A Convex Parimutuel Formulation for Contingent Claim Markets

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1 Summary

We have developed a convex parimutuel formulation for centrally organizing markets for contingent claims and provided the first polynomial time algorithm for the problem. We study the problem of centrally organizing a market where the participants submit bids for contingent claims over the outcome of a future event and the market organizer must determine which bids to accept. The bidder will select a set of future states and a price at which he is willing to buy the contingent claims. By accepting a bid, the market organizer agrees to pay the bidder a fixed amount if one of the bidder’s selected states is realized. We will specifically study markets which are run as call auctions where the organizer holds the auction open until a certain time and then determines the bids to accept and reject. This type of market has broad usage in financial markets, betting markets or general prediction markets.

Lange and Economides [7] have developed a parimutuel mechanism for solving such a market with many positive characteristics. Their model is being implemented by Goldman Sachs and Deutsche Bank to run markets on options for economic data [2]. However, one drawback of their formulation is that their mathematical model is not convex so that no efficient algorithm is known to solve it. In this paper, we introduce a new mathematical formulation called the Convex Parimutuel Call Auction Mechanism (CPCAM). This formulation produces many of the same advantageous properties of the Lange and Economides model but can more easily be solved due to its convexity. Moreover, we show that our model actually produces identical state prices as the Lange and Economides model.

2 Introduction

Often it can be advantageous for a contingent claim market to be centrally organized. Central organization can provide greater liquidity than relying on the market participants to trade amongst themselves. Parimutuel techniques for organizing a contingent claim market offer the