
UNIVERSITY OF TEXAS AT AUSTINQuiz #1

Prerequisite material.

Problem 1.1. (2 pts) If X and Y are independent random variables, then

$$F_{X+Y}(a) = F_X(a) \cdot F_Y(a).$$

*True or false?***Problem 1.2.** (2 points) Let X be a normal random variable with parameters $(\mu = 2, \sigma^2 = 1)$, and let Y be a normal random variable with parameters $(\mu = -2, \sigma^2 = 1)$. Assume that X and Y are independent. Then, the variance of the random variable $X + Y$ equals 2. *True or false?***Problem 1.3.** (2 points) In our usual notation, let $S(0) = 40, r = 0.08, \sigma = 0.3, \delta = 0$. You need to construct a 2-period forward binomial tree for the above stock with every period in the tree of length $h = 0.5$. Then, $u > 1.45$. *True or false?***Problem 1.4.** (2 points) You are using a binomial asset-pricing model to model the evolution of the price of a particular stock. Then, the Δ in the replicating portfolio of a single call option on that stock never exceeds 1. *True or false?***Problem 1.5.** (8 points)Let X be a continuous random variable with probability density function $f_X(x)$. Let its cumulative distribution function be denoted by $F_X(x) = \mathbb{P}[X \leq x]$. Define the new random variable Y as

$$Y = F_X(X).$$

Find $\mathbb{E}[Y]$.