

Hierarchical Cournot games with financial call options  
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In 1993, Allaz and Vila showed in a two-settlement forward and spot market, the presence of forward contracts can mitigate market power. Motivated by the need to mitigate market power and consumer risk as well as cope with the increasing uncertainty in generation availability, we consider the role of call options in a strategic setting. Specifically, we consider a two-settlement market in which generation firms may sell call options in the first period and compete in an uncertain real-time Cournot game in the second period. We consider two avenues for modeling such strategic problems: (i) First, in a fully rational regime, the problem reduces to a stochastic multi-leader multi-follower game; and (ii) Under a bounded rationality regime, the game can be viewed as a stochastic Nash game. Analytically, we show that despite its natively intractable nature, a closely related variant of (i) admits equilibria that can be obtained by solving a stochastic MPEC. Furthermore, (ii) can be cast as a stochastic complementarity problem and existence statements can also be provided. Through tests on a networked electricity market, we examine whether the availability of call options does indeed aid in mitigating market power and consumer risk.