

Budgeting & Forecasting in Excel

LIVE &
ONLINE

with

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Welcome to “Budgeting & Forecasting in Excel”! This handbook contains some take-away instructions for some of the practical exercises we’ll cover during the course. You do not need to read it in advance, but you might like to print it for easy reference. The course materials also contain some references to the two books by Danielle Stein Fairhurst “**Using Excel for Business and Financial Modelling**” and “**Financial Modeling in Excel for Dummies**”. These books can be purchased online from Amazon or may be included in your enrolment. It is a good accompanying reference for the course, but it not required that you have a copy when taking the course.

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FORECASTING FOR SEASONALITY

Seasonality can be stripped out of historical numbers, and then reapplied to provide a more accurate forecast.

See page 158 of Using Excel for Business and Financial Modelling, for more information on how to use the FORECAST function.

Based on the following data, create a budget for the four quarters of 2021. Remove the quarter-related seasonality, forecast for 2021 using the FORECAST function, and then reapply seasonality. (Assume a calendar year)

	Q1	Q2	Q3	Q4
2018	520	730	820	530
2019	590	810	900	600
2020	650	900	1000	650

1. Enter this table into a blank Excel workbook, starting from cell A1, or use the template provided.
2. Firstly, we need to calculate the seasonality for each quarter. Below the table in the next row, calculate the average for each quarter.
3. Insert the formula **=AVERAGE(B3:B5)** in cell B6 and copy it across. You will notice a trend – some quarters are higher and lower than others.
1. Now to calculate the seasonality index we need to compare the average of the quarter to the average of the data as a whole. Your formula in cell B7 should be **=B6/AVERAGE(\$B\$3:\$E\$5)**, and the answer is 0.81.
2. Copy this across, and sum all of the seasonality indexes together to check. The total should be 4.
4. Your model should look something like this:

B7 =B6/AVERAGE(\$B\$3:\$E\$5)					
	A	B	C	D	E
1					
2		Q1	Q2	Q3	Q4
3	2018	520	730	820	530
4	2019	590	810	900	600
5	2020	650	900	1000	650
6	Q Average	587	813	907	593
7	Seasonality Index	0.81	1.12	1.25	0.82
8					

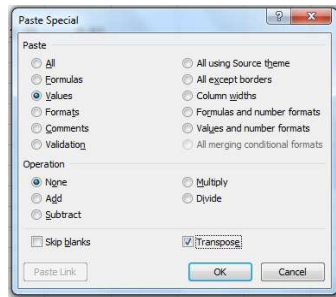
5. The FORECAST function needs the numbers to be in a consecutive line, so create a table further down from cell A11 with the exact quarter end date beginning with 31st March 2018.
6. Begin the next quarter by adding 3 months to the previous cell with an EDATE function. Your formula in cell A12 should be **=EDATE(A11,3)** Copy it down, through to the end of December 2021.

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Note that because 2020 is a leap year, the dates in 2020 are a day earlier than in the previous years, but the EDATE (or the EOMONTH function) will take care of that.

See page 165 of Using Excel for Business and Financial Modelling, for more information on Working with Dates

1. In column B, transpose the data from the table above using either a paste values transpose as shown below, or a =TRANSPOSE array formula.



2. Cut and paste the data until it looks like the below:

	A	B	C	D	E
1					
2		Q1	Q2	Q3	Q4
3	2018	520	730	820	530
4	2019	590	810	900	600
5	2020	650	900	1000	650
6	Q Average	587	813	907	593
7	Seasonality Index	0.81	1.12	1.25	0.82
8					
9					
10	Dates	Raw Data	Seasonality Index	Seasonalised Data	
11	31-Mar-18	520			
12	30-Jun-18	730			
13	30-Sep-18	820			
14	30-Dec-18	530			
15	30-Mar-19	590			
16	30-Jun-19	810			
17	30-Sep-19	900			
18	30-Dec-19	600			
19	30-Mar-20	650			
20	30-Jun-20	900			
21	30-Sep-20	1,000			
22	30-Dec-20	650			
23	30-Mar-21				
24	30-Jun-21				
25	30-Sep-21				
26	30-Dec-21				
27					

Now, try using the FORECAST function in cells B23 to B26 and then graph it. Use the FORECAST function.

- X is the date or number for which you want the numbers to be forecast.
- Known Y's is the known historical data
- Known X's is the known historical dates or numbers

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Function Arguments

FORECAST

X	A23	=	44285
Known_ys	\$B\$11:\$B\$22	=	{520;730;820;530;590;810;900;600;65...}
Known_xs	\$A\$11:\$A\$22	=	{43190;43281;43373;43464;43554;43...}

= 841.758979

This function is available for compatibility with Excel 2013 and earlier.
Calculates, or predicts, a future value along a linear trend by using existing values.

X is the data point for which you want to predict a value and must be a numeric value.

Formula result = 842

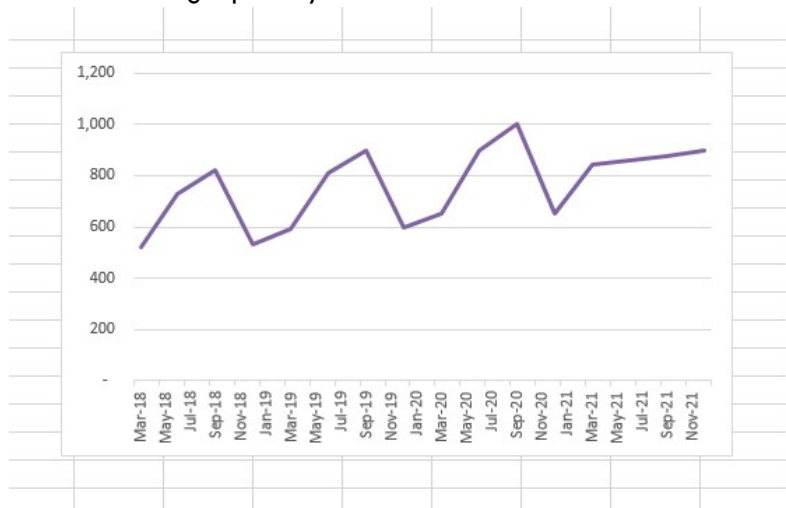
[Help on this function](#) OK Cancel

Note, the TREND formula will also work in pretty much the same way.

Your formula in cell B23 should be:

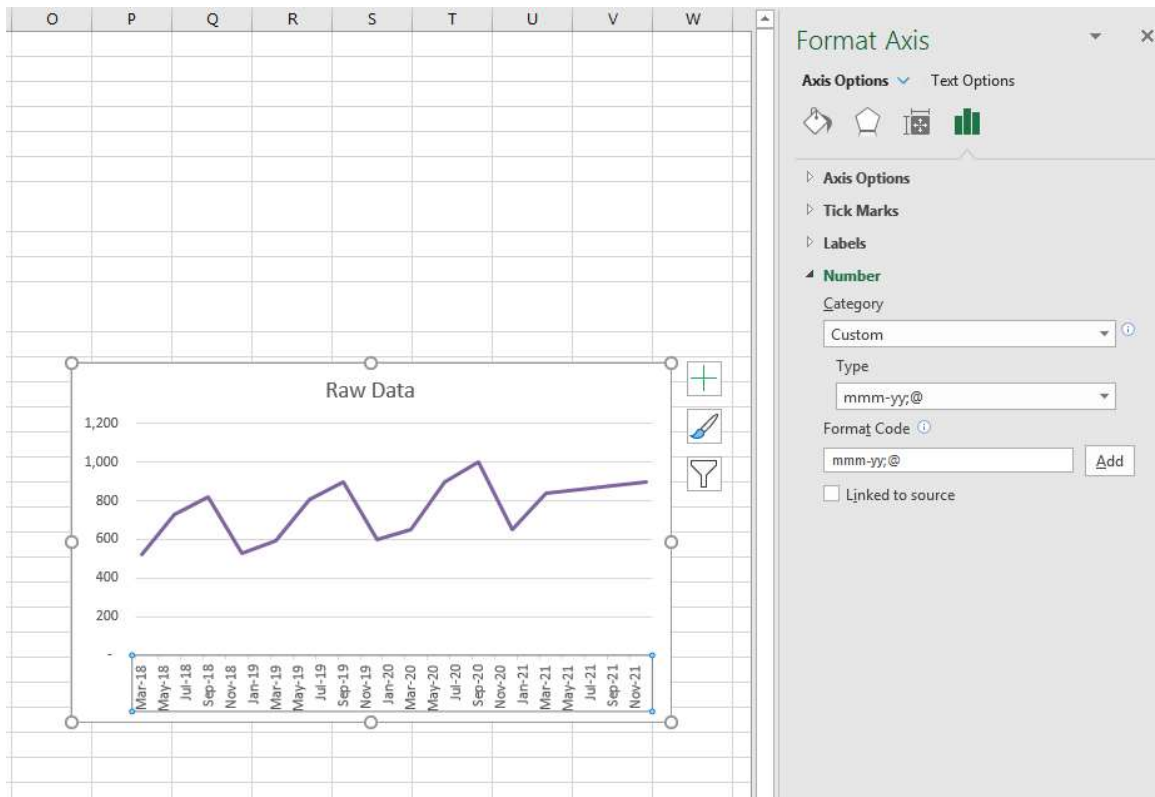
=FORECAST(A23,\$B\$11:\$B\$22,\$A\$11:\$A\$22)

Create a line graph of your data which should look like this:



Note that you may need to change the formatting of the dates on the X-Axis by double-clicking on the X-Axis and changing the format in the panel which appears to the right as shown below:

BUDGETING & FORECASTING IN EXCEL



What we have forecast so far will evenly smooth the quarters and apply the linear trend, but it will not show the seasonality. In order to forecast these numbers more accurately, we need to apply the seasonality.

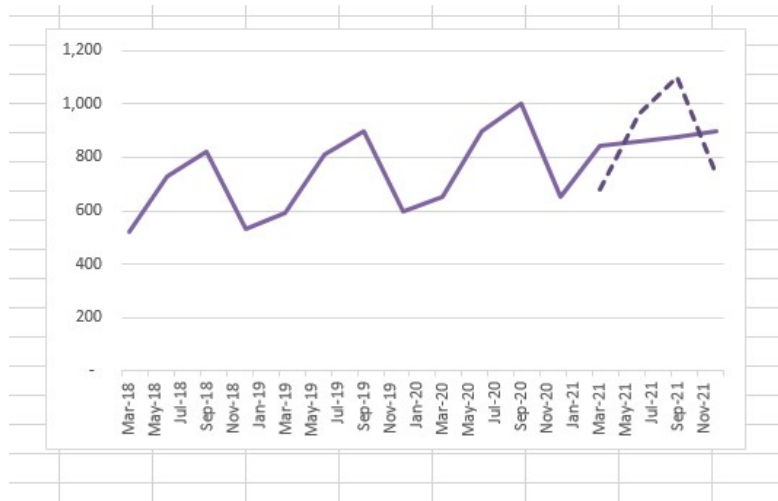
3. Transpose the seasonality numbers from cells B7:E7 to cells C23:C26. You may link, or hard-code, depending on whether you want the model to be dynamic or static. If you have the time, a dynamic solution is always best!
4. Leave the rest of the fields blank.
5. Multiply the seasonality index by the raw data to achieve the seasonalised data. Your sheet should look something like this:

BUDGETING & FORECASTING IN EXCEL

D23					
	A	B	C	D	E
1					
2		Q1	Q2	Q3	Q4
3	2018	520	730	820	530
4	2019	590	810	900	600
5	2020	650	900	1000	650
6	Q Average	587	813	907	593
7	Seasonality Index	0.81	1.12	1.25	0.82
8					
9					
10	Dates	Raw Data	Seasonality Index	Seasonalised Data	
11	31-Mar-18	520			
12	30-Jun-18	730			
13	30-Sep-18	820			
14	30-Dec-18	530			
15	30-Mar-19	590			
16	30-Jun-19	810			
17	30-Sep-19	900			
18	30-Dec-19	600			
19	30-Mar-20	650			
20	30-Jun-20	900			
21	30-Sep-20	1,000			
22	30-Dec-20	650			
23	30-Mar-21	842	0.81	681	
24	30-Jun-21	860	1.12	965	
25	30-Sep-21	878	1.25	1,098	
26	30-Dec-21	896	0.82	733	
27					

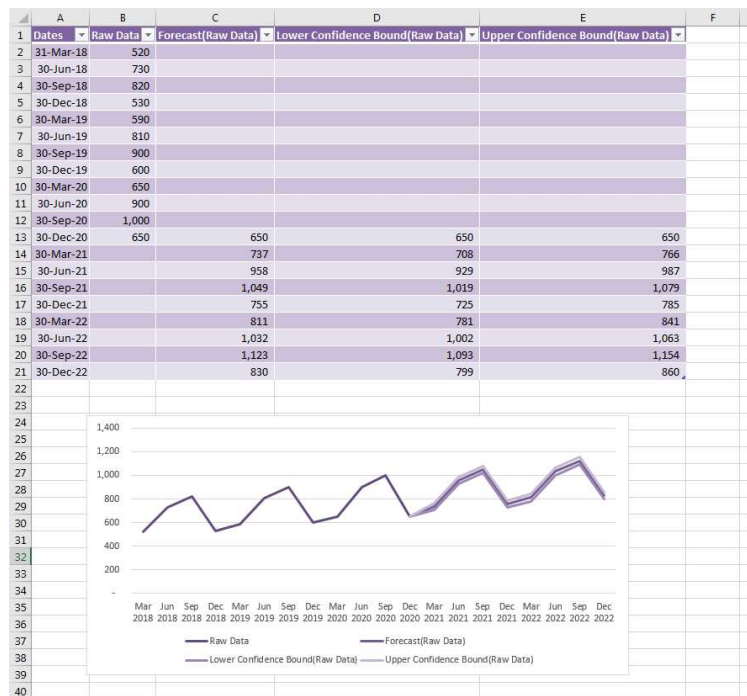
6. Add another series to the chart such that it looks like this:

BUDGETING & FORECASTING IN EXCEL



Tip: you can do this by editing the chart, or simply copy the data in cells D11 to D26 and paste it directly into the chart.

Forecast Sheet: Note that instead of using this method, simply highlight the historical data, and go to Data – Forecast Sheet and the forecasted seasonality with three confidence intervals are automatically created for you as shown below:



MODELLING FOR STEPPED COSTS

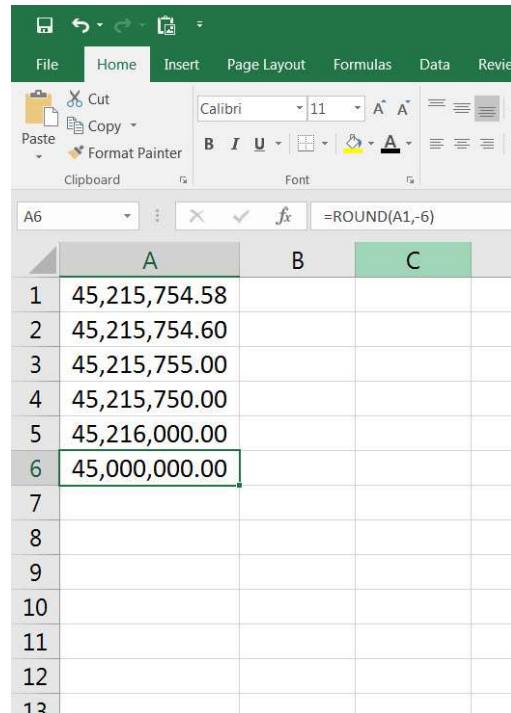
ROUND Functions

There are several functions in Excel which round off numbers. The ones that are the most useful for modellers are ROUND, ROUNDUP and ROUNDDOWN. Each of these work in exactly the same way, except that the ROUND function will round to the nearest specified value; whether it is up or down. The ROUNDUP function will round up to the nearest, and – you guessed it – the ROUNDDOWN will round down to the nearest.

To understand how this particular function works, instead of showing you a pre-worked example, it's best to simply try it out for yourself by following these steps:

1. Open up Excel, and in cell A1 enter a long number with several decimal places, such as 45215754.575
2. On the Home tab, in the Numbers section, press the comma button once to format the cell. The formatting will change so the number now looks like this: 45,215,754.58. Note that the number remains the same; the third decimal place is still there but it's just not showing due to the way the cell is now formatted.
3. In cell A2, enter the formula =ROUND(A1,1). This will reduce the decimal places to only one so that cell A2 contains the value 45,215,754.60. Note that the number really does only contain one decimal place; the extra decimal places are not being suppressed by formatting as they are in cell A1.
4. In cell A3, try removing all decimal places completely with the formula =ROUND(A1,0)
5. Now in cell A4, we'll go one step further and round our number to the nearest ten with the formula =ROUND(A1,-1). The result will be 45,215,750.00
6. Then in cell A5, try rounding it to the nearest thousand with =ROUND(A1,-3). The result will be 45,216,000.00
7. And finally in cell A6, round to the nearest million with =ROUND(A1,-6). The result will be 45,000,000.00, as shown in figure 7-17.

Note that the ROUNDUP and ROUNDDOWN function will work in exactly the same way, except to round up or down instead of the nearest.



	A	B	C
1	45,215,754.58		
2	45,215,754.60		
3	45,215,755.00		
4	45,215,750.00		
5	45,216,000.00		
6	45,000,000.00		
7			
8			
9			
10			
11			
12			
13			

Figure 7-17 Using the ROUND function

MODELLING FOR “STEPPED COSTS”

- Let's say you are building a five year plan for a financial planning office.
- Each paraplanner can handle 40 customers.
- In year 1 you have 500 customers, and you expect that to increase by 20% per year
- How many paraplanners will you need each year? Hint: don't forget to **ROUNDUP!**
- Calculate the total expenses.

Forecasting Fixed, Variable and Stepped Costs with ROUNDUP

For a practical example of how to use the ROUNDUP function as part of a financial model, follow this series of steps as shown.

- * Let's say you are building a five-year plan for a call centre
- * Each call operator can handle 40 customers.
- * In year 1 you have 500 customers, and you expect that to increase by 20% per year
- * How many call operators will you need each year? Hint: don't forget to ROUNDUP!
- * You have fixed costs of \$250,000
- * Variable overheads are \$100 per customer
- * Each call operator costs \$65,000 per annum
- * All costs increase by inflation of 3%

This exercise demonstrates the difference between fixed, variable and stepped costs, which are important concepts in management accounting and budget modelling. As shown in figure 7-18, fixed costs do not change as the number of units produced increases. Variable costs change directly in line with the number of units produced, and are also very simple to model. Stepped costs, however, do not increase in a linear fashion, but increase in increments or "steps" and these can be modelled using the ROUNDUP function.

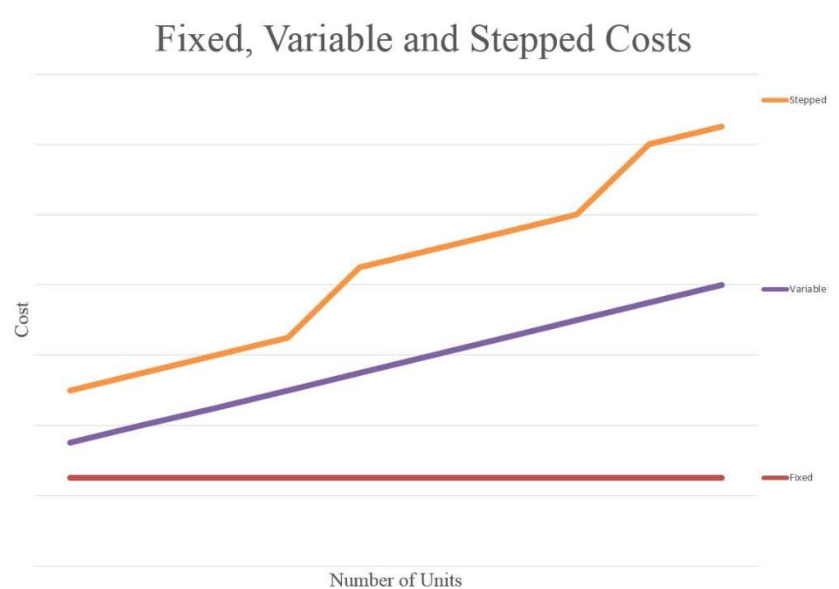


Figure 7-18 Fixed, Variable and Stepped Costs

This exercise also demonstrates a common escalation technique for increasing amounts by a growth rate, or inflation amount. We often need to be able to include escalation in our models for the purpose of forecasting such as our example here. In this exercise, we need to increase our number of customers by 20% each year. The number of customers in the first year is 500. When we add the 20% growth to this number it becomes 600. We then calculate the customer number in the third year based on this number (600) not the first

year (500). This effect whereby the growth increases exponentially is called *compounding*.

To calculate growth, we use the formula:

base amount*(1+growth)

The reason we are adding 1 (effectively 100 percent) to the growth rate (20%) is because we want the capital sum returned along with the accrued interest. Multiplying an amount by (1+growth) is a very common calculation in financial modelling.

1. Download the sample file or enter and format data as shown in Figure 7-19
2. Firstly, we need to calculate the number of customers over time. Select cell C12 and enter the formula `=B12*(1+$B$4)` to calculate the number of customers expected in Year 2. Don't forget to use the F4 shortcut to anchor the cell reference.
3. Copy this formula all the way across the row. The calculated result in Year 5 is 1,037.
4. Next, in cell B13 we need to work out how many call operators we need each year, so divide the number of customers by the customers per operator with the formula `=B12/$B$3` and the calculated result is 12.50. Don't forget to use the F4 shortcut to anchor the cell reference.
5. Huh? That doesn't make sense because we can't employ a fraction of a person! We'll need to round up to the nearest whole person with the formula by wrapping a ROUNDUP function around our existing formula like this: `=ROUNDUP(B12/$B$3,0)`
6. Copy it all the way across the row and the calculated result in Year 5 is 26. Compare your results to Figure 7-19.

	Year 1	Year 2	Year 3	Year 4	Year 5
Five Year Strategic Forecast Costs for Call Center					
Customers per call operator	40				
% Customer Growth	20%				
Inflation	3%				
Annual Fixed Costs	\$250,000	fixed + inflation			
Variable Overhead	\$100	per customer + inflation			
Call Operator Staff Cost	\$65,000	per staff + inflation			
Workings					
Forecast customers	500	600	720	864	1,037
Number of Call Operators	13.00	15.00	18.00	22.00	26.00
Overhead cost per customer					
Cost per Call Operator					
Expenses					
Fixed Costs					
Overheads					
Call Staff Costs					

Figure 7-19 Calculating number of call operators required with ROUNDUP

We now have calculated the number of staff required so we can use this later on in row 20 to work out their costs. For now, we will continue working down the page.

In row 14 we need to calculate the overhead amounts for each year. There are two parts to this calculation; firstly, we need to apply inflation, and secondly multiply it by the number of customers. We could do the entire calculation in a single row, but the formula would be difficult to follow.

<Remember>

When it comes to formula layout in a financial model, simple is best! It is far better to lay out the calculation step by step instead of trying to do the whole thing in one row.

7. Select cell B14 and link this to the overhead assumption with the formula $=B7$
8. In cell C14 we need to add inflation. We'll use exactly the same technique as we did when increasing the number of customers, but we'll pick up the inflation assumption instead of the growth assumption. Enter the formula $=B14*(1+\$B\$5)$. Don't forget to use the F4 shortcut to anchor the cell reference.
9. Copy it all the way across the row and the calculated result in Year 5 is 113.

Note that we have different formulas in cell B14 and C14. Ordinarily, we try to have consistent formulas wherever possible, to reduce the number of formulas in the model but in this case, it's not practical.

In row 15 we need to calculate the staff costs per operator for each year. This works in exactly the same way as the overhead costs. We'll increase the per operator costs by inflation each year and multiply it by the number of operators later on.

10. Select B15 and link this to the cost per operator with the formula $=B8$
11. Add inflation to this number in cell C15 with the formula $=B15*(1+\$B\$5)$ (don't forget to F4!)
12. Copy it all the way across the row and the calculated result in Year 5 is \$73,158.

Now we've finished the workings block, we can start to calculate the costs below in row 18.

13. Select B18 and link this to the fixed cost assumption with the formula $=B6$
14. Add inflation to this number in cell C18 with the formula $=B18*(1+\$B\$5)$
15. Copy it all the way across the row and the calculated result in Year 5 is \$281,377
16. In B19, calculate the total overhead costs by multiplying the overhead cost per customer per year by the number of customers in that year with the formula $=B14*B12$. No need to lock the cell referencing, as we want this to copy across the row.
17. Copy it all the way across the row and the calculated result in Year 5 is \$116,693
18. Next, in cell B20, calculate the total call staff costs by multiplying the cost per operator by the number of operators with the formula $=B15*B13$
19. Copy it all the way across the row and the calculated result in Year 5 is \$1,902,110
20. Lastly, sum the total costs in cell B21 with the formula $=SUM(B18:B20)$ or select cell B21 and use the shortcut ALT+= to add up all the costs.
21. Copy it all the way across the row and the calculated result in Year 5 is \$2,300,180. Compare your results to figure 7-20.

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Chapter 7 - Excel

File Home Insert Page Layout Formulas Data Review View Developer Power Pivot Tell me what you want to do

Clipboard Font Alignment Number

B21 =SUM(B18:B20)

	A	B	C	D	E	F	G
1	Five Year Strategic Forecast Costs for Call Center						
2							
3	Customers per call operator	40					
4	% Customer Growth	20%					
5	Inflation	3%					
6	Annual Fixed Costs	\$250,000	<i>fixed + inflation</i>				
7	Variable Overhead	\$100	<i>per customer + inflation</i>				
8	Call Operator Staff Cost	\$65,000	<i>per staff + inflation</i>				
9							
10		Year 1	Year 2	Year 3	Year 4	Year 5	
11	Workings						
12	Forecast customers	500	600	720	864	1,037	
13	Number of Call Operators	13.00	15.00	18.00	22.00	26.00	
14	Overhead cost per customer	\$100	\$103	\$106	\$109	\$113	
15	Cost per Operator	\$65,000	\$66,950	\$68,959	\$71,027	\$73,158	
16							
17	Costings						
18	Fixed Costs	\$250,000	\$257,500	\$265,225	\$273,182	\$281,377	
19	Overheads	\$50,000	\$61,800	\$76,385	\$94,412	\$116,693	
20	Call Staff Costs	\$845,000	\$1,004,250	\$1,241,253	\$1,562,600	\$1,902,110	
21	Total Costs	\$1,145,000	\$1,323,550	\$1,582,863	\$1,930,193	\$2,300,180	
22							

Figure 7-20 Completed Five Year Strategic Forecast

BUILDING DROP-DOWN SCENARIOS

The most commonly used method of building scenarios (and the one that I most often teach in my training courses) is to use a combination of formulas and drop-down boxes. In the model, you create a table of possible scenarios and their inputs and link the scenario names to an input cell drop-down box. The inputs of the model are linked to the scenario table. If the model has been built properly with all the inputs flowing through to the outputs, then the results of the model will change as the user selects different options from the drop-down box.

Data validation drop-down boxes are used for a number of different purposes in financial modeling, including scenario analysis.

Using data validations to model profitability scenarios

Go to the tab called “Stepped”.

The way I’ve modeled this, the inputs are lined up in column B. You could perform sensitivity analysis simply by changing one of the inputs — for example, change the customers per call operator in cell B3 from 40 to 45, and you’ll see all the dependent number change. This would be a sensitivity analysis, because you’re changing only one variable. Instead, you’re going to change multiple variables at once in this full scenario analysis exercise, so you’ll need to do more than tweak a few numbers manually.

To perform a scenario analysis using data validation drop-down boxes, follow these steps:

1. Take the existing model and cut and paste the descriptions from column C to column F. You can do this by highlighting cells C6:C8, pressing Ctrl+X, selecting cell F6, and pressing Enter.
2. The inputs in cells B3 to B8 are the active range that drives the model and will remain so. However, they need to become formulas that change depending on the drop-down box that you’ll create.
3. Copy the range in column B across to columns C, D, and E.
4. You can do this by highlighting B3:B8, pressing Ctrl+C, selecting cells C3:E3, and pressing Enter. These amounts will be the same for each scenario until we change them.
5. In row 2 enter the titles Best Case, Base Case, and Worst Case, as shown in Figure 8-1.

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Note that the formulas still link to the inputs in column B, as we can see by selecting cell C12 and pressing the F2 shortcut key as shown in figure 8-1.

	A	B	C	D	E	F	G	H
1	Five Year Strategic Forecast Costs for Call Center							
2			Best Case	Base Case	Worst Case			
3	Customers per call operator	40	40	40	40			
4	% Customer Growth	20%	20%	20%	20%			
5	Inflation	3%	3%	3%	3%			
6	Annual Fixed Costs	\$250,000	\$250,000	\$250,000	\$250,000	fixed + inflation		
7	Variable Overhead	\$100	\$100	\$100	\$100	per customer + inflation		
8	Call Operator Staff Cost	\$65,000	\$65,000	\$65,000	\$65,000	per staff + inflation		
9								
10		Year 1	Year 2	Year 3	Year 4	Year 5		
11	Workings							
12	Forecast customers	500	=B12*(1+\$B\$4)		864	1,037		
13	Number of Call Operators	13.00	15.00	18.00	22.00	26.00		
14	Overhead cost per customer	\$100	\$103	\$106	\$109	\$113		
15	Cost per Operator	\$65,000	\$66,950	\$68,959	\$71,027	\$73,158		
16								
17	Costings							
18	Fixed Costs	\$250,000	\$257,500	\$265,225	\$273,182	\$281,377		
19	Overheads	\$50,000	\$61,800	\$76,385	\$94,412	\$116,693		
20	Call Staff Costs	\$845,000	\$1,004,250	\$1,241,253	\$1,562,600	\$1,902,110		
21	Total Costs	\$1,145,000	\$1,323,550	\$1,582,863	\$1,930,193	\$2,300,180		
22								

Figure 8-1: Setting up the model for scenario analysis

6. Edit the inputs underneath each scenario. You can put whatever you think is likely, but in order to match the numbers to those in this example, enter the values as shown in Figure 8-2. Ignore column B for now.

	A	B	C	D	E	F	G	H
1	Five Year Strategic Forecast Costs for Call Center							
2			Best Case	Base Case	Worst Case			
3	Customers per call operator	40	40	40	40			
4	% Customer Growth	20%	20%	20%	20%			
5	Inflation	3%	3%	3%	3%			
6	Annual Fixed Costs	\$250,000	\$250,000	\$250,000	\$250,000	fixed + inflation		
7	Variable Overhead	\$100	\$100	\$100	\$100	per customer + inflation		
8	Call Operator Staff Cost	\$65,000	\$65,000	\$65,000	\$65,000	per staff + inflation		
9								

Figure 8-2: Inputs for scenario analysis

7. Now you need to add the drop-down box at the top, which is going to drive your scenarios. It doesn't really matter where exactly you put the drop-down

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box, but it should be in a location that's easy to find, usually at the top of the page.

8. In cell E1, enter the title Scenario:.

9. Select cell F1, and change the formatting to input so that the user can see that this cell is editable. The easiest way to do this is to follow these steps:

- Click one of the cells that are already formatted as an input, such as cell E3.
- Press the Format Painter icon in the Clipboard section on the left-hand side of the Home tab., Your cursor will change to a paintbrush.
- Select cell F1 to paste the formatting.

<Tip>

Format Painter is normally for single use. After you've selected the cell, the paintbrush will disappear from the cursor. If you want the Format Painter to become "sticky" and apply to multiple cells, double-click the icon when you select it from the Home tab.

10. Now, in cell F1, select Data Validation from the Data Tools section of the Data tab.

The Data Validation dialog box appears.

11. On the Settings tab, change the Allow drop-down to List, use the mouse to select the range =C\$2:\$E\$2 (see Figure 8-3), and click OK.

The screenshot shows the Excel interface with the Data Validation dialog box open for cell F1. The dialog box is on the 'Settings' tab, and the 'Allow' dropdown is set to 'List'. The 'Source' field contains the range '\$C\$2:\$E\$2'. The background spreadsheet is titled 'Five Year Strategic Forecast Costs for Call Center' and includes columns for 'Best Case', 'Base Case', and 'Worst Case' scenarios across five years. The spreadsheet data is as follows:

	Year 1	Year 2	Year 3	Year 4	Year 5
Customers per call operator	40	35	40	45	
% Customer Growth	20%	25%	20%	15%	
Inflation	3%	2.5%	3.0%	3.5%	
Annual Fixed Costs	\$250,000	\$225,000	\$250,000	\$275,000	
Variable Overhead	\$100	\$90	\$100	\$110	
Call Operator Staff Cost	\$65,000	\$60,000	\$65,000	\$70,000	
Workings					
Forecast customers	500	600	720	864	1,037
Number of Call Operators	13.00	15.00	18.00	22.00	26.00
Overhead cost per customer	\$100	\$103	\$106	\$109	\$113
Cost per Operator	\$65,000	\$66,950	\$68,959	\$71,027	\$73,158
Costings					
Fixed Costs	\$250,000	\$257,500	\$265,225	\$273,182	\$281,377
Overheads	\$50,000	\$61,800	\$76,385	\$94,412	\$116,693
Call Staff Costs	\$845,000	\$1,004,250	\$1,241,253	\$1,562,600	\$1,902,110
Total Costs	\$1,145,000	\$1,323,550	\$1,582,863	\$1,930,193	\$2,300,180

Figure 8-3: Creating the data validation drop-down scenarios

Click the drop-down box, which now appears next to cell F1, and select one of the scenarios (for example, Base Case).

Applying formulas to scenarios

The cells in column B are still driving the model, and these need to be replaced by formulas. Before you add the formulas, however, you should change the formatting of the cells in the range to show that they contain formulas, instead of hard-coded numbers. Follow these steps:

1. Select cells B3:B8, and select the Fill Color from the Font group on the Home tab.
2. Change the Fill Color to a white background.

<Remember>

It's very important to distinguish between formulas and input cells in a model. You need to make it clear to any user opening the model that the cells in this range contain formulas and should not be overridden.

Now you need to replace the hard-coded values in column B with formulas that will change as the drop-down box changes. You can do this using a number of different functions; an HLOOKUP, a nested IF statement, an IFS, and a SUMIF will all do the trick. Add the formulas by following these steps:

1. Select cell B3, and add a formula that will change the value depending on what is in cell F1.

Here is what the formula will be under the different options:

* =HLOOKUP(\$F\$1,\$C\$2:\$E\$8,2,0)

Note that with this solution, you need to change the row index number from 2 to 3 and so on as you copy the formula down. Instead, you could use a ROW function in the third field like this: =HLOOKUP(\$F\$1,\$C\$2:\$E\$8,ROW(A3)-1,0)

* =IF(\$F\$1=\$C\$2,C3,IF(\$F\$1=\$D\$2,D3,E3))

* =IFS(\$F\$1=\$C\$2,C3,\$F\$1=\$D\$2,D3,\$F\$1=\$E\$2,E3)

* =SUMIF(\$C\$2:\$E\$2,\$F\$1,C3:E3)

<Tip>

As always, there are several different options to choose from and the best solution is the one that is the simplest and easiest to understand. Any of these functions will produce exactly the same result, but in my opinion, having to change the row index number in the HLOOKUP is not robust, and adding the ROW may be confusing for a user. The nested IF statement is tricky to build and follow, and although the new IFS function is designed to make a nested IF function simpler, it's still rather unwieldy. I find the SUMIF quite simple to build and follow, and it's easy to expand if you need to add extra scenarios in the future.

<Warning>

Note that IFS is a new function that is only available with Office 365 and Excel 2016 or later installed. If you use this function and someone opens this model in a previous version of Excel, she can view the formula, but she won't be able to edit it.

2. Copy the formula in cell B3 down the column.

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<Tip>

By using an ordinary copy and paste, you'll lose all your formatting. It's important to retain the formatting of the model so that you can see at a glance which inputs are in dollar values, percentages, or customer numbers. Use Paste Formulas to retain the formatting. You can access it by copying the cell onto the clipboard, highlighting the destination range, right-clicking, and selecting the Paste Formulas icon to paste formulas only, and leave the formatting intact (see Figure 8-4).

	Year 1	Year 2	Year 3	Year 4	Year 5
Five Year Strategic Forecast Costs for Call Center					
Customers per call operator	40	35	40	45	
% Customer Growth	20%	15%			
Inflation	3.0%	3.5%			
Annual Fixed Costs	\$250,000	\$257,500	\$265,225	\$273,182	\$281,377
Variable Overhead	\$50,000	\$61,800	\$76,385	\$94,412	\$116,693
Call Operator Staff Cost	\$845,000	\$1,004,250	\$1,241,253	\$1,562,600	\$1,902,110
Workings					
Forecast customers	720	864	1,037		
Number of Call Operators	18.00	22.00	26.00		
Overhead cost per customer	\$106	\$109	\$113		
Cost per Operator	\$68,959	\$71,027	\$73,158		
Costings					
Fixed Costs	\$250,000	\$257,500	\$265,225	\$273,182	\$281,377
Overheads	\$50,000	\$61,800	\$76,385	\$94,412	\$116,693
Call Staff Costs	\$845,000	\$1,004,250	\$1,241,253	\$1,562,600	\$1,902,110
Total Costs	\$1,145,000	\$1,323,550	\$1,582,863	\$1,930,193	\$2,300,180

Figure 8-4: Using Paste Formulas to retain formatting.

Now for the fun part! It's time to test the scenario functionality in the model. Click cell F1, change the drop-down box, and watch the model outputs change as you toggle between the different scenarios, as shown in Figure 8-5.

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FileHomeInsertPage LayoutFormulasDataReviewViewDeveloperPower PivotTell me what you want to do

CutCopyPasteFormat PainterClipboard

Calibri11

</

Figure 8-5: The completed scenario analysis

ACTUAL VS BUDGET VARIANCE REPORT

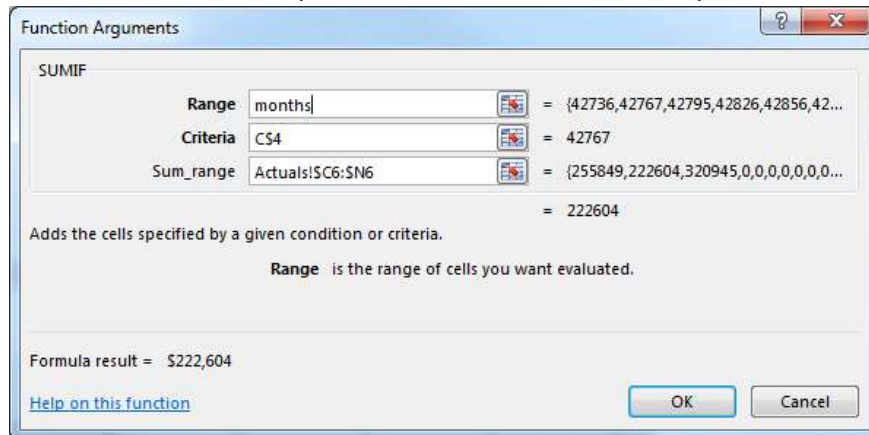
See page 104 of “Using Excel for Business and Financial Modelling” for more information on using cell referencing.

A typical Actual versus Budget report will have at least three columns; Actual, Budget, Variance – and possibly % Variance for each month. This means at least 36 columns across the page, which is not a manageable or readable size for a good report. A way around this is to create a concise, dynamic report into which actual and budgeted numbers can be compared and analysed quickly and efficiently. This concise report will show only the current month depending on the month selected by the user.

22. Open up the file called “Act vs Budget Variance Report”.
23. On the “Summary” page, in cell A5, we need to create a linked drop-down which will enable the user to select the current month. Do this by:
24. Go to the “Actual” page and create a named range called “months” which includes all the dates in row 4.
25. Go back to the “Summary” page, and create a drop-down box. Link it to dates using the named range.
26. Name cell A5 as “curr_month”, and select February just as an example to get your model working.
27. On the “P&L” page, we need to use a SUMIF to populate the Actual column in column C. In cell C6, create a SUMIF referencing the “Actuals” sheet where the periods are the range, the criteria is the current month, and the sum range is the corresponding row in the “Budget” sheet.

See page 107 of “Using Excel for Business and Financial Modelling” for how to create a Named Range and page 205 for how to create a data validation drop-down list.

If you have created the named range for your months then your wizard in cell C6 should look like this, and the result should be \$222,604:



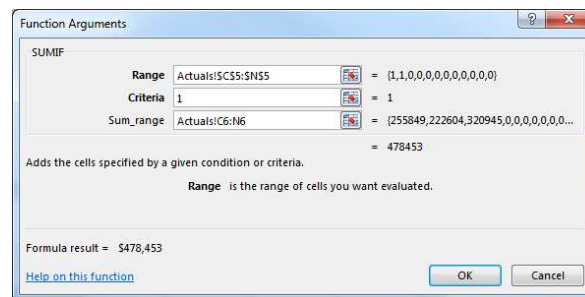
28. The formula should be: **=SUMIF(months,C\$4,Actuals!\$C6:\$N6)** Don't forget to use absolute referencing!
29. Copy the formula all the way down to the bottom.
30. Now, do exactly the same thing to populate the "Budget" column, by pulling the data from the Budget page. Your formula in cell D6 should be **=SUMIF(Budget!\$C\$4:\$N\$4,D\$4,Budget!\$C6:\$N6)**

Note that a VLOOKUP could also be used to complete this task, but a SUMIF is simpler in this case. We'll come back to the variance in column E later. Let's move on to the Year to Date columns in F & G.

Creating a Year to Date (YTD) Formula

We need to identify on the "Budget" and "Actual" pages which months have already passed, and therefore should be included in the Year to Date (YTD) formula. The easiest way to do this is to create an IF statement which will return the word "actual" if we already have actuals for this month or "budget" if we do not.

1. Go to the "Budget" page and in the blank row 5 under the periods in cell C5, enter your IF statement.
2. Your formula should look like this: **=IF(C4<=curr_month,1,0)**. Because we've got February selected, January and February should be showing a 1 and the other months a zero. This will automatically change as we move through the months.
3. Copy this formula all the way across the row, and repeat for the "Actual" page.
4. Now go back to the "P&L" page and in the Actual column in cell F6, create another SUMIF which will pick up ONLY the budget for the months which have already passed.
5. Your wizard should look like this:



6. The formula should be: **=SUMIF(Actuals!\$C\$5:\$N\$5,1,Actuals!C6:N6)**, and the result \$478,453. Don't forget your absolute referencing.
7. Copy this formula all the way down to the bottom of the report. Instead of copying the entire column and having to recreate the SUM cells, use the shortcuts Control-c and then Control-v repeatedly to copy down the cells instead.
8. Now go to column G and repeat the procedure for the budget as well.
9. Your formula in cell G6 should be **=SUMIF(Budget!\$C\$5:\$N\$5,1,Budget!C6:N6)**. Copy it down.

Adding Variances

In typical variance formulas, **better than budget** must show as a **positive** value, and **worse than budget** must show as a **negative** value. Therefore there is a different formula for revenue and expenses.

1. For Revenue and profit, our formula will be ACTUAL – BUDGET, and for expenses it will be BUDGET – ACTUAL.
2. In columns E and G insert the variance formulas.
3. In cell E6 (the revenue row) your formula should be: **=C6-D6**. Repeat for column G.
4. In cell E10 (the revenue row) your formula should be: **=D10-C10**. Repeat for column G.
5. Alternatively, you could create a more intelligent formula which looks at the first character of the account code to determine whether it is a revenue or expense item. If you choose to do this, then your formula in cell E6 would be **=IF(LEFT(A6,1)="4",C6-**

D6,D6-C6), and this follows better financial modelling practice because it means the formulas can be consistent all the way down the page, rather than changing for expenses.

Actual / Budget

It would be useful to know how we are tracking for the full year, therefore we will insert a full year Budget and Actual / Budget columns.

1. In cell I6, sum the entire budget with the formula **=SUM(Budget!C6:N6)** and copy it all the way down.
2. In cell J6, add another SUMIF formula which adds only the budget columns which are in the future, and add the actual amounts to it. The columns which are in the future have a zero in row 5. Your formula should be:
=SUMIF(Budget!\$C\$5:\$K\$5,0,Budget!C6:K6)+F6.
3. Copy this all the way down to the bottom of the report. Your Actual versus Budget P&L report is now complete. Go back to the "Summary" page, and practice changing the month from the drop-downs and see the numbers change.

Adding a Trendline with Sparklines

It's useful to see on the Summary page how the full year trends. There isn't enough data to show the actuals, but the budget has a whole year's worth of data we can show on the summary.

See page 195 of "Using Excel for Business and Financial Modelling" for instructions on how to create a sparkline.

1. Go to the Budget page and for each summary line, starting from cell O7, create a sparkline.
2. Copy this down to each summary line as shown below
3. Change the weight and colour of the sparkline if desired
4. Cut and paste each sparkline to the corresponding cell on the Summary page.

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per Help Power Pivot Sparkline

Add-ins Add-ins Bing Maps People Graph Recommended Charts Charts Maps PivotChart 3D Map Tours Sparklines Filters Links

	G	H	I	J	K	L	M	N	O	P	Q
pr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21			
0	0	0	0	0	0	0	0	0			
0,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000			
0,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
0,000	\$145,000	\$100,000	\$120,000	\$145,000	\$100,000	\$120,000	\$145,000	\$100,000			
5,000			\$30,000	\$4,500	\$45,000		\$14,000	\$450			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
5,000	\$145,000	\$100,000	\$150,000	\$149,500	\$145,000	\$120,000	\$159,000	\$100,450			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000			
5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
2,500	\$12,500	\$12,500					\$12,500	\$12,500			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
2,500	\$12,500	\$12,500					\$12,500	\$12,500			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500			
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500	\$8,500			

Create Sparklines

Choose the data that you want

Data Range: C20:N20

Choose where you want the sparklines to be placed

Location Range: O\$20

OK Cancel