

# Option Pricing by Game Theory

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## ABSTRACT

This thesis formulates the participant behavior in the financial market as a two-person zero-sum game by using the observed options prices. The players are individual investor and market mechanism with their own mixed strategy linear programs. Assume that the underlying asset states of nature are discrete and finite. When the market has no arbitrage opportunity, the optimal value of game is zero, an implied risk neutral probability measure from observed options prices can be recovered by the mixed strategy linear program. By this way, the model does not have to assume the asset price dynamic as well as does not have to calculate the volatility of the asset prices, a fair option price then can be calculated by the martingale theory through the recovered risk neutral probability. Finally, an empirical study will be presented by applying to Taiwan's option market. The empirical results show that the recovered risk neutral probability is indeed not a lognormal distribution.

**Key words:** option pricing, risk neutral probability, martingale probability measure, game theory, linear programming