

Advertising

Several kinds of models

1] Information

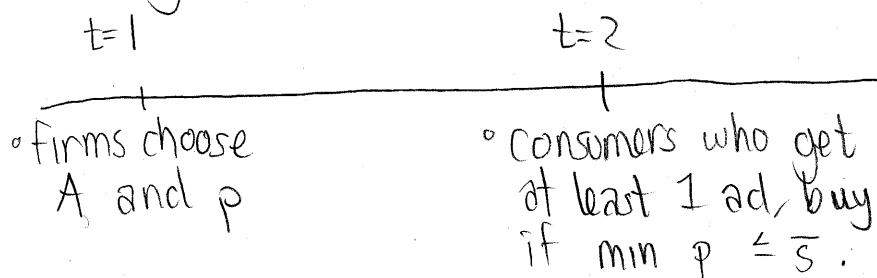
2] Signalling

3] Changing tastes (*) Difficult to do welfare analysis here.

4] Behavioral - Shapiro

Butters 1977

- N firms, unit mass of consumers
- identical goods, identical consumers with value \bar{s} .
- cost c of production
- advertising cost $A(x)$ to reach fraction x .

Observations1] Dispersed price equilibrium: mix on $[p, \bar{s}]$ 2] Symmetric equilibrium with $x^* \in (0, 1)$ if $A'(0)$ small and $A'(1)$ large.

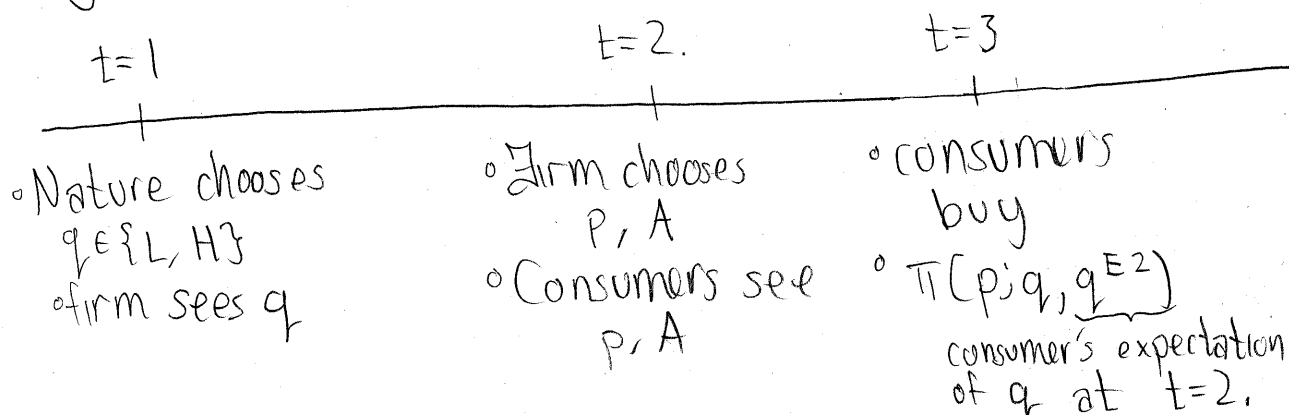
3] $MC = MB \Rightarrow A'(x^*) = p - c$

also, $A'(x^*) = (\bar{s} - c) \underbrace{\Pr[\text{consumer sees no other ad}]}_{(1-x^*)^{N-1}}$

4) advertising is socially efficient.

Signalling

Milgrom-Roberts 1986



Prop: $(p_L^*, 0), (p_H^*, A^*)$, $A^* > 0$ is part of a separating Bayesian equilibrium iff

$$1] p_L^* \in \operatorname{argmax}_p \pi(p; L, L)$$

$$2] \pi(p_H^*; H, H) - \pi(p; H, L) \geq A^* \quad \forall p \neq p_H^*$$

$$3] \pi(p_H^*; L, H) - \pi(p_L^*; L, L) \leq A^*$$

- Need $\pi(p_H^*; H, H) > \pi(p_H^*; L, H)$ by a significant amount.

- repeat purchases can give us this

- Need $\pi(p; H, L) \approx \pi(p_L^*; L, L)$

- limited word of mouth communication.

- Depending on π -fns, it could be that prices

alone can signal quality

Comments

- 1] A can signal quality (but p can as well)
- 2] A has no direct social value but can be valuable in equilibrium.
- 3] Better model for new goods than old goods.
 - this does not explain the observation that most ads are not for new goods.

Milyo-Waldfoegel (1999)

- Benham (1972) - eye glass prices are 20-50% less in states in which eye glass ads are legal
 - Do ads raise or lower prices?
- Rhode Island liquor store prices
 - 1956 - May 13, 1996: illegal to advertise prices
 - 44 liquor market case
 - May 13, 1996 - present: allowed

Data:

- prices for 33 alcoholic beverages at 115 liquor stores at MA and RI
 - June 1995-1997
- MA and RI wholesale prices
- Data on ads used

◦ lottery ticket sales by store.

Results:

- 1] Advertising has very little impact on prices.
- 2] Advertised prices are about 20% lower than the price the store would normally have charged.
 - Unadvertised prices the same.
 - No competitive responses.
- 3] Advertising stores share of lottery tickets: 16.4% \rightarrow 18.4%. Proxy for a small shift in demand.

Markov Processes

Defn: a time-homogeneous Markov chain is a sequence of random variables X_1, X_2, X_3, \dots such that there exists a finite set S and a function $p: S \times S \rightarrow \mathbb{R}^+$ s.t.

$$1] \text{Supp } \{X_t\} = S$$

$$2] \Pr [X_{t+1} = z' \mid X_t = z, X_{t-1}, X_{t-2}, \dots] = p(z, z')$$

We typically write $S = \{1, \dots, N\}$ and represent the transition function as a matrix:

$$P(i, j) = P_{ji}$$

Write the distribution μ_t of X_t as a vector

$$\begin{bmatrix} \mu_{t1} \\ \vdots \\ \mu_{tn} \end{bmatrix}$$

Prop: $\mu_1 = P \mu_0$

Corollary: $\mu_t = P^t \mu_0$

Defn: A Markov chain is irreducible if $\forall z, z' \in S$,
 $\exists t$ s.t. $\Pr[X_t = z' \mid X_0 = z] > 0$

Defn: A Markov chain is aperiodic if

$$\text{GCF} \{ t \mid \Pr[X_t = z \mid X_0 = z] > 0 \} = 1 \quad \forall z.$$

greatest common factor,

Defn: A steady state distribution of (S, P) is a vector $\pi \in \mathbb{R}^{+n}$ s.t. $\pi = P \cdot \pi$

Prop: If (S, P) is irreducible and aperiodic, then

1] \exists a unique steady state distribution π

2] $\lim_{t \rightarrow \infty} P^t \mu_0 = \pi \quad \forall \mu_0$

3] $\lim_{t \rightarrow \infty} \frac{1}{t} \sum_{\tau=1}^t \mathbb{1}\{X_\tau = z\} = \pi_z$

4] $\exists \lambda < 1$ s.t. $\|P^t \mu_0 - \pi\| = O(\lambda^t) \quad \forall \mu_0.$

• converge at an exponential rate.