Talk 19: Peter Tankov (CREST, ENSAE, Institut Polytechnique de Paris) (Joint work with Zorana Grbac, Simone Pavarana and Thorsten Schmidt)

Title: Propagation of carbon price shocks through the value chain: the mean-field game of defaults

Abstract. We develop a mean-field game framework to assess the impact of carbon pricing in a multisectoral economy composed of multiple defaultable firms in each sector. In our model, each sector produces a homogeneous good, the price of which is endogenously de termined through market clearing. Firms act as price takers and maximize their profits by optimally combining inputs — including intermediate goods from other sectors, emissions, and labour — while interacting with other firms via the sectoral good's price. Firms select optimal default dates to maximize shareholder value.

Taking the mean-field limit, we reformulate the economy as an optimal stopping mean field game within each sector. We then solve the resulting system of coupled mean-field games using the linear programming approach, which characterizes Nash equilibria in terms of population measure flows. We prove the existence of a linear programming Nash equilibrium and establish the uniqueness of its corresponding price system.

Numerical illustrations are provided for firms with CES production functions in a stylized two-sector economy (green and brown sectors). Our experiments demonstrate that carbon price shocks can trigger significant spillover effects across sectors, highlighting the importance of sectoral interdependencies in shaping decarbonization pathways.