Webinar
July 9th, 2020 – 9:00 AM to 10:30 AM (EDT)

Advanced Analytics For Risk Management
The Montreal Group was founded in 2012 to promote international cooperation, mutual learning and exchange of technical expertise among MSME-focused Development banks.

The Group’s name is derived from the city in which it was founded, Montreal, Canada.
Presenters

Webinar Advanced Analytics for Risk Management

Gabriel Youssef
President Founder

Vasantha Narasimhan
Senior Research Associate
Agenda

- Introduction 10 minutes
- White Paper Presentation 35 minutes
- TMG Member Experiences 25 minutes
- Q & A 20 minutes
Advanced Analytics for Risk Management

WHITE PAPER
Summary: Ecosystem (Pre-COVID-19)

- MSMEs Expect Enhanced Financial Services from DBs
- New Entrants – Attractive Alternative to Banks
- Smart Moves
- Winning Strategy
The Ecosystem for Development Banks Now: What has Changed?

Key Trends

- Unprecedented economic crisis
- New policies from governments
- Need for quick assessment of risk
- Requirement for banks to operate in uncharted territories
- Higher costs stemming from immediate access to financial technology and talents

Opportunity to reevaluate how technology, insight and analytics can accelerate the future growth and sustainability of financial institutions globally
Chapter 2

RISK MANAGEMENT NOW AND IN THE FUTURE
Evolution of the Role of Risk Management (RM)

Digitization of risk expands the traditional role of RM:

- it is not restricted to risk avoidance

The new role of RM involves working with business functions across the organization in a digital transformation to enable:

- strategic decisions regarding identification of emerging risks
- pursuit of growth opportunities presented by the ecosystem

RM would be forward looking and vigilant to emerging risks while assisting to:

- shape the risk culture of the organization
- focus on risk adjusted performance
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Relevance of Risk Management to Pre-Crisis and Crisis situations

- The Risk Management role reflected in the white paper is stronger now than before
- Potential processes that will require more support include:
  - Responding to government support programs (SMEs and others)
  - Lending and loan servicing modifications (high volume, rapid speed, new grace periods)
  - Safeguarding financial operations to protect against cybersecurity risk and fraud
  - Active monitoring to identify customers, who are most vulnerable to primary and secondary effects of outbreak
Definition of Digital Risk Management

“Essentially, digital risk implies a concerted adjustment of processes, data, analytics and IT, and the overall organizational setup, including talent and culture.”
Considerations for Digital Risk Management

**Strategic Digital Capabilities**
- Strategic partnering with senior management
- Advanced analytics & methodologies
- Efficient services management
- Constant innovation with models and tech

**Governance**
- Fostering open and collaborative culture
- Strengthening capabilities in data and analytics without losing risk type expertise
- Seamless embedding of risk in business decisions

**Cooperation Across Functions**
- Developing own supervisory strategy
- Alliance with other business units
- Open dialogue and transparent engagement
- Alignment with peers

**New Talent Acquisition, Development and Retention**
- Attractive package (compensation, flexibility, progression, recognition, etc.)
- Rigorous performance management
- Collaborative environment

**Front-to-Back Process Redesign**
- Process digitization tracking customer journey
- Consideration for data/IT, cost, regulations, compliance, statutory reporting, control mechanisms, etc.

**Technology Infrastructure**
- Upgrading of core banking systems and interfaces
- Decisions on legacy systems
- 3rd party providers and APIs

**Regulatory/Supervisory Controls**
- Developing own supervisory strategy
- Alignment with peers

**Collaboration**
- Achieving broad buy-in within and outside
- Championing for success
- Promoting a new approach and culture
The Role of RM in Technological Transformation

According to EY’s survey, RM groups in banks have taken a passive role in technology transformation.

Stronger inputs to the organization’s IT and digital strategy as well as alignment of bank strategy with risk management’s operating plan are needed.

Exceptions are noted in some banks with advanced digital maturity, embedding risk at the heart of all processes.
Chapter 3

RISK MANAGEMENT AND THE ROLE OF AA IN FINANCIAL INSTITUTIONS
From Descriptive to Prescriptive Analytics

**Prescriptive Analytics – What needs to happen?**
Models focusing on courses of action:
- Founded on results from descriptive, diagnostic and predictive analysis
- What, why and how a situation is likely to occur and having rules to meet the situation

**Predictive Analytics – What will happen?**
Models which use patterns in data from the past to predict future events:
- Portfolio risk
- Market risk
- Anticipated drop in value
- Anticipated churn

**Diagnostic Analytics – Why something happened?**
Models which allow to drill down to the root-cause and to isolate confounding information based on:
- AI and Machine Learning
- Scenarios
- Propensity models

**Descriptive Analytics – What has happened?**
Comprehensive, accurate live data, with effective visualisation:
- Operational reporting
- Market uncertainty
- Market volatility
- Customer portfolio performance
- Bank portfolio performance
Relationship between AI, ML, DL, and NLP

**Deep Learning**
- Subset of machine learning in which a deep hierarchy of interconnected neural network layers help to arrive at common features found in massive amounts of data.
  - Neural networks
  - Mimic human decisions

**Artificial Intelligence**
- Computing systems that have the ability to reason about things and make classifications and decisions that would normally require human intelligence.
  - Big Data
  - Hard-coded Logic

**Machine Learning**
- Technique that allows computers to learn from data on their own without rules that are explicitly programmed. The machine learns the rules from the data and refines the model over time.
  - Rules-based
  - Patterns

**Natural Language Processing**
- Ability of a machine to process and use human languages as an input for certain activities.
  - Chatbots
  - Sentiment analysis
Credit Risk Process and Fraud Activities that could be Leveraged Using AA

Activities

- Improve underwriting operational efficiency by lowering cost and time
- Enhance credit scoring and generate appropriate pricing for customers
- Develop early credit warning and improve collections
- Refine fraud monitoring and compliance activities
## Examples
(see White Paper for more details)

### Underwriting

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<thead>
<tr>
<th>ORGANIZATION</th>
<th>TECHNOLOGY</th>
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<tr>
<td>Wellen Capital, US</td>
<td>Cloud based predictive modelling capability from DataRobot</td>
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<tr>
<td>M-Pesa Equity Bank, Kenya</td>
<td>Artificial intelligence, Underwrite.ai</td>
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### Credit Scoring & Related Activities

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<tr>
<th>ORGANIZATION</th>
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<tr>
<td>Piraeus Bank Group, Greece</td>
<td>SAS platform for automated credit scoring</td>
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<tr>
<td>JPMorgan Chase</td>
<td>On Deck Capital technology platform for SME loan approvals</td>
</tr>
<tr>
<td>MYbank, China (SME Forum Award)</td>
<td>SME credit and loans processing system 310 for collateral free loans</td>
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### Fraud Prevention, AML & Compliance

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<th>ORGANIZATION</th>
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<tr>
<td>Citibank, USA</td>
<td>FeedzAI uses ML algorithms to detect fraud cases at once</td>
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<tr>
<td>HSBC, USA</td>
<td>Ayasdi uses artificial intelligence for AML and complex fraud patterns</td>
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<tr>
<td>JP Morgan Chase</td>
<td>Big Data Analytics uses AI for fraud detection</td>
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### Cybersecurity

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<td>Canada’s Scotiabank, Italian banking group Intesa</td>
<td>Shape Security AI Powered system.</td>
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<td>TruWest Credit Union, US</td>
<td>Darktrace called “Enterprise Immune System”</td>
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### Early Warning Default Risk & Collection

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<td>Bank of America</td>
<td>DataRobot for Default risk, use the predictive analytics platform to predict the risk of default for new borrowers using historical data.</td>
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Chapter 4

BENCHMARKING
Benchmark Analytics - Comparison of Survey Responses Provided by TMG Members

> Goal of survey
  – To understand the position of each TMG member organization in application of new technologies like AI and machine learning to risk management

> Methodology
  – An electronic survey was sent to each member
  – A bilateral telephone interview was conducted to add insights to the survey
  – The survey questions covered similar areas as the global surveys administered to financial institutions by EY, IIF, McKinsey, Deloitte and others to enable an indirect comparison for benchmarking

> Caveats
  – TMG has fewer members compared to a large sample size in the global surveys
  – Banks in TMG are development banks with a public mandate
# Key Observations

**Competitive Threats**

Many TMG members operate under indirect models but see the need to ramp up technology transformation to keep up with partners and customer expectations. For those who operate under direct or hybrid models, new players with digital prowess provide a competitive thrust.

**Key Drivers**

TMG members selected cost savings, operational efficiencies, cybersecurity threats, improvement of risk management, and automation of regulatory procedures as key drivers behind technology transformation. Other banks had a higher priority for market share and competitive advantage.

**Long-term Sustainable Performance**

For TMG members, like other banks in the IIF survey, risk management's influence on long-term sustainable performance was related to linking strategy and risk appetite. For TMG members, the next area of influence was in shaping risk cultures and behaviours (higher than other banks).

**Enabling Growth**

For TMG members and other banks, RM’s influence on approaches enabling growth included faster, more accurate risk decisions. Partnering with business and validating risks in business plans were not a priority for TMG members, however, they preferred to be at the front-end of product design.

**Risk Priorities**

Over the next three years, TMG members and other banks had similar priorities regarding data-related risks and cybersecurity risks. TMG members considered technology architecture risk as a higher priority compared to other banks.
### Key Observations (cont’d)

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<th>Processes</th>
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<td>For TMG members, fraud surveillance and modelling were key areas to leverage technology to improve risk management in 2023 whereas for other banks, they were key areas to leverage technology in the 2018-21 period. Financial crime was not seen as a key area by TMG members compared to other banks.</td>
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<th>Technologies</th>
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<td>TMG members selected adoption of technologies like cloud technology for risk management in 2023. In general, adoption of artificial intelligence, cryptography, cybersecurity, and machine learning appear to be delayed in TMG member banks compared to other banks.</td>
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<th>Types of AI</th>
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<td>Both TMG members and other banks use or consider using assisted decision-making with an analytical data model for risk management as a first step, this was to be followed by machine learning and deep learning models with human intervention, and finally culminate in fully automated artificial intelligence models.</td>
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<th>Challenges</th>
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<td>TMG members and other banks stated that key challenges to implementation of new technologies for risk management were IT resources/talents, current infrastructure, and cyberthreats. Regulatory impediments were not seen as a key challenge by TMG members.</td>
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<th>Areas of Risk in Talent Shortage</th>
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<td>For TMG members and other banks, talent shortage was encountered with respect to AA skills and model-risk assessment. TMG members also encountered shortage of talent in technology risk assessment, cyber risk management, and communication skills to explain AA models and results to decision makers.</td>
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Digital Maturity

Definition

**Beginning** — considering how digital technology can transform the business, building internal support and developing the business case

**Transitioning** — exploring the application of new technologies and starting to digitize some elements of the business

**Maturing** — optimizing middle- and back-office processes via new technologies as part of a coherent digital investment plan

**Digital Leader** — integrated front-, middle- and back-office operations supported by data that flows across functions and geographies
Five Top Priorities to Handle the Crisis

- Mobilize a “credit war room” to coordinate the bank’s response
- Proactively engage with customers
- Build a dynamic credit decisioning framework
- Step up operations to manage increased volumes
- Understand the economic impact on existing loan portfolio
Current Crisis and Adaptation by Leading Organizations

Analytics aligned with business priorities

• Inform strategic and financial decisions
• Assist COVID-19 scenario modeling, operational transparency, and scenario planning for cash flow and market demand
• Engage with customers using a customer-centric analytic framework that segments customers based on value and potential risk to enable staff to modify offers across products, functional areas and sectors weekly

Functional silos made more flexible

• Create cross-functional crisis-response teams with all relevant stakeholders to develop analytics solutions for faster response
• Empower frontline employees to provide practical and viable suggestions for decisions based on data
• Promote agility and creative thinking
• Remove data in silos to release data for analytics to support decisions
Current Crisis and Adaptation by Leading Organizations (cont’d)

Move on with model changes

- Use existing data, perhaps not so robust, to generate useful insights when used with a healthy dose of human judgment
- Adjust models with documentation and review adjusted models to tweak further

Standardize tooling and technology

- Deploy tools in weeks using massive amounts of standardized data and centralized processes
- Introduce agile methods to create viable solutions in weeks
- Employ iterative development sprints that have practical results
1. Based on strategy, evaluate projects for AA
   Select target projects to achieve results in RM and strategic goal attainment

2. Map processes, data and AA requirements
   Integrate processes using customer journey and chart out data and AA requirements

3. Create cross-functional team
   Find a champion, collaborate and get buy in, assign responsibilities, have right mix of talents

4. Resolve infrastructure issues
   Create the right platform, resolve legacy problems, consider modernized solutions

5. Develop models and analytic algorithms
   Decide to use partners or hire competent, skilled professionals depending on project needs e.g. automation, AI, ML, DL, NLP, etc.

6. Test and refine
   Use the output and assess impact on decisions, efficiency and effectiveness

Monitor and show results
   Monitor and improve continuously. Showcase advantages to build enthusiasm
### How to Sustain Momentum with AA During and After Crisis

1. Clearly articulate the advantages of new ways of working to help with key strategic imperatives

2. Shore up AI and analytics resources in priority domains e.g., credit assessment, underwriting, stress testing, fraud monitoring, cybersecurity

3. Reskill and retrain employees

4. Validate data models and build a data strategy with clear timelines to meet near and far term needs

5. Establish a standardized AA environment
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"Lessons Learned and Priorities going forward"

Sherrilyn Lequin
Assistant Vice President, Risk Assessment and Models
Lessons Learned during the crisis and Priorities for advanced analytics going forward

- Risk Management ensures that strategy is linked with risk appetite.
- RM is a key collaborator on strategic projects, such as digital transformation.
- Leverage internal and external data sources to augment insights.
- Support enterprise wide management and governance of data.
- Build diversified teams with analytical, data visualization, computer programming, statistical modelling and domain expertise.
- Increase technical training and provide cross-functional opportunities.
- Improve speed and accuracy of predictions.
- Expand use of new tools, dashboards, and machine learning techniques for both portfolio monitoring and modelling activities.
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Faisal Al-Sadaan
Senior Risk Manager

"What is the importance of the applications of advanced analytics to business continuity and stress testing"
What is Business Continuity Management (BCM) & Stress Testing

**Business Continuity Management**

“Ensures that operations continue at predefined level whenever disruptive incidents occur” (ISO22301)

**Stress Testing**

Evaluates an institution’s options of reaction to different adverse scenarios using one or more variables.
Main Objective of Business Continuity Management (BCM) & Stress Testing

Business Continuity Management

- Prioritization of Process
- Availability of Resources
- Systems capabilities

Sustainability & Optimization

Business continuity plans that includes:
- Prioritization of Process
- Availability of Resources
- Systems capabilities

Stress testing analysis that includes:
- Running different possible scenarios with different reactions
- Analyze the results and decide on the best action to take
The importance of the applications of advanced analytics to business continuity and stress testing

As data is a major component of both BCM & Stress Testing, Advance Analytics will contribute toward:

Better understanding of data

Reduced effort in analysis

More accuracy in predictions & results

Enhanced decisions

Overall Sustainability & Optimization
"What is the impact of the digital maturity state in handling the economic fall-out of the COVID-19 crisis"

Charlie Berger
Ongoing Monitoring, Head of Model Validation
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"ALM Modeling & Balancesheet Optimization: A Mathematical Approach to Banking"

Diogo Gobira
Market Risk Manager

BNDES

The Montreal Group
What is ALM?

Set of policies, processes, activities and models a bank use to deal with the risks arising from the mismatch between its assets and liabilities. But, for the BNDES Risk Division “ALM“ refers to the entire balancesheet, not only to Interest Rate portfolios.

What Is Our Motivation as Risk Managers?

To answer the following question: is the bank sustainable in the long-run? A bank is sustainable if it can comply with its business plan, generating returns compatible risks-adjusted returns in the long-run, and respecting the limits with a high confidence level.

How Can We Test These Capacity?

We need to analyze the bank’s balance sheet under different perspectives (accounting, economic and regulatory) in several scenarios over a given time horizon.
What Is Desired Banking *Modus-Operandi*?

To **maximize** its profits in a **planning horizon**, respecting a range of operational and regulatory **constraints**, considering the **uncertainty** and the possibility of **rebalancing** the portfolios over time.

**Putting this in Mathematical Terms…**

It seems the AI tool that better represent the banking problem is a **Multistage Stochastic Optimization Model**, in which the balancesheet is driven by a clear objective but and constrained by the rules of the game!

**Some Practical Applications**

Regulatory and Internal **Stress Tests**, **Business Plans** Tests, **Forecast** Bank Results, Test **Hedging Strategies**, Seek for **Optimization Opportunities** at the BS Level… And, while developing, provides a deep insight about how the bank works and evolve.
ALM@Risk Model Architecture

Input Data
- Parameters
  - Horizon & Steps
  - Scenarios
- Contracts
  - Old
  - New
- Scenarios
  - Stocks
  - FX
  - IR Curves
  - Inflation
  - PD & LGD

Mathematical Model
- Objective Function
- Decision Variables
  - Composite Variables
    - Prepayment
    - Default
    - Buy
    - Sell
- Constraints
  - Accounting
  - Business
  - Regulatory
  - Demand
  - Liquidity
  - ...
Q & A
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Please enter your questions into the chat function, select to “everyone”, and send.

To request technical support:
Select “Host”, type what you need assistance with into the Chat panel located in the lower right side of your screen and send.
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