Chapter-15 Working with What-If Analysis Goal seek in MS Excel

What-If Analysis in Microsoft Excel allows you to explore different scenarios in your data by changing input values and seeing how these changes impact the output. One of the most useful tools in **What-If Analysis** is **Goal Seek**, which is used to find the input value needed to achieve a specific result.

Goal Seek in Excel

Goal Seek allows you to work backward in a formula to determine the value of an input that will produce a desired output (or result). Essentially, you tell Excel the result you want, and Excel figures out what input is needed to reach that result.

How Goal Seek Works

1. **Formula-based**: Goal Seek works with formulas that have a specific output based on certain inputs. For example, in a financial model, you may have a formula that calculates profits based on sales and costs.
2. **Determine the Required Input**: If you know the result you want (e.g., a target profit), but you're unsure about the required input (e.g., sales), Goal Seek helps you calculate the necessary input value to achieve that target.

Steps to Use Goal Seek in Excel

1. Set Up the Formula

Ensure that you have a formula in a cell where the result is dependent on one or more input cells.

Example: Suppose you have a formula for profit, where the **profit** is the **sales** minus the **cost**.

- In cell **A1**: Sales (input cell).
- In cell **A2**: Cost (input cell).
- In cell **A3**: Profit (calculated using the formula `=A1-A2`).

You want to know what sales (A1) are needed to reach a target profit of $5,000, given that the cost (A2) is $3,000.

2. Access Goal Seek

1. Go to the **Data** tab in the Excel ribbon.
2. In the **Forecast** group, click on **What-If Analysis**.
3. Choose **Goal Seek** from the dropdown menu.

3. Set Up the Goal Seek Dialog Box

In the Goal Seek dialog box, you will need to input three pieces of information:

1. **Set cell**: The cell that contains the formula whose result you want to change. In the example, this would be **A3** (Profit).
2. **To value**: The value that you want the formula result to reach. In this case, you want the **Profit** to be **5,000**.
3. **By changing cell**: The input cell that you want Excel to change in order to reach the target value. In this case, it would be **A1** (Sales).

Example Goal Seek Setup:

- **Set cell**: `A3` (Profit)
- **To value**: `5000` (Target profit)
- **By changing cell**: `A1` (Sales)

4. Click OK and Let Excel Find the Solution

- Click **OK**. Excel will now calculate and show the input value (Sales in A1) required to achieve the desired result (Profit in A3).
- If Goal Seek finds a solution, it will display the new value in the input cell (**A1**). If a solution cannot be found, it will notify you.

Example Output: If the cost (A2) is $3,000 and you want a profit of $5,000, Excel will tell you that you need to generate **$8,000** in sales.

5. Optional: Review Results

Once the Goal Seek process is complete, you can choose to keep the new value or revert back to the original value. You can click **OK** to keep the solution, or **Cancel** to discard the changes.

Practical Example of Goal Seek

Let's say you want to calculate how much you need to sell to reach a specific profit goal.

Scenario:

- **Sales (A1)**: Unknown.
- **Cost (A2)**: $3,000.
- **Profit (A3)**: Formula `=A1 - A2`.

You want the profit (A3) to be $5,000, but you're unsure how much you need to sell (A1).

Steps:

1. Enter **3000** in **A2** (cost).
2. In **A3**, enter the formula `=A1 - A2` for profit.
3. Go to **Data > What-If Analysis > Goal Seek**.
4. Set the Goal Seek parameters:
    - **Set cell**: A3
    - **To value**: 5000
    - **By changing cell**: A1
5. Excel will calculate that you need **$8,000** in sales to achieve a $5,000 profit (i.e., $8,000 - $3,000 = $5,000).

Goal Seek Limitations

- **One Variable**: Goal Seek can only solve for one input value at a time. If you need to adjust multiple variables to reach a target result, you would need to use other tools like **Solver** (which allows for multiple inputs and constraints).
- **Linear Relationship**: Goal Seek assumes a linear relationship between the input and the output. It might not work well with complex, non-linear equations or very large datasets.

Using Goal Seek with Complex Formulas

Goal Seek is also useful for more complex formulas. For instance, if you are working with loan payments and want to find the interest rate needed to achieve a particular monthly payment:

Example: You have a loan formula for monthly payments:

- Loan Amount = $100,000
- Term = 30 years
- Interest Rate = unknown
- Monthly Payment (calculated using the PMT function).

To determine the interest rate that gives a specific monthly payment, you could set up the formula for the PMT function and use Goal Seek to find the interest rate.