Exercise 1: Basic Demand Estimation

To be handed it as a printout in the beginning of the lecture on Oct 17, 2018

In this exercise we will go through the standard steps that one needs to undertake in conducting a basic demand analysis. For this purpose, we will use scanner data obtained from Kraft. Kraft uses Nielsen as its scanner data vendor in all product categories. In this exercise, we use a small subset of all possible product/geography/ variable combinations available in this sort of data. (You will only need columns 1,2, and 20). We will explore store level-scanner data at the account level (Jewel), and at a higher level of aggregation (Central Region).

R: There are different import commands for estimation and destringing data. Also see for example for how to import csv and STATA's own .dta files: http://www.statmethods.net/input/importingdata.html

To make things easy, I have put a small R script into the course folder. This contains all the commands you will need for estimation, but is not complete for all markets (you should at least make some transfers in terms of using the commands). Feel free to use a different software/programming language instead. The most important thing for me is that you will be able to interpret the results in a good way.

Category: Viscous salad dressings (Mayonnaise/Miracle Whip/other "spreadables")
- Sub-categories: Mayonnaise, Miracle Whip
- Product aggregates:
  - Kraft 32oz Mayo
  - Hellman's 32 oz Mayo
- Geographical aggregates:
  - Kraft Midwest Region (called the "Central Region")
  - Chicago market: Jewel-Osco
- Time aggregation/periods
  - Weekly data in 91/92

Names of files
Kraft Central Region
- kc_kr32.xls (Kraft 32 oz)
- kc_hl32.xls (Hellman's 32 oz)

Jewel Region
- jwl_kr32.xls
- jwl_hl32.xls

These data sets have a lot of different variables available. In this assignment, we will only use a small fraction of the variables.

Variables or "facts" available

Column	Name	Definition
C1	sales_u	Sales in equivalent units (lbs)
C2	sales_$	$ Sales
C3	%ACV	%ACV distribution of product
C4	AnyF_%	%ACV in any feature condition
C5	AnyD_%	%ACV in any display condition
C6	base_u	Baseline equivalent units
C7	base_$	Baseline $ sales (units x regular price)
C8	FnoD_u	Feature with no display - units
C9	FnoD_$	Feature with no display - $ sales
C10	FnoD_%	Feature with no display - % ACV
C11	DnoF_u	Display with no feature - units
C12	DnoF_$	Display with no feature - $ sales
C13	DnoF_%	Display with no feature - % ACV
C14	FandD_u	Feature and Display - units
C15	FandD_$	Feature and Display - $ sales
C16	FandD_%	Feature and Display - % ACV
C17	PrDec_u	Any Price Decrease - units
C18	PrDec_$	Any Price Decrease - $ sales
C19	PrDec_%	Any Price Decrease - % ACV
C20	date	starting date for the week

Data check

1. Construct a price variable by dividing $ sales by unit sales (employ the sales_$ and sales_u variables). Explain how to interpret this price variable (i.e. what sort of average price is this?).

2. Compute the mean prices across weeks of Hellman's in Jewel and the Central Region. Are they comparable? Repeat the exercise for Kraft in Jewel and the Central Region.

3. Price variation: Compute the standard deviation of prices across weeks of Hellman's in Jewel and the Central Region. Is there more price variation at Jewel or in the Central Region? Why? What does this tell you upfront about your ability to estimate price elasticities with either account level data or data in a large geographic market? Repeat the exercise for Kraft in Jewel and the Central Region.

4. Price plots: Construct time-series plots of sales and prices for Hellmans in the Central division and for Jewel (i.e. weeks on the X-axis, prices and unit-sales on the Y-axis). Repeat the exercise for Kraft. Describe the differences or similarities between Kraft and Hellman's pricing policies in each account.

5. Scatter-plots: Construct scatter-plots of sales versus prices for Hellmans in the Central division and for Jewel (i.e. prices on the Y-axis, unit-sales on the X-axis). Repeat the exercise for Kraft. Is there evidence for a negatively sloped demand-curve in the data? Eye-balling these plots, does demand appear more elastic in the Central Region or at Jewel (for either Hellman's or Kraft)?

Demand estimation

1. Fit the "multiplicative" demand model discussed in class for Kraft and Hellman's at Jewel (i.e. 2 separate regressions, one for Hellman's, and one for Kraft).

2. Fit the "multiplicative" demand model discussed in class for Kraft and Hellman's for the Central Region (i.e. 2 separate regressions, one for Hellman's, and one for Kraft).

3. Elasticity differences: Is the demand elasticity higher (in absolute magnitude) at the Jewel account or in the Central Region? Can you offer some compelling explanations for the difference? (think of as many potential reasons as possible)

4. Forecasting demand under a price change: Using your regression results from the multiplicative demand model, compute the % change in unit sales for a 10% increase in the price of Kraft and Hellman's at Jewel. (Note: You can do this brute force in Excel, but for your benefit you should try to compute this on a sheet of paper with the help of a calculator).

5. Focus on the data for Kraft and Hellman's 32 oz at Jewel. Fit the "multiplicative" demand model for Kraft and Hellman's at Jewel allowing for cross-price effects (i.e. 2 separate regressions, one for Hellman's, and one for Kraft, with Hellman's own price and Kraft's price affecting sales of Hellman's; and Kraft's own price and Hellman's price affecting sales of Kraft).

6. You may be called upon to report to your manager whether your brand is vulnerable to a competitor's pricing policies. That is, to what extent does the demand for your product depend on (or is affected by) your competitors' pricing policy? From the results in 5, which brand is more "vulnerable"? Be specific as to why.

7. While making a crucial presentation of the above results in front of your team, your analyst colleague questions your results as follows: "This is all fine. But, you know, you're missing a lot of variables in your so-called

regression model. For instance, the sales of Kraft mayo at Jewel are clearly affected by store traffic. When it snows, less people visit Jewel, and you don't have such factors -- the weather, temperature, traffic congestions, etc. So aren't your cross-price effects all wrong?" Is your colleague right or wrong?

8. Suppose you work at Kraft, and you realize that Hellman's price is cut by 10% at Jewel. Using your estimates from 5, compute by what percent you have to lower the Kraft 32 oz price at Jewel to obtain the same sales as you currently enjoy.