

## Lesson 10. Market Models

### 1 A model for partial market equilibrium

- Let's consider a market with only one product
- Variables:

- Assumptions:

- Standard market equilibrium condition: demand and supply are balanced

- Quantity demanded is determined by:  $D = a - bP$  ( $a > 0, b > 0$ )

Does this make sense? Why?

- Quantity supplied is determined by:  $S = -c + dP$  ( $c > 0, d > 0$ )

Does this make sense? Why?

- Putting this all together, we have the model:

$$\begin{aligned}
 D &= S \\
 D &= a - bP \quad \text{where } a, b, c, d > 0 \\
 S &= -c + dP
 \end{aligned}
 \tag{A}$$

- (A) is a system of 3 variables and 3 linear equations

**Example 1.** Find a solution to (A).

• For what values of  $a, b, c, d$  does the solution in Example 1 make sense?

◦ Equilibrium price must be positive

◦ Equilibrium quantity must be positive

## 2 Two commodity partial market equilibrium

- Market with two products that are related to each other
- Variables:

$D_1$  = quantity demanded for product 1

$S_1$  = quantity supplied for product 1

$P_1$  = price of product 1

$D_2$  = quantity demanded for product 2

$S_2$  = quantity supplied for product 2

$P_2$  = price of product 2

- Model:

$$D_1 = S_1$$

$$D_2 = S_2$$

$$D_1 = d_0 + d_1P_1 + d_2P_2$$

$$D_2 = \delta_0 + \delta_1P_1 + \delta_2P_2$$

(B)

$$S_1 = s_0 + s_1P_1 + s_2P_2$$

$$S_2 = \sigma_0 + \sigma_1P_1 + \sigma_2P_2$$

- (B) is a system of 6 variables and 6 linear equations
- Depending on the economic context, the parameters  $d_0, d_1, d_2, s_0, s_1, s_2, \delta_0, \delta_1, \delta_2, \sigma_0, \sigma_1, \sigma_2$  will have particular signs, magnitudes or relationships between each other

- Product 1 and product 2 are **substitutes** if:

- Product 1 and product 2 are **complements** if:

- Using the equilibrium conditions, we can simplify the above model into 2 variables and 2 linear equations:

## 3 What's next?

- We have seen some examples of economic models that lead to systems of linear equations
- What if we have 3 products? 4 products? 100?
- **Matrices** are a useful tool for solving linear systems of any size