Giorgio Costa

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EDUCATION

Sep 2015 – Present **Ph. D. Candidate in Operations Research**, University of Toronto
Advisor: Professor Roy H. Kwon
Thesis: Advances in risk parity portfolio optimization

Sep 2007 – May 2012 **B. Eng. Hons. in Mechanical Engineering**, McGill University
Minor in Economics
Advisor: Professor Michael P. Paidoussis
Thesis: Stability of pipes subjected to fluid flow induced vibration with flexible boundary conditions in discharge

RESEARCH INTERESTS

- Convex optimization
- Robust optimization
- Unsupervised learning
- Distributed algorithms for non-convex problems
- Multi-period optimal decision making
- Quantitative finance and risk management

PUBLICATIONS AND PRESENTATIONS

Journal Publications

- **Costa, G.** and Kwon, R. H. (accepted). Generalized risk parity portfolio optimization: an ADMM approach. *Journal of Global Optimization*.
- **Costa, G.** and Kwon, R. H. (2020). A regime-switching factor model for mean–variance optimization. *Journal of Risk*, 22(4), 31-59.
- **Costa, G.** and Kwon, R. H. (2019). Risk parity portfolio optimization under a Markov regime-switching framework. *Quantitative Finance*, 19(3), 453-471.
- Wu, D., Kwon, R. H., and **Costa, G.** (2017). A constrained cluster-based approach for tracking the S&P 500 index. *International Journal of Production Economics*, 193, 222-243.
- Kheiri, M., Paidoussis, M. P., **Costa, G.**, and Amabili, M. (2014). Dynamics of a pipe conveying fluid flexibly restrained at the ends. *Journal of Fluids and Structures*, 49, 360-385.

Manuscript Preprints

- **Costa, G.** and Kwon, R. H. (2020). A robust framework for risk parity portfolios. Manuscript submitted for publication to the Journal of Asset Management.

Conference Proceedings

- Kheiri, M., Paidoussis, M. P., and **Costa, G.** (2014). Dynamics of a Pipe Conveying Fluid Flexibly Supported at the Ends. *Proceedings of the ASME 2014 Pressure Vessels and Piping Conference. Volume 4: Fluid-Structure Interaction*. Anaheim, California, USA. July 2024, 2014.

Presentations

- **Costa, G**. (November 2019). *Generalized Risk Parity Portfolio Optimization: An ADMM Approach*. CASCON x EVOKE, IBM annual academic and research conference. Markham, ON.
- **Costa, G**. (May 2019). *Generalized Risk Parity Portfolio Optimization: An ADMM Approach*. CORS Annual Conference. Saskatoon, SK.
- **Costa, G**. (November 2018). *A Regime-Switching Framework for Portfolio Optimization*. Fourth Industrial-Academic Workshop on Optimization and Artificial Intelligence in Finance at The Fields Institute. Toronto, ON.
- **Costa, G**. (November 2018). *A Regime-Switching Framework for Portfolio Optimization*. University of Toronto Operations Research Group. Toronto, ON.
- **Costa, G**. (January 2018). *Hidden Markov Model for Risk Parity Optimization*. Master of Mathematical Finance Symposium 2018. Blue Mountain, ON.

TEACHING, MENTORSHIP AND ACADEMIC SERVICE

Course Instructor (Lecturer)

Division of Engineering Science, University of Toronto

Winter 2018 – 2020 — MIE377 – Financial Optimization Models

- Third-year undergraduate course; enrolment: 25 students
- Instructor rating: 4.6 / 5.0
- Prepared and delivered lectures. Updated the course curriculum. Redesigned the course-work to emphasize practical applications with real financial data. Managed a team of two teaching assistants. Successfully underwent the Canadian Engineering Accreditation Board skills assessment process during the Winter 2018 term.

Department of Electrical and Computer Engineering, University of Toronto

Fall 2019 — ECE302 – Probability and Applications

- Third-year undergraduate course; enrolment: 100 students
- Instructor rating: 4.0 / 5.0
- Prepared and delivered lectures. Designed a new set of lecture notes. Managed a team of six teaching assistants.

Division of Engineering Science, University of Toronto

Fall 2018 — MIE375 – Financial Engineering

- Third-year undergraduate course; enrolment: 30 students
- Instructor rating: 4.5 / 5.0
- Prepared and delivered lectures. Updated the course curriculum. Managed the teaching assistant to ensure proper alignment between lectures and tutorials.

Teaching Assistant

Master of Mathematical Finance Program, University of Toronto

Summer 2017 – 2020 — MMF1921 – Operations Research

- Graduate course; enrolment: 30 students
- Responsibilities included preparation and delivery of tutorials, and preparation and grading of exams and assignments.

Fall 2017 – 2019 — MMF2000 – Risk Management

- Graduate course; enrolment: 30 students
- Responsibilities included grading of assignments and exams.

Division of Engineering Science, University of Toronto

Fall 2019 — MIE479 – Capstone Design Project

- Fourth-year undergraduate course; enrolment: 30 students
- Responsibilities included preparation and delivery of Python coding workshops and regular check-ins with the student teams to discuss model development.

Department of Mechanical and Industrial Engineering, University of Toronto

Fall 2016 — MIE1621 – Non-Linear Optimization

- Graduate course; enrolment: 45 students
- Responsibilities included grading of assignments and exams.

Student Supervision

Sep 2019 – Apr 2020 — Yu Zhang (undergraduate student, co-supervised with Prof. Roy H. Kwon)
Thesis: Financial fundamental factors: A comparative and data-driven approach.

Sep 2019 – Apr 2020 — Yang Yang (undergraduate student, co-supervised with Prof. Roy H. Kwon)
Thesis: A quantitative approach to build a predictive model of PE ratio for stocks using linear regression with log transformations.

Academic Service

Sep 2017 – Present — *The Engineering Economist Journal*
Journal paper reviewer in mathematical optimization and applications

Volunteer Tutor

Sep 2015 – Jun 2017 — *Pathways to Education, Regent Park*
High school mathematics and physics tutor in a priority-neighbourhood in Toronto

HONOURS AND AWARDS

Sep 2019 – Aug 2020	**Ontario Graduate Scholarship**, Scholarship
Sep 2016 – Aug 2020	**Department of Mechanical and Industrial Engineering**, Fellowship
Sep 2018 – Aug 2019	**Ontario Graduate Scholarship**, Scholarship
Sep 2017 – Aug 2018	**Queen Elizabeth II Graduate Scholarship in Science and Technology**, Scholarship
Sep 2016 – Aug 2018	**Mitacs Accelerate**, Research grant
Sep 2010 – Apr 2012	**MEES (Quebec) International Fee Exemption**, Scholarship

PROFESSIONAL EXPERIENCE

Toronto–Dominion Bank, Toronto, ON

Oct 2017 – Sep 2018/ Oct 2016 – Mar 2017 — **Senior Risk Analyst**, TD Wealth – Credit and Market Risk

Received a Mitacs Accelerate research grant to develop a novel equity risk model that measures the propensity of a stock to suffer from price shocks. This model applies machine learning principles while retaining interpretability, and leverages large financial data sets. The development included feature selection and engineering, predictive model design, backtesting, and documentation. This model was successfully validated through the TD validation process. Other responsibilities included volatility surface re-calibration for option pricing, as well as general quantitative research of U.S. and Canadian equities.

Apr 2017 – Sep 2017 — **Research Associate**, TD Securities – Capital Markets Risk Management

TD Securities faced a problem modelling interest rate shocks under a negative rate environment. The proposed solution adapted peer-reviewed academic research into a tailored model that produced reasonable simulated shocks when interest rates approached near-zero and negative values. This allowed TD Bank to generate more faithful interest rate shock simulations using Monte Carlo methods to measure the 10-day Value-at-Risk of the bank's portfolios. My responsibilities included research, model selection and adaptation to meet our requirements, coding and implementation, and backtesting.

Wood plc (formerly Amec Foster Wheeler plc), Oakville, ON

Sep 2014 – Aug 2015 — **Project Engineer-in-Training**

Project: Rainy River

Coordinated the preparation of deliverables between the engineering, scheduling, and cost control departments. These deliverables included technical drawings, calculations, and specifications. Evaluated equipment tender bids and provided technical recommendations.

Mar 2014 – Aug 2014 — **Field Engineer**, On-site at Buchanan, Liberia

Project: Liberia Western Range Iron Ore – Phase II

Performed project management duties for a large-scale construction project. Supervised construction and scheduling of project activities. Coordinated between the engineering and construction management teams.

Jul 2012 – Feb 2014 — **Mechanical Engineer-in-Training**

Projects: Liberia Western Range Iron Ore – Phase II, Belle Plaine, Copper Cliff

Prepared and checked engineering calculations and technical drawings. Prepared computational fluid-flow models and stress analysis of piping systems.

PROFESSIONAL AFFILIATIONS

Apr 2019 – Present	Student Member, Institute for Operations Research and Management Sciences (INFORMS)
Nov 2018 – Present	Student Member, Canadian Operations Research Society (CORS)
Aug 2012 – Present	Engineer-in-Training, Professional Engineers Ontario (PEO)

PROGRAMMING AND SOFTWARE

Programming	Julia, R, Python, HTML5/CSS3, LaTeX
Software	MATLAB, MS Office Suite
Optimization tools	Gurobi, Mosek, Ipopt, CPLEX, SCS, JuMP, CVXPY
Cloud Computing	MS Azure, Docker