Yang, J. (2015). CreditRisk⁺ model with dependent risk factors. *North American Actuarial Journal*, **19**(1), 24–40. [↗](#)
- 2014
- [16] Peng, L. and Wang, R. (2014). Interval estimation for bivariate t-copulas via Kendall’s tau. *Variance*, **8**(1), 43–54. [↗](#)
- [15] Wang, R. (2014). Sum of arbitrarily dependent random variables. *Electronic Journal of Probability*, **19**(84), 1–18. [↗](#)
- [14] Embrechts, P., Puccetti, G., Rüschendorf, L., Wang, R. and Beleraj, A. (2014). An academic response to Basel 3.5. *Risks*, **2**(1), 25–48. [↗](#)
- [13] Peng, L., Qi, Y. and Wang, R. (2014). Empirical likelihood test for high-dimensional linear models. *Statistics and Probability Letters*, **86**, 85–90. [↗](#)
- [12] Wang, R. (2014). Asymptotic bounds for the distribution of the sum of dependent random variables. *Journal of Applied Probability*, **51**(3), 780–798. [↗](#)
- [11] Bernard, C., Jiang, X. and Wang, R. (2014). Risk aggregation with dependence uncertainty. *Insurance: Mathematics and Economics*, **54**, 93–108. [↗](#)
- 2013
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- [2] Wang, B. and Wang, R. (2011). The complete mixability and convex minimization problems for monotone marginal densities. *Journal of Multivariate Analysis*, **102**(10), 1344–1360. [↗](#)
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Other publications

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- [30] Wang, R. (2024). The only admissible way of merging e-values. *arXiv*: <http://arxiv.org/abs/2409.19888>.
- [29] Blier-Wong, C. and Wang, R. (2024). Improved thresholds for e-values. *arXiv*: <https://arxiv.org/abs/2408.11307>.

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arXiv: <https://arxiv.org/abs/2407.16099>.
- [27] Liu, F., Chen, Z., Wang, R. and Wang, S. (2024). Newsvendor under mean-variance ambiguity and misspecification.
arXiv: <https://arxiv.org/abs/2405.07008>.
- [26] Chen, Y., Wang, R., Wang, Y. and Zhu, W. (2024). Sub-uniformity of harmonic mean p-values.
arXiv: <https://arxiv.org/abs/2405.01368>.
- [25] Chen, Y., Hu, T., Wang, R. and Zou, Z. (2024). Dominance between combinations of infinite-mean Pareto random variables.
arXiv: <https://arxiv.org/abs/2404.18467>.
- [24] Bellini, F., Mao, T., Wang, R. and Wu, Q. (2024). Disappointment concordance and duet expectiles.
arXiv: <https://arxiv.org/abs/2404.17751>.
- [23] Lin, L., Wang, R., Zhang, R. and Zhao, C. (2024). The checkerboard copula and dependence concepts.
arXiv: <https://arxiv.org/abs/2404.15023>.
- [22] Fissler, T., Liu, F., Wang, R. and Wei, L. (2024). Elicitability and identifiability of tail risk measures.
arXiv: <https://arxiv.org/abs/2404.14136>.
- [21] Ghossoub, M., Principi, G. and Wang, R. (2024). Allocation mechanisms in decentralized exchange markets with frictions.
arXiv: <https://arxiv.org/abs/2404.10900>.
- [20] Huang, M. and Wang, R. (2024). Coherent risk measures and uniform integrability.
arXiv: <https://arxiv.org/abs/2404.03783>.
- [19] Gasparin, M., Wang, R. and Ramdas, A. (2024). Combining exchangeable p-values.
arXiv: <https://arxiv.org/abs/2404.03484>.
- [18] Chen, Y., Embrechts, P. and Wang, R. (2024). Risk exchange under infinite-mean Pareto models.
arXiv: <https://arxiv.org/abs/2403.20171>.
- [17] Chambers, C. P., Miller, A., Wang, R. and Wu, Q. (2024). Max-stability under first-order stochastic dominance.
arXiv: <https://arxiv.org/abs/2403.13138>.
- [16] Shen, Y., Van Oosten, Z. and Wang, R. (2024). Partially law-invariant risk measures.
arXiv: <https://arxiv.org/abs/2401.17265>.
- [15] Lauzier, J.-G., Lin, L. and Wang, R. (2024). Negatively dependent optimal risk sharing.
arXiv: <https://arxiv.org/abs/2401.03328>.
- [14] Han, X., Wang, R. and Wu, Q. (2023). Monotonic mean-deviation risk measures.
arXiv: <https://arxiv.org/abs/2312.01034>.
- [13] Cui, Z., Liu, Y., Wang, R., Wu, C. and Zhu, L. (2023). Variance optimality of empirical martingale simulation estimators.
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arXiv: <https://arxiv.org/abs/2310.09173>.
- [11] Chambers, C. P., Liu, P. and Wang, R. (2023). A duality between utility transforms and probability distortions.
SSRN: <https://ssrn.com/abstract=4557303>.
- [10] Liu, H., Wang, B., Wang, R. and Zhuang, S. C. (2023). Distorted optimal transport.
arXiv: <https://arxiv.org/abs/2308.11238>.
- [9] Principi, G., Wakker, P. and Wang, R. (2023). Antimonotonicity for preference axioms: The natural counterpart to comonotonicity.
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- [8] Boerma, J., Tsyvinski, A., Wang, R. and Zhang, Z. (2023). Composite sorting.
arXiv: <https://arxiv.org/abs/2303.06701>.
- [7] Lauzier, J.-G., Lin, L. and Wang, R. (2023). Risk sharing, measuring variability, and distortion riskmetrics.
arXiv: <https://arxiv.org/abs/2302.04034>.
- [6] Mao, T., Wang, R. and Zhao, L. (2022). Characterizing fractional degree stochastic dominance by invariance laws.
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- [5] Wang, Q., Wang, R. and Ziegel, J. (2022). E-backtesting.
arXiv: <https://arxiv.org/abs/2209.00991>.
- [4] Jiao, Z., Kou, S., Liu, Y. and Wang, R. (2022). An axiomatic theory for anonymized risk sharing.
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- [3] Mao, T., Wang, R. and Wu, Q. (2022). Model aggregation for risk evaluation and robust optimization.
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- [2] Wang, R. and Zhang, Z. (2022). Simultaneous optimal transport.
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- [1] Han, X., Wang, Q., Wang, R. and Xia, J. (2021). Cash-subadditive risk measures without quasi-convexity.
arXiv: <https://arxiv.org/abs/2110.12198>.

Dissertation

- [1] Wang, R. (2012). Some questions in high-dimensional data analysis and risk management. *Ph.D. Thesis*. Georgia Institute of Technology, USA.

Books

- [1] Wang, R. (2011). *Sanguosha: The Royal Road*. (Non-academic, in Chinese.) Publishing House of Electronics Industry, Beijing. ISBN-9787121126833.
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Regular Courses

University of Waterloo

ACTSC446/846 - Mathematics of Financial Markets	Fall 14; Winters 13, 18-19, 21-22
ACTSC625 - Casualty and Health Insurance Mathematics	Winters 13-15, 17
ACTSC631 - Financial Mathematics III	Spring 15
ACTSC964 - Foundations of Quantitative Risk Management	Winters 17-18, 20-21, 23-24
ACTSC970 - Finance I	Fall 16
ACTSC971 - Finance II	Winter 15
ACTSC991 - Topics in Actuarial Science - Copulas and Dependence Modeling	Winter 14
ACTSC991 - Topics in Actuarial Science - Risk Measurement	Spring 15
ACTSC991 - Topics in Actuarial Science - Robust Risk Aggregation	Winter 20
STAT964 - Topics in Statistics - Game-theoretic Statistics	Winter 21
Joint PhD course with Glenn Shafer (Rutgers) and Aaditya Ramdas (Carnegie Mellon)	

Georgia Institute of Technology

MATH1522 - Linear Algebra for Calculus	Spring 12
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Invited Short Courses and Minicourses

Chinese Academy of Sciences

Minicourse - Risk Measurement under Model Uncertainty (4 hours)	Spring 16
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Peking University

Minicourse - Optimal transport and its applications in economics (5 hours)	Summer 23
Short Course - Theory and Practice of Risk Measurement (20 hours)	Spring 16

ETH Zurich

FIM Minicourse - Risk Aggregation and Fréchet Problems (10 hours)	Fall 15
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University of Milan-Bicocca

Minicourse - Risk Aggregation and Fréchet Problems (10 hours)	Fall 15
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Scientific Service

Affiliated Member

Waterloo Artificial Intelligence Institute	2018 - present
RiskLab, ETH Zurich	2015 - present
Centre for Computational Mathematics, Waterloo	2015 - present
Big Data Research Lab, Waterloo	2014 - present
Waterloo Research Institute in Insurance, Securities and Quantitative Finance	2012 - present

Conference and Workshop Organizers

BIRS Workshop: Game-Theoretic Statistical Inference, Chennai, India	2025.06
5rd Waterloo Conference in Statistics, Actuarial Science & Finance, Waterloo, Canada	2025.04
Oberwolfach Workshop: Game-theoretic Statistical Inference, Oberwolfach, Germany	2024.05
3rd Waterloo Conference in Statistics, Actuarial Science & Finance, Waterloo, Canada	2023.04
INFORMS Annual Meeting (Co-Chair, Finance Cluster), Indianapolis, USA	2022.10
3rd Waterloo Student Conference in Statistics, Actuarial Science & Finance, Waterloo, Canada	2022.10
International Conference on Robust Statistics, Waterloo, Canada	2022.07
INFORMS/CORS International Conference (Chair, Finance Cluster), Vancouver, Canada	2022.06
2nd Waterloo Student Conference in Statistics, Actuarial Science & Finance (online)	2021.11
1st Waterloo Conference in Statistics, Actuarial Science & Finance (Chair), Waterloo, Canada	2019.04
Workshop on Risk Measurement and Regulatory Issues in Business, Montreal, Canada	2017.09
Workshop on Random Complex Structures and Data Analysis in Finance, Beijing, China	2016.08
4th Québec-Ontario Workshop on Insurance Mathematics, Waterloo, Canada	2016.02
6th Annual Graduate Student Probability Conference, Georgia Tech, Atlanta, USA	2012.04
5th Annual Graduate Student Probability Conference, Georgia Tech, Atlanta, USA	2011.04

Conference and Workshop Scientific Committee

2025 Advanced Mathematical Methods for Finance, Verona, Italy	2025.06
2024 Extreme Value Theory and Quantitative Risk Management, Shanghai, China	2024.07
International Conference on Insurance and Actuarial Science, Tianjin, China	2024.06
12th Conference in Actuarial Science and Finance on Samos, Karlovasi, Greece	2024.05
26th International Congress on Insurance: Mathematics and Economics, Edinburgh, UK	2023.07
58th Actuarial Research Conference, Des Moines, USA	2023.07
5th European Actuarial Journal Conference, Tartu, Estonia	2022.08
2022 Extreme Value Theory and Quantitative Risk Management, Shanghai, China	2022.08
Online International Conference in Actuarial Science, Data Science and Finance (OICA)	2020.04
2nd International Workshop on Optimal (Re)Insurance, Beijing, China	2018.07
6th International Gerber-Shiu Workshop, Beijing, China	2016.06

PhD Committee and Thesis External Examiner

Name	Department	Institution	Year
Yuxuan Guo	Statistics and Actuarial Science	University of Waterloo	
Morten Wilke	Business	VU Brussels/Ulm University	
Zev Hirsch	Finance	Rutgers University	
Michael Zhu	Statistics and Actuarial Science	University of Waterloo	
Xiyue Han	Statistics and Actuarial Science	University of Waterloo	2024
Wenyue Liu	Mathematical and Statistical Sciences	University of Alberta	2023
Yixuan Li	Economics	University of Waterloo	2023
Gracia Dong	Statistics and Actuarial Science	University of Waterloo	2022
Zhiwei Tong	Risk and Actuarial Studies	University of New South Wales	2021
Ou Dang	Statistics and Actuarial Science	University of Waterloo	2021
Takaaki Koike	Statistics and Actuarial Science	University of Waterloo	2020
Ahmed Abdalrahman	Electrical and Computer Engineering	University of Waterloo	2020
Edgars Jakobsons	Mathematics	ETH Zurich	2016
Fangda Liu	Statistics and Actuarial Science	University of Waterloo	2015

Tenure and Promotion Letters Written: 12 since 2022

External Program Review

Applied Mathematics, Ryerson University 2018

External Committees

Alibaba Global Mathematics Competition Exam Committee, Alibaba (China) Co. 2020 - 2024

CAS Exam 9 Committee, Casualty Actuarial Society 2020

Peer-review Service

Total: 80 journals, 213 papers, 16 grant proposals

Some Journals

- Annals of Statistics
- Annals of Applied Statistics
- Annals of Applied Probability
- Biometrika
- Journal of the Royal Statistical Society - Series A/B
- Statistical Science
- Bernoulli
- Journal of the American Statistical Association
- Journal of Machine Learning Research
- Management Science
- Operations Research
- Manufacturing & Service Operations Management
- Mathematics of Operations Research
- SIAM Journal on Optimization
- Journal of Economic Theory
- Review of Economics and Statistics
- Journal of Banking & Finance
- Journal of Econometrics
- Journal of Business & Economic Statistics
- Mathematical Finance
- Finance & Stochastics
- SIAM Journal on Financial Mathematics
- ASTIN Bulletin
- Insurance: Mathematics & Economics
- Journal of Risk & Insurance
- North American Actuarial Journal
- Scandinavian Actuarial Journal
- European Actuarial Journal
- Proceedings of the National Academy of Sciences

Some Grant Proposals

- CANSSI (Canada) ◦ FRQNT (Canada) ◦ NSERC Discovery (Canada) ◦ SNSF (Switzerland)
 - European Research Council (EU) ◦ FONDECYT (Chile) ◦ Leventis Foundation (Cyprus)
 - Israel Science Foundation (Israel) ◦ Dutch Research Council (Netherlands)
-

Invited Academic Presentations

Total: 200 invited academic talks (in 15 countries)

Some Seminars

Pennsylvania (Wharton Statistics); Princeton (ORFE); Stanford (MSE); Berkeley (Statistics; IEOR); Columbia (Statistics); Chicago (Statistics); Cornell (ORIE); ETH Zurich (Mathematics); EPF Lausanne (Finance); Carnegie Mellon (Mathematics; Statistics); Canadian Imperial Bank of Commerce

Some Keynote Addresses

2023 CSIAM Conference on Actuarial Theory and Applications	2023
56th Actuarial Research Conference	2021
24th International Congress on Insurance: Mathematics and Economics	2021
4th European Actuarial Journal Conference	2018

Personal

Born in Beijing (1984), citizen of China, permanent resident of Canada

Number of countries visited: 60

Number of continents visited: 7 (✓ July 2018)

Number of courses taught: 24 regular courses, 1 short course, 4 minicourses (in 6 institutions)

Erdős Number: 3 (Ruodu Wang ← Ričardas Zitikis ← Endre Csáki ← Paul Erdős)
