MGMT 675

AI-ASSISTED FINANCIAL ANALYSIS

RICE | BUSINESS
Jones Graduate School of Business

RETIREMENT PLANNING AND SIMULATION

EXAMPLES FROM APPLIED FINANCE

- Long-run risk
- Retirement planning
- Retirement planning with simulation
- Monte-Carlo option valuation
- Monte-Carlo stock valuation

LONG-RUN RISK

- 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.

RETIREMENT PLANNING WITH SIMULATION

- 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.

MONTE-CARLO OPTION VALUATION

- Tell Julius you want to value a European call option by Monte Carlo. 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.

TWO-STAGE GROWTH MODEL

- Give Julius the following data (from Applied). Then ask what the share price should be.
  - A firm with no debt will have free cash flow of 100M next year.
  - The cash flow will grow by 12% per year for years 2 through 5. Then, it will grow by 3% per year forever.
  - The firm's cost of capital is 10%, and there are 44.75M shares outstanding.

CHECK FOR ERRORS

- It is quite possible that Julius - like any assistant - might misunderstand the timing you want.
- Quickest way to fix mistakes: edit the code.

Check the following:

- There should be five cash flows in the first stage.
- The first cash flow should be 100M (no growth).
- The terminal value should be 100M with 4 years of growth at 12% and 1 year of growth at 3% divided by (10% - 3%).
- The terminal value should be discounted back 5 years.

SENSITIVITY ANALYSIS

Ask Julius to vary the first stage growth rate between 6% and 18% and to plot the share price as a function of the growth rate.

MONTE-CARLO VALUATION

- Now ask Julius to simulate the first-stage growth rate from a normal distribution with a mean of 12% and a standard deviation of 3%.
- Ask Julius to compute the share price in each simulation and to describe the share price distribution.
- Ask Julius to produce a histogram of the share price distribution.

A SECOND SOURCE OF UNCERTAINTY

- Tell Julius to model the first-stage growth rate as x + y where
  - x is drawn from a normal distribution with a mean of 12% and a standard deviation of 3%,
  - y is a Bernoulli random variable which is 12% with 10% probability and is 0 with 90% probability.
- Ask Julius to compute the share price in each simulation, to describe the share price distribution, and to produce a histogram.