

**RETURN THIS ENTIRE EXAM PLUS THE ATTACHED ANSWER STAPLED, WITH YOUR NAME ON EACH SHEET.**

This is a take-home exam. It is due back to the plastic box outside of my office door at Parsons 1261 no later than **3:00 PM on Thursday, May 5th**. Here are the rules:

1. This is an open-book exam. You may use the book, your notes, and the internet to complete your answer.
2. You may not discuss the exam, any of its questions, or any of its answers, with anyone else.
3. When you turn in your answers, I must see the evidence of how you arrived at your answer. The Black-Scholes model assignment required you to use an Excel spreadsheet or MatLab or Mathematica or Java or FIXX or whatever you decided to use. You must turn in the worksheet that your work generated with the answer. ***I do not need to see your code and you do not need to show it to me***, although you can if you want to.
4. I expect your answers to be orderly, coherent, and fully explained.
5. The model you use must be of your own construction. You cannot use any internet model or any other options pricing model available. You **can** however use such models to check your work.
6. Staple all of your material together in the proper order. Don't turn it in looseleaf or with a paper clip. Put this sheet with your name on it on the front.
7. Part of this is an essay exam. I expect clear, coherent essays, and on that standard you will be judged relative to your peers.
8. The Harvey Mudd Honor Code is in effect.

**Your question** - Shown below is a TD Ameritrade quote for IWM and four options:

IWM Jun 18 ...	IWM Jun 18 2011 88.0 Call	1.46	1.47	1.46
IWM Jun 18 ...	IWM Jun 18 2011 87.0 Call	1.92	1.94	1.92
IWM	ISHARES TR RUSSELL 2000	85.89	85.90	85.89
IWM Jun 18 ...	IWM Jun 18 2011 84.0 Put	1.88	1.89	1.89
IWM Jun 18 ...	IWM Jun 18 2011 83.0 Put	1.58	1.59	1.59

Your assignment requires that you use the options pricing model assigned in the last homework, where you use the formula that requires **daily volatility** to estimate duration volatility. Remember that I corrected the formula in the last lecture (although it wouldn't make a difference in the calculation) to the following:

$$d_1 = \frac{\ln(S/K) + (r/365 + \sigma^2/2)t}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\ln(S/K) + (r/365 - \sigma^2/2)t}{\sigma\sqrt{t}}$$

To calculate the value of a put you have to change a couple of signs - it is easy to figure out.

1. Go find the implied volatility estimates that I gave you for IWM and plug in the 30-day volatility estimate for the 87 call shown above (given IWM's price shown above) to see what call price you get, and compare it to the actual price above. (If you lost the copy, the workbook will be on the same page as this exam).
2. Using an iterative technique or trial and error, solve for the implied volatility for the four options shown.