Trade with Incomplete information: "The Lemons Problem"

Based on Akerlof (1970)

Players: Buyer, Seller, Nature

Trade with Incomplete information: "The Lemons Problem"

Based on Akerlof (1970)

Players: Buyer, Seller, Nature

Play: [Board – Sketch tree]
1. Nature chooses quality of car x according to probability distribution:
x ˜$U(0,1)$ (standard uniform distribution; revise)

Trade with Incomplete information: "The Lemons Problem"

Based on Akerlof (1970)

Players: Buyer, Seller, Nature

Play: [Board – Sketch tree]
1. Nature chooses quality of car x according to probability distribution: $x \,\tilde{}\, U(0,1)$ (standard uniform distribution; revise)

2. Seller proposes a *tioli* price (could have buyer propose, or some bargaining process).

Technical: an equilibrium must specify what price each type of Seller would propose, i.e., specify a function $p^*(x)$.

Trade with Incomplete information: "The Lemons Problem"

Based on Akerlof (1970)

Players: Buyer, Seller, Nature

Play: [Board – Sketch tree]

1. Nature chooses quality of car x according to probability distribution: $x \,\tilde{}\, U(0,1)$ (standard uniform distribution; revise)

2. Seller proposes a *tioli* price (could have buyer propose, or some bargaining process).

Technical: an equilibrium must specify what price each type of Seller would propose, i.e., specify a function $p^*(x)$.

3. Buyer decides whether to buy or not.

Trade with Incomplete information: "The Lemons Problem"

Based on Akerlof (1970)

Players: Buyer, Seller, Nature

Play: [Board – Sketch tree]

1. Nature chooses quality of car x according to probability distribution: $x \,\tilde{}\, U(0,1)$ (standard uniform distribution; revise)

2. Seller proposes a *tioli* price (could have buyer propose, or some bargaining process).

Technical: an equilibrium must specify what price each type of Seller would propose, i.e., specify a function $p^*(x)$.

3. Buyer decides whether to buy or not.

Technical: An equilibrium profile must specify a complete strategy for Buyer, i.e., a function $B^*(p) \in \{0,1\}$. It is wlog to assume that such a strategy will be "Buy if $p \leq \overline{p}$ " for some maximum price $\overline{p}$.

Payoffs:

Buyer values the car at $\frac{3}{2}x$;

thus gets payoff $u_B = \begin{cases} \frac{3}{2}x - p \text{ if buy} \\ 0 \text{ otherwise} \end{cases}$ (we assume separable utility here)

Payoffs:

Buyer values the car at $\frac{3}{2}x$;

thus gets payoff $u_B = \begin{cases} \frac{3}{2}x - p \text{ if buy} \\ 0 \text{ otherwise} \end{cases}$ (we assume separable utility here)

Seller values the car at x,

thus gets payoff $u_s = \begin{cases} p \text{ if Buyer chooses "buy"} \\ x \text{ otherwise (keeps the car)} \end{cases}$

Payoffs:

Buyer values the car at $\frac{3}{2}x$;

thus gets payoff $u_B = \begin{cases} \frac{3}{2}x - p \text{ if buy} \\ 0 \text{ otherwise} \end{cases}$ (we assume separable utility here)

Seller values the car at x,

thus gets payoff $u_s = \begin{cases} p \text{ if Buyer chooses "buy"} \\ x \text{ otherwise (keeps the car)} \end{cases}$

Efficient outcome: Buyer must buy the car.

Any price p s.t. $x \leq p \leq \frac{3}{2}x$ will yield trade and will be a Pareto-improvement over no trade.

Equilibrium outcome:

Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

Equilibrium outcome:
Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

What is $E(x|p)$?

Equilibrium outcome:
Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

What is $E(x|p)$?
Note: Seller will never set $p < x$, since Seller would prefer to keep the car at such a price. Thus, observing p tells Buyer that $x \leq p$.

Equilibrium outcome:
Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

What is $E(x|p)$?
Note: Seller will never set $p < x$, since Seller would prefer to keep the car at such a price. Thus, observing p tells Buyer that $x \leq p$.

For a standard uniform distribution, $E(x|x \leq p) = \frac{1}{2}p$. Thus $E(x|p) = \frac{1}{2}p$.

Equilibrium outcome:

Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

What is $E(x|p)$?

Note: Seller will never set $p < x$, since Seller would prefer to keep the car at such a price. Thus, observing p tells Buyer that $x \leq p$.

For a standard uniform distribution, $E(x|x \leq p) = \frac{1}{2}p$. Thus $E(x|p) = \frac{1}{2}p$.
Thus, $\bar{p} = \frac{3}{2}E(x|p) = \frac{3}{2} \times \frac{1}{2}p = \frac{3}{4}p$.

Equilibrium outcome:
Buyer's equilibrium strategy must set $\bar{p} = \frac{3}{2}E(x|p)$. I.e., buy if the price is below $\frac{3}{2}$ of buyer's expectation over the quality of the car – where that expectation will depend on the price offered!

What is $E(x|p)$?
Note: Seller will never set $p < x$, since Seller would prefer to keep the car at such a price. Thus, observing p tells Buyer that $x \leq p$.

For a standard uniform distribution, $E(x|x \leq p) = \frac{1}{2}p$. Thus $E(x|p) = \frac{1}{2}p$.
Thus, $\bar{p} = \frac{3}{2}E(x|p) = \frac{3}{2} \times \frac{1}{2}p = \frac{3}{4}p$.

What does this mean? For any price p offered, the Buyer values the product at $\frac{3}{4}p$. Thus, for any price offered, the Buyer will reject! Thus, the only equilibrium must involve no trade, and thus be inefficient!