Market simulation

- Your mission: maximize portfolio value
  \[ = \text{(# shares} \times \text{your valuation per share}) + \text{cash}.\]
- Different people have different valuations for shares; hence there are “gains from trade.” Keep your valuation secret!
- You may freely buy and/or sell shares at any agreed upon price, but: cash balance must be positive at all times.
- Keep a record of all transactions.

Record Sheet

<table>
<thead>
<tr>
<th>Number</th>
<th>Buy/Sell</th>
<th># of Shares</th>
<th>Price</th>
<th>Cash Balance</th>
<th>Portfolio Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Buy</td>
<td>1</td>
<td>340</td>
<td>340</td>
<td>780</td>
</tr>
<tr>
<td>2</td>
<td>Sell</td>
<td>2</td>
<td>40</td>
<td>1040</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Buy</td>
<td>1</td>
<td>1</td>
<td>1040</td>
<td>1010</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Context and concepts

- Context: Analyst/investor/consultant needs to estimate product price in (new or changing) market.
- Concepts: demand curve, supply curve, equilibrium; shifts in demand, supply and price.

The demand curve

- Demand curve: quantity “demanded” at any given price
  - Slope and shape depend on tastes
  - Normally downward sloping
  - Price on the vertical axis
- Inverse demand: what would you be willing to pay for a new laptop?

Demand curve: at price \( P_1 \) buyers are willing to purchase \( Q_1 \).
The demand function
- Quantity demanded also depends on “other factors”
  - prices of substitutes or complements (Pepsi and Coke; cars and gas)
  - population and income (expensive vacations; higher education)
  - advertising (Nike; cod fish)
  - lots of other things
- Changes in other factors shift the demand curve
- Important to distinguish between
  - movements along the demand curve (changes in price)
  - shifts in the curve itself (changes in other factors)

The supply curve
- Supply curve: quantity “supplied” at any given price
  - Slope and shape depend on costs (+ market power)
  - Normally upward sloping
  - Price on the vertical axis
- Inverse supply: at what price would you be willing to sell your new laptop?

The supply function
- Quantity supplied also depends on “other factors”
  - Input prices (gasoline ← oil price)
  - technology and nature (earthquake)
  - Number of suppliers
  - lots of other things
- Changes in other factors shift the supply curve
- Important to distinguish between
  - movements along the supply curve (change in price)
  - shifts in the curve itself (changes in other factors)
**Market equilibrium**

- [Equilibrium of a system: situation where all forces cancel out, so that the system is at rest]
- Equilibrium price: a price \( P^* \) such that supply equals demand
- \( P > P^* \) implies excess supply
- \( P < P^* \) implies excess demand

![Market equilibrium: intersection of supply and demand curves](image)

**Law of supply and demand**

In competitive markets,
- When there is excess supply, there is a tendency for price to decrease
- When there is excess demand, there is a tendency for price to increase
- In general, price tends to its equilibrium level

**Simulation analysis**

- Why did the price behave as it did?
- Who ended up with the shares?
- Who were the big winners?

**Changes in market conditions**

- [a.k.a. "comparative statics"]
- What is the impact of changes in "other factors" on price and output? (higher fuel prices and airfares; Taiwan earthquake and DRAM prices; economic growth in Calif and price of electricity)
- Answer: compute new equilibrium after one or both curves shift

![Impact of Taiwan earthquake on DRAM price and output](image)
**Price vs output effect**

- The relative impact of a change on price and output depends on the slope of the relevant curve.
  - Supply shift:
    - Impact on price greater the “steeper” the demand curve
    - Impact on output greater the “flatter” the demand curve
  - Demand shift:
    - Impact on price greater the “steeper” the supply curve
    - Impact on output greater the “flatter” the supply curve

**Exercises**

For each of the following events, shift the appropriate supply and demand curves [markets in brackets]. What is the impact on price and output? Is the impact primarily on price or output?

- Unusually rainy fall in NYC [umbrellas]
- Fall in the NASDAQ [housing market in Palo Alto]
- Wireless bandwidth breakthrough [wireless web]
- More liberal Medicare [prescription drugs]

**Supply and demand in practice**
### Application: rent regulation

- In NYC (and many other cities), rents are capped below their equilibrium level.
- What is the impact of rent regulation on market equilibrium?
- Who gains and who loses from rent controls?
- What are the goals of rent regulation? Are there any alternatives to achieve the same goals?

### Tricky ones

- **Microprocessors:**
  - Who’s the consumer? How is demand determined?
- **Textbooks**
  - Who’s the consumer? How price sensitive?
- **Prescription drugs**
  - Who’s the customer? How price sensitive?
  - What if they’re OTC?
- **“The Sopranos” (cable TV show)**
  - What’s the demand? What’s the revenue model?

### Takeaways

- The supply and demand diagram is a framework for understanding markets.
- Inputs: characteristics of buyers and sellers (demand and supply curves).
- The quantitative impact of “shocks” depends on the sensitivity of buyers and sellers to changes in price (slopes of demand and supply curves).
- Market forces are often felt even when prices are “controlled” by regulation.