

Lecture Notes on Dynamic Demand Estimation II

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Akerberg (2001)

- advertisement in nondurable experience-goods markets
- informative effects: alert consumers to the existence of the new product or "signal" the consumers that the product is of high quality
- prestige effects: consumers obtain utility from consuming more advertised products (or products that are associated with something)
- empirically measure the existence and extent of such effects

Key Model Caveats

- Information on product existence and search characteristics, i.e. Stigler (1961), Butters (1977), Grossman and Shapiro (1984): should not affect the behavior of experienced users.
- Implicitly signal information about experience characteristics, i.e. Nelson (1974), Kihlstrom and Riordan (1984), Milgrom and Roberts (1986): (1) if a consumer learns a brand's experience characteristics perfectly after one consumption: not affect the behavior of experienced users, (2) if a consumer continues to learn on the second and subsequent consumption experiences: the effect should decrease in the number of consumption experiences.
- Prestige and image effects, i.e. Becker and Murphy (1993): not depend on whether or not consumers are experienced.

Data

- Scanner data collected by A.C. Nielson: Sioux Falls, South Dakota and Springfield, Missouri. Weekly prices at drugstores and supermarkets over three years (1986-1988).
- A.C. Nielson TV meters: household TV advertisement exposures.
- Four categories are PUBLICLY available: ketchup, laundry detergent, soap, yogurt. This paper uses yogurt: (1) least affected by stockpiling behavior (2) avoid initial condition problem: use a newly introduced brand Yopait 150.
- Simple correlation: market share and price, market share and advertising
- Further decompose: OLS results show that advertisement affects initial purchases much more than repeat purchases.

TABLE 3 OLS Regressions

	Dependent Variable: Initial Purchases				Dependent Variable: Repeat Purchases			
	1	2	3	4	1	2	3	4
<i>N</i>	918	918	678	918	918	918	678	918
<i>R</i> ²	.066	.085	.107	.066	.162	.149	.120	.162
Market	.222	.002	.224	.223	.700	.006	.832	.700
Dummy	(.062)	(.000)	(.069)	(.062)	(.089)	(.000)	(.111)	(.089)
Price	-5.298 (1.568)	-.038 (.013)	-7.388 (1.726)	-5.354 (1.585)	-3.954 (1.829)	-.029 (.014)	-5.512 (2.207)	-3.942 (1.838)
Ads	.044 (.022)	.030 (.015)	.042 (.021)	.044 (.022)	.020 (.023)	.014 (.017)	.014 (.024)	.016 (.024)
<i>t</i> -value	1.981	1.925	2.046	1.988	.873	.818	.596	.679

Notes: Unit of observation is a market day. Constant term and third-order polynomial in time not reported. SEs corrected for serial correlation using Newey-West.

Specifications: Column 2 uses market shares (quantity/shopping trips) as dependent variables (Ads coef * 100); column 3 eliminates data when advertisements not observed (first three months); column 4 uses mean advertising level for first three months.

Model Setup

- Reduced-form representation of whether to purchase Yoplait 150:

$$c_{it} = I(\alpha_i + X_{it}\beta_1 - \gamma p_{it} + \epsilon_{1it} > Z_{it}\beta_2 + \epsilon_{2it})$$

- X_{it} for household i : advertising (intensity), income, family size, market dummy (1 for SF), functions of previous purchases, time trend. Previous purchases and time trend: better approximate value function and allow for habit persistence.
- Z_{it} : index of the prices of the prices of other yogurts. Unobservables ϵ_{it} idiosyncratic, time-specific shocks, type I extreme values.
- α_i : unobserved preference for Yoplait 150 that persist over time. Modeled as a normally distributed random effect.

- Distinguish two effects: interactions between advertising and previous purchases in X_{it} .
- Likelihood function for household i :

$$\begin{aligned} L_i(\theta) &= Pr[c_{i1}, \dots, c_{iT_i} | W_i^t, Z_i^t, p_i^t; \theta] \\ &= \int \prod_{t=1}^{T_i} Pr[c_{it} | X_{it}(c_i^{t-1}), Z_{it}, p_{it}, \alpha_i; \theta] f(d\alpha_i | \theta) \end{aligned}$$

W_i^t is the subset of explanatory variables that is completely exogenous.

Estimation Results

- Advertising*Experienced: image and prestige effects. (insignificant)
(Advertising*Inexperienced-Advertising*Experienced): informative effects. (significant)
- Economics significance: 30-second commercial every week substitutes for a 10-cent price decrease.
- Advertising*Number of Purchases: the marginal effect of advertising is going down as number of previous purchases increases.

