Bounds on Multiple Contingent Claims

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Abstract

In [2], Lo considered the problem on bounding a European option on a single asset. He obtained an upper bound on the payoff of the European call in terms of the mean and variance of the underlying asset. The usual assumption that the price of the underlying asset follows a lognormal distribution is not required and hence the bound is distribution-free. It is easy to see from the form of the payoff function that there is a close connection between the call option and the stop-loss premiums in insurance. Noting that, Cox[1] used a different approach to obtain the upper and lower bounds on expected loss with several deductibles. He pointed out in his paper that there is a need to consider a bound on a call option type payoff when there is more than one underlying asset or contingent claim.

In this talk, we extend Lo's result to the multi-asset case. Unlike the one asset case, the correlations between the assets play an important role and have to be taken into consideration. With the help of Lo's idea, we are able to obtain upper bounds in terms of the means, variances and covariances of the underlying assets. Thus, these bounds are still distribution-free.

There are many applications in finance and insurance. In finance, call options on the maximum of several assets, outperformance options, default-free currency option bonds, and adjustable rate preferred stocks are a few among such examples. In insurance, we may apply our result to equity indexed annuities, 'Greater of' benefits in pension plans and insurance contracts covering both property Loss and liability loss. We will give two numerical examples in this talk.

References

[1] Cox, S.H. (1991). Bounds on expected values of insurance payments and option prices, *Transactions of the Society of Actuaries*, XLIII,231-260.

[2] Lo, A.W. (1987). Semi-parametric upper bounds for option prices and expected payoffs, *Journal of Financial Economics*, 19,373-387.