ECON 180

Introduction to Principles of Microeconomics and Financial Project Evaluation

Lecture 3: Introduction to Excel

September 15th, 2020

Version 1

Recommended Viewing

- Stratvert, K. (2019, September 20). Microsoft Excel Tutorial for Beginners [Video File]. Retrieved from https://youtu.be/e7xGuGqgp-Q
- Stratvert, K. (2019, July 12). Excel Formulas and Functions Tutorial [Video File]. Retrieved from https://youtu.be/Jl0Qk63z2ZY
- **A second perspective on much of the same material we'll be covering in this lecture.**

How to get Microsoft 365 for free

- Microsoft 365 [Web Page]. (2020). Retrieved from https://www.uvic.ca/systems/support/computerssoftware/microsoft365/index.php
- **Follow the instructions on the above page to get the free access to Microsoft 365, including Excel, that you're entitled to as a UVic student.**
- **It's available for Mac and PC. If you run Linux or Android, a good free alternative is LibreOffice (LibreOffice Calc is their Excel equivalent): https://www.libreoffice.org/**
- **LibreOffice is not officially supported by ECON 180, so I won't be able to help you with differences in commands, etc.**

Learning Objectives

- Gain an introductory understanding of how to use Excel to create tables and solve simple problems.

Sketch of this Lecture

- Pricing for AAA batteries can be confusing.
- I've collected info on non-rechargeable AAA battery prices from Amazon and entered it in Excel.
- We'll use Excel to decide which pack of batteries to buy, in 2 ways:
- Way 1: Find the cheapest cost/battery
- Way 2: Treat the packs as mutually exclusive projects & use incremental BCR analysis to determine the preferred project.
- This is NOT the same problem! Way 1 and Way 2 are answering two different questions. (Way 2 will ask, *given* a given $ value/battery, are the extra batteries from the more expensive packs worth the added cost?)

Entering Data

- Type away!
- Note: Excel ‘remembers’ previous column entries
- Note: Each cell has a unique identifier (e.g. B39)
- Double-click column dividers to auto-size
- Can center, bold, italic, justify, etc.

Formatting

- Can tell Excel what type of values we're dealing with (format)
  - Select cells, then right-click: Format Cells → Number
- Drag-select and use border tools to make it look like a table.
- Can also just click on top left cell, then shift-click to bottom right cell of selection (saves time).
- Can select entire rows or columns by clicking on header.
- Want to get rid of part of a selection? (Cell, column, etc.) Use Ctrl-clicks (or Cmd-clicks on Mac).

Basic Calculations

- Starting a cell with = tells Excel a formula or function follows.
- Basic math works as you'd expect: +, / , *, etc.
- Click on cells, select them with arrows and press return/enter, or type their names to use them in your math.
- Worried if you typed the right cells? Excel highlights & color-codes (just click your formula in the formula bar).

Filling Formulas for Fun and Profit

- Once you've entered a formula, you can use the *Fill* command to extend it up, down, left, right, etc.
- Most often used: Fill Down or Fill Right: Ctrl-D, Ctrl-R. (Cmd for Mac)
- Others can be accessed with Edit→Fill
- Excel treats the cell values you entered as *relative* identifiers.
- If your formula was '=A1+B1' and you fill down, on the next row it'll become '=A2+B2'.
- If you fill right, on the next column it'll become '=B1+C1'.
- What if you *don't* want the cell references changing like this?
- We'll get to that later…

Formatting for Clarity

- Excel has built-in standard formats for common types of cell:
- Input, linked cells (e.g. ‘=X125’), output, calculations, notes, etc.
- These formats don’t *do* anything…
- …BUT they make it MUCH easier to read your work.
- Important when someone else looks at it, or you go back to it.
- (Think commenting on code.)
- I encourage you to use these.
- Select cells, then use the ‘Cell Styles’ drop-down.

Summary Statistics

- Excel has built-in functions for a **lot** of things.
- I'll show you some of the most common:
- MIN,MAX,AVERAGE,MEDIAN
- To enter, use =FUNCTION(firstcell:lastcell), e.g. =MIN(A2:A10)
- Can also use =FUNCTION(cell1,cell2,cell3) etc.
- Different functions will have different required formats for their arguments. Excel will remind you what these are in mini-popups.

Conditional Formatting and Sorting

- Excel's 'Conditional Formatting' drop-down can be VERY useful.
- Example: Make below-average or average costs/battery green, above-average costs/battery red with just a few button clicks.
- (Other options for those with red-green colourblindness.)
- You can also sort tables (or even sections of tables) using Data→Sort
- You can arrange things alphabetically, smallest to largest, etc.
- In our case, this lets us quickly see which our 'winning' pack is.
- We can make our result look nice by judicious cell referencing and formatting (I used merge/center, and cell format→align, both common and useful, to create the 'Winner' cell).

The end result...

Brand	Count	Price	Price/Battery
ACDelco	48	$13.49	**$0.28**
AmazonBasics	100	$29.12	**$0.29**
Powermax	100	$34.56	**$0.35**
Medline	144	$51.62	**$0.36**
ACDelco	24	$9.10	**$0.38**
GI	50	$19.49	**$0.39**

MIN	$0.28
MAX	$6.90
MEAN	$1.42
MEDIAN	$0.98

Winner	Brand	Count	Price	Price/Battery
	ACDelco	48	$13.49	$0.28

Checking for duplicates

- Now to Benefit Cost analysis.
- Before we start: two things.
- 1) Check for duplicate entries
- 2) Attach $ value to benefits

- To check for duplicates…
- Use the CONCATENATE function to string together brand,count,price & create unique identifiers for each combination.
- You need to use commas & individual cells, not ranges like A2:A5 for this to work.
- Use highlight cell rules → duplicates to find duplicates.
- Delete any duplicate rows.

Turning benefits to $ with fixed reference formulas

- Suppose I always buy the Duracell 8-pack for $19.29…
- I could use that as a stand-in for the value of a battery to me: I'm willing to pay at least that much, but not more if the 8-pack is always available.
- →Create a small table to get that $19.29/8 value for me.
- Use copy-paste, not cell references, because I may delete the Duracell row from my main table later, & that would break the reference.
- Use a formula that points to *that specific* cell, with the reference cost/battery, to turn batteries/pack into $ of benefit.
- When you write a '$' before the row or column identifier in a cell, you tell Excel you mean THAT specific row or column – don't change it.
- e.g. A1 (both fixed), $A1 (column fixed, row relative), A$2 (column relative, row fixed).
- Now we're ready to run our algorithm.

IBCR Algorithm

1. Eliminate projects with BCR < 1
2. Sort by cost, check for dominance
3. Eliminate dominated projects
4. Incremental BCR on two cheapest
5. Eliminate losing project, then iterate
6. Stop when one project is left

1. Eliminate projects with BCR < 1

- Side note: select columns/rows and right-click ‘Hide’ to hide any columns/rows you still need, but would be distracting. We’re doing this with the ‘Usual Purchase’.
- You can also use ‘Insert Row/Column’ by selecting a row/column and right-clicking on the header, if you need more room.
- Calculate BCR from our cost & benefit values
- Use Highlight Cells Rules to identify BCR < 1
- Delete those rows (easier if you sort by BCR first).

2. Sort by cost, check for dominance

- Once we've deleted projects with BCR < 1, it's easy to sort our data by cost. (Also: don't need BCR anymore, so can hide it.)
- To find dominated projects, one projects are sorted by increasing cost, calculate the difference in benefits from one row to the next.
- It should be positive, otherwise you're paying more & getting less.

3. Eliminate dominated projects

- We can highlight negative benefit increments with the usual rules, then delete the rows.
- This may break the formula in Excel, but just fill down to fix, & we may see new negative incremental benefits appear, so delete those & keep going until there's nothing left to delete.

4. Iterated IBCR checks

- I deleted the ‘change in benefits’ column, since I didn’t need it anymore.
- I find it helps to have columns for the following:
- IB = Incremental Benefits
- IC = Incremental Costs
- IBCR = IB/IC = Incremental Benefit/Cost Ratio
- Vs = Reminder of which two projects are being compared (for this, I add an easy identifier, like a number or letter)
- Wins (which project wins that round?)
- Easy to do in Excel. You can Fill Down, use highlight rules to check for IBCR > 1, and switch to ‘manual control’ when the first IBCR < 1 pops up.
- (Since that means you can no longer compare two adjacent projects.)

The end result…

Identifier	Brand	Count	Cost	Benefit	BCR	IB	IC	IBCR	Vs	Wins
1	Energizer	2	$2.53	$4.82	1.91					
2	Mastercell	4	$6.58	$9.65	1.47	$4.82	$4.05	1.2	1 vs 2	2
3	Panasonic	8	$7.21	$19.29	2.68	$9.65	$0.63	15.3	2 vs 3	3
4	AmazonBasics	20	$8.61	$48.23	5.60	$28.94	$1.40	20.7	3 vs 4	4
5	ACDelco	24	$9.10	$57.87	6.36	$9.65	$0.49	19.7	4 vs 5	5
6	EBL	28	$12.58	$67.52	5.37	$9.65	$3.48	2.8	5 vs 6	6
7	POWXS	30	$12.98	$72.34	5.57	$4.82	$0.40	12.1	6 vs 7	7
8	ACDelco	48	$13.49	$115.74	8.58	$43.40	$0.51	85.1	7 vs 8	8
9	GI	50	$19.49	$120.56	6.19	$4.82	$6.00	0.8	8 vs 9	8
10	AmazonBasics	100	$29.12	$241.13	8.28	$125.39	$15.63	8.0	8 vs 10	10
11	Medline	144	$51.62	$347.22	6.73	$106.10	$22.50	4.7	10 vs 11	11

Medline's 144-pack wins, despite having a higher cost/battery, because the extra benefits > extra cost.

If the projects *weren't* assumed mutually exclusive, or time & batter life played a role, different matter…