Second exam take-home portion Spring 2018 - 60 points

Note: This is an open book exam where you are expected to use your models to answer questions. You may look at all questions immediately, even if you do not intend to answer them right away.

Rules and restrictions (please read carefully):

1. **Due date and time:** This exam is due back to Professor Evans at the start of class on Monday, April 2.

2. This is an open-book, open-note exam with no limits whatsoever. You may use notes and lectures. You can access the internet, my notes, and Wikipedia. You must only use your own models.

3. You are prohibited from collaborating with others while taking this exam (even though you worked in teams to develop your models). You may not communicate with anyone else about your models or how they work.

4. If one of your models is not working right or is not completed, you may fix or continue to work on the model. But you **may not ask for assistance from anyone** after the in-class exam is taken on Wednesday.

5. **I will accept nothing associated with this exam in email**.

6. You are required to provide your numeric answers on *this exam sheet*, no options (it is easier for me to grade).

7. Unless I otherwise state, I do not need to see your support material BUT hold on to it for one week in case I ask for it. This is **not** because I don't trust you. Instead, if you get and answer wrong I may be able to give you partial credit if I can see why you missed the answer.

[The exam begins on the next page].

Your legible name goes here: _____

Tear off the front page of this exam and return this page with two plots attached. Do not attach work pages.

This question is based upon homework 6, where we developed a model to calculate a delta hedge. We are simply choosing the same model to evaluate a different stock, in this case Amazon.

[Interesting note of relevance: I drew up the draft of this question after market close on the evening before the in-class exam. AMZN has closed that day at 1510 so the put options being consider were centered on the 1510 strike for two expiries. The problem was to hedge against a large drop in the market over the three day period. As you saw in class while you were taking the exam the very next day, the hedge would have been nice! … when we pulled up our screen, AMZN was priced at 1401! The puts we were to consider as hedges were up nearly 100%. Since I have the values from that evening, let's do a time machine …. lets go back to my original Tuesday values and calculate the actual hedge that would have saved us $100,000 in one day, assuming that our long position in AMZN was 1,000 shares].

Date/time: Tuesday, March 27, 2018, 15 minutes before market close.
Rumor: Bad news about AMZN would surface before Friday, so we want a **3-day hedge**.
Position that we are hedging: 1,000 shares long, AMZN
AMZN price: 1510.00
AMZN estimated historical volatility (1 year daily volatility): 0.013041
Two expiries that we are considering: April 6, 10 days and May 18, 52 days
Hedge bias adjustment: 0.80
Risk-free rate: 0.0255
Vector of strikes that we are using (in numpy format): strike = np.linspace(1450,1570,13, dtype="float64")

1. Plot the deltas for these strikes for these expiries for AMZN and attach it to this sheet to be turned in. [Note: this is a realistic range. No delta will go to one in this range].
2. Plot the **per-share** cash requirement for a 3-day hedge (offset on late Friday) for these expiries for AMZN and attach it to this sheet. Use an adjustment factor of 0.80.
3. By whatever method you choose, calculate the insurance costs of both expiries at the 1500 strike. You are not required to calulate for all strikes (but you can if you want). Nor do you do not need to plot that out. You will need to provide the calculations for the 1500 strike to answer #4.
4. Although you were not asked to do this in the HW, using a print command or some other device that allows you to see the actual values of your plots to answer these three specific questions:

What is the delta of the Apr 6 1500 Put?	What is the delta of the May 18 1500 Put?
What is the per-share (of Amazon stock) cash requirement of the Apr 6 1500 Put hedge?	What is the per-share (of Amazon stock) cash requirement of the May 18 1500 Put hedge?
What is the per-share (of Amazon stock) insurance of the Apr 6 1500 Put hedge for three days?	What is the per-share (of Amazon stock) insurance of the May 18 1500 Put hedge for three days?