Mean Field Games with Kou Jump-Diffusion Productivity

IADU Working Paper · WP-2026-001

T. Zamrik
Institute of Advanced Dynamic Uncertainty

May 2026

Abstract

We study a mean field game formulation of the Huggett–Moll heterogeneous-agent economy under Kou double-exponential jump-diffusion productivity shocks. The stationary equilibrium is characterised by a coupled PIDE–Kolmogorov system. A Wiener–Hopf reduction eliminates the non-local integral term, yielding a local PDE cascade solvable by Howard iteration.

1 Model

Household productivity z_t follows

$$dz_t = \mu_z\, dt + \sigma_z\, dW_t + d\left(\sum_{k=1}^{N_t} J_k\right),$$

where N_t is a Poisson process with intensity λ and J_k are i.i.d. double-exponential: upward jumps $\sim \text{Exp}(\eta_+)$ with probability p, downward $\sim \text{Exp}(\eta_-)$ with probability $1-p$.

2 Equilibrium System

The value function $V(a,z)$ and stationary density $m(a,z)$ satisfy

$$\rho V = \max_c \{u(c) + \mathcal{A}V\} + LV, \qquad 0 = \mathcal{A}^* m + L^* m,$$

where $\mathcal{A}$ is the local diffusion generator and L the jump operator.

3 Wiener–Hopf Reduction

Applying the Wiener–Hopf factorisation to L decomposes the non-local term into two auxiliary first-order ODEs, reducing the PIDE to a local system amenable to standard finite-difference upwind schemes.

4 Conclusion

The Kou specification introduces asymmetric tail risk absent from Brownian-motion benchmarks. Numerical experiments show heavier left tails in the stationary wealth distribution relative to the Gaussian case.