



GLOBALRISK
INSTITUTE

GRI ANNUAL
REPORT
—
2017

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**GLOBAL RISK
INSTITUTE**

in Financial Services

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Introduction

“*The global financial crisis was hugely damaging, costing tens of millions of jobs, trillions of lost output and trust in the system itself. Over the past decade there has been a global effort to strengthen the world’s financial system. We have now agreed the measures to address the fault lines that caused the crisis. The system is now safer, simpler and fairer. The work of the Global Risk Institute in education and research – which I first experienced during my time as Governor of the Bank of Canada – has been an invaluable support to understanding how to build a more resilient financial system in Canada and beyond. But such work is never finished.*

GRI’s mission to provide risk insight and build capacity is more critical than ever. We will continue to rely on the GRI’s education, research and engagement to strengthen system stability in Canada and to bring a bit of a Canada to the world.”

Mark Carney, Governor,
Bank of England
November 2017

GRI FOUNDING MEMBERS

Government of Canada
Province of Ontario
Manulife Financial
TD Bank Group

GRI MEMBERS

bcIMC
BMO Financial Group
Business Development Bank of Canada
Canadian Institute of Actuaries
Canada Mortgage and Housing Corporation
CIBC
CPP Investment Board
Desjardins
Equitable Bank
Export Development Canada
Fairfax Financial Holdings Limited
Gluskin Sheff & Associates
Insurance Bureau of Canada
La Caisse de Dépôt et Placement du Québec
Laurentian Bank
MD Financial Management
Munich Re Canada
National Bank of Canada
OMERS
Ontario Pension Board
Ontario Teachers' Pension Plan
Payments Canada
PC Bank
Power Financial Corporation, including- IGM
Financial- Great-West Life Assurance Company-
Mackenzie Investments
PSP Investments
RBC
Scotiabank

LETTER FROM THE BOARD CHAIR

In the decade since the 2008 Global Financial Crisis, sweeping regulatory reforms have been implemented and financial institutions have invested heavily in strengthening risk management, compliance, and risk culture. As a result, the global financial system is much safer today.

Nevertheless, risk management is no less pressing. As quickly as needed reforms have been implemented, new risks have emerged including data privacy, cyber security, conduct, strategy and technology risk, climate change, and populism. These risks require new thinking and new skills. The Global Risk Institute strives to provide insight on emerging risks, bringing thought leadership and building new capacity on risk issues.

In 2017, GRI had a strong year, providing insights and education to members. The Board is delighted with the pace of growth in applied research and the scope and quality of the educational initiatives developed and supported by GRI. With new learning programs under development, new investments in applied research into pensions and income security, and an active calendar of interaction amongst risk professionals, GRI continues to gain momentum and expand its contribution to sound risk management in financial services.



GOVERNANCE:

The Global Risk Institute continues to strengthen its governance through the effective use of its committee structure and the quality of our Board participation.

In January 2018, GRI was proud to welcome two new board members whose professional experience and risk management knowledge contribute to our goal of defining thought leadership in risk management globally:

1. *Julie Dickson, Director, Canadian Public Accountability Board, and former Superintendent of Financial Institutions*
2. *Lynn Oldfield, President & CEO, AIG Insurance Company of Canada*

We wish to thank all of the Board members for their dedicated work, and a very special thank you to Eli Dadouch, Malcolm Knight and Bill Black, who complete their terms in early 2018.

GRI continues to utilize a number of management committees to engage its members, industry experts and advisors. These include:

- . *Advisory Council*
- . *Business Strategy Committee*
- . *Research Advisory Committee*

With the expanded role of research following the launch of the National Pension Hub initiative, we are strengthening our research processes to ensure we have the highest level of performance in creating value for our members. GRI has developed a unique capability in working with both industry and academics, bringing new insights to risk issues, and, at the same time, developing relevant findings that members can immediately apply.

ANNUAL GENERAL MEETING:

We will host our annual general meeting on Thursday, **April 19, 2018** at our GRI offices in Toronto, Canada.

GOING FORWARD:

GRI strives to contribute significantly to the dialogue on risk management issues in the financial services industry. As an industry, we cannot take our eye off the enduring risks in financial services – credit, market risk, and liquidity risk, maturity mismatch, and leverage – but in a world of increasing complexity and connectivity, risk management must embrace a plethora of new issues spanning technology, the environment, and conduct and reputation. For board members, executives and management of financial institutions, new risks are creating new challenges, requiring new competencies, new processes, and new

organizational structures and governance. While GRI will continue to be small and to efficiently deploy members' contributions, the impact and breadth of its research, education and engagement will continue to expand as risks broaden.

Ten years ago the Global Financial Crisis was finally contained by extraordinary coordinated actions taken by the G7 group of countries. In 2018, Canada is the chair of the G7. GRI's mission is to work with the financial services industry and government to ensure that sound risk management remains a competitive advantage for Canada, and this continues to be something Canada can export to the world.



Tiff Macklem

LETTER FROM THE CEO

At the Global Risk Institute, we continue to support the work of the financial services industry in management of evolving risks. 2017 has been a year of building on our strengths by launching exciting new initiatives. Our work this past year included:



New Initiative: National Pension Hub (NPH) for Pension Knowledge & Research

NPH was launched in October 2017 at the GRI Annual Conference. The purpose of the NPH is to provide pension and income security research that will lead to innovative solutions to pension design, governance and investment challenges. So far, 18 firms have committed research funds to this exciting project. More details are available on our website.

GRI Annual Summit

The GRI Annual Summit in October was our best ever, with record attendance and fantastic contributions by the presenters. The 2018 Summit will take place on October 4, 2018.

Research

Our Research agenda continues to grow and strengthen. GRI has made meaningful contributions to the research focus and discussion in the fields of Cyber Security, Quantum Computing, Artificial Intelligence and Climate Science.

Publications

We continued to produce important white papers with relevant management responses on key topics such as cyber threats, and a strategic framework to manage global risk and trends (GRAFT), as well as Student Insights.

Events

We have set new records in the number and quality of events totaling over 40 in 2017, including 9 in New York and 2 in London, UK.

NEW INITIATIVES IN 2018

In 2018, we will be seeing the culmination of our work on a number of fronts.

New course: "Risk Management for Emerging Leaders"

This new GRI course is intended for non-executive management of our member firms and consists of five half-day sessions presented over five months. Our first cohort begins February 2018 and is fully subscribed. The second cohort is planned for September 2018.

Province of Ontario Workshops and Education on Risk Management.

GRI will be working directly with the Province, on a number of initiatives, to provide intensive risk management education for civil service members and management within the government.

Risk Management of Cyber Threats

GRI is hosting an industry round-table in February 2018 in conjunction with the Department of Finance Canada to examine issues around cyber threats. In addition, we are the lead partner for the International Cyber Risk Management Conference to be held in Toronto in April 2018.

GRI STAFFING

We were pleased to announce that Mr. Mark Caplan joined us as President of GRI. His appointment will permit us to expand the work we do to build value for GRI members.

I would like to thank Prof. Tom Coleman, Ms. Anca Drexler and Mr. Brian O'Donnell for their contributions to GRI and wish them well in their next endeavours.

It will be the quality of our ideas and the engagement of our members that will continue to make GRI successful.



Richard Nesbitt



Institute Growth in 2017

NATIONAL PENSION HUB (NPH)

At the 2017 Annual Summit, GRI announced the creation of a National Pension Hub (NPH) that will serve as Canada's centre for pension thought leadership and research.

The NPH will bring Canada's pension leaders together to pool knowledge and resources, collaborate and debate, and develop valuable insights on the most critical issues challenging the country's retirement security.

With the strategic partnership of GRI, a syndicate of industry experts and academic researchers will collaborate to incubate a sustained pipeline of transformative, risk managed outcome-based, pension research.

PROPOSED RESEARCH TOPICS

The NPH will examine a broad spectrum of research topics that span across plan types and pension stakeholders. Preliminary discussions on areas of topical interest have been plentiful, signalling a healthy pipeline for research over time.

Research focus will be collectively informed, prioritized and funded by the NPH. GRI will support the research mandate through topical guidance, overall administration and project management.

Research ideas generated include:

- Plan Adequacy / Plan Design*
- Discount Rates & Liability Modeling*
- Private Market Risk Assessment*
- Portfolio Construction from a pension plan perspective*



Research Report

The GRI Research team is tasked with identifying emerging risks and with providing valuable and actionable insights in the field of risk management. This is achieved through internal research initiatives and funded collaborations with leading academic institutions around the globe.

NEW RESEARCH INITIATIVES IN 2017

In continuing to support research on emerging risks, two new collaborative projects have commenced in the fields of financial technology and cybersecurity.

Climate Extremes: Aging Dams and Failure Impacts

Project Lead: Upmanu Lall, Director, Columbia Water Center, Columbia University

This project will develop and test a framework for rapid, scalable applications over many regions for a preliminary ranking of the priority areas of concern, and also for detailed region specific applications. The intended application is for a portfolio level risk analysis by investors, asset managers, and insurance providers. The framework will develop general climate risk exposure tools that can be used to assess risks across a portfolio of dams to answer the question of what is exposed below them, to identify the critical climate factors contributing to the failure and the associated return period and expected loss.

Rotman Financial Innovation Hub

Project Lead: Professor Peter Christoffersen of the University of Toronto's Rotman Business School

The Rotman Financial Innovation Institute and Hub (FinHub) will comprise several components, including a network of researchers, masters programs, and a fintech start-up incubator. The research project will focus on the economic impact of (a) incentive fees on settlement speed and (b) settlement speed on intermediated liquidity of blockchain based exchanges.

Cyber Resilience Project

Project Lead: Benoit Dupont, Canadian Research Chair in Cybersecurity

The Cyber-Resilience Project will combine a literature review on the outcomes of cyber-attacks (both from an actuarial and remedial perspective) with semi-directed interviews of respondents working for organizations particularly exposed to data breaches and security companies providing incident response services. Through a series of industry reports, this project will provide insights into best practices for ensuring post-breach resiliency.

COLLABORATIVE RESEARCH EVENTS



2017 brought new opportunities to collaborate with academic organizations on tailored research events. Based on GRI's global strategy to expand its presence internationally, nine research events were held in New York City along with other key events hosted domestically. Some of our most notable research events include:



TMX Panel on Clearing Houses and Systemic Risk

GRI and the TMX Group held a panel on Clearing Houses and Systemic Risk. The panelists discussed a wide array of topics including: ways to address systemic risks of Central Counterparty Clearing House (CCPs), concerns regarding their "too big to fail" status, the impact of regulation and stress testing, and the application of Distributed Ledger Technologies.



Financial Engineering Practitioner's Seminar

This bi-monthly seminar was hosted in conjunction with Columbia University's Industrial Engineering and Operations Research Department and introduced nine speakers. These included Nobel Laureate Robert Engle, who discussed Environmental Risk, Darrel Duffie, who introduced converting LIBOR rates into new reference rates, and Charles Calomiris, who discussed the impact of news on financial markets.



Climate Disclosure & Scenario Analysis Workshop

GRI and the Shareholder Association for Research and Education (SHARE) organized a half-day workshop that focused on the challenges and opportunities of implementing the Task Force on Climate-related Financial Disclosures (TCFD) recommendations. The workshop included presentations by representatives of the Financial Stability Board (FSB) TCFD, experts in emerging climate risk management approaches from the 2-Degree Investing Initiative, and representatives from the United Nations Environment Programme Finance Initiative (UNEP FI) Climate Change Working Group.

In addition to presentations from expert speakers, the workshop included substantial discussion under Chatham House Rules, to delve deeper into the challenges financial institutions face in applying scenario analysis models to address climate-related risks.

Publications Report

The Global Risk Institute continued to deliver high quality research in the field of risk management in 2017. During the year, GRI published 15 white papers and 14 research reports.

TOP RESEARCH PUBLICATIONS

Through external contracts, collaborations, and members of the GRI research group, GRI produced 29 publications in 2017 focusing on the Institute's seven risk categories: Technological Disruption & Innovation; Cyber Security & Fraud; Climate Change and Environmental Risk; Regulatory Compliance & Financial Stability; Systemic Risk; Macroeconomic Risk; and Risk Management Practices.

SOME HIGHLIGHTS FROM THESE PUBLICATIONS INCLUDE:

Authors:

*Alex LaPlante, MD Research,
Global Risk Institute*

*Thomas F. Coleman, Professor,
University of Waterloo*

Authors:

*Terrance Charles, Independent
Consultant,*

*Alexander Shipilov, Partner,
Financial Risk Management, KPMG,*

*Brian O'Donnell, Executive-in-
Residence, Global Risk Institute*

Authors:

*Michele Mosca, Co-founder and CEO,
evolutionQ Inc., &*

*John Mulholland, Director,
Quantum Risk Management,
evolutionQ Inc*

How Natural Language Processing is Reshaping the World of Finance

Natural Language Processing (NLP) is a sub-section of the artificial intelligence domain that is focused on teaching computers to understand natural human languages. This report briefly introduces NLP and details how financial institutions can employ these techniques to extract valuable information and improve their risk management processes.

The Challenges of Implementing IFRS 9 – Impairment Part 1

This article provides an overview of IFRS 9 and its potential impacts, such as increasing the complexity of a bank's credit risk systems and models, and introducing new operational risks. The most fundamental change from the implementation of these standards is that banks will now be required to take a provision on all loans in their banking book, which will cause loan loss provisions to increase and become more volatile.

A Methodology for Quantum Risk Assessment

This report describes the risks of quantum computing and provides insights into how to prepare for this complex emerging risk. The authors introduce a six phase Quantum Risk Assessment (QRA) for businesses with potential exposure to quantum risk and provide guidance as to what businesses should do now to ensure that they are adequately prepared for a future attack.

Education Report

As part of our mission to build the capacity of risk professionals in the financial services sector, our Members gain access to GRI's education programs and networking events.

MEMBER EDUCATION PROGRAM HIGHLIGHTS

Board Risk Oversight and Insight Program

With a focus on strengthening risk governance best practices at the highest levels of our members' organizations, GRI's **Board Risk Oversight and Insight Program** continued to be a core, and very well received, part of GRI's education programming during 2017. This year 38 individuals attended sessions held in April and September, 2017.

Enterprise Risk Management (ERM) Roadmap Program

In the latter part of 2016, GRI introduced the **Enterprise Risk Management (ERM) Roadmap Program**. The ERM Roadmap Program identifies seven core ERM processes and the associated interdependencies required to achieve the formation of an effective, holistic and integrated approach to ERM in a financial services context. In 2017, this Program has seen impressive growth with 48 individuals attending three separate sessions.

44  **IN JUNE**
students

graduated from the
Master of Financial Risk
Management Program.

Program Sponsored by GRI

Rotman School of Management Master of Financial Risk Management

UNIVERSITY OF TORONTO

GRI was instrumental in the development of this intensive full-time eight-month degree program, introduced in the 2016/2017 academic year, to offer advanced education specific to risk management for the financial sector.

Rotman
MASTER OF FINANCIAL RISK MANAGEMENT

WORKSHOPS & EDUCATION

GRI was active in training and educating member organizations on important risk areas that are top-of-mind in the financial services industry. GRI staff presented on the following topics in 2017:

- *Reputational and Cultural Risk*
- *Cyber Security, "You've been Hacked" Case Study*
- *Enterprise Risk Management (ERM)*
- *Global Risks and Trends Framework (GRAFT)*

Queen's University's Graduate Diploma in Risk Policy and Regulation

QUEEN'S UNIVERSITY

GRI provided seed funding for this new graduate diploma which seeks to provide risk managers and financial regulators with the capacity to identify and manage risks to deliver the best possible outcomes for their organizations.


Queen's
UNIVERSITY

Engagement Report

ANNUAL CONFERENCE

2017 GRI SUMMIT

This year's conference was hosted in Toronto in early October, moved from previous years' date of November.

We also changed the venue of the summit to The Toronto Region Board of Trade. Based on the participation numbers and attendee feedback, both of these changes were key factors in this year's success, marking the 2017 GRI Summit our most successful to date.

Summit presentations focused on the following key risk themes:

DISRUPTIVE TECHNOLOGY

Blockchain 2.0

Campbell R. Harvey, Professor, Duke University and Investment Strategy Advisor, Man Group, PLC

ARTIFICIAL INTELLIGENCE

Watson (AI) Demonstration

Marc Andrews, Vice President, Watson Financial Services Solutions, IBM Industry Academy Member

CLIMATE CHANGE

Climate Shock

Gernot Wagner, Co-Director, Harvard's Solar Geoengineering Research Program and Research Associate, Harvard University

RISK MANAGEMENT PRACTICES

Insurance & Climate Change

Don Forgeron, CEO, IBC & Sharon Ludlow, Head of Insurance Investment Strategy, OMERS

CYBER SECURITY

Internet Security

Douglas Stebila, Assistant Professor in Cryptography, McMaster University

PENSION RESEARCH

National Hub for Pension Research & Education

Barbara Zvan, Chief Risk & Strategy Officer, Ontario Teachers' Pension Plan

245

Individuals in attendance this year representing 50 Organizations

93%

of attendees in the room were senior decision makers

Event attendees rated the

98%

Summit: 4.2/5

Strongly agreed/agreed that the summit was relevant to their business needs



2017 EVENTS

In 2017 GRI hosted over 40 events in Canada with 912 individuals in attendance. These events featured leading financial services experts from academia, industry and the public sector.

HIGHLIGHTS OF 2017 EVENTS INCLUDED:

Trump Administration: Impact on Regulation & Financial Services

Speakers included:

Mark Hughes, RBC; John Hull, Rotman School of Management, Sheryl Kennedy, Promontory Financial Group; Richard Nesbitt, Global Risk Institute; and Gregory Wilson, U.S. Treasury Department.

Artificial Intelligence:

The coming risks and rewards to finance

Speaker:

Michael Durland, CEO of Melancthon Capital and Professor of Practice, Munk School of Global Affairs

Canada's Housing Market – Future Possibilities

Speaker:

Benjamin Tal, Deputy Chief Economist, CIBC

Investment Risks and Opportunities in Response to Climate Change

Speaker:

Barbara Zvan, SVP & Chief Risk & Strategy Officer, Ontario Teachers' Pension Plan

The Future of Financial Services

Hosted by:

Ivey Business School- Scotiabank Digital Banking Lab Conference in Partnership with GRI

Mitigating Impact of Earthquake Risk

Speaker:

Nick Le Pan, Chair CPAB

Canada's competitiveness and the Trump Tax Reform Plan

Speaker:

Jack Mintz, University of Calgary

Governance and Oversight Report



BOARD OF DIRECTORS

Tiff Macklem, Chair, Global Risk Institute, Dean, University of Toronto, Rotman School of Management

William A. Black, Corporate Director

Alister Campbell, Corporate Director

Francine Champoux, Chief Risk Officer, Desjardins Group

Eli Dadouch, President & CEO, Firm Capital Corporation

Dwight Duncan, Senior Strategic Advisor, Mcmillan LLP

Janet L. Ecker, Corporate Director

Rahim Hirji, Executive Vice President and Chief Risk Officer, Manulife Financial

Timothy E. Hodgson, Managing Partner, Alignvest Management Corporation

Mark Hughes, Group Chief Risk Officer, Royal Bank of Canada (RBC)

Malcolm D. Knight, Distinguished Fellow at The Centre For International Governance Innovation (CIGI)

Paul Langill, Chief Operating Officer, TD Securities, Executive Vice President, TD Bank Group

Richard Nesbitt, Chief Executive Officer, Global Risk Institute

Nicola Wickes, Senior Vice-President and Chief Risk Officer, Europe And Asia- Canadian Imperial Bank of Commerce (CIBC)

Don M. Wilson III, Chair of The Risk Review Committee, Bank of Montreal (BMO)

Barbara Zvan, Senior Vice President, Chief Risk and Strategy Officer, Ontario Teachers' Pension Plan (OTPP)

Our Advisory Council includes world leading finance experts from industry, government and academia.

GRI ADVISORY COUNCIL

The Advisory Council guides the GRI board committees and management in establishing an international presence.

MEMBERS INCLUDE:

The Right Honourable Paul Martin
Prime Minister of Canada from 2003 to 2006 and Minister of Finance from 1993 to 2002.

Prof. John Hull
The Maple Financial Professor of Derivatives and Risk Management at the Rotman School of Business.

Tiff Macklem

Dean of the University of Toronto's Rotman School of Management and former Senior Deputy Governor of the Bank of Canada.

Dr. Jack Mintz

The President's Fellow of the School of Public Policy at the University of Calgary, and former President of the CD Howe Institute.

RESEARCH ADVISORY COMMITTEE

The Research Advisory Committee's (RAC) mandate is to advise the GRI research team, Chief Research Officer, and CEO on matters of research.

MEMBERS ARE:

Claude Bergeron, EVP and Chief Risk Officer, La Caisse de Depot et Placement du Quebec

Peter Carr, Executive Director, Math Finance program at NYU's Courant Institute

Michel Crouhy, Head of Research & Development, Natixis in France

Darrell Duffie, Economist and Professor of Finance, Stanford University

Paul Glasserman, Professor and Research Director, Columbia University

Toni Gravelle, Managing Director of the Financial Markets Department, Bank of Canada

Kathryn Hyland, SVP, Risk Management, Swiss Re

Malcolm Knight (GRI Director), Distinguished Fellow at The Centre for International Governance Innovation (CIGI)

Stefan Dunatov
Senior Vice President, Investment Risk, Strategy & Research, British Columbia Investment Management Corporation (bcIMC)

Dan Rosen, Professor of Mathematical Finance, Fields Institute, University of Toronto

Barbara Zvan (GRI Director), Chief Risk & Strategy Officer, Ontario Teachers' Pension Plan (OTPP)

BUSINESS STRATEGY COMMITTEE

The Business Strategy Committee makes recommendations on major strategic and policy initiatives that will impact the direction of GRI.

MEMBERS ARE:

Edwin D. Cass, Senior Managing Director & Global Head of Real Assets, Canada Pension Plan Investment Board (CPPIB)

J. Michael Durland, President & Chief Operating Officer, Melancton Capital

Stephen Forbes, EVP Banking Centres, Canadian Imperial Bank of Commerce (CIBC)

Richard Frank Goulding, Former Chief Risk Officer, Standard Chartered PLC

Daniel Moore, Chief Risk Officer, Scotiabank

Ozench Ibrahim, Partner, Audit, Financial Services, KPMG



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