Market Equilibrium and Linear Equations

Market Equilibrium and Linear Equations

- Linear equations can be used to solve the market equilibrium by setting the quantity supplied equal to the quantity demanded

  - The market is in equilibrium when $Q_d = Q_s$

- **Example;** Suppose the market for cappuccino can be modeled by the following, $Q_d = 600 - 50P$ and $Q_s = -200 + 150P$

Linear supply and demand schedules: Cappuccinos		
Price of Cappuccinos (P)	**Quantity demanded (Q_D)**	**Quantity supplied (Q_S)**
10	100	1300
8	200	1000
6	300	700
4	400	400
2	500	100
0	600	-200

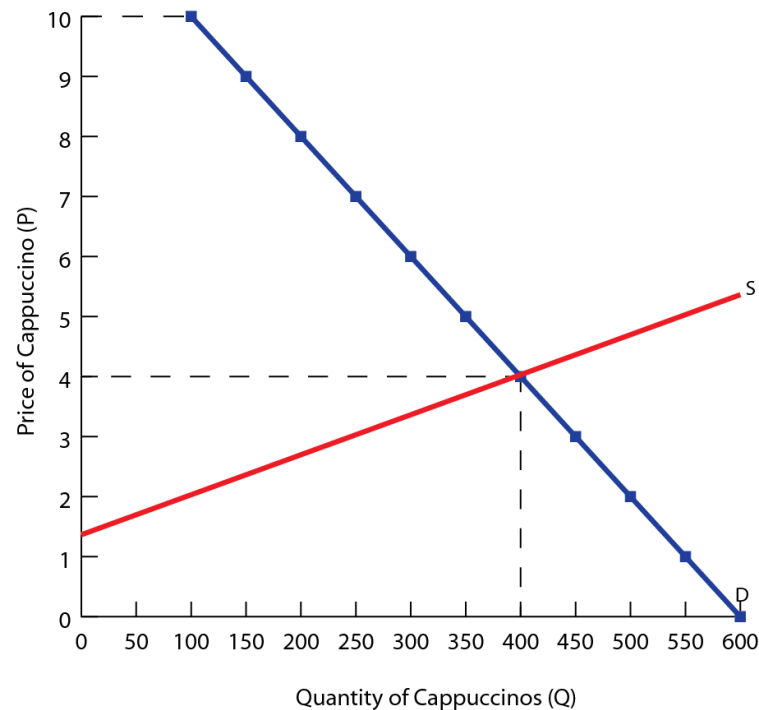- The equilibrium is the point at which supply equals demand,

$$Q_d = Q_s$$

$$600 - 50P = -200 + 150P$$

$$200P = 800$$

Therefore, $P_E = \$4$ and $Q_E = 400\ \textbf{units}$

Therefore the equilibrium price is $4 and the quantity is 400 units

Price of Cappuccino (P) / Quantity of Cappuccinos (Q)

Shifts in Supply and Equilibrium

- Shifts in the supply can also be illustrated using linear functions

- **Example;** Suppose the price of coffee beans increases, adding to the costs of the production of cappuccino and reducing the supply. The new supply function is $\mathbf{Q_s = -400 + 150P}$

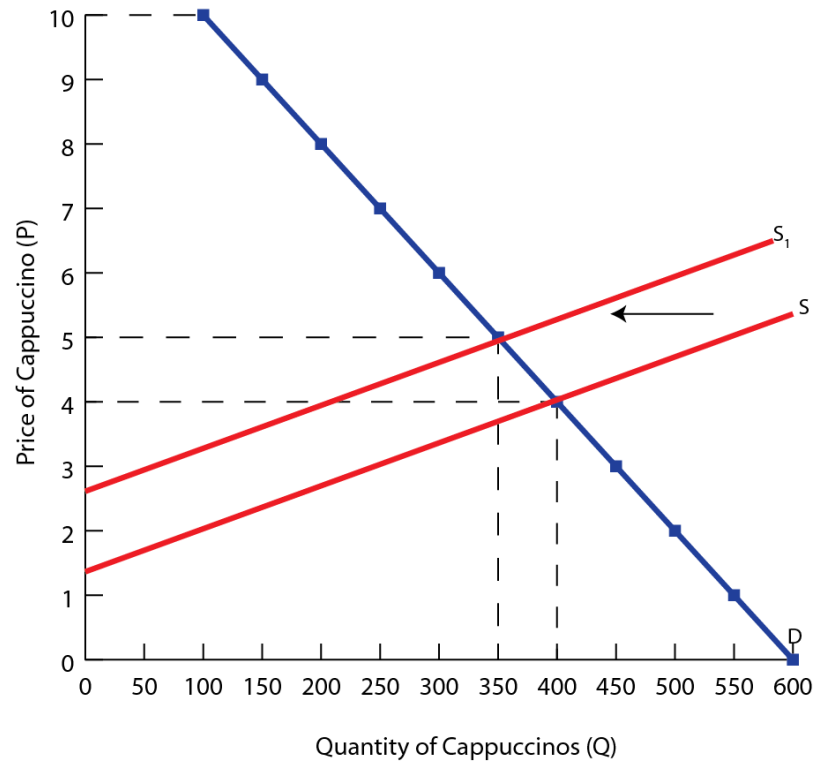| Linear supply schedule: Cappuccinos	
Price of Cappuccinos (P)	**Quantity supplied per day (Q_D)**
10	1100
8	800
6	500
4	200
2	-100
0	-400

o Solving the new equilibrium,

$$Q_d = Q_s$$

$$600 - 50P = -400 + 150P$$

$$200P = 1000$$

Therefore, $P_E = \$5$ and $Q_E = 350$ units

o The price rises until the market is cleared, with all excess demand eliminated

Shifts in Demand and Equilibrium

- Changes in demand will also effect the equilibrium price and quantity

- **Example;** Suppose a decrease in the demand for cappuccinos shifts the demand curve to the right. In addition, the demand curve becomes less elastic. The new demand function is $Q_d = 400 - 25P$

    - Solving the new equilibrium algebraically,

        $Q_d = Q_s$

        $400 - 25P = -200 + 150P$

        $600P = 175$

        Therefore, $P_E = \$3.43$ and $Q_E = 314$ **units**

The decrease in demand causes the price of cappuccinos to fall from $4 to $3.43 and the equilibrium quantity to decrease from 400 to 314 drinks