

November 6, 2020

Organized by the Department of Probability Theory and Statistics, Faculty of Science,

ELTE Eötvös Loránd University, Budapest, Hungary

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Dear Participants,

The Organizers welcome you to the 4th Workshop on Understanding the Diversity of Financial Risk – which is focused on modern approaches to measuring risk. Unfortunately, we cannot meet in person this time – thus the exchange of ideas, discussions can mostly be continued using one electronic way or another, but we are convinced that it will provide many new ideas even in this way.

Our topic this year is “*Modern approaches of measuring risk*”, which is definitely a hot topic, especially as we all face new risks during these unprecedented times. The covered subjects range from the effect of network structure to the best practices within the field of risk estimation. The conference intends to give an overview of these new developments, which are certainly interesting both for financial institutions and researchers.

By organizing this event, our general aim is unchanged: we intended to bring together experts from financial institutions and researchers from academia in order to broaden the views of the participants on the topic and gain information on the recent developments in the field. The program is again an exciting combination of lectures and contributions on both theoretical and practical issues. We have put a lot of effort into bringing together leading experts from all over Europe and are extremely grateful to all of those who accepted our invitation.

We wish you a very fruitful workshop and do hope that we shall be able to meet all of you again in person next year.

András Zempléni

Chair of Program and Organizing Committee

Department of Probability Theory and Statistics

Faculty of Science

ELTE Eötvös Loránd University, Budapest, Hungary

4th Workshop on

Understanding the Diversity of Financial Risk: Modern approaches to measuring risk

Budapest, Hungary, November 6, 2020 (online)

As there will be a waiting room, please join the meeting at 8:45 and 13:45.

9:00-9:15 **Opening: Norbert Fogarasi** (Morgan Stanley) and **András Zempléni** (ELTE)

Morning session 1 (chair: András Zempléni, ELTE)

9:15-10:45 Keynote by **Claudia Klüppelberg** (TU Munich)

Modelling risk in an agent-object market by a random bipartite graph structure

10:45-11:00 break

Morning session 2 (chair: Gábor Molnár-Sáska, Morgan Stanley)

11:00-11:30 **Zsolt Pándi** (Morgan Stanley)

Emerging challenges in risk management

11:30-12:00 **Réka Janosik** (MSCI)

A new standard for risk management

12:00-12:30 **István Barra** (BlackRock)

Outlier robust volatility forecasting in practice

12:30-14:00 break

Afternoon session 1 (chair: Miklós Vörös, MSCI)

14:00-15:00 Invited talk by **Carlo Acerbi** (Banque Pictet & Cie)

A new game theoretical perspective on Risk Attribution and Performance Attribution

15:00-15:30 **Árpád Szilávik** (Morgan Stanley)

Model Risk Management Evolution

15:30-15:45 break

Afternoon session 2 (chair: László Márkus, ELTE)

15:45-16:15 **László Antal** (Black Rock)

Risk measures and uncertainty in portfolio construction – a case study of Sustainability

16:15-17:15 Invited talk by **Chen Zhou** (De Nederlandsche Bank and Erasmus University of Rotterdam)

Why risk is so hard to measure?

Claudia Klüppelberg (TU Munich)

Modelling risk in an agent-object market by a random bipartite graph structure (9:15-10:45)

We introduce a random network model for business relationships as for instance an insurance market, overlapping portfolios, or Operational Risk. Using Pareto-tailed losses (as are observed for large risks) with a dependence structure introduced by the graph we study systemic risk measures, which are based on the Value-at-Risk and the Expected Shortfall. We show that the dependence on the network structure plays a fundamental role for the individual agent's risk as well as for the market risk. The focus of our analysis lies in the study of the influence of the random graph on risk measures, where we consider the Bernoulli graph and a Rasch-type graph as examples. In particular, we explain the influence of the network structure on diversification in such models. This is joint work with Oliver Kley and Gesine Reinert.



The research interests of Prof. Klüppelberg combine various disciplines of applied probability theory and statistics with applications in the area of financial and insurance risk, also environmental and technical risk. Her fundamental research concentrates on advancing the modeling and extension of the spectrum of methods for risk analysis and risk measurement, but she is also interested in real-world problems and cooperation with industry. Recently she has focused on extreme dependence in networks with applications to high risks in financial systems.

After studying mathematics and receiving her doctorate (1987) at the University of Mannheim, Prof. Klüppelberg completed her lecturer qualification at the Swiss Federal Institute of Technology Zurich (1993). Before becoming full professor of mathematical statistics at TUM, she was a professor of applied statistics in Mainz until 1997. She headed up the IAS focus group Risk Analysis and Stochastic Modeling at TUM from 2008 to 2011. Along with more than 150 publications in scientific journals and books, she is the editor of the *Springer Finance* series of books and the *Springer Lecture Notes in Mathematics* subseries *Lévy Matters*. She is an Elected Fellow of the Institute of Mathematical Statistics. Currently she is President of the Bernoulli Society for Mathematical Statistics and Probability.

Zsolt Pándi (Morgan Stanley)

Emerging challenges in risk management (11:00-11:30)

The environment in which financial service providers operate has changed significantly since the financial crisis. Risk management had to address various issues over that period motivated in part by stricter regulations. However, changes in the global economy as well as changes in the focus of global regulatory agenda present new questions for risk management to answer. This talk intends to highlight some of these from a practitioner's point of view.



Zsolt Pándi started working in financial services in 2006. He spent 13 years working on pricing and risk models in the Fixed Income division of Morgan Stanley in Budapest. Over this period he ran structured credit, structured rates and FX exotics modeling teams and also worked with quant developers to provide analytical libraries for firmwide use. He joined the Risk division in 2019 and is currently the Budapest Head of Risk Analytics. He holds a M.Sc. in Informatics and a Ph.D. in Technical Sciences. After all these years he still thinks he is an engineer.

Réka Janosik (MSCI)

A new standard for risk management (11:30-12:00)

The demand for market risk measurement over long horizons increases as mutual funds and pension plan managers want to control their long-term risk/return profile. The naïve extension of the classic risk management framework fails to capture key components of long term risk. Mean reversion and regime shifting are important factors shaping long horizon scenarios, while portfolio rebalancing with state dependent transaction cost, redemptions and forced trading are examples of wrong way liquidity risk.



Réka is a Vice President in MSCI's Risk Management and Liquidity Core Research Team, focusing on general pricing and risk management. She is responsible for credit-derivatives pricing, ETF modeling and simulation for long horizon. Before joining MSCI, Réka was a member of Morgan Stanley Strats & Modeling Team. She graduated from Corvinus University of Budapest with a master's degree in financial mathematics.

István Barra (BlackRock)

Outlier robust volatility forecasting in practice (12:00-12:30)

We introduce the generalized autoregressive score (GAS) models by Creal et al 2014 which provide a flexible yet computationally tractable framework to model latent variables such as volatility or default intensity. By tying the dynamics of the latent variables to the distributional assumption on the observations GAS models coherently accommodate, and appropriately moderate, the impact of outliers on parameter estimates. We showcase novel empirical adaptations of GAS models to equity risk forecasting, highlighting their intuitive appeal, computational simplicity and empirical benefits relative to current industry standard volatility forecasting models.



István Barra is a member of the Financial Modelling Group at BlackRock. Within the Portfolio Modelling team he works on the research and development of equity risk models. Before joining BlackRock, István was working in London at a mobile gaming company as a Principal Data Scientist. He has a PhD in Financial Econometrics from the VU University Amsterdam. His research focused on Bayesian econometrics and stochastic volatility models and his papers were published in Journal of Applied Econometrics, Journal of Business and Economic Statistics and Journal of Financial Econometrics.

Carlo Acerbi (Banque Pictet & Cie)

When Quantitative Finance meets Harsányi (14:00-15:00)

In the 100th birth anniversary of the mathematician and Economics Nobel winner János Károly Harsányi, we explore possible fertile connections between some of Harsányi's key results in game theory and open questions in Quantitative Finance. Harsányi dividends, unknown to the large risk community public, represent a canonical way to decompose the result of a cooperative game into cohort contributions, showing interference effects at all orders. Interpreting risk or return as the game result, and risk factors, portfolio positions or investment decisions as the players of the game, we immediately obtain new paradigms to risk attribution, performance contribution and performance attribution. We compare common best practices with these new paradigms and we highlight the challenges (computational, theoretical) that these methods open, in the hope to spur future research.



Carlo Acerbi received a PhD in Theoretical Physics from the International School for Advanced Studies (SISSA - ISAS), Trieste, Italy, before turning to Finance in 1997. He worked as a Risk Manager and a Financial Engineer for Italian banks, as a senior expert in the risk practice of McKinsey & Co and as Head of Risk Management Research at MSCI. He joined Banque Pictet in Geneva, in 2018 where he is currently Head of Model Risk. His main areas of interest in finance are risk management and derivatives pricing. He is the author of several papers in renowned international journals, focusing in particular on the theoretical foundations of financial risk and the extension of portfolio theory to illiquid markets. He is a member of the board of 'The Journal of Risk', an Executive Fellow of the Essex Business School and a honorary professor at Corvinus University of Budapest.

Árpád Szlávik (Morgan Stanley)

Model Risk Management Evolution (15:00-15:30)

Model Risk Management (MRM) within banks has been evolving from model validation towards becoming an effective and value-centric function. What are the drivers, stages, and results of this evolution? Is it possible to measure model risk? How can we use Artificial Intelligence (AI) / Machine Learning (ML) models? These are the questions we will address in the talk.



Árpád Szlávik has been the manager of Morgan Stanley's Model Risk Management (MRM) Risk and Capital models group in Budapest since May, 2019.

He joined Morgan Stanley in December, 2006, worked in the Fixed Income division on quantitative modelling for more than 10 years. Árpád became an Executive Director in 2015 and was the Head of Structured Credit and Loan modelling for more than 2 years. In the less than 2 years he was away from Morgan Stanley, he had an expedition in the crypto-currency world, where he was doing blockchain research and development.

Árpád started his professional career in the telecommunications industry, where he worked for almost 10 years as a math researcher for Ericsson, while receiving an applied math PhD from ELTE.

László Antal (BlackRock)

Risk measures and uncertainty in portfolio construction – a case study of Sustainability (15:45-16:15)

Investors are becoming increasingly aware of the fundamental idea of inevitable uncertainty in future estimates, and would like to reflect this in their asset allocation decisions. The tectonic shift of financial markets towards sustainable solutions underlines the importance of this mindset, given the variation in different views and beliefs, and the magnitude of its impact. We develop a systematic way to construct portfolios, residing on robust and stochastic optimisation techniques, minimising portfolio VaR/CVaR. We demonstrate how this method can be used to account for uncertainty in return estimates, and create less concentrated portfolios.



László Antal, Quant Researcher Vice President, is a member of the Portfolio Research Group at BlackRock. His responsibilities include developing and curating the core principles and intellectual property that underpin BlackRock's approach to portfolio design, such as Capital Market Assumptions and optimisation tools.

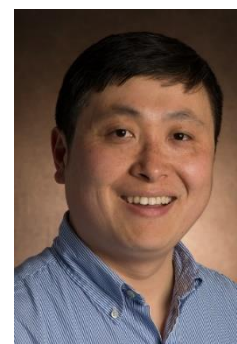
Prior to this, László was working as a quantitative developer in the Strats and Modeling group at Morgan Stanley, focusing on xVA and counterparty credit risk.

László earned an MSc and a BA in Actuarial and Financial Mathematics and Applied Economics respectively.

Chen Zhou (De Nederlandsche Bank and Erasmus University of Rotterdam)

Why risk is so hard to measure? (16:15-17:15)

This paper analyzes the reliability of standard approaches for financial risk analysis. We focus on the difference between Value-at-Risk and expected shortfall, their small sample properties, the scope for underreporting risk and how estimation can be improved. Overall, we find that risk forecasts are extremely uncertain at low sample sizes, with Value-at-Risk more accurate than expected shortfall. Value-at-Risk is easily deliberately underreported without violating regulations and control mechanisms. Finally, we discuss the implications for academic research, practitioners and regulators, along with best practice suggestions.



Chen Zhou is a professor of Mathematical Statistics and Risk Management at Erasmus University Rotterdam. He also holds a side position as senior economist at De Nederlandsche Bank (Bank of The Netherlands). Chen obtained his PhD in 2008 at Erasmus University Rotterdam. His research focuses on quantitative risk management, financial stability and financial regulation. His work has been published in Journal of Financial and Quantitative Analysis, Journal of Economic Theory, among others. In addition, his research spans to the field of mathematical statistics, especially extreme value statistics. His statistical work appears in Journal of the Royal Statistical Society (Series B), Journal of American Statistical Association, among others. Chen is also the area editor of Extremes on extremes in economics, finance and insurance.

4th Workshop on **Understanding the Diversity of Financial Risk:**

Modern approaches to measuring risk

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- József Gáll (University of Debrecen)
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