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Arbitrage Pricing of Multi-Person Game Contingent Claims

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Abstract: In most existing papers on arbitrage pricing of financial derivatives a contract only involves two parties. Our goal is to design and evaluate financial contracts involving multiple parties. This is done by utilising and extending the concepts from the game theory, financial mathematics and backward stochastic differential equations. We deal with two closely related, but distinct, issues: the existence of equilibria for multi-player stochastic competitive games and arbitrage pricing of multi-person financial contracts.

In the first step, we examine a novel class of multi-period multi-player stochastic stopping games, dubbed affine games, which encompass as a very special case the classic two-player Dynkin games. The focus is on designing the dependence between the payoffs of all players and their stopping decisions. The affine game are shown to be weakly unilaterally competitive and sufficient conditions are given for the existence of optimal equilibria, individual values and coalition values.

In the second step, we introduce the concept of a multi-person financial contract by extending the notion of a two-person game option introduced by Kifer in 2000. These contracts may involve an arbitrary finite number of parties and each party is allowed to make a wide array of decisions, which then determine the settlement date as well as the payoffs. The generalised Snell envelope is introduced for the valuation of multi-person contracts and it is used to obtain sufficient conditions for the existence and additivity of unique arbitrage prices. The talk is based on joint works with Ivan Guo.