

Homework 6

1. Consider a 1 step binomial model of security with $S(0) = 120$ and $r = .05$ and $\mathbb{P}(S(1) = 120) = 1/3$ and $\mathbb{P}(S(1) = 132) = 2/3$. Can you find the Risk neutral measure? what is the transformation function τ (Radon-Nikodym Derivative/Girsanov transformation) of the original probability to the risk neutral measure?
2. Consider security S so that the value of the security is $S(1)$ at time $t = 1$ year. Suppose the risk neutral distribution of the price is given by the formula, $S(1) = 110 - U^2$ for U uniformly distributed on $[-3, 3]$. If the continuous interest rate is 3%, what is the current price?
3. Consider a European call option on the security from problem 2 with strike price $X = 107$ and maturity 1 year, what is the value of the call?
What can we say about the value of the American call (with the same strike and maturity)?
What about the value of the American call (with the same strike and maturity)?
4. Consider binomial model with security $S(0) = 110$ and bond rate $r = .04$ and two possible return values of the security $m_1 = .08$ and $m_2 = .02$. Find the time 0 value of a European put (maturity time 1) with strike price $X = 115$. What are the holdings of the replicating portfolio at time $t = 0$?