Instructions for the Trend Curves Macro

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1. Purpose of the spreadsheet model

The Trend Curves Macro was designed to demonstrate the use of various market response models for time series forecasting in marketing and sales.

2. Required version of Excel and settings to run the spreadsheet model

The spreadsheet model was built in the MS-Excel 2007. Therefore it will work best with MS-Excel 2007 or a later version. As the spreadsheet model uses macros and VBA (Visual Basic Application) code, the user should enable macros. Brief steps are given here:

1. Go to the "Developer" ribbon on the window menu
2. Click on "Macro security"
3. Choose "Enable all macros" under the macro settings
4. Also check "Trust access to the VBA project object model"
5. You may need to restart your MS-Excel for these actions to take effect.

3. How to run the spreadsheet model

The forecasting spreadsheet model is driven by the graphical user interface. The graphical user interface (GUI) can be accessed by clicking the gray button, "Click here to call the Forecasting Graphical User Interface" on the "Trend Curves Example" sheet. The required user inputs are:

1. Type of response model
2. Location or range of data to be forecast – if the data series has its own heading, the user needs to tick on "Label" to inform the macro
3. Number of observations in the Holdout sample - these data will be held out for model validation purposes
4. Forecast horizon - number of data periods to be forecast beyond the end of the sample
5. Option to use a second response model - this option allows the user to compare two different market response models at the same time
6. Type of second response model
7. Parameters – the user can specify the model to find the optimal parameter values for the given model by checking the "Optimize parameters" option. If the user does not tick the "Optimize parameters" option, the spreadsheet will build the trend curve model with pre-set parameters.

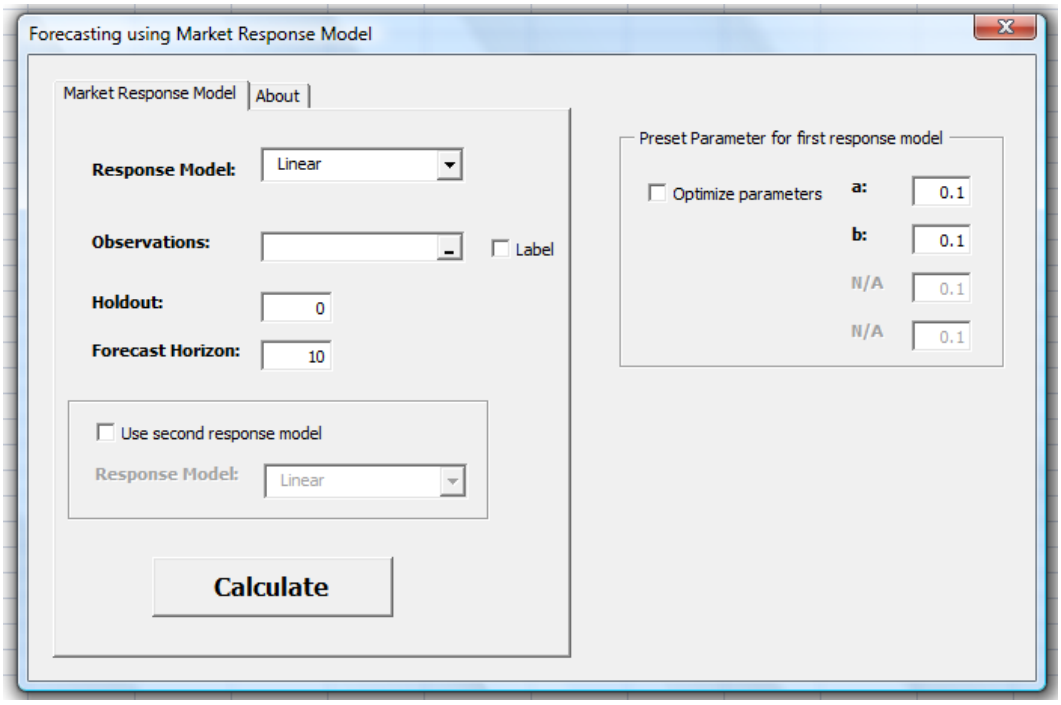

Figure 1: Screen shot of the forecasting graphical user interface for the default set up

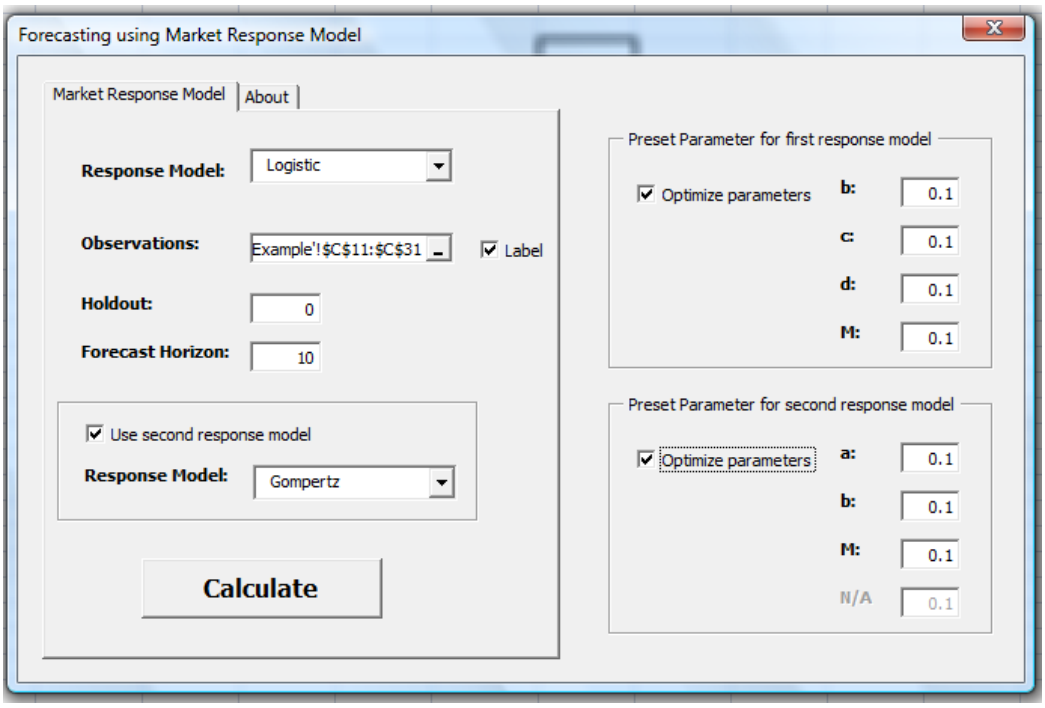

Figure 2: Forecasting graphical user interface after the user inputs are specified: The given setting compares the Logistic response model with the Gompertz model using the sales data provided as an example in the spreadsheet. The check marks on “Optimize parameters” indicate that optimal parameters are to be used for both response models.

Pressing the “Calculate” button at the foot of the GUI will trigger the spreadsheet model to build response models according to the given settings. A new worksheet will be created containing the estimated models. From the left side of worksheet, each column contains period, actual data, first response model and second response model. On the right side, the parameter estimates and forecasting error measures are shown.

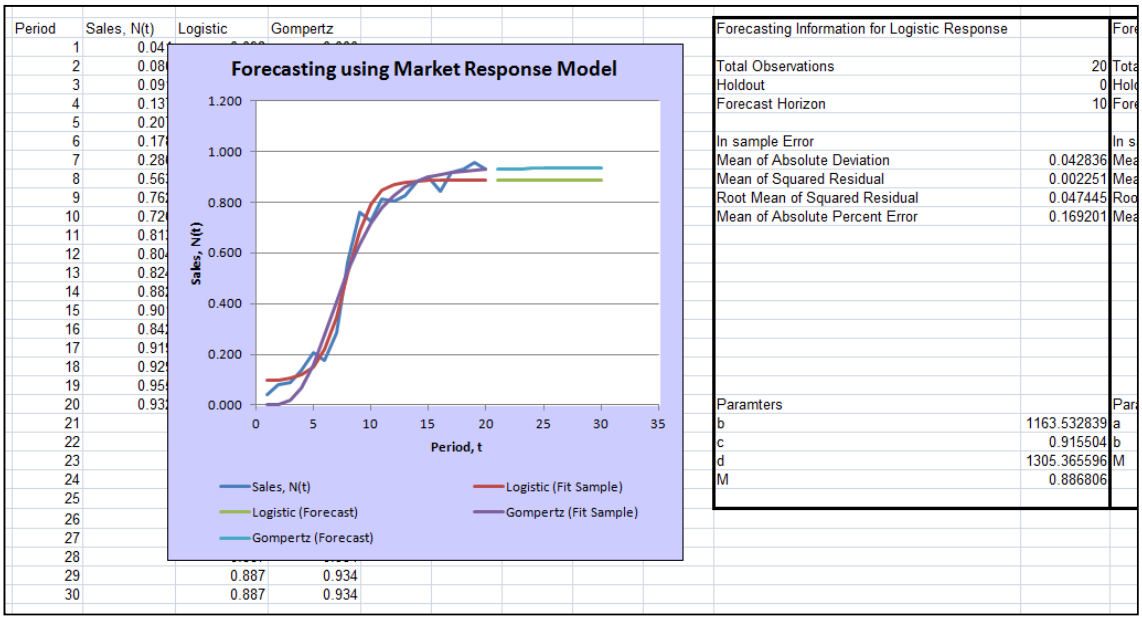

Figure 3: New worksheet created by the spreadsheet model: The chart shows the plots of actual sales data, the Logistic response curve and the Gompertz curve.

4. Bibliography

Lilien G., 1997, *Marketing Engineering: Computer Assisted Marketing Analysis and Planning*, 1st ed., New York: Prentice Hall

Mead N., Islam T., 2006, Modelling and forecasting the diffusion of innovation-a 25 years review, *International Journal of Forecasting*, 22, 519-545

5. Appendix

Trend curves available in the spreadsheet modeling include:

1. Linear, $N(t) = a + bt$
2. Semilog, $N(t) = a + \ln(t)$
3. Exponential, $N(t) = aexp(bt)$
4. Modified exponential, $N(t) = c + aexp(bt)$
5. Logistic, $\mathrm{N(t)} = M\left(\frac{1-bexp(-ct)}{1+dexp(-ct)}\right)$
6. Gompertz, $N(t) = Mexp(-aexp(-bt))$

The coefficients *a*, *b*, *c*, *d* and *M* represent the parameters of each model; an additive error structure is used in each case.