FE545 - Final Exam

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Pledge: I pledge my honor that I have abided by the Stevens Honor System.

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Background

Tree-based methods can be used for obtaining option prices, which are especially popular for pricing American options. Binomial, trinomial, and random tree methods can be used to price many options, including plain vanilla options, and also exotic options such as barrier options, digital options, Asian options, and others.

We will be pricing American options using TAPM/RT methods via design principles in C++.

Pricing a derivative security entails calculating the **expected value of its payoff**. This reduces, in principle, to a problem of *numerical integration*; but in practice this calculation is often difficult for high-dimensional pricing problems.

The binomial options pricing model (BOPM) approach has been widely used since it is able to handle a variety of conditions for which other models cannot easily be applied. This mainly since the BOPM is based on the description of an underlying instrument over a period of time rather than a single point. Therefore, it can be used to price Americans that are exercisable $\forall\, t \in [0, T]$.

The TOPM, proposed by **Phelim Boyle** in '86, is (considered to be) more accurate than BOPM, producing the same results w/fewer steps.

Broadie and **Glasserman** ('97) proposed the simulated random tree to price Americans, deriving the upper/lower bounds; this combo makes it easier to measure & control error as computational effort increases $(m \to \infty)$. The main drawback of RTM is *computational requirements* grow exponentially with m, # of exercise dates, applicable only when $m < \mathrm{big} \setminus \#$. For $m = \mathrm{small} \setminus \#$, RTM works well & shows theme of **mananging scores** of **high/low bias**.