**Problem Set 2**

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**Digital Options**

1. The value of digital put option at t = 0 should be equal to , where if there is no arbitrage opportunities. (: continuously compounded dividend yield) Since digital put options pays if and otherwise pays nothing, the value of option should be equal to , where denotes risk-neutral probability. Because we already know that is equal to risk neutral probability such that is greater than or equal to strike price, is calculated as follows.

Therefore, the value of digital put option should be equal to .

1. Consider the following investment strategies.
2. Short a digital call option which pays dollars with strike price and maturity .
3. Invest on a riskless zero coupon bond with face value and maturity .

Then, at the maturity, the payoff structure of the portfolio above is as the following table.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Digital Call Option |  | 0 |
| Zero Coupon Bond |  |  |
| Total | 0 |  |

Since the payoff structure is identical to digital put option, the portfolio completely replicate payoff of digital put option.