行政院國家科學委員會專題研究計畫　成果報告

在多期模型下或有求償權的 Super replicating 投資組合 (2/2)

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計畫主持人：彭彭彭

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Boyle and Vorst work in the framework of the binomial model and derive self-financing strategies perfectly replicating the final payoffs to long and short positions in call and put options, assuming proportional transactions costs on trades in the stock and no transactions costs on trades in the bond. However, even when the market is arbitrage-free and a given contingent claim has a unique replicating portfolio, there may exist super replicating portfolios of lower cost. Now it is known that there is no super replicating portfolio for long calls and puts of lower cost than the replicating portfolio but this is not true for short calls and puts. In this proposal the aim was to find the super replicating portfolio with least cost for short calls and puts.

In the paper ``The Least Cost Super Replicating Portfolio in the Boyle-Vorst Model with Transaction Costs'', 陳冠宇, 許元春 and I first determine the least cost super replicating portfolio for an arbitrary contingent claim in a one-period binomial model. Then by using the fundamental theorem of linear programming, we show that there are only finitely many possibilities for a least cost super replicating portfolio for any contingent claim in a two-period binomial model. As an application of our results, we give an example in which we compute the least cost super replicating portfolio for a butterfly spread in a two-period model. This article has been submitted to the Journal Of Economic Dynamics and Control.

In a second paper ``The Least Cost Super Replicating Portfolio for Short Puts and Calls in the Boyle-Vorst Model with Transaction Costs'', we consider two-period binomial models and show that for a special class of claims including short call and put options there are just four possibilities so that the least cost super replicating portfolio can be easily calculated for such positions. Also we show that, in general, the least cost super replicating portfolio is path-dependent. This paper has been accepted for publication in the Review of Quantitative Finance and Accounting.

I have also worked with three master's students. 長洛賓and I have submitted an article entitled ``Smooth Convergence in the Binomial Model'' to Finance and Stochastics. Next it is known that long calls and puts have unique replicating portfolios in the Boyle-Vorst model in the case of settlement by delivery. 黃建毫showed that in the Boyle-Vorst model a long position in a European lookback option has a unique replicating portfolio in the case of settlement by delivery and also cash settlement. 林欣亭 gave fairly general sufficient conditions that a European contingent claim have a unique replicating portfolio. These conditions can be used to give necessary and sufficient conditions for short calls or puts to have a unique replicating portfolio and can also be used to show that long calls and puts have unique replicating portfolios in the case of cash settlement and also in the case of settlement up to the seller.