


MAT116 Project 3 Chapter 13

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13-1: Computer Simulations

- Now that we have normed our closing ratios, we are now in a position to simulate many stock option periods so that we can get an estimate of the closing price for our stock.
- We will use simulation tools in Excel to do this.

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Example

- Suppose you have a 30% chance of pulling out the red ball from a bag, and a 70% chance of pulling out a blue ball.
- Simulate 50 trials using Excel.

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Example

- Suppose you are playing a game. There is a 22% chance you'll draw a number one. There is a 40% chance that you draw a number two. Finally, there is a 38% chance you'll draw a number three.
- Simulate this game and 100 trials using Excel.
- How is this game different from the previous example?

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Random Selection

- The next kind of random simulation we need to know how to create is what we will call "Random Selection."
- In this kind of simulation, we have a list from which to choose and we randomly pick one item from the list.

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Example

- Open the file Chapter 13.xls and view the sheet called "employees."
- Use Excel to randomly pick one of the employees from the list and report back his or her employee number, total sales, in years with the company in three empty cells.

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Project Question

- Let's use Excel to randomly pick one of a normed ratios from class Project data.

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13-3: Fair Price

- Recall from the first project the idea of expected value.
- Let's calculate the fair price of playing the gambling game in a local casino.

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Example

- Suppose you have the game where you pull out the colored ball from a bag.
 - If you pull one of 10 red balls you win three dollars.
 - If you pull one of 15 green balls you win two dollars.
 - If you pull one of 20 you will balls you win one dollar.
- What would be a fair price for playing this game?

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Definition

- A **fair price** is a price to charge so that the expected value for both the buyer and seller is zero.

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Example

- The first thing to do is calculate all the appropriate probabilities.
- After that, exactly the expected value and for playing the game.
- The expected value will give us price for this game.

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Example

- What is a fair price of the game that has a 10% probability of winning two dollars, 40% probability of winning 25 cents and 50% probability of winning five cents?

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13-4: Focus on the Project

- In this project, we will assume that the weekly ratio for stock is a random number.
- The weekly ratio for stock tells us how much the stock has gone up in price or how much it's gone down in price.
- We will simulate a 14 week option by randomly choosing 14 normed weekly ratios and applying them to the price of the stock when the option began.

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Focus on the Project

- Here are the variables we will use:
 - n = number of weeks in the option period
 - p = starting price of the stock
 - r_i = the ratio for week i which is randomly chosen the list of normalized ratios.
 - C = the closing price after n weeks
 - S = the strike price
- If we take the starting price of the stock and multiply by each of the ratios (one for each week in the option period), this gives us one possible closing price for the stock after n weeks.

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Focus on the Project

- If the closing price is greater than the strike price, the stock option is in-the-money, and the value of the option is $C-S$.
- If the closing price is less than or equal to the strike price, the stock option is out-of-the-money in the value of the option is zero.become

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Focus on the Project

- Let's use this idea to simulate a 14 week option, choosing random ratios from our list of normalized ratios.
- We will use the PRODUCT command in Excel to find the closing price and then use the IF command to determine the value of the option.

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Focus on the Project

- This single simulation gives us the closing price of our stock and the value of our option 14 weeks into the future.
- Hence, but we really have is the future value of our option.
- We need to adjust that to compute the present value of the option, keep in mind that it's in the present than or actually considering buying or selling the option.

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Focus on the Project

- Recall that the law of large numbers tells us the more simulations we have the better estimate for the option price will be.
- Hence, we now repeat the steps in simulate 1000 option simulations.
- This will make the Excel file very large, so please make sure to save your data to the student network or to a zip disk.

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Focus on the Project

- If we take the average of all the present values of our simulations, we get an estimated fair price to charge were to pay for the stock option.
- Note that if we use the F9 key to do another simulation, our fair price will change. It's probably a good idea to do several of the simulations, taken average of that, and use that for a fair price.

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Focus on the Project

- You are now ready to use the bootstrap method to find a fair price for your stock option.
- Please be prepared to submit the Excel file that you create to generate the simulations. Because the files will be large in size, it's probably a good idea to have one team member stated to their student drive so I can make a copy of it and transfer it to a zip disk.

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