MARKET RESPONSE MODELS

QUESTION 1

You have been hired by a firm producing different brands aimed at different market segments (i.e. there are no cannibalization effects, and a separate model can be built for every product). Your first assignment on your new job is to build a response model for each of these brands. The managers of the respective brands give you the following description of the properties your model should have:

BRAND A: (30 points)

You have the following time-series data available (100 weeks of data): the sales and price of your brand with the leading retailer, and the price of the three main competing brands at that retailer.

You want to test whether consumers react to
(a) Deviations from an internal reference price – how would you do that?

(b) Deviations from an external reference price – how would you do that?

(c) Next, you want to determine to what deviations they react most heavily – how would you do so?

(d) Assume that the weekly number of shelf-facings is also given, and suppose that management wants to test whether the impact of the external reference price increases with the number of shelf facings – how would you test that?

(e) Assume you want to test whether they only react to deviations from the internal reference price when this involves a positive deviation that exceeds a certain critical level – how would you test that? How would you determine that critical level? Dwz als prijs/refprijs <u>hoger</u> is dan een bepaald kritiek punt. Hoe kunnen we testen of customers enkel reactie hebben na dit bepaald kritiek punt en hoe vinden we dit punt?

PS. You can asssume constant returns to scale. Also, be very specific in your answers (i.e., clearly define all variables you would use, how specifically you would test significance, etc..)

BRAND B: (20 points)

The manager of brand B is new on the job. His/her predecessor suddenly left the company, and all the manager has is a set of historical data. He/she first wants to determine who (of, say, the two main competitors) is likely to react to (i.e. follow) price

changes in *B*, potentially with some delay. Also, the manager wants to find out whether these two competitors would react with changes in the same marketing-mix instrument (i.e. price) or whether they would react with changes in the advertising support for their products.

1. How would you determine (be VERY specific in your test equations and in the test statistics to be used) <u>which</u> competitors would react with <u>what</u> instrument? (10 points)

2. Suppose your boss questions the validity of your findings, and argues that they are very sensitive to the specific test equation you used. How would you address this concern? Give two different types of sensitivity analysis that you could do. Again, be very specific. (10 points)

QUESTION 2　　　　　(20 points)

Please comment on the following 2 statements. Do you agree? Why (not)? Provide, when relevant, the underlying intuition.

Statement 1 (10 points): "When the residuals over time do <u>not</u> show a strong zigzag pattern we have neither a serial correlation nor a heteroscedasticity problem."

Statement 2 (10 points): "To solve a multi-collinearity problem, it is a good idea to mean-center the data."

QUESTION 3　　(15 points)

Suppose a consulting firm proposes the following multiplicative model to link the market share of brand C to its own and its competitive advertising and price:

$$m_{c,t} = \alpha \, (p_{c,t}/p^*_{c,t})^{\beta_p} \, (a_{c,t}/a^*_{c,t})^{\beta_a} \, \exp(u_{C,t})$$

Where

$m_{C,t}$=market share of brand C in period *t*,

$p_{C,t}$=price of *C* in period *t*,

$a_{C,t}$=advertising expenditures of C in period t,

$p^*_{c,t}$, $a^*_{c,t}$=defined in a similar way but referring to the combined competition,

$u_{C,t}$ = error term

α, β_p, β_a=parameters that need to be estimated.

Discuss in some detail THREE <u>distinct</u> "improvements" (which allow additional insights, and/or which avoid certain less desirable features of the current specification) to this model specification which can be implemented even if you only have $m_{C,t}$, $p_{C,t}$, $p^*_{C,t}$, $a_{C,t}$ and $a^*_{C,t}$ as columns in your data matrix. <u>So don't give improvements which require additional data gathering</u>. Be sure to also indicate <u>why</u> your suggested changes are improvements. Also, the 3 improvements should be conceptually/substantially different (so not 3 small variations of a single, intrinsically very similar, improvement).

<u>QUESTION 4</u>   (15 points)

You are a manager for a coffee brand in the Netherlands. You have built a sales response model to link your brand's historical sales to its historical advertising and price. However, your boss is concerned about potential endogeneity problems for the price variable.
- Explain why he/she may be justified in being concerned (3 points).
- You check with a statistical consultant, who suggests to use an instrumental-variable approach, and he/she proposes as potential instruments:

(option 1): the price of competing coffee brands in the Netherlands;

(option 2): the price of the coffee brand in a neighboring country (like Belgium);

(option 3): the price of the brand in the Netherlands in the previous period and/or

5 periods ago;

(option 4): the price of tea brands in the Netherlands.

Do you think these are "good" instruments? Discuss this <u>in detail</u> for each of the options. For option 3, which of the two past prices would you prefer, and why?

GOOD LUCK!

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IMPORTANT INFORMATION FOR THE HOMEWORK ASSIGNMENT

This assignment MUST be made individually;
Due data: Tue December 8, 8pm; Can be done through e-mail in pdf format