

**Design for Real Estate and Infrastructure Development (11.434, 15.428, ESD.712)  
Spring 2010**

**Assignment: Monte Carlo “engineering analysis” of value of flexibility (2 pages!)**

**Due date: Lecture 9**

This exercise has three objectives:

- to ensure that you understand the analysis using simulation;
- to focus your attention on the potential value of flexibility in the design; and
- to get you well on your way to your final report.

Each team is to do three related tasks.

Task 1: Prepare a “deterministic base case” analysis. This is a spreadsheet analysis of the business plan for the project, without flexibility and without uncertainty (e.g., using most likely values for demand, price, etc.)

Task 2: Develop a “base case with uncertainty,” by analyzing deterministic case recognizing the uncertainty in the forecasts. You should summarize the results of the analysis in a Table that gives the:

- Expected Net Present Value (ENPV)
- $P_5$  and  $P_{95}$  values of the distribution of outcomes (the 5% and 95% extremes of the cumulative distribution).
- The initial capital investment required (CAPEX)

Task 3: Each team member should analyze a particular form of flexibility, as agreed within the team. [This spreads the work, and also ensures that each participant demonstrates familiarity with the analysis.] Each individual analysis should include a “one sentence” explanation of why this flexibility is interesting to the team.

Each flexibility should represent a way to deal with a major uncertainty concerning the product success. Some will be aimed at minimizing downside losses, others at exploiting upside potential. It may be within the design, it may concern the way the project is rolled out, or it may simply involve a different “decision rule” about the when a given flexibility is to be exercised.

Each individual report should use the information in the deterministic and uncertainty “base cases” report of the team (same values for demand, price, etc.). This is to permit you to compare the results of the individual report directly with the team’s base case results. Likewise, each individual report should report its results with the same information as the team (plot of cumulative distribution and table of results).

**Notes:**

- **We expect you to submit the team and individual reports separately. No need to wait on each other.**
- **Individuals should provide the team with copies of their results, for use in the final team report.**
- **We understand that some team members may have difficulty with this exercise, because they are less prepared in Excel skills. However, we want to make sure that each of you develops the capability to do the analysis yourself, and demonstrate it by turning in the individual exercise when you have done so.**
- **To reinforce the above, the entire class period for Lecture 9 will be devoted to reviewing this material so that you can “get it right” for final report**

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