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Effort Expenditure for Cash Flow in a Mean-Field Equilibrium

We study a mean-field game framework in which agents expend costly effort in order to transition into a state where they receive cash flows. As more agents transition into the cash flow receiving state, the magnitude of all remaining cash flows decreases, introducing an element of competition whereby agents are rewarded for transitioning earlier. An equilibrium is reached if the optimal expenditure of effort produces a transition intensity which is equal to the flow rate at which the continuous population enters the receiving state. We give closed-form expressions which yield equilibrium when the cash flow horizon is infinite or exponentially distributed. When the cash flow horizon is finite we implement an algorithm which yields equilibrium if it converges. We show that in some cases a higher cost of effort results in the agents placing greater value on the potential cash flows in equilibrium. We also present cases where algorithm fails to converge to an equilibrium.

Joint work with Tim Leung.