

# Call Centre Helper - Forecasting Excel Template

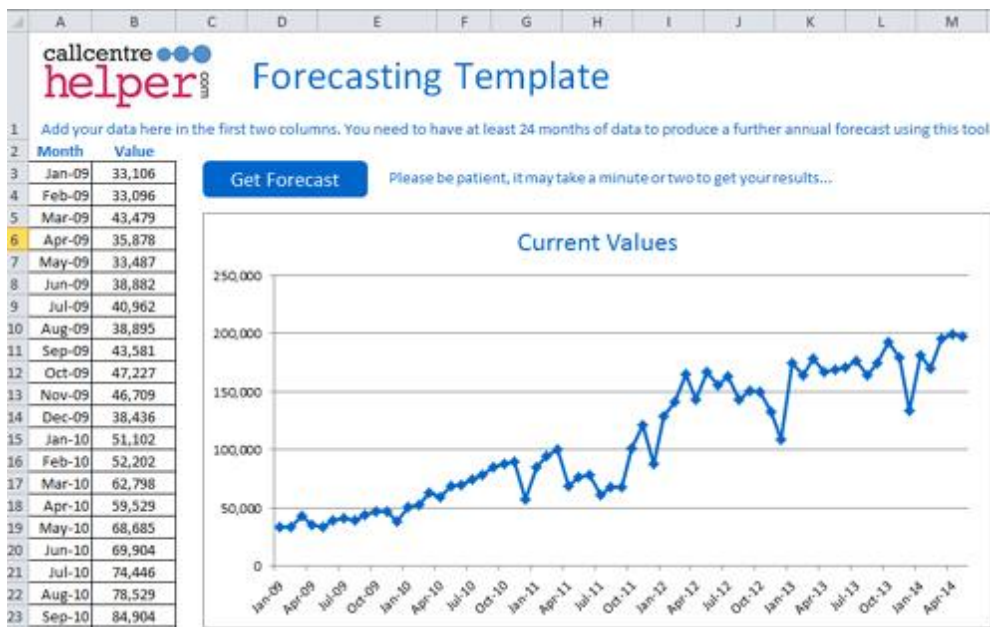
This is a monthly forecaster, and to use it you need to have at least 24 months of data available to you.

## Using the Forecaster

Open the spreadsheet and enable macros (or Enable Content) if you are prompted to do so.

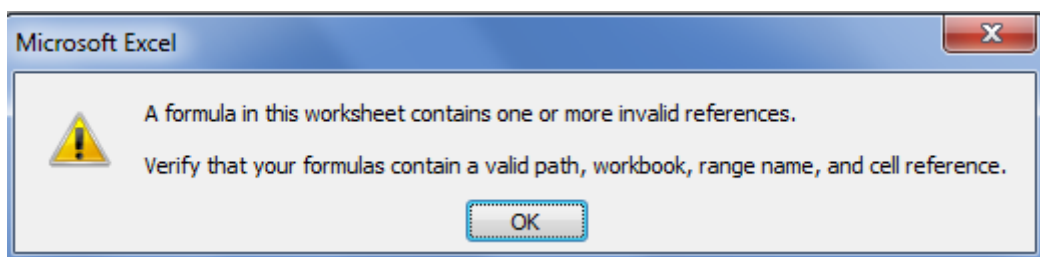
You will need to have at least 24 months of data in order to produce the next 12 predicted months.

When you open up the tool you will see that it has some dummy data in it and you should be able to see a chart, with the data that feeds it to the left hand side, starting with the oldest month in cell A3 and the oldest value in cell B3. You can add as many values as you wish in columns A and B. For best results please don't leave any gaps in the data.



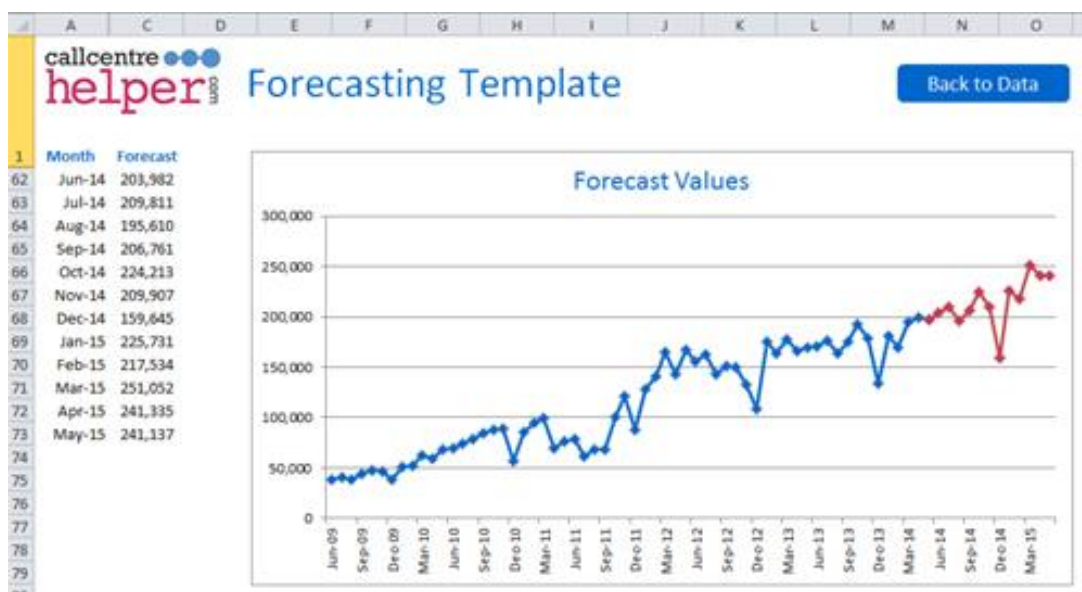
You can replace the values by simply overwriting them or copying and pasting data from another spreadsheet, as long as it is the same format of date in the first column (dd/mm/yyyy) and value in the second column. It's best to Copy and Paste Special (Paste as Values) to be absolutely sure that you don't inadvertently copy over any formulas from elsewhere.

If you select the current data and press the delete key, you may get the following message



This is fine, click OK and the chart will refresh and show just one point in the centre. When you enter your new data the chart will redraw with the data you've entered and everything should work.

Click the blue "Get Forecast" button and Excel will start to use Solver to find the most likely next points for your data. You will need to be patient at this point. It can take around 20-30s for Solver to settle on a most probable solution and you will see numbers changing at the bottom left of your screen as different values are tried out. After this time you will be taken to the Forecast and you will see a new chart with the next 12 predicted values showing in red. The next 12 predicted months and forecast values are shown to the left of the chart.



Your original data also exists in this sheet but the rows have been hidden, leaving only your forecast visible. If you'd like to forecast even further in to the future then you should take these values and enter them in to the data worksheet at the end of your current data, and run the forecast again to get another 12 months. In this way you can forecast a few years.

Do take care when copying these values back to the data worksheet. Please note that in the Forecast sheet the values are in columns A and C (column B has been hidden for calculations) If you use copy and paste then please copy each column of data separately.

## How does the Forecaster work?

### Triple Exponential Smoothing (The Holt-Winters Method)

Our forecaster assumes that there's three components to any forecast

**Seasonal Adjustment** – changes a monthly forecast based on previous data available for those months. e.g. if you're tracking incoming customer service calls you might expect them to go down in December, or you might always expect a rise in calls in July.

**Trend** – a factor that we use to show whether values are generally growing or shrinking over time

**Level** – a constant part of the forecast once the trend and seasonal factors are removed. This is like a baseline.

#### To start with we initialise all the values

We initialise the level as being the same as the first month of data you have.

We initialise the trend as the average of monthly increases in the first two years of data you have. E.g. we look at the change from January to January, then February to February, then March to March etc.. and then take an average of all the changes

To start the seasonal adjustment we need 12 initial values, one for each month. To do this we take the average monthly values for each year (see column F in the Calcs worksheet) and then calculate how much each month in the year deviates from that average (see column G in the Calcs worksheet)

We can then initialise the seasonal weightings based on all the data you have and in the top section of the spreadsheet we then average all the January weightings, all the February weightings, all the March weightings etc until we have the first 12 seasonal factors

To create a future forecast we then perform calculations on all the data, refining every factor as the months go by. This is where the triple smoothing factors come in.

These factors are shown at the top of the calcs sheet and initially they're all set to 50%

We look at the first month of your data to set the level. With all the factors set to 50% then the next value is achieved by taking 50% of the previous level plus one month of trend then combining it with 50% of the current month's demand adjusted using the most recent seasonal factor available for that month.

For the trend the initial calculation is 50% of the previous trend value and 50% of the difference between the current value and the previous one

The new seasonal variation is 50% of the previous seasonal variation and 50% current month over the current level.

These are then copied down the sheet so the factors change moving down through the data.

To forecast in to the future we take the last level and trend calculated then adjust for future months using the latest seasonal variation available for that month.

### **Training the factors**

It's highly likely that using 50% for all the factors won't produce the best results. So we now need to "train" the model to produce the right factors. This is done by forecasting the last known year based on the year before that and seeing how close we can get this to the actual values by changing the three factors.

You'll see in the Calcs worksheet that we've calculated the average error between the last known 12 months of data and what we would have got had we used the forecast. At the top of the sheet is then the average of all these errors.

Excel's Solver is then used to find the values of level, trend and seasonality that produce the lowest average error to the last known data.

We've set the Evolutionary solver as we don't know if your particular data is linear or non linear and in theory this is the best method to use where this is unknown.

### **Excel's Solver**

Built in to the CCH forecaster is the "Evolutionary" solving method.

At best, the Evolutionary method – like any other algorithm – will be able to find a *good* solution to a reasonably *well-scaled* model. Because the Evolutionary method does not rely on derivative or gradient information, it can't really determine whether a given solution is *optimal* – so it never really knows when to stop.

You could spend a lot of time running and re-running Solver, trying to find better solutions. You can never be sure whether you've found the best solution, or what the payoff might be of running the evolutionary algorithm for a longer time. When the Evolutionary method stops, you may very well find that if you keep the resulting solution and restart the Evolutionary method, it will find an even better solution.

However, if the values you get are similar from run to run of Solver, and if the Standard Deviations are small, this may be reason for confidence that your solution is close to the optimum.

The Evolutionary method allows you to spend less time analyzing the mathematical properties of your model, and still obtain "good" solutions – but it is not perfect! Try running the forecast for the same data a few times and see how close your results are.

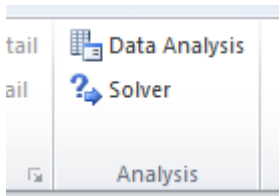
## Preparing for first use

Add-ins are a feature in Microsoft Excel that provide additional features and commands. Two of the more popular add-ins are the Analysis ToolPak and Solver, both of which provide extended data analysis capability for "what-if" planning. This calculator requires both of these add-ins and so you need to install and activate them before using the calculator for the first time.

To see if the add-ins are already installed click on the Data tab



If the add-ins have been installed you should be able to see an Analysis group, usually at the right hand end of the Data tab. This group will contain command buttons for Data Analysis and for Solver.



If it's there then click **Solver** in the **Analysis** group on the Data tab to ensure that the Solver add-in is loaded properly

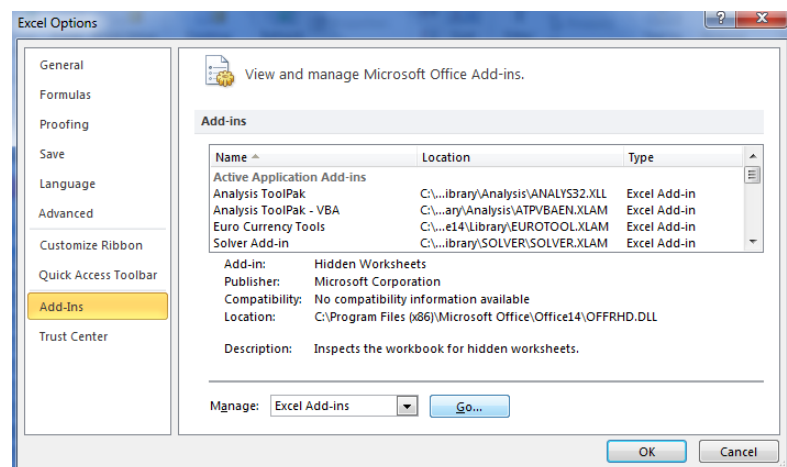
If you don't see the Analysis group box then:

Click the File tab.

Click Options, and then click the Add-Ins category.

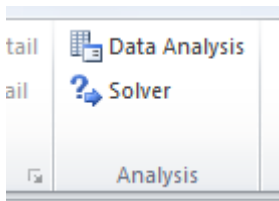
Near the bottom of the Excel Options dialog box, make sure that Excel Add-ins is selected in the Manage box, and then click Go.

In the Add-Ins dialog box, select the check boxes for Analysis ToolPak and Solver Add-in, and then click OK.



If Excel displays a message that states it can't run this add-in and prompts you to install it, click Yes to install the add-ins. If you are installing two add-ins, Excel prompts you to install an add-in twice; once for the Analysis ToolPak and once for Solver.

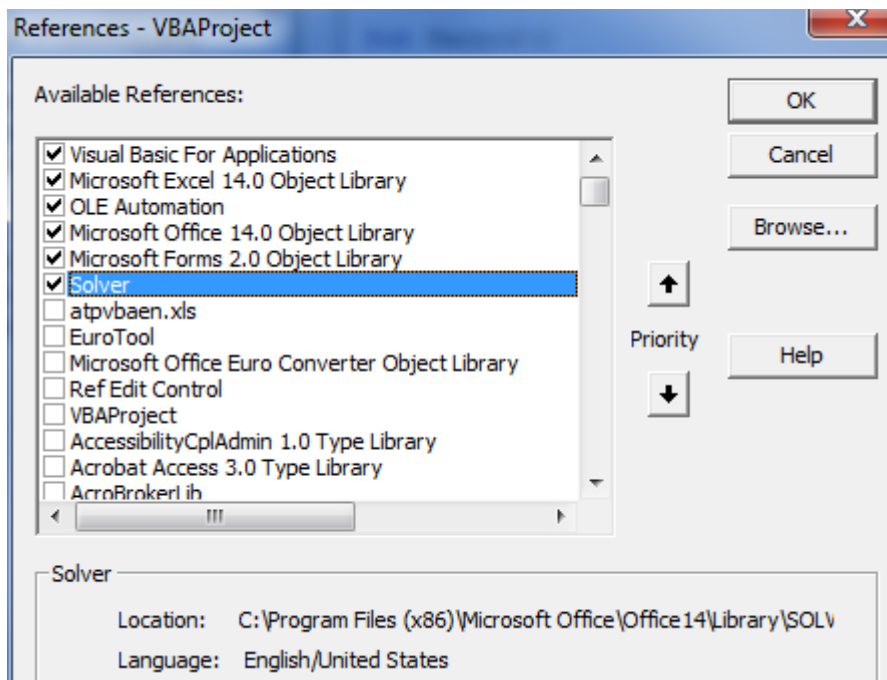
Back in the main Excel spreadsheet view you will see that an Analysis group has been added at the end of the Data tab. This group now contains command buttons for Data Analysis and for Solver.



Click **Solver** in the **Analysis** group on the Data tab to ensure that the Solver add-in is loaded properly

This tool calls the Solver functionality in a macro and so we also need to check that your Visual Basic module includes a reference to the Solver add-in (Solver.xlam).

Press the Alt-F11 keys together to open the Visual Basic Editor, choose **Tools References...** and make sure that the box next to **Solver** is checked.



You should now be ready to use the tool.