ESD.70J Engineering Economy

Fall 2011

Session Zero

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http://ardent.mit.edu/real_options/ROcse_Excel_latest/Excel_Class.html
Course Information

Credits: 3 units to those that want them, otherwise students can register as listeners or simply sit in on class.

Website: all materials can be downloaded from the following,

http://ardent.mit.edu/real_options/ROcse_Excel_latest/Excel_Class.html

Time and Location: MTWR EVE (5-7.30 PM) (32-155)

Excel materials: credit to former TA - Michel Cardin
Class outline

1. Objective: get you up to speed for Session 1!
   - Excel versions and languages
   - Excel basics for ESD.70
   - Case introduction
   - More learning material
Excel versions

• Versions currently “in use”
  – Open source: Open Office Calc (see website)

• Many, many languages
  – Chinese, English, French, Japanese, Spanish...
  – Obviously cannot support all (see website for handy tips in French and Spanish)
Recommended versions

• Class supported in Excel 2007 for PC, and Excel 2004 for Mac
  – Excel 2007 widely used on PC
  – Excel 2008 for Mac does not support Solver and other functionalities required for class

• Make sure you have one of those installed!

• For MIT students, get online for a free copy of software
  http://ist.mit.edu/services/software/available-software
Course Materials

• Excel spreadsheets

Step1: file [ESD70session# –1.xls] is setup before the class

Step2: in class exercise solving the case with tutor

Cells marked as [ ] are for you to fill

Step3: refer to file [ESD70session# –2.xls] which reflects all the work done in class
Excel basics

Open ESD70session0-1.xls
Case: Big vs. Small setup

- Building a computer plant
- Deterministic demand projections for years 1, 2 and 3 are 300,000, 600,000, and 900,000 respectively
- No sales in year 4 or thereafter
- Plan A – a big plant; Plan B – one small plant each year;
- Plants take a few months to construct
- Big plant capacity of 900,000 with capital cost of $900 million
- Each small plant capacity of 300,000 with capital cost of $300 million
- No salvage value for Plan A; $300 million salvage value for Plan B
- Discount rate for Plan A is 9%, and 8% for Plan B [why?]
- The company will sell each computer for $2,000
- Variable cost for each computer, for Plan A is $1,280 due to economies of scale; Variable cost for Plan B is $1,500
- See “Entries” Worksheet...
Class Structure with the Big vs. Small Case

$NPVA - NPVB = f(Capacity, Demand, Price, Cost, Investment, Salvage, Discount rate)$

Session 0: Extract all values from the case and input into Excel
Class Structure with the Big vs. Small Case

\[ NPVA - NPVB = f(Capacity, Demand, Price, Cost, Investment, Salvage, Discount rate) \]

Session 0

Session 1

Session 1:
Sensitivity Analysis by varying cost and discount rate
Class Structure with the Big vs. Small Case

\[ NPVA - NPVB = f(Capacity, Demand, Price, Cost, Investment, Salvage, Discount rate) \]

Session 0

Session 1

Session 2

Session 2:
Monte-Carlo Simulation by simulating demand with a uniform distribution
Class Structure with the Big vs. Small Case

\[ NPVA - NPVB = f(\text{Capacity}, \text{Demand}, \text{Price}, \text{Cost}, \text{Investment}, \text{Salvage}, \text{Discount rate}) \]

Session 0

Session 1

Session 2

Session 3:
Modeling uncertainty using different stochastic models and probability distributions
Class Structure with the Big vs. Small Case

\[ NPVA - NPVB = f(Capacity, Demand, Price, Cost, Investment, Salvage, Discount rate) \]

Session 0

Session 1

Session 2

Session 3

Session 4:
Introducing flexibility: Capacity(t) ~ f\{Capacity (t-1), Demand(t-1)\}
Manual vs. automatic calculations

• How to set it up
  – Mac: Excel ⇒ Preference ⇒ Calculations
  – PC: Excel ⇒ Excel options ⇒ Formulas

• Shortcuts
  – “F9” on PC and “command =“ on Mac
More learning material

• Excel 2004 for Mac:

• Excel 2007 for PC:

• Excel hotkeys
http://allhotkeys.com/microsoft_excel_hotkeys.html
Next session...

We begin the main session about NPV, Sensitivity Analysis and Data Tables

TAKE A SHORT BREAK AND COME BACK