Exploring the Parameter Space

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1 Introduction to Parameter Exploration

- If you've merely done a calculation, you have a single answer and can't learn any more about the problem without redoing the calculations
- Instead because we are building models which can flexibly take any input and convert that into the appropriate output, it opens up a lot of possible extensions to the model
- This is our main focus for a large portion of the course: how can we extend any financial model to get a greater understanding of the underlying problem
- Sensitivity analysis is useful to understand how the full range of possible inputs affects the main results of your model
- Scenario analysis allows analyzing outcomes in example situations
- Monte Carlo Simulation allows assigning outputs to a probability distribution, which helps you understand the risk of your result

2 Introduction to Sensitivity Analysis

- The formal definition of sensitivity analysis may seem complicated, but all we are doing is running the model multiple times with different inputs and showing the outputs
- A key component of sensitivity analysis is the visualization, as now that there are many different outputs it is much easier to draw meaning from them when visualized

3 Sensitivity Analysis in Excel

- Data tables in Excel allow calculating a cell multiple times, changing some other cell. This is perfect for sensitivity analysis if we target an output cell and change an input cell
- One-way data tables change one input at a time, two-way data tables change two inputs at a time
- You are basically limited to changing two inputs at once, without doing some clever hacks
- Visualization rule of thumb: graph one-way data tables and use conditional formatting for two-way
- Conditional formatting changes the format of cells based on conditions, such as putting the largest numbers in green and the smallest in red
- Row input cell means that your inputs are going horizontally in a row. Column input cell means that your inputs going vertically in a column. For one-way data tables, you will use only one of the two. For two-way data tables, you will use both

4 Using Python Dictionaries

- There are three ways to loop through dictionaries: through the keys (the default), through the values (.values()), and through both at once (.items())
- If you want one way to do it, just always loop through the items as you have access to both the key and the value at once
- Combine dictionaries using update. Add items to dictionaries with brackets and assignment. Remove items from dictionaries with pop

5 Python List Comprehensions - Convenient List Building

- List comprehensions are an example of "syntactic sugar," or a feature of a programming language which is not necessary but makes things easier (makes the programming experience "sweeter")
- They allow us to write simple loops made to create lists with only a single line of code

6 Python Imports and Installing Packages

- Import can be used for third-party and built-in packages, but also for your own code offloaded into separate files
- I had you install Anaconda to get Python because it includes most of the Python packages we would want to use pre-installed. So we haven't had to install any package up to now
- With more than 250k packages out there and only about 200 installed in Anaconda, the time will come when you need to install something
- It will even happen in this course because we will use some packages I have created

7 Introduction to Sensitivity Analysis in Python

8 Sensitivity Analysis in Python Example