Intro and Simulation

MGMT 675, AI-Assisted Financial Analysis

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Julius Inputs and Outputs

- Julius will read data that we've uploaded, execute code generated by ChatGPT, and provide links to outputs.
- Can output images, Excel tables, csv files, ...
- Julius can also read some online data.

Running Code Elsewhere

- We can copy code from Julius and paste into a Jupyter notebook - for example, in Google Colab.
- We can save Colab notebooks to Google Drive and then reload them into Colab and run them whenever we want.
- Or, we could copy code into notebooks on our own machines.

Outline for Today

- Compound market returns
- Retirement planning
- Option valuation
    - European calls and puts
    - Average price options
- Capital budgeting example
- Google Colab

Compound Market Returns

- Ask Julius to simulate how much a $1 investment would grow to in 10 years if the investment return is normally distributed with a mean of 6% and a standard deviation of 20%.
- Ask Julius to calculate the fraction of times the investment outperforms a risk-free return of 1% over 10 years.
- Ask Julius to generate boxplots and histograms of the ending investment account balance.

Retirement Planning

- Tell Julius you want to check if a retirement savings plan is feasible. Ask Julius what information you need to provide and provide it.
- Ask Julius to calculate the ending balance as a function of the rate of return over some range and plot it.
- Ask Julius to simulate the retirement plan assuming the annual returns are normally distributed with some mean and variance.
- Ask Julius to describe the distribution of ending account balances and to produce a boxplot and histogram.

Calls and Puts

- Tell Julius you want to simulate to value a European call option. Ask Julius what information you need to provide and provide it.
- Ask Julius to value the same call option using Black-Scholes.
- Ask Julius to value a put option both ways.

Asian Options

- An Asian (or "average price") option is a cash-settled contract. If you are long an Asian call, you receive

the average price of the underlying asset during the option maturity minus the strike price if that is positive and zero otherwise.

- In other words, the underlying price at maturity is replaced by the average price.
- The contract specifies when the price is sampled for computing the average (e.g., weekly).
- There is no simple formula like the Black-Scholes formula for Asian options, so simulation is very useful.
- An Asian option is an example of a path-dependent option. The path of the underlying asset price must be simulated (not just the value at the option maturity).
- Ask Julius what information it needs to value an Asian option by simulation and provide it.

Google Colab

- Go to https://colab.research.google.com/ and sign in.
- Open a new notebook.
- Copy and paste code from Julius into the notebook cells.
- Run the notebook.
- Save the notebook to your Google Drive.