Homework 5

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/Girsonov transformation) of the original probability to the risk neutral measure?

2. Consider binomial model $S(0) = 110$ and $r = .04$ and two possible return values $m_1 = .1$ and $m_2 = .02$. Find the time 0 value of a European put (maturity time 1) with strike price $X = 115$.
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   For problems 3 - 6

   Consider a binomial model $S(0) = 100$ and $r = .01$ and two possible return values $m_1 = .05$ and $m_2 = -.03$.

3. Find the (time 0) value of a European call with expiry time at step 5 and strike price $X = 105$.

4. Find the (time 0) value of a European put with expiry time at step 5 and strike price $X = 105$.

5. Find the (time 0) value of a American call with expiry time at step 5 and strike price $X = 105$.

6. Find the (time 0) value of a American put with expiry time at step 5 and strike price $X = 105$.
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7. Consider a binomial model $S(0) = 100$ and $r = .001$ and two possible return values $m_1 = .005$ and $m_2 = -.003$. Find the value of a European call with expiry time at step 50 and strike price $X = 105$. *Use the Gaussian approximation of the binomial distribution to approximate the sum.*