Recap

- Last week
  - Double marginalization
  - Supply Chain Coordination
    - Take it or leave it, Marginal pricing
    - Two-part Tariff, Quantity Discount
    - Revenue Sharing
    - Buy-back contracts
  - Risk
  - Voluntary Compliance
- Tues Feb 13
  - Contracts with Sales Effort
  - Contracts under uncertain demand
- Thurs Feb 15: EXAM

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Revenue Sharing with Sales Effort (CSC)

- Revenue depends on quantity and effort: R(q,e)
- CSC: $\Pi^* = R(q,e) - cq - g(e)$
  - g(e) is an increasing, differentiable, convex function with g(0) = 0
- Optimal effort:
  - $\partial\Pi/\partial e = \partial R(q,e)/\partial e - g'(e) = 0$ ..... (1)
- Optimal quantity:
  - $\partial\Pi/\partial q = \partial R(q,e)/\partial q - c = 0$ ..... (2)

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Revenue Sharing with Sales Effort (DSC)

- Retailer's profit
  - $\Pi(q) = \alpha R(q,e) - wq - g(e)$
- Optimal effort:
  - $\partial\Pi/\partial e = \alpha\partial R(q,e)/\partial e - g'(e) = 0$ ….. (3)
  - Implications?
- Optimal quantity:
  - $\partial\Pi/\partial q = \alpha\partial R(q,e)/\partial q - w = 0$
  - At optimal alpha:
  - $\partial R(q,e)/\partial q - w = 0$ …..(4)
  - Implications?
- Overall conclusion?

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Revenue Sharing vs QD

- Retailer's revenue?
- If demand is uncertain, who bears the risk?

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Quantity Discount with Sales Effort

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Buy-back Contracts under Uncertainty

- Simple model
  - Single selling period, retail price *p*
  - Random demand with probability distribution F(x)
- Retailer's expected profit
  $P(q,w,b) = p(q - \int_{0\to q} F(x)dx) + b \int_{0\to q} F(x)dx - wq$
  Optimal q:
  $F(q) = (p-w)/(p-b)$
- The profit of the integrated system
  $P(q) = p(q - \int_{0\to q} F(x)dx) - cq$
  Optimum q_I:
  $F(q_I) = (p-c)/p$

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Buy-back contracts

- $F(q)=(p-w)/(p-b)$
- $F(q_l)=(p-c)/p$ in the integrated system

$F(q_l)=F(q)$ if $(p-c)/p = (p-w)/(p-b)$
$w=?$ $b=?$
Set $b=p(1-\alpha)$, $w=p(1-\alpha)+\alpha c$ $(0<\alpha<1)$

$(p-w) = p - p + \alpha p - \alpha c = \alpha(p-c)$
$(p-b) = p - p + \alpha p = \alpha p$
$F(q)=(p-w)/(p-b) = \alpha(p-c)/\alpha p = (p-c)/p = F(q_l)$

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Price as a Decision

- Do the contracts still coordinate?

- Revenue Sharing
- Quantity Discount
- Two-part tariff
- Buy-back

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Recap

- Previously
  - Supply Chain Coordination
    - Revenue Sharing with Sales Effort
    - Mostly deterministic models
  - Pricing in automotive
- Today Feb 27
  - Contracts with Sales Effort (cont)
  - Contracts under uncertain demand

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