Building in Stages

- Build formula in stages
- Use cells to hold parts of the equation
- Makes it easier to build complex equation

Consider amortized loan formula:

\[ P = R(1 - (1 + (r/n)^n - nt)(r/n)) \]

- Start by identifying the inputs and the result
- Inputs \( P, r, n, t \)
- Solve for \( R \)
  - Let's also compute \( R_{\text{total}} \) and total interest

Spreadsheets 2

Lecture Set 13

Spreadsheet Layout

- Start by labeling input cells
  - “Inputs” (bold, underline, center)
  - Principal, Length of Loan, Payments per Year, Interest Rate
    - Make the column bigger
    - Right-align the labels
- Identify the output cell
  - “Outcome” as above
  - Payment

Sub-Formulas

- Hint – to the right (e.g., column D), use cells for sub-formulas (label in E)
  - Makes calculation easier when formula is complex
    - \( D3 = B6/B7 \)
    - \( D4 = B7^2/B5 \)
    - \( D5 = 1+r = 1+D3 \)
    - \( D6 = ^n-t = D5^2-D4 \)
    - \( D7 = 1 = 1-D6 \)
    - \( D8 = (r/n) = D7/D3 \)
    - \( B10 = B4/D8 \)
    - How about \( R_{\text{total}} \) and total interest?
      - \( B11 = B4^2/D4 \)
      - \( B12 = B11-B10 \)

Example Formula Layout

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Inputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Principal</td>
<td>B4/B7</td>
<td>( n )</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Length of Loan</td>
<td>B3+1</td>
<td>( 1+r )</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Interest Rate</td>
<td>B5/B4</td>
<td>( -1 )</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Payments each Year</td>
<td>1 = 0</td>
<td>( (1+r)^n )</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Outcome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Payment</td>
<td>B4/B3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Total Paid</td>
<td>B11/B10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Total Interest</td>
<td>B11/B10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Plug in Numbers!

- Plug in numbers and see what happens
  - Initially, spreadsheet displays “error”
    - As we fill in numbers, cells are calculated
- Different scenarios, different numbers!
  - Suppose we want to borrow $20,000 for a car at 4.5%
    - We can try different lengths of time for the loan and see what happens to the payment!
    - Try 3, 5, 7 years, about how much?
- Homework asks you to create a similar spreadsheet for Regular Savings
  - Place a long description above about what the scenario is
    - E.g., “I’m going to save $150 a month at 3%, how much will I have in 5 years?”
Copy & Paste

- So you set up one scenario but we want 3
  - Select the cells holding your formulas and labels
  - “Copy”
  - Move the cursor a few cells below your last cell
  - “Paste”

- Notice that the formulas are copied too
  - All cells referenced by the formulas are “adjusted” to refer to the same relative cell
  - Sometimes we don’t want copied formulas to refer to “adjusted” locations
    - You can “lock” a reference in a formula to a row or column by prefacing the name with a $,
    - E.g., $A$10 is a locked reference to the cell A10, even if the formula is copied to another location

Output to Input

- Output from one scenario can be input to the next
  - Suppose you wanted to save to buy a house
    - You select the price-range of a house today
      - Use inflation formula to find out how much that might cost in, say 5 years
      - Determine how much you’ll need for a downpayment
        - E.g., 10% of the inflated price of the house
      - Let that result be F in the regular savings formula
        - Find D, the regular deposit amount
      - The output of one formula is used as the input to another formula
    - Also note that if you use the same cell for t (time) in both formulas, it’s easy to change the scenario for different time periods – change one value and both calculations remain synchronized