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NITheCS COLLOQUIUM:
The Financial Impact of Carbon Emissions on Power Utilities Under Climate Scenarios

Prof Andrea Macrina (University College London & University of Cape Town)

Friday, 20 October 2023 | 16h00 – 17h00 SAST

Venue: in person* and online
* Neelsie Cinema, Stellenbosch University

--- Cheese and wine will be served at the venue ---

ABSTRACT

Power utilities, especially those that generate electricity by burning fossil fuels, produce significant amounts of carbon emissions. Mitigation of CO_2e emissions can be achieved by replacing power plants with renewable power installations and by adopting carbon-sequestration technologies. Physical upgrades are expensive, but carbon taxes, or the purchase of certificates and allowances on a voluntary carbon market, can be costly, too. Carbon costs may increasingly become a threatening liability for power utilities, eating into profits and undermining the financial viability of emission-intensive electricity generation. Thus, we consider an asset-and-liability, structural firm model to investigate the creditworthiness of a generic power utility. The utility's assets dynamics are driven by the financial returns generated from the sold electricity for a set tariff which is modelled by a simple stochastic process. The liabilities not only depend on fuel, running, and depreciation costs, but also on the costs of CO_2e emissions. As a case study, we consider Eskom, the South African power utility. We show the evolution of Eskom's default probability under various fuel mix plans and technologies, and under the Network for Greening the Financial System (NGFS) carbon price scenarios. The obtained results and insights present a trying path ahead.

BIOGRAPHY

Andrea Macrina is Professor of Mathematics and the Director of the Financial Mathematics MSc Programme in the Department of Mathematics, University College London. Dr Macrina is Adjunct Professor at UCT in the African Institute of Financial Markets and Risk Management where in 2014 he co-founded the Financial Mathematics Team Challenge (FMTC). He is a recipient of the Fields Research Fellowship awarded by The Fields Institute for Research in Mathematical Sciences.

He held a Senior Lectureship followed by a Readership in the Department of Mathematics, University College London, an Adjunct Professorship at the Department of Actuarial Science of UCT, a Lectureship in Financial Mathematics in the Department of Mathematics, King's College London, a one-year Visiting Research Associate Professorship in the Institute of Economic Research, Kyoto University, and a six-month Research Fellowship at ETH Zurich.

Prof Macrina is a principle developer of information-based asset pricing, a novel stochastic framework for, e.g., the pricing of a variety of asset classes including credit, fixed-income, equity, and insurance-linked assets. He is co-editor of a book on Financial Informatics, published in 2022, containing 18 foundational articles on the information-based modelling framework. He is a regular speaker at seminars and conferences worldwide where he presents his research findings to academics and industry professionals. His research programme includes collaborations with doctoral students, researchers at many international universities in Africa, Australia, East-Asia, Europe, North-America, and practitioners of the financial service industry in The City of London. He is Associate Editor of the *International Journal of Theoretical and Applied Finance* and a member of various mathematical societies. He holds a PhD in Mathematics from King's College, University of London, and an MSc in Physics from the University of Bern, Switzerland.

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