

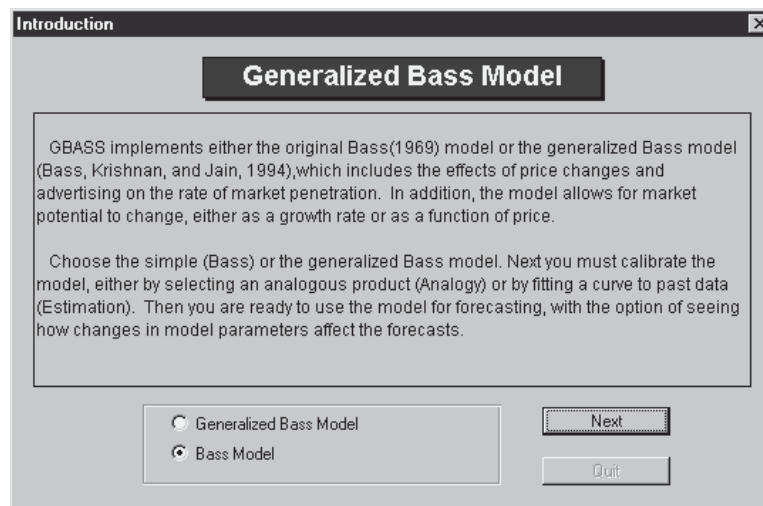
14. TUTORIAL FOR (generalized) BASS MODEL (gbass.xls)

CASE: ZENITH HIGH DEFINITION TELEVISION, P. 279

The Excel spreadsheet Gbass is a tool for forecasting the adoption of new products and new product categories. It implements the original Bass model (Bass 1969) as well as an extended version of it, the generalized Bass model (Bass, Krishnan, and Jain 1994). The generalized model extends the original Bass model by including the effects of advertising and price changes.

The software provides two modes for calibrating the model: (1) by analogy and subsequent refinement (i.e., visual tracking), and (2) by fitting the Bass model to past data via nonlinear least squares (Srinivasan and Mason 1986). The forecasting component of Gbass is set up for visual tracking: you can watch how changes in model parameters affect forecasts.

On the **Model** menu, select **Bass Model** (gbass.xls) to see the **Introduction** screen.

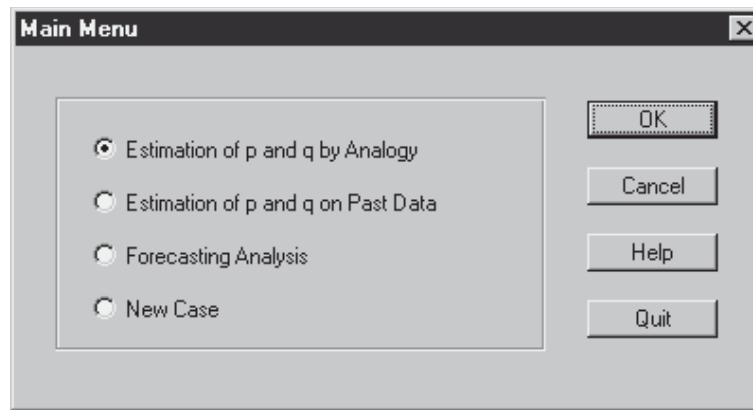


First select either the **Generalized Bass Model** or the **Bass Model** and click **Next**. The generalized Bass model includes two decision variables, pricing and advertising, which are assumed to determine the speed of diffusion. The Bass model sets up the original model without decision variables.

Because the generalized Bass model includes the Bass model, we will describe its use. Both versions have the same setup.

MODEL CALIBRATION BY ANALOGY

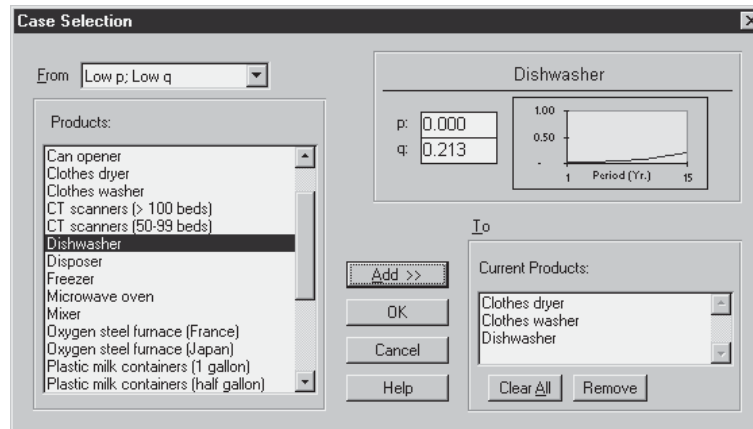
When there are no past data for the product of interest, calibrating the model by analogy can be useful. This can also be useful when you do not have enough data to feel confident about estimating numerical parameters for the model.



You need to identify an analogous product or technology that has market characteristics similar to those of the product you want to analyze.

The software includes a database that contains actual data points, estimated p and q coefficients, and estimates of market potential for several product categories. For further information about the database, see Exhibit 7.10 in the text, which lists the p and q coefficients, the market potential, and the time period of analysis for each case.

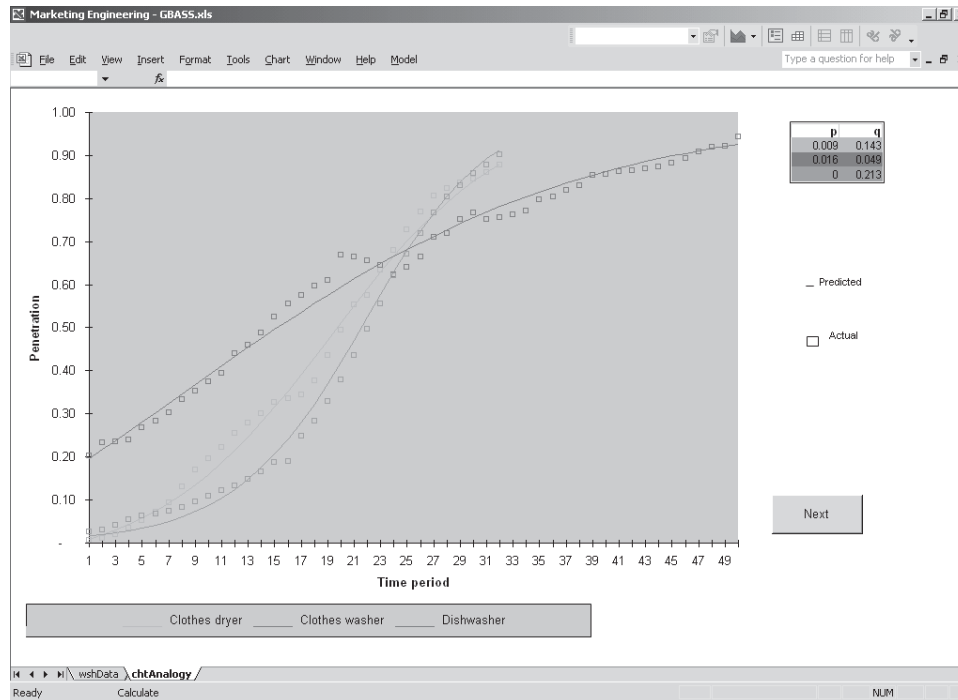
To explore the sales patterns of analogous products, select **Estimation of p and q by Analogy** and click **OK**.



First select a category. All cases have been divided into four categories (low p , low q ; high p , low q , etc.) using the median values of p and q in Exhibit 7.10, in the text, as cut offs. When you click a product in the **Products** list, you will see a preview of its curve and its coefficients.

Now choose a product and click **Add>>** to add a product to the group of potential reference cases in the **Current Products** area. (Add no more than three products, since at most three curves can be graphed at a time.)

After you choose your cases and click **OK**, the program will chart the actual data points and the estimated diffusion curves for them.

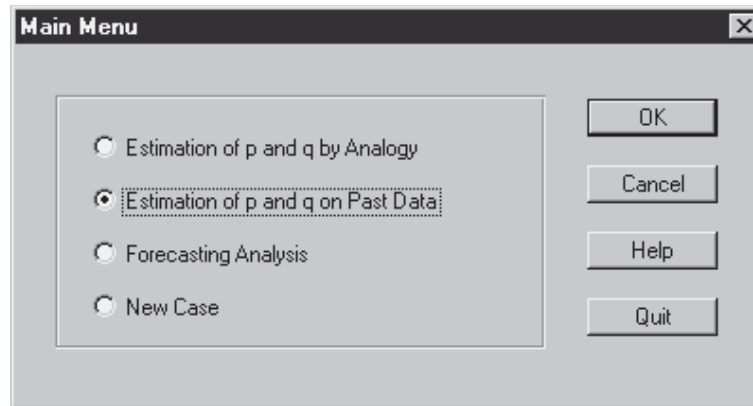


To simplify comparisons we have normalized the available cases to a maximum market penetration equal to 1.

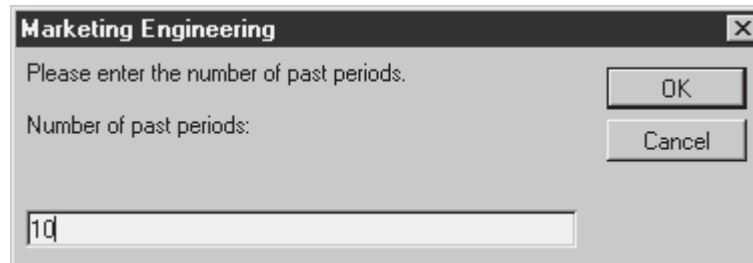
Click **Next** to get to the next box. Indicate the product that you think offers the best analogy and that you want to keep for further reference.

The "Parameter Register" dialog box contains the following text: "Indicate the product parameters you want to keep for further analysis". Below this text is a list of radio buttons. The first radio button is labeled "None". The second radio button is selected and is followed by a list box containing three items: "Clothes dryer", "Clothes washer", and "Dishwasher". To the right of the list box are two buttons: "OK" and "Cancel".

MODEL CALIBRATION BY ESTIMATION



To estimate the model parameters numerically (using Solver), choose **Estimation of q and p on Past Data** and click **OK**. Enter the number of past periods for which you have data. Click **OK**.



*Note: Once you have specified this number you will not be able to change it for subsequent estimations for this product. To make estimates for a different number of periods you must go to the **Main Menu** and select **New Case**.*

Next, enter data for **Market Penetration Before Period 1**, **Market Growth Rate**, **Market Potential at Start** (your estimate of the total market size at the starting period), and **Market Potential Price Elasticity**.

Marketing Engineering - GBASS.xls

File Edit View Insert Format Tools Data Window Help Model Type a question for help

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Estimation of p and q on Past Data

Market Penetration Before Period 1

Market Growth Rate

Market Potential at Start

Market Potential Price Elasticity (1)

(1) % increase in market potential with a 1% decrease in price

Advertising Coefficient (2.1)

Price Coefficient (2.2)

(2.1) for generalized Bass model only: % increase in speed of market penetration with a 1% increase in advertising
(2.2) for generalized Bass model only: % increase in speed of market penetration with a 1% decrease in price

Period	Adoptions/period	Relative Price	Relative Advertising (*)	(*) for generalized Bass model only
1	0	1	1	1
2	3	1	1	1
3	6	1	1	1
4	12	1	1	1
5	21	1	1	1
6	35	1	1	1
7	22	1	1	1
8	13	1	1	1
9	6	1	1	1
10	3	1	1	1

p = 0.030
q = 0.200
R²=

wshData wshEsti/ NUM

If you chose the **Bass Model**, you do not need to provide values for the advertising or price coefficients. If you chose the **Generalized Bass Model**, you must provide estimates for these coefficients, because historical data rarely have enough variability to permit estimation of these parameters. The advertising and price coefficients can be roughly thought of as “market acceptance speed elasticities” indicating the speed with which the market adopts the new product:

- The advertising coefficient reflects the percent increase in speed of market acceptance with a one percent increase in advertising. (Documented values for the advertising coefficient typically range between 0.3 and 1.)
- The price coefficient reflects the percent increase in speed of market acceptance with a one percent decrease in price. (Documented values for the price coefficient typically range between 1 and 2.)

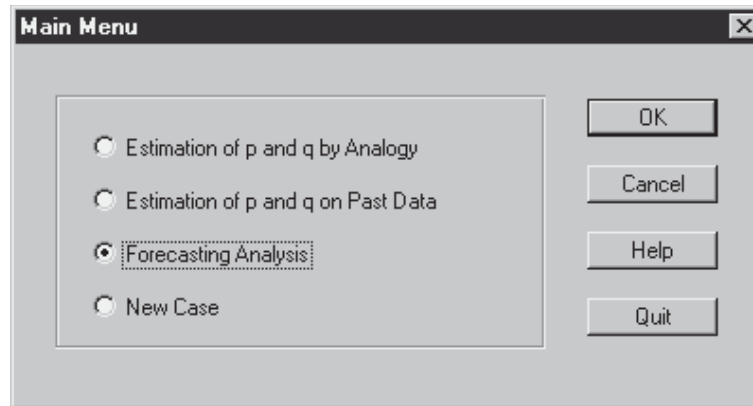
Now enter the data on adoption in each period and, optionally, an index for price and advertising in each period. Note that marketing effort and price should be measured relative to a base level in period 1 indexed to 1.0. Thus, if advertising was \$4 million in period 1 and \$6 million in period 2, the index in period 2 is 1.5.

Click **Best Fit** to start the calibration of the model. The program estimates only the coefficients for p and q . The market potential estimate is fixed at your best guess input.

Click **OK** to go back to the **Main Menu**.

Note: It is sometimes possible to obtain negative R-Square with nonlinear least squares estimation for some ill-structured data. However, more common reasons for this situation are (1) you made an error in your input data, or (2) the nonlinear estimation procedure (in Excel's Solver) started the estimation in an infeasible region. For example, you can get a negative R-Square if you enter cumulative sales data instead of sales per period in the data sheet, or if you specify a market potential that is smaller than first period sales.

FORECASTING ANALYSIS



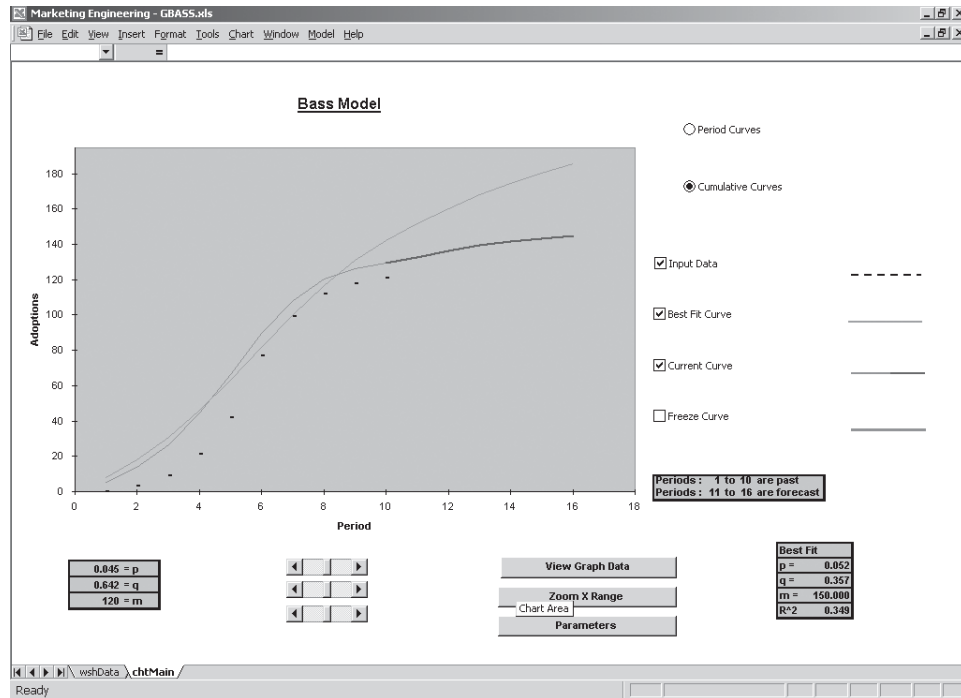
Select **Forecasting analysis** and click **OK**.
You will see the following box:

Setup For Forecast		OK
Number of Forecast Periods :	6	Cancel
Market Growth Rate :	1.00%	
Market Potential Price Elasticity(*) :	1.00	

(*) : % increase in market potential with a 1% decrease in price

Enter values for the **Number of Forecast Periods**, the **Market Growth Rate**, and the **Market Potential Price Elasticity** (that is, the percent increase in market potential with a one percent decrease in price). Click **OK**.

Click **OK** to see the estimated adoptions curves.



You can view the adoption curves either period by period (**Period Curves**) or cumulatively (**Cumulative Curves**). Check the box to the left of **Current Curve** to see the forecasted adoption pattern for the values of p , q , and m shown in the left bottom part of the screen. By using the scroll bars under **Period** you can adjust the parameters for the **Current Curve** and observe how changes in the parameter values affect the shape of the graph.

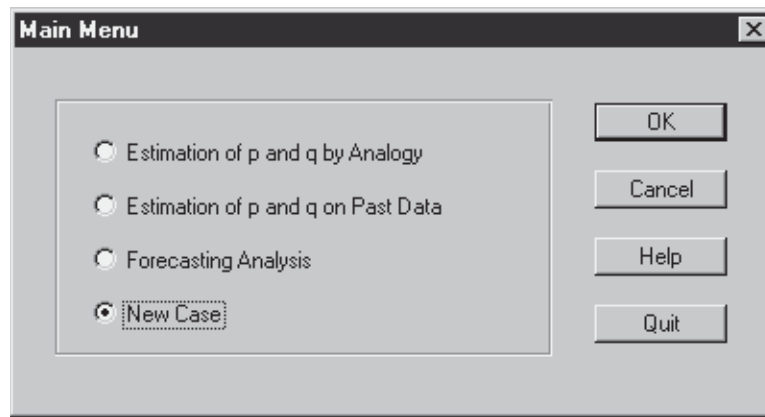
Once you think you have a reasonably good match between your **Input Data** (if available) and the **Current Curve**, you can freeze this curve as a benchmark. All the parameter values for **Freeze Curve** are displayed in the area in the lower right corner. Compare them to the parameter values for the **Best Fit Curve** if you checked that option. You can continue to change the shape of the **Current Curve**, and the **Freeze Curve** will remain fixed.

Clicking the **View Graph Data** button brings up a worksheet listing the raw data. You can only view and not change the data in this data sheet.

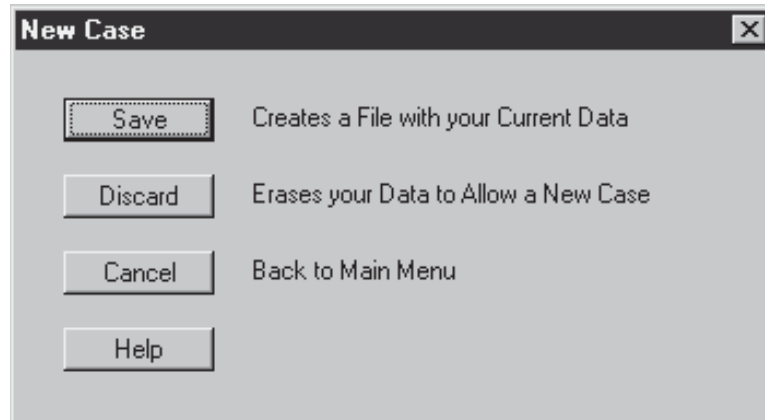
Clicking **Zoom X Range** allows you to limit the number of periods for which the data are plotted.

Clicking the **Parameters** button brings back the display **Chart Parameters**. You can enter new values for the starting points of the coefficients and increments.

If you want to try another case or another analogy, modify your data points, or save the current case, you need to bring up the **Main Menu**. To do so, go to the **Model** menu and choose **Main Menu**.



If you want to analyze another product, select **New Case** from the **Model Menu**. Decide whether you want to **Save** or **Discard** the current scenario.



REFERENCES

- Bass, Frank M. (1969) "A new product growth model for consumer durables," *Management Science*, 15, No. 4 (January), 216-227.
- Bass, Frank M., Trichy V. Krishnan and Dipak Jain (1994) "Why the Bass model fits without decision variables," *Marketing Science*, Vol. 13, No. 3 (Summer), 204-223.
- Srinivasan, V. and Charlotte H. Mason (1986) "Nonlinear least squares estimation of new product diffusion models," *Marketing Science*, Vol. 15, No. 4, 169-178.