Summary: This exercise reinforces the concept of valuation by replicating portfolio.

Learning Objective: to give you the opportunity to value an option using a replicating portfolio.

Setting: The assignment is a take-off on the example call option presented in the “Arbitrage-Enforced Pricing” presentation. You will be dealing with the same format, but some numbers will be different.

As in the lecture:
- Start value of asset = 100
- Low value of asset at end = 85
- Strike price = 110

Tasks:

1. **Find high value of asset at end**
   For the purpose of giving the class a variety of possibilities, the value you should use is \([100 + 10 \times 5 \times \text{number of the month of your birth}]^{0.5}\) – rounded to nearest integer. For example, if you were born in May, use \([100 + 10 \times 5]\) = 150

2. **Find the Risk-Free Discount Rate**
   A standard (but debatable) way to do this is to identify the current rate on US Government bonds over a period comparable to that of the option. To illustrate this, find the current rate of interest on 3-month “treasury bills” (commonly called T-Bills).

   You can do this in a variety of ways, such as:
   - Looking in the financial pages of Wall Street Journal or the New York Times
   - Consulting a web site (such as [http://www.treasurydirect.gov/indiv/indiv.htm](http://www.treasurydirect.gov/indiv/indiv.htm)) to get the latest rates. If you use the suggested site, it will direct you to “auction results” at [http://www.publicdebt.treas.gov/AI/PFBills](http://www.publicdebt.treas.gov/AI/PFBills)

   Depending on when and how you do this, you will find different values. Indeed the rate fluctuates. The important thing for this part of the exercise is that you see how this rate might be found.

   Give the rate to two decimal points. Cite your source and date

3. **Define the portfolio that replicates the option**
   Use the above data to update the Tables illustrating the example in the lecture.

4. **Define the value of the call option**
   Given your data, what’s the value of the option?

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* Note that this table gives two rates for every T-Bill listed: a “discount” and an “investment” rate. This needs some explaining. First, the “discount rate” does not have the same meaning as used in class; it refers to the fact that T-Bills are sold at a discount of a certain percentage, calculated over the period. Thus a 182 day (½ year) T-Bill sold at a 4% discount (2% over ½ year) is sold at 0.98 of the face value of the Bill. The actual interest the investor gets is then the increase in value to maturity (0.02 in this case) over the cost (0.98) for the period (½ year) which equals 4/98 or about 4.08%. This is the investment rate, which is what you should pay attention to, and it is systematically somewhat higher than the “discount rate” reported.