

## Agenda

1. Where Are We?
2. What is Economics?
3. Three Key Analytical Tools
  - ▶ Constrained Optimization
  - ▶ Equilibrium Analysis
  - ▶ Comparative Statics
4. Two More

## What is Economics

- ▶ Economics - Science of

**Macroeconomics**

**Microeconomics**

## Economic Modeling

- ▶ Economic models are simplifications.
  - ▶ **Exogenous Variable** -
  - ▶ **Endogenous Variable** -



- ▶ Three important tools used in almost all economic models.
  - ▶ Constrained Optimization
  - ▶ Equilibrium Analysis
  - ▶ Comparative Statics

## Constrained Optimization

- ▶ Constrained optimization - make best choice given limitations.
  - ▶ **Objective Function** -
  - ▶ **Constraint** -
- ▶ Examples:

Objective Function	Constraint
Corn Planted	
Clothes Purchased	
Hours Studying	
Items Produced	

- ▶ Farmer with  $F$  feet of fence wants to maximize size of fenced area.

### Constrained Optimization - Example

▶ Example: Maximize Computer Sales Given Advertising Revenue

- ▶  $I$  - Money Spent on Internet Ads
- ▶  $T$  - Money Spent on TV Ads
- ▶  $S(I, T)$  - New Beer Sales given  $I$  and  $T$ .
- ▶ Budget = \$ 1,000

▶ Problem written as:

$$\begin{aligned} & \max_{(I, T)} S(I, T) \\ & \text{subject to: } I + T = 1,000 \end{aligned}$$

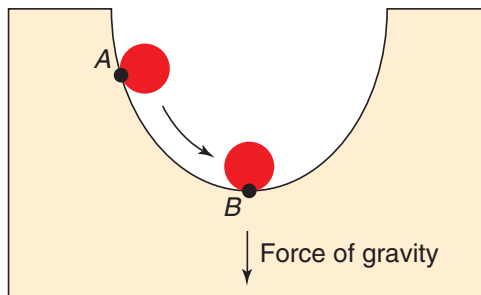
### Constrained Optimization

New Sales Generated $S(I, T)$		
Total Spent	Internet Ads	TV Ads
0	0	0
100	4,750	3,000
200	9,250	5,800
300	13,000	8,500
400	15,750	11,100
500	18,050	13,600
600	20,150	16,000
700	22,050	18,000
800	23,750	19,500
900	25,250	20,500
1,000	26,550	21,000

Marginal Sales Generated		
Total Spent	Internet Ads	TV Ads
0→100	4,750	3,000
100→200	4,500	2,800
200→300	3,750	2,700
300→400	2,750	2,600
400→500	2,300	2,500
500→600	2,100	2,400
600→700	1,900	2,000
700→800	1,700	1,500
800→900	1,500	1,000
900→1000	1,300	500

### Equilibrium Analysis

Definition (Equilibrium)



### Equilibrium Analysis Example

Buyers - Willing to Pay

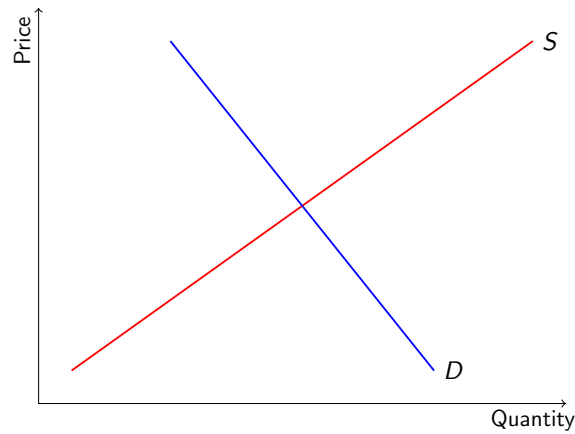
- ⦿ \$ 0.75
- ⦿ \$ 0.65
- ⦿ \$ 0.55
- ⦿ \$ 0.45
- ⦿ \$ 0.35
- ⦿ \$ 0.25

Sellers - Willing to Accept

- ⦿ \$ 0.25
- ⦿ \$ 0.35
- ⦿ \$ 0.45
- ⦿ \$ 0.55
- ⦿ \$ 0.65
- ⦿ \$ 0.75

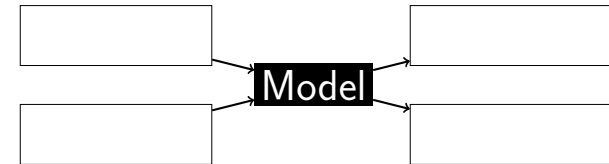


Equilibrium Analysis Example



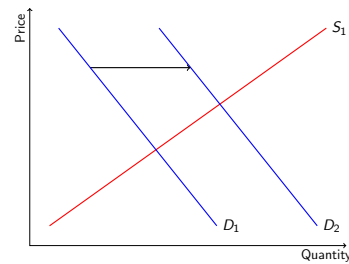
Comparative Statics

Definition (Comparative Statics)



Comparative Statics Examples

Exogenous Variable	Endogenous Variable
Rain in Columbia	Coffee prices
Number of Firms	Industry price
Consumer Income	Demand for food
Cost of Microchip	Supply of computers
Demand	Price, Quantity



Positive vs. Normative

Definition (Positive Analysis)

Attempts to explain how an economic system works or to predict how it will change over time.

Definition (Normative Analysis)

Analysis that typically focuses on issues of social welfare, examining what will enhance or detract from the common good.

## Two Equations, Two Unknowns

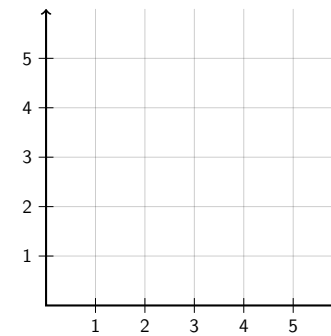
- ▶ Two Equations, Two Unknowns,

$$9 = 6y - 3x \quad (1)$$

$$18 = 2y + 4x \quad (2)$$

- ▶ With 2 equations and 2 unknowns, we can

## Two Equations, Two Unknowns

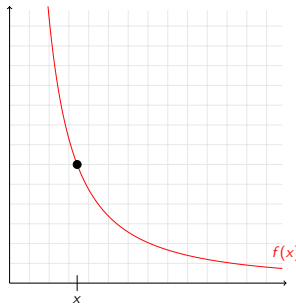


- ▶ Examples where this will show up:
  - ▶ Supply and demand
  - ▶ Maximizing utility subject to budget
  - ▶ Profit maximization for firm

## Derivatives

- ▶ Derivatives are the slope of the function at a given point.

$$\frac{d}{dx}f(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$



## Derivatives

- ▶ Derivative approximation
- ▶ Common derivatives,
  - ▶ Linear Function,
  - ▶ Polynomial
  - ▶ Exponential
- ▶ The \_\_\_\_\_  $\Delta x$ , the more accurate the approximation.