Cantelli's Lemma and the Estimation of Transaction Costs
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There is a great variety of mathematics that has found its way into the world of finance. Without a doubt a great deal of this work occurs at hedge funds and investment companies who profit directly from the use of mathematics. One area of particular interest is the mathematical study of transaction costs – those costs associate with buying and selling in financial markets. The estimation of such costs have interesting – and sometimes surprising – mathematical limits which allow us to illustrate in a general sense the flavor of the mathematical research that takes place within our group.

When a trader buys or sells in financial markets the trade affects the very market in which the transaction takes place. Mathematical methods for depend on our ability to bound what is – and especially what is not – within the realm of possibility.

In this talk we give an introduction to the mathematics and economics of transaction costs then show how Cantelli's lemma may be used to make some surprising statements about the limits of our ability to estimate transaction costs. We also give a simple derivation of Cantelli's lemma, which states that for a random variable X with mean μ and standard deviation σ we have

$$P(X \leq \mu - k\sigma) \leq \frac{1}{1+k^2}.$$

Finally, we give applications of the above to portfolio selection theory.

About the Speaker

Andrew Mullhaupt is Director of Research of the Meridian Group at S.A.C. Capital Management in New York. S.A.C. Capital Management is a Stamford and New York City based private investment firm. Andrew has a PhD in Mathematics from the Courant Institute of Mathematical Sciences and has held positions at Morgan Stanley and Renaissance Technologies.