

# Guide to Writing Technical Reports for Dynamic Models in Excel

*The purpose of this guide is to aid you in writing technical reports for dynamic models in Microsoft Excel. The goal must always be to create a report that breaks down the formulas in the clearest and most simple manner possible. It is important to note that the use of absolute references as the sole identifier of a particular cell in the model is not allowed for reasons that will be discussed shortly. Therefore it is crucial that careful consideration be given to the most effective way to structure the report, such that it is easy for readers to follow along in Excel.*

## Step 1 - Understanding the Model

Before you begin to write your report it is critical that you have a strong understanding of the model you will be explaining. This is important because, not only is it necessary to simply explain the surface level translation of the excel formulations in plain English, it is also necessary to explain the purpose of the formula and how the cell interacts with other cells. Therefore, it is not sufficient to only explain the cell in isolation, instead it is necessary to explain how that cell contributes to the functioning of the model as a whole.

## Step 2 - Grouping Elements

Once you have a good understanding of the model from a bottom-up and high-level prospective, it is important to take time to consider the best way to structure the flow of your explanation. It is common for dynamic models to include groups of cells that together form common components, such as a “Control Panel”, “Index Cells” as well as the “Core” of the model. It is typically most clear to explain these components in groups. Therefore, the first step in structuring the flow of your report will be to assess which cells can be grouped together. For example, looking at the figure below, the red outline shows how a collection of cells can be grouped together in your report. In this example, the control panel for the model is isolated.

The screenshot displays an Excel model with several key components:

- Control Panel:** A red-outlined box on the left containing input fields for 'Calculation', 'Rate Share', 'Initial Period', 'Frequency', 'No. Periods Calc.', 'Index Option', 'Circular Reference', 'Reading starting value', 'Rate starting on', and 'Rate starting value'.
- Consolidated Income Statement:** A table with columns for 'Revenue', 'Cost of Goods Sold', 'SG&A Expense', 'SG&A Expense', 'Manufacturing', 'Depreciation', 'Amortization', and 'Manufacturing of Subassembly'.
- Historical & Projected IS:** A large table with columns for 'ACTY', 'ACTY', 'ACTY', 'ESTY', 'ESTY', 'ESTY', and 'ESTY'. It contains data for 'Revenue', 'Cost of Goods Sold', 'Gross Profit', 'SG&A Expense', 'Manufacturing', 'Depreciation & Amortization Expense', 'Depreciation', 'Amortization', 'Manufacturing of Subassembly', 'Operating Profit', 'Non-Operating Income (Expense)', 'Interest Income', 'Earnings From Equity Interest', 'Other Income Net', 'Income, Reported to Owners: ROE', 'Income, Manufacturing Net PDB', 'Other Special Charges', 'EBIT', 'EBITDA', 'Interest Expense', and 'Income Taxes'.

### Step 3 - Order of Your Explanation

Now that you have identified which cells are related and should be grouped together into specific objects (i.e. control panel, index cells, etc.) you must decide the order in which you will explain each object and the individual cells within that object. To the greatest extent possible, order your report by breaking down the model from top to bottom and left to right, however, there may be some situations in which it is best to deviate from this general rule. Be sure to explicitly state how your explanations will flow. For example:

#### CONTROL PANEL

*Located in the top left corner of the model, this explanation flows from top to bottom, however, when a row has more than one column, the explanations flow along the row from left to right, before continuing down.*

### Step 4 - Creating a Frame

Once you have decided how to structure your report, you can now begin to start writing. It is helpful to first create a “skeleton” of your report that includes only the general headings in the order and format you will structure your report. This will help keep things organized as you then go down, one-by-one and fill in each section with your detailed explanation. For example:

#### INSTRUCTIONS

*\*Explain the flow and order of your explanations to guide users as they follow along with the model in Excel.\**

#### CONTROL PANEL

##### **[1] Calculations**

- Cell Description:
- Function:
- Purpose:

##### **[2] Data Sheet**

- Explanation
- Purpose

....and so on

#### INDEX CELLS

*\*Explain the flow and order of your explanations to guide users as they follow along with the model in Excel.\**

##### **Annual Data Index Cells (6 Columns)**

###### **Column 1 to Column 5:**

- Cell Description
- Sample Formula
- Translation

###### **Column 6:**

- Cell Description
- Sample Formula
- Translation

## Step 5 - Indexing

As previously mentioned absolute references (i.e. \$D\$4) **cannot** be used in your report to direct the reader's attention to a particular cell. It is imperative that the report be a dynamic explanation. For example, Imagine a row or column was to be inserted in the model, if absolute references were used in the report, it would now be inaccurate. The report should still be readable even in the event that the model changes. Therefore, to avoid the use of absolute references it is helpful to include an index in the appendix of your report. For example:

Appendix	
INDEX	
[1]	Annual Data Sheet
[2]	Quarterly Data Sheet
[3]	Data Starting Row
[4]	Data Starting Column
[5]	Number Of Annual Periods
[6]	Number Of Quarterly Periods
[7]	Actual Statements

The index will be used to reference particular cells throughout the report. For Example:

### [5] Number of Annual Periods

- Enter the number of annual periods you would like to be included in the model
- This can range from 0 to the total number of periods in the database collected by the data feeder (Data validation will not allow the user to input a number greater than this)

*\*This introduces the indexed cell; the title of the cell should relate to the purpose or output of the cell.*

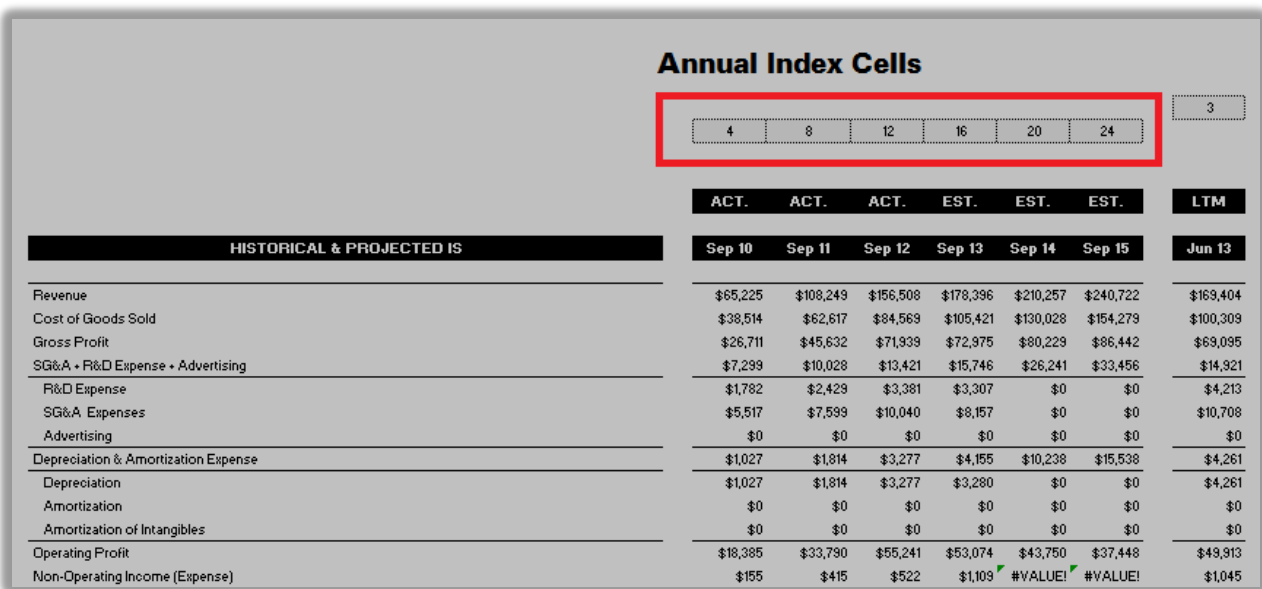
Later in the report when you encounter another cell that is dependent on a cell in the index you will use the name you have defined in the index to refer to it. For example:

### [7] Actual Statements

- This row is a critical row because it builds the frame (width) of the model based on what the user inputs in [5] Number of Annual Periods and [6] Number of Quarterly Periods.

## STEP 6 – Using Pictures

The use of indexing is one method of eliminating the need to use absolute references to specify to the reader which cell you are currently discussing, however it can still be confusing at times if you are dealing with a particularly large and complex model. The use of pictures and screenshots is another method which will greatly help to clarify to the reader which cells you are referring to, without having to resort to absolute references. Taking a screenshot of a portion of your model will allow the reader to see what the object you are discussing looks like and where it lies relative to other objects in the model, thus greatly improving their ability to follow along in Excel. It is a good idea to edit your screenshot with a simple photo editor, such as Paint (Windows). With this application you can quickly label objects and draw outlines that will draw your reader's attention to the object you would like them to focus on. For example:



	4	8	12	16	20	24	3
	ACT.	ACT.	ACT.	EST.	EST.	EST.	LTM
	Sep 10	Sep 11	Sep 12	Sep 13	Sep 14	Sep 15	Jun 13
Revenue	\$65,225	\$108,249	\$156,508	\$178,396	\$210,257	\$240,722	\$169,404
Cost of Goods Sold	\$38,514	\$62,617	\$84,569	\$105,421	\$130,028	\$154,279	\$100,309
Gross Profit	\$26,711	\$45,632	\$71,939	\$72,975	\$80,229	\$86,442	\$69,095
SG&A + R&D Expense + Advertising	\$7,299	\$10,028	\$13,421	\$15,746	\$26,241	\$33,456	\$14,921
R&D Expense	\$1,782	\$2,429	\$3,381	\$3,307	\$0	\$0	\$4,213
SG&A Expenses	\$5,517	\$7,599	\$10,040	\$8,157	\$0	\$0	\$10,708
Advertising	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Depreciation & Amortization Expense	\$1,027	\$1,814	\$3,277	\$4,155	\$10,238	\$15,538	\$4,261
Depreciation	\$1,027	\$1,814	\$3,277	\$3,280	\$0	\$0	\$4,261
Amortization	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Amortization of Intangibles	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Operating Profit	\$18,385	\$33,790	\$55,241	\$53,074	\$43,750	\$37,448	\$49,913
Non-Operating Income (Expense)	\$155	\$415	\$522	\$1,109	#VALUE!	#VALUE!	\$1,045

## STEP 7 – Creating the Content

Now that you have an idea for how to refer to cells without using absolute references you can begin your explanations. There are a few things to consider when explaining the cells:

- What is the purpose of the cell?
- What cells does it depend on? [Precedents]
- What cells are dependent on it [Dependents]
- What does the formula mean?
- What is the output value and what does it mean?

It is not always easy for someone who is unfamiliar with the model to understand the formulas, therefore it is important that you do your best to make your explanations as simple and straightforward as possible. Try to break down each cell into a few components.

- Cell Description:
  - Is the cell value input by the user? Is it a drop-down list?

- Are there data validation rules?
- What is the format? A date, number, etc.
- User-Action:
  - This will not be relevant for all cells, but when the cell requires the user to either input a value or select from a drop-down list, I will explain what action the user should take to achieve a certain output in the model
- Sample Formula:
  - =IF(\$D\$10=FALSE,"-", \$G\$12-\$E\$12+1)
  - While this does include absolute references, the actually references are irrelevant, this is strictly a sample, however providing this will make it easier for the reader to follow along with the translation.
- Translation:
  - Here is where the formula should be translated from Excel language to plain English
  - For example:

IF: [1] Calculations Toggle = FALSE

THEN: the cell will return “-“

ELSE: [6] Total Number of Periods - [4] Column Number of Initial Period  
+ 1

- Explanation/Purpose:
  - Describe the purpose of the cell
    - How does this cell contribute to the model?
    - What cells depend on this cell’s value

**Note:** Please review the sample report attached in the appendix of this guide to see this structure in action.

## General Tips

To improve readability and ease of understanding you will notice in the examples above that consistent formatting is used for particular purposes:

- Indents are used to group related items under its heading.
  - For example, in the above illustration “Cell description” is the description for “[50] Calculation Check” and therefore it is indented to group it under this header.
  - Furthermore, the bullet points relate to “Cell description” therefore, they are indented to illustrate they are both related to this component.
  - Indenting in this manner makes it easier for readers to understand how things relate to each other.
- The use of **bold**, underlines, CAPITAL LETTERS, and *italics* are used to differentiate different levels, however, it is important to be consistent, if your first master header (i.e. INSTRUCTIONS) is in capital letters, blue font and 2 font points higher than its subtext, it is important to do the same for the next master header.

Hopefully this guide has provided you with some helpful insight into writing a technical report for dynamic models in excel. The most important and beneficial way for you to understand the concepts discussed here is to analyze a sample of a technical report and see these concepts in action. Please

carefully review the sample report and pay attention to how the concepts discussed in this guide are implemented in the report.

**Note:** The report has been cut down and modified to provide a more concise example.

## SAMPLE REPORT

### CONTROL PANEL

Located in the top left corner of the model, this explanation flows from top to bottom, however, when a row has more than one column, the explanations flow along the row from left to right, before continuing down.

Control Panel				
Calculations	TRUE			
Data Sheet	FINANCIAL1\$A\$1			
Initial Period	Sep 09	5	16	20
Frequency	3	4		
No. Periods Est.	10	26	9	25
Solver Option	0			
Circular Breaker	FALSE			
Heading starting column	5			
Data starting row	7			
Data starting column	16	20		

CONSOLIDATED INCOME STATEMENT		HISTORICAL & PROJECTED IS	
Revenue	18	Revenue	\$55,235
Cost of Goods Sold	19	Cost of Goods Sold	\$18,216
Gross Profit		Gross Profit	\$37,019
S&S Expense	17	S&S Expense	\$1,782
S&S Expense	18	S&S Expense	\$5,517
Advertising	19	Advertising	\$8
Depreciation	21	Depreciation	\$1,827
Amortization	22	Amortization	\$8
Amortization of Intangibles	23	Amortization of Intangibles	\$8
Interest Income	27	Interest Income	\$11
Earnings From Equity Interest	28	Earnings From Equity Interest	\$8
Other Income Net	29	Other Income Net	-\$15
Income, Reported In Process R&D	30	Income, Reported In Process R&D	\$8
Income, R&D including R&D PMB	31	Income, R&D including R&D PMB	\$8
Other Special Charges	32	Other Special Charges	\$8
Interest Expense	34	Interest Expense	\$18,216

### [1] Calculations

- Cell Type:
  - True/ False drop-down menu
- User-Action:
  - Setting this cell to “False” will turn off the calculations in all cells in the worksheet

- Setting this value to “**True**” will activate the calculations in all cells in the worksheet
- Function:
  - This allows for quick re-calculation of all formulas, which can fix circular references and other calculation issues.

## [2] Data Sheet

- User-Action:
  - Enter the name of the worksheet which contains the financial data for the company you are analyzing followed by “!\$A\$1”.
  - Example: FINANCIAL1!\$A\$1
- Function:
  - This provides reference for offset or lookup formulas as to where the financial data is located.

## Initial Period (4 Columns)

### Column 1: [3] Initial Period Date

- Cell Description:
  - Drop-down menu that includes all the periods with financial data available (based on the historical data included in the database).
- User-action:
  - Select the period from the dropdown menu that you would like to be the initial period in your analysis

### Column 2: [4] Column Number of Initial Period

- Cell Description:
  - Returns the column number of the initial period in the database (as selected in [3] Initial Period Date)
  - This will be used in later offset formulas to retrieve the historical data from the database starting with the initial period as determined by the user’s selection.
- Sample Formula:
  - =IF(\$D\$10=FALSE,"-",MATCH(\$D\$12,OFFSET(INDIRECT(\$D\$11),\$D\$18-1,\$D\$19-1,1,\$G\$12),0))
- Translation:
  - **IF** [1] Calculations Toggle = FALSE, then the cell will return “-” .
  - **ELSE:** The “MATCH” function uses the initial period, as chosen by the user in [3] Initial Period Date, to search for this period in the database and count the number of columns into the financial database the initial period is found and returns this number.

### Column 3: [5] Number of Historical Periods Included in the Model

- Cell Description:
  - Returns the number of historical periods included in the model based on the initial period selected by the user. (This includes the initial period and the number of periods occurring after that period)
- Sample Formula:
  - =IF(\$D\$10=FALSE,"-",\$G\$12-\$E\$12+1)

- Translation:
  - **IF:** [1] Calculations Toggle = FALSE
  - **THEN:** the cell will return “-”.
  - **ELSE:** [6] Total Number of Periods - [4] Column Number of Initial Period + 1
- Output:
  - Cell returns the total number of historical periods included in the model.

#### Column 4: [6] Total Number of Periods

- Counts the total number of historical periods available in the database (even those occurring before the selected initial period)
- Sample Formula:
  - =IF(\$D\$10=FALSE,"-",COUNT(OFFSET(INDIRECT(\$D\$11),\$D\$18-1,\$D\$19-1,1,100)))

#### Translation:

- **IF:** [1] Calculations Toggle = FALSE
- **THEN:** the cell will return “-”.
- **ELSE:** The “COUNT” function counts the number of periods included in the financial database worksheet (Limited to 100 periods)

## Frequency (2 Columns)

#### Column 1: [7] Frequency

##### Cell Type:

- Drop-down menu {1, 3, 6, 12}

##### Function: allows user to specify the number of months per period

- **1 = Monthly** (i.e. 1 month / period)
- **3 = Quarterly** (i.e. 3 months / period)
- **6 = Semi-annually** (i.e. 6 months / period)
- **12 = Annual** (i.e. 12 months / period)

#### Column 2: [8] Number of Periods per Year

##### Cell Description:

- Returns the number of reporting cycles in a year

##### Formula:

- 12 / [7] Frequency

## Number of Periods Estimated (4 Columns)

#### Column 1: [9] Number of Estimated Periods

##### Cell Type:

- Input Cell

##### User-Action:

- User enters an integer corresponding to the number of projected periods they would like included in the analysis

##### Data Validation:



- User Entry limited to a value between 1 and *[The Number of Remaining Slots Available]*

Function:

- Entry dictates the number of periods to be estimated
- Must fit into the total number of periods the model can handle

**Column 2: [10] Total Number of Periods in the Model**

Cell Description:

- Returns the total number of periods included in the model (i.e. Historical Periods + Estimated Periods)

Sample Formula:

- =IF(\$D\$10=FALSE,"-", \$F\$12+\$D\$14)

Translation:

- **IF:** [1] Calculations Toggle = FALSE
- **THEN:** cell returns "-".
- **ELSE:** [5] Number of Historical Periods Included in the Model + [9] Number of Estimated Periods

**Column 3: [11] Number of Remaining Slots Available**

Cell Description:

This returns a value equal to the number of slots in the model that remain open

Function:

- The value of this cell is used to limit the range of acceptable entries into [9] Number of Estimated Periods
- The user can look to this cell to determine the maximum number of estimated periods that can still be projected given the room available in the model

Sample Formula:

- =IF(\$D\$10=FALSE,"-", \$G\$14-\$F\$12)

Translation:

- **IF:** [1] Calculations Toggle = FALSE
- **THEN:** Cell will return "-".
- **ELSE:** [12] Maximum Number of Periods – [5] Number of Historical Periods Included in the Model

**Column 4: [12] Maximum Number of Periods**

Hardcoded = 25

The maximum number of periods that the model can hold

**[13] Solver Option**

▪ Cell Type:

- Drop-down menu {0, 1}
  - 0 = Cash & Cash Equivalents (ST Inv.)
  - 1 = Marketable Securities

▪ Function:

- Used in later calculations
- Depending on the solver option, either [91] Marketable Securities or [88] Cash & Cash Equivalents (ST Inv.) will be used as the plug (to eliminate any difference between assets & liabilities on the balance sheet)

- **IF:** Solver Option = 1, Then: [Marketable Securities](#) is used as the plug
- **IF:** Solver Option = 0, Then: [Cash& Cash Equivalents \(ST Inv.\)](#) will be used as the plug

#### [14] Circular Breaker

##### Cell Type:

- Toggle {True, False}

##### Function:

- Designed to allow for the model to be “reset” should a circular reference become a problem.
- This allows for the update of interconnected accounts.

#### [15] Heading Starting Column

Hardcoded = 5

#### [16] Data Starting Row

##### Cell Type

- User Input

##### User-Action:

- Enter the row number where the data begins in the database
- Data beginning is defined as the row in the database with the period dates

##### Function:

- This allows the model to be easily adapted in the event that changes are made to the worksheet where the historical financial data is recorded

### Data Starting Column (2 Columns)

#### Column 1: [17] Starting Column Number of Data

##### Cell Type

- User Input

##### User-Action:

- Enter the column number where the data begins in the database
- Data beginning is defined as the column in the database with the account names for the financial statements (i.e. Revenue, Cost of Goods Sold etc.)
- **Note:** *Columns are represented as letters in excel, you must enter the corresponding number, not letter (i.e. A = 1, B = 2, C = 3)*

##### Function:

- This allows the model to be easily adapted in the event that changes are made to the worksheet where the historical financial data is recorded

#### Column 2: [18] Starting Column Number of Initial Period

##### Cell Description:

- Returns a value equal to the number of columns over from the first period in the database where the initial period is located

##### Function:

- This is used in later offset functions to reference the column of the initial period

##### Sample Formula:


- **IF:** [1] Calculations Toggle = FALSE,
- **THEN:** Cell returns “-”.
- **ELSE:** [17] Starting Column Number of Data + [4] Column Number of Initial Period – 1

## INDEX CELLS

*These are located along the top line, spanning the width of the model. This explanation flows from top to bottom, however, when a row has more than one column, the explanations flow along the row from left to right, before continuing down.*

[illegible]

### Index Cells Located above Reference Values

6	
8	

<b>CONSOLIDATED INCOME STATEMENT</b>	7
--------------------------------------	---

<b>Revenue</b>	10
<b>Cost of Goods Sold</b>	13

**\*Note:** The report has been cut down and modified to provide a more concise example.

INDEX	
[1]	Calculations
[2]	Data Sheet
[3]	Initial Period Date
[4]	Column Number of Initial Period
[5]	Number of Historical Periods Included in the Model
[6]	Total Number of Periods
[7]	Frequency
[8]	Number of Periods Per Year
[9]	Number of Estimated Periods
[10]	Total Number of Periods in the Model
[11]	Number of Remaining Slots Available
[12]	Maximum Number of Periods
[13]	Solver Option
[14]	Circular Breaker
[15]	Heading Starting Column
[16]	Data Starting Row
[17]	Starting Column Number of Data
[18]	Starting Column Number of Initial Period