Identification of conduct, homogenous demand

212QEC9X01 QUANT METHODS&ECONOMET FOR APP IN COMPT

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Identification of conduct

- Our task is to investigate competition in Dutch coffee market.
- Time-series monthly data contains information about the Dutch coffee market during the period 1990-1996 (more information in Bettendorf and Verboven (1998)).

The data include the following variables

- month: year and month of observation;
- qu: per capita consumption of roasted coffee in kg;
- cprice: price of roasted coffee per kg in current guilders;
- tprice: price of per kg tea in current guilders;
- oprice: price index for other goods;
- incom: income per capita in current quilders;
- q1-q4: dummy variables for seasons 1 to 4;
- bprice: price of coffee beans per kg in current guilders;
- wprice: price of labor per man hours (work 160 hours per month).

Empirical model - log linear demand

Market demand is assumed to take the following form:

$$Q_t = \beta(\alpha - P_t)^\gamma + \epsilon_t$$

assuming that $\alpha = 0$ and $\gamma < 0$ we have a log-linear demand function:

$$ln(Q_t) = ln(-\beta) + \gamma ln(P_t) + \epsilon_t$$

where Q_t is total is total output in the market and P_t is the market price, and ϵ_t is the error term

Refresher: elasticities in different demand models

Model	Demand	Transformed demand	Own-price elasticity
Linear	$Q = \alpha + \beta P + \gamma X$	$Q = \alpha + \beta P + \gamma X$	$\varepsilon = \beta * P/Q$
Semi-log	$Q = \exp(\alpha + \beta P + \gamma X)$	$lnQ = \alpha + \beta P + \gamma X$	$\varepsilon = \beta * P$
Log-log	$Q = \exp(\alpha) P^{\beta} X^{\gamma}$	$lnQ = \alpha + \beta lnP + \gamma lnX$	$\varepsilon = \beta$

Production technology

The coffee market is characterized by a relatively simple production technology with constant marginal cost:

$$c = c_0 + kP_{coffeebeans}$$

where c_0 represents all variable costs other than those related to coffee beans, i.e., labour and packages; and k is a parameter that measures the fixed technology in production. It is estimated that one kg of roasted coffee requires 1.19 kg of beans. The c_0 is estimated to be around 4 guilders.

Profit

The profit for firm i is given by:

$$\pi(q_i, q_{-i}) = (P(Q) - c)q_i$$

where $Q = \sum_j q_i$

First order condition for profit maximisation in Cournot implies:

$$\frac{\partial \pi(q_i, q_{-i})}{\partial q_i} = 0 \rightarrow P(Q) + \lambda_i q_i \frac{\partial P(Q)}{\partial Q}$$

where $\lambda_i = 1 + \sum_{j \neq i} \frac{\partial q_j}{\partial q_i}$ represents conjectural variation.

Solving for the conduct parameter

Multiplying by $\frac{Q}{Q}$:

$$P(Q) + \lambda_i \frac{q_i}{Q} Q \frac{\partial P(Q)}{\partial Q} = c$$

In the case of N identical firms we have: $\frac{q_i}{Q} = \frac{1}{N}$:

$$P(Q) + \theta Q \frac{\partial P(Q)}{\partial Q} = c$$

Conduct parameter, and costs

The conduct parameter can take the following values:

- $\theta = 0$ for perfect competition
- $0 < \theta < 1$ for oligopoly
- $\theta = 1$ for monopoly or collusion

If we have access to information about costs, conduct parameter θ can be expressed in the following way:

$$\theta = -\gamma \frac{P - c}{P} \equiv L_\eta$$

where $\eta(P)$ is the elasticity of demand and L_η is the adjusted Lerner index, i.e. Lerner index adjusted for elasticity (Genesove and Mullin, 1998).

Prices, costs and the conduct parameter

The market price can be written as a function of the conduct parameter θ, the estimated demand, and cost parameters:

$$P(c) = \frac{\gamma}{\gamma + \theta} c$$

where γ is the estimated demand elasticity in log-linear demand specification

Obtaining theta from our coefficient on cost (b)

Rearranging:

$$b = \frac{\gamma}{\gamma + \theta}$$

$$\gamma = b(\gamma + \theta)$$

$$b\theta = \gamma - b\gamma$$

$$\theta = \frac{\gamma(1 - b)}{b}$$

Our task

- Analyse data by computing simple statistics and provide graphical illustration.
- Estimate demand for roasted coffee using reasonable explanatory variables and instrumental variables.
- Explain what allows for identification of conduct in this model.
- Estimate Lerner index adjusted for elasticity and conduct parameter, and provide interpretation.