ESD.70J Engineering Economy

Fall 2011
Session Zero

Xin Zhang – xinzhang@mit.edu
Prof. Richard de Neufville – ardent@mit.edu

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"
  - PC: 2000, XP or 2003, 2007
  - Mac: 2004, 2008
  - 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

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

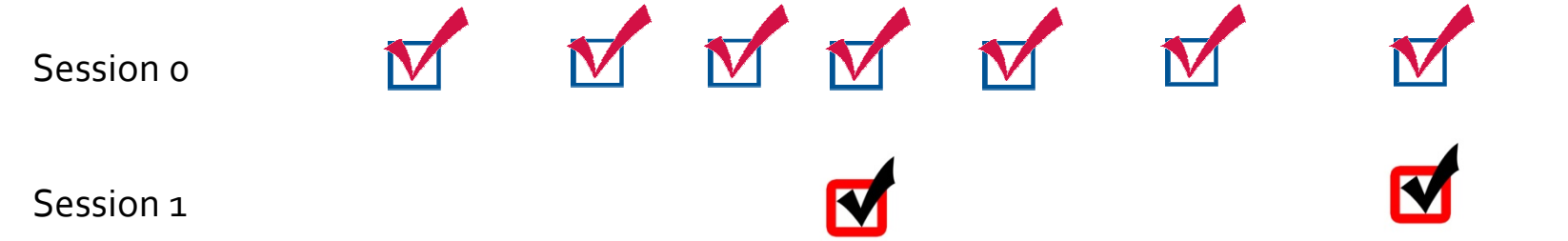
Session o 

Session o:

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 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

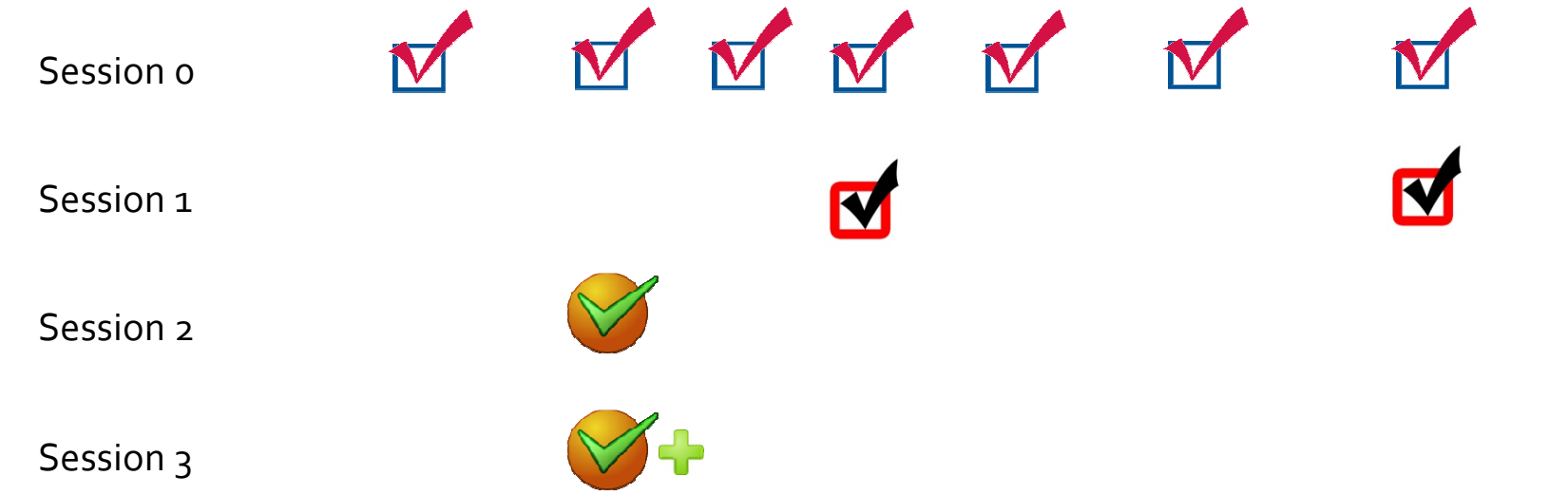
Session 2

Session2:

Monte-Carlo Simulation by simulating demand with a uniform distribution

Class Structure with the Big vs. Small Case

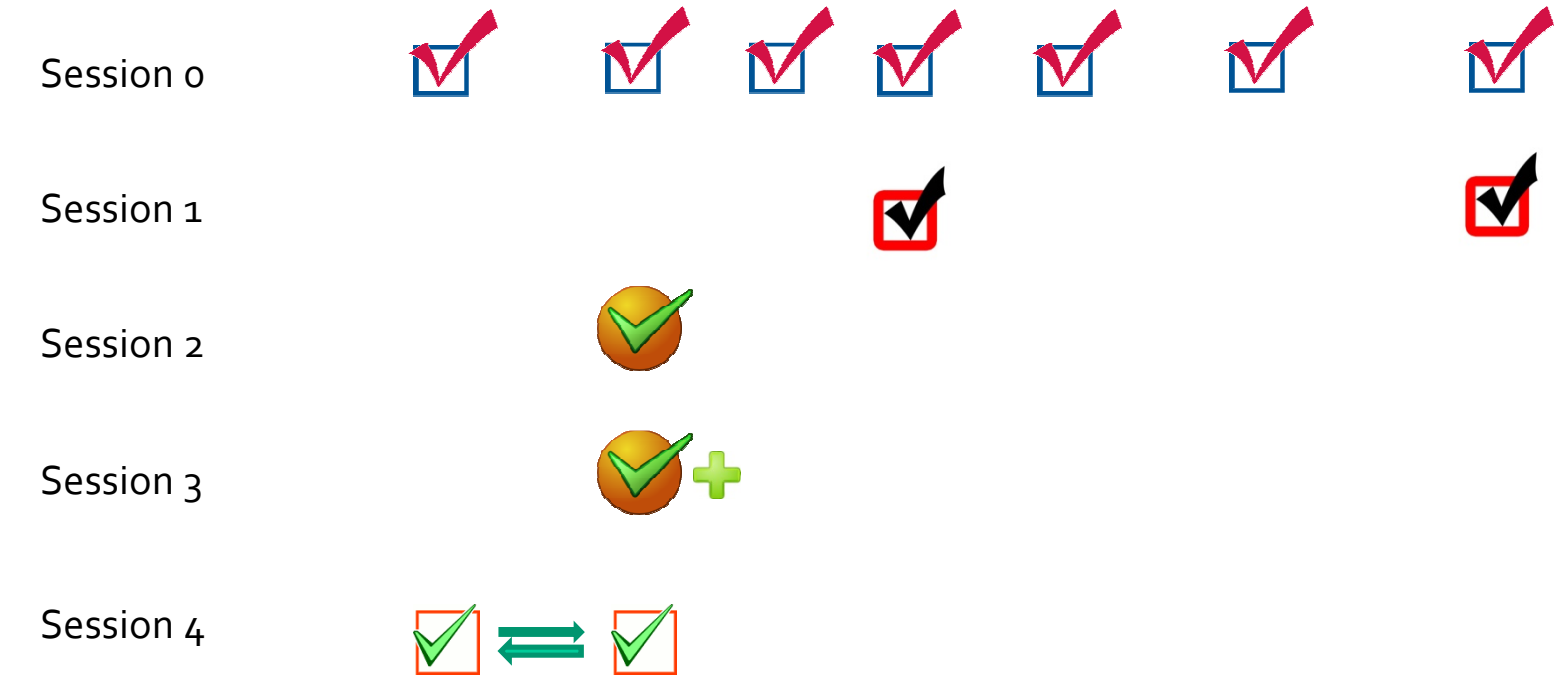
$$NPVA - NPVB = f(Capacity, Demand, Price, Cost, Investment, Salvage, Discount\ rate)$$



Session3:
Modeling uncertainty using different stochastic models and probability distributions

Class Structure with the Big vs. Small Case

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



Session4:

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:

http://web.mit.edu/macardin/Public/docsESD70/DiscoveringMicrosoftOffice2004.pdf

- Excel 2007 for PC:

http://office.microsoft.com/en-us/training/HA102255331033.aspx

- 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