Before the exam, we talked about price search and saw one model, Diamond, that said all firms price at $P^m$ in the presence of any search costs at all:

- knife-edge aspect of pricing seems unrealistic
- there is a lot of price dispersion in real life
- casual empiricism suggests that degree of price dispersion might be a function of level of search costs

First, we must introduce a notion of a mixed strategy.

What we’ve encountered so far in games we’ve seen are what are called “pure strategies.” A pure strategy is a well-defined, non-stochastic action or set of actions.

A “mixed strategy” is simple one of a number of pure strategies chosen stochastically with a fixed frequency.

- e.g., flip a coin
  - H → set $P = P^m$
  - T → set $P = c$
- e.g., game played between pitcher and batter in baseball
  - strategies:
    * pitcher: what pitch to throw
    * batter: whether to prepare for a particular pitch & which one
  - batter has huge advantage if he knows a fastball or curveball or slider is coming
  - even though there are some game situations where fastball sort of makes more sense than other pitches, pitcher will still want to employ a mixed strategy of what pitch to throw
  - batters will also want to employ a mixed strategy between swinging aggressively for a particular pitch or more tentatively to be able to adjust

**Model**

\[
\begin{align*}
\text{same as Diamond} \quad \begin{cases} 
N \text{ firms produce homogeneous goods} \\
\text{constant, common } mc, c \\
\text{continuum of consumers, each with } D(P) \\
\text{assume } (P - c)D(P) \text{ concave} \\
firms \text{ simultaneously choose prices } P_1, ..., P_N \\
\end{cases} \\
\end{align*}
\]

- fraction of consumers $\mu$ have search cost $s \leq 0$ “shoppers”
- fraction $1 - \mu$ have search cost $s \sim [s, \bar{s}]$ with $0 < s < \bar{s} < cs(P^m)$
- consumers search optimally and purchase as before
Proposition (Stahl, 1989)

- the model has no pure strategy NE
- there exists a symmetric mixed strategy NE where firms choose prices from a continuous distribution $F$ with support not containing $c$–price dispersion.
- as proposition of shoppers ($\mu$) goes from 0 to 1, the NE changes continuously from Diamond NE to Bertrand NE
- as $s$ and $\bar{s}$ decrease, the NE converges to Bertrand

Notes

- Diamond produces extreme result ($P^m$) with infinitesimal search costs
- search costs confer de factor monopoly status on every seller
- Diamond also predicts that everyone prices the same – no dispersion
- empirical evidence suggests that markets where search costs are substantial exhibit a lot of price dispersion
- including a fraction of people who like to shop in the model changes results substantially
  - price dispersion
  - doesn’t have knife-edge characteristic like Diamond
- in Stahl model, prices increase with increased search costs, which suggests collective incentive of firms to raise search costs (perhaps not individual)