

Probability & Statistics Seminar Series

Friday August 6th 2004

at 11 am in Room M345, Building 28

On the generalization of Esscher and variance premiums modified for Elliptical family of distributions

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Abstract

Esscher premium, Esscher transform and "exponential tilting" (Wang (2002)) are regarded as convenient tools in risk measurement and portfolio allocation methods. The main component of these measures is the variance-covariance structure of the multivariate distribution, that makes them especially attractive for multinormal portfolio, which is uniquely determined by its variance-covariance structure. However, if the distribution deviates from the normal, having, for example, heavy tailed marginals, but still preserving the same variance-covariance structure as normal, the allocation methods based on Esscher transform or have no sense at all or fail to reject this deviation.

In this paper we suggest a premium measure, which seems natural for elliptical multivariate structure and which coincides with the Esscher premium for the normal case. The underlying Elliptical family essentially generalizes the multivariate normal and contains multivariate Student, Cauchy, symmetric stable and many other distributions. This family has variance covariance structure like that of the multivariate Normal family, but it is essentially richer, because its marginal tails are allowed to decrease to zero exponentially, powerly or at many other rates. We also generalize the "exponential tilting" and suggest the "elliptical tilting" as a tool for deriving a portfolio capital decomposition formula for multivariate Elliptical family. The traditional variance premium is also generalized, and is now affected by the shape of distribution. The results will be illustrated with Generalized Student Family (GST), which is popular in the portfolio of log daily returns of stocks.

References

[1] Wang, S. A set of new methods and tools for enterprise risk capital management and portfolio optimization. 2002 CAS Summer Forum, Dynamic Financial Analysis Discussion papers.

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