

## Notes on Chapter 3

### DEMAND AND SUPPLY

#### PRICES IN THE MARKET

- ✧ This chapter explains how prices are determined and how markets guide and coordinate choices.
- ✧ A **market** is a network or an arrangement that enables buyers and sellers to get information and exchange goods and services as well as resources, and respond to market prices.
- ✧ Prices are determined through the interaction between demand for and supply of the goods in goods markets or resources in resources market.
- ✧ Economists differentiate between two types of prices: money price and relative price.
  1. The **money price** of a good or service is the amount of money needed to buy it; i.e., it equals the actual money paid for the good.
  2. The **relative price** of a good is the *ratio* of its money price to the money price of the next best alternative good. A relative price is a measure of what you must give up to get one unit of a good or service. Therefore, relative price is a measure of the *opportunity cost* of this good.

✧ Example:

If the price of a TV is \$600 and the price of a PC is \$300, then

The money price of the TV = \$600

The relative price of the TV =  $\frac{600}{300} = 2 \text{ PCs}$

Find the money price and relative price of the PC.

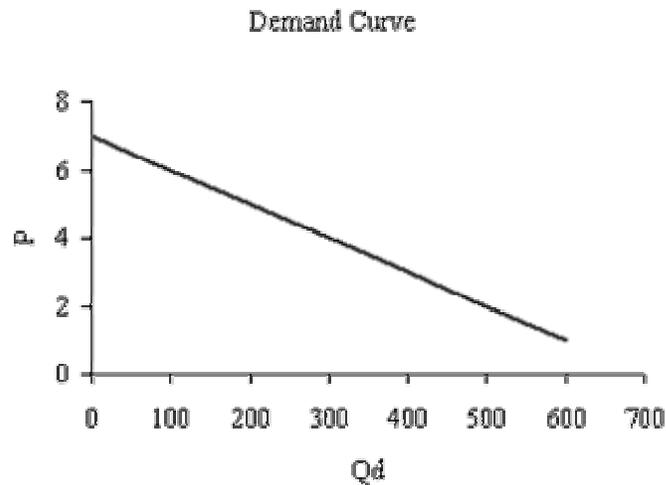
The demand for and supply of a good depend, in part, on its relative price.

## DEMAND

- ✧ We begin with demand because demand is usually easier to understand from our personal experiences. We are all consumers and we all demand goods and services.
- ✧ **Demand (D)** is defined as the different quantities of a good or service that consumers are willing and able (ready) to buy at different prices within a given time period, *ceteris paribus*.
- ✧ Demand is an expression of consumers' plans or intentions to buy – an offer to buy – not a statement of actual purchase. Actual quantities that will be purchased depend on the interaction between demand and supply through price adjustments.
- ✧ Time is important element here. Without time dimension we cannot tell whether the quantity demanded is large or small.
- ✧ Demand is represented by the whole demand schedule and the entire demand curve.
- ✧ **Demand schedule** is a table that lists the quantities of a good a consumer is willing and able to buy at each price level in a given time period, *when all other things remain the same*.
- ✧ **Demand curve** is a graphical representation of the demand schedule.
- ✧ Demand curve can be considered as the **willingness-and-ability-to-pay curve**. It shows the **maximum price** a consumer is willing to pay for that quantity of a good or service.
- ✧ The maximum price a consumer is willing to pay for that quantity of a good or service is the measure of **marginal benefit** that the consumer receives for that unit of output. As the quantity available increases, the marginal benefit of each additional unit falls and the highest price the consumer is willing and able to pay also falls.
- ✧ It indicates the opportunity cost of buying the good.
- ✧ It does not also tell us the amount of the good the consumer will actually buy. It just tells us the planned purchase.

**Demand Schedule**

<b>P</b>	<b>Q<sub>d</sub></b>
7	0
6	100
5	200
4	300
3	400
2	500
1	600



- ✧ The **quantity demanded (Q<sub>d</sub>)** of a good or service is a specific amount that consumers are ready (they plan) to buy at a particular price during a given period of time assuming other factors influencing the purchase of goods and services are constant.
- ✧ A quantity demanded is represented by a specific line in the demand schedule and a specific point on the demand curve at specific price.

**The Law of Demand**

- ✧ The law of demand shows an inverse (negative) relationship between price and quantity demanded *everything else remains the same*.
- ✧ Quantity demanded of a good increases in a given time period as its price falls, *ceteris paribus*. The opposite is true; consumers will buy less if the price of the good is high, *ceteris paribus*.
- ✧ Because of the law of demand, demand curve has negative slope (is downward sloping)
- ✧ **(Reading)** The inverse relationship between price and quantity demanded depends on two factors:
- ✧ Substitution effect:  
When the relative price (opportunity cost) of a good or service rises, people seek substitutes for it, so the quantity demanded decreases.

✧ Income effect:

When the price of a good falls, individual tend to buy more of that good because, with the lower price, the individual consumer can afford to buy exactly the same amount as before and have money remaining, as if his income increases. Then, with the remaining money the consumer can buy more goods.

○ Example:

Suppose income = \$100, price of good A = \$10, and price of good B = \$5.

Suppose you buy 4 units of A and 12 units of B  $\Rightarrow (4)(10) + (12)(5) = \$100$ . Now, if price of B rises to \$10  $\Rightarrow (4)(10) + (12)(10) = \$160$ . To buy the same quantity of A and B you need more income; so you end up buying less of the good(s) than before, as if your income decreases by \$60.

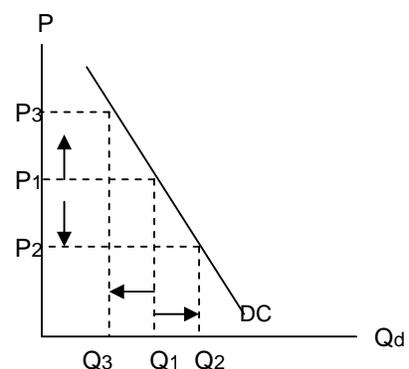
Suppose, on the other hand, the price of B stays at \$5 while the price of A falls to \$5. Now the same quantity of both goods could be purchased by \$80, and you are left with \$20 extra, as if your income increased by \$20.

**Change in Quantity Demanded vs. Change in Demand (Movements vs. Shifts)**

- ✧ It is important to make a distinction between the change in demand and the change in quantity demanded to distinguish a shift in the demand curve from a movement along demand curve.

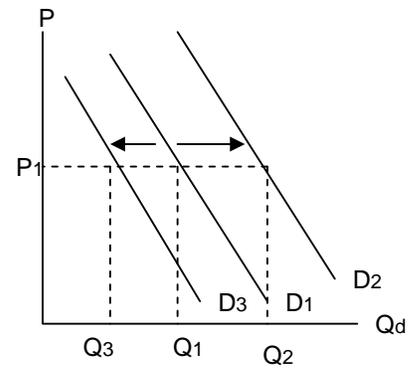
**Change in the quantity demanded:**

- ✧ Changes in the quantity demanded refers to the movements along a “fixed” demand curve as a response to a change in the good's own price, *ceteris paribus*.
- ✧ An increase in quantity demanded is caused by a decrease in price while a decrease in quantity demanded is caused by an increase in price.



**Change in demand:**

- ✧ When one or some of the factors influencing demand change, with the price of the good remains constant the demand will change and the demand curve will shift rightward or leftward.
- ✧ The shift in demand refers to the change in the quantity demanded at every given price.
- ✧ In this case, even though the price of the good remains constant the quantity will either rise or fall as shown in the graph. When the other factor causes the demand to shift to the right, the move from  $D_1$  to  $D_2$ , then this is referred to as an increase in demand. This is because; at the same price of  $P_1$  the quantity that consumers plan to buy increases from  $Q_1$  to  $Q_2$ . Likewise, when the other factor causes the demand curve to shift to the left, the move from  $D_1$  to  $D_3$ , then this is referred to as a decrease in demand. This is because; at the same price of  $P_1$  the quantity that consumers plan to buy decreases from  $Q_1$  to  $Q_3$



## Factors that Affect Demand (Determinants of Buying Plans)

- ✧ Aside from the price of the good, there are other variables that obviously do influence consumers' decisions on how much of a good they are willing and able (ready) to buy. These factors that affect demand include:

### 1. Change in Consumers' Incomes:

- The influence of consumers' income on demand depends on whether the good is normal good or inferior good.
- For a **normal good**, an increase in income increases demand for the good and shifts the demand curve rightward; (examples include cloths, cars, vacations)
- For an **inferior good**, an increase in income decreases demand for the good and shifts the demand curve leftward. Examples of inferior goods include used cars or used furniture. Inter-city bus is another example of an inferior good

If Income	↑	↓
Demand for normal good	↑	↓
Demand for inferior good	↓	↑

### 2. The Prices of Related Goods:

- Goods are either related or unrelated to each other for consumers.
- When two goods are **unrelated**, then the change in the price of one good will have no impact on the demand for the other good. For example, the change in the price of potatoes will not affect the demand for cars.
- The availability and price of related goods affect the demand for goods and services. The effect of related goods depends on whether they are substitute goods or complementary goods.
- **Substitutes:**
  - Substitute goods in consumption are goods that can be used or consumed in place of one another. For example, Pepsi and Coke, black pen and blue pen that I usually use in class, oil fuel versus nuclear fuel, CDs and cassettes.

- When two goods are substitutes in consumption, then a rise in the price of one good will increase demand (shifts demand curve rightward) for the other good and the opposite is true for the decrease in the price of the first good.
- **Complements:**
  - Two goods are complements in consumption if they are normally consumed together. For example, cars and gasoline, DVDs and DVD players, sugar and tea, etc.
  - When two goods are complements in consumption, then an increase in the price of one of the goods will decrease the demand for the other good and the opposite is true. For example, the demand for rented DVDs would increase and the demand curve will shift rightward if the price of DVD players decreases.
- If X and Y are related goods, then

	P (X)	D(Y)	Relationship
Substitutes	↑	↑	+
Complements	↑	↓	-

### 3. Expectations about the Future:

- If the price of a good is expected to rise in the future, current demand increases and the demand curve shifts rightward.
- If consumers' income is expected to rise in the future, current demand increases and the demand curve shifts rightward.

### 4. Tastes and Preferences

- People with the same income have different demands if they have different preferences.
- If the taste is in favor of the good, demand for it will increase. The opposite is true

### 5. The Number of Buyers in the Market (Population)

- The larger the population or the buyers of the good, the greater is the demand for the good.

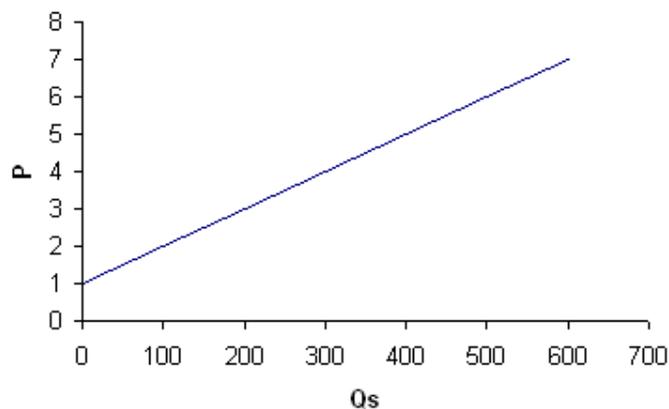
## SUPPLY

- ✧ Supply is derived from a producer's desire to maximize profits. Profit is the difference between revenues and costs.
- ✧ Resources and technology determine what it is possible to produce. Supply reflects a decision about which technologically feasible items to produce.
- ✧ The **supply** of a good or service refers to the quantities of a good or a service that producers are willing and able (ready) to produce (sell) at different prices in a given time period, *ceteris paribus*.
- ✧ Supply is an expression of seller's plans or intentions – an offer to sell – not a statement of actual sales.
- ✧ Supply is represented by the whole supply schedule and the entire supply curve
- ✧ **Supply curve** is a graphical representation of the supply schedule that shows the relationship between quantity supplied of a good and its price when all other influences on producer's planned sales remain the same.
- ✧ We can view the supply curve as a "**minimum-price-supply**" curve. For each quantity, the supply curve shows the minimum price a supplier must receive in order to produce that unit of output. When quantity supplied rises it increases the cost of production. So price of the good has to increase to compensate for the increased **marginal cost**.

**Supply Schedule**

<b>P</b>	<b>Qs</b>
7	600
6	500
5	400
4	300
3	200
2	100
1	0

**Supply curve**



- ✧ **The quantity supplied (Qs)** of a good or service is one particular amount that producers plan to sell during a given period of time at a particular price assuming other factors influencing the production of goods and services are constant.
- ✧ Quantity supplied is represented by a specific line in the supply schedule and a specific point on the supply curve.
- ✧ Time is important element here. Without time dimension, we cannot tell whether the quantity supplied is large or small.

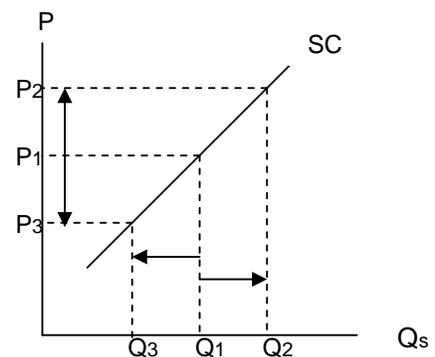
### The Law of Supply

- ✧ The law of supply shows a positive (direct) relationship between price and quantity supplied. The quantity of a good supplied in a given time period increases as its price increases, *ceteris paribus*.
- ✧ The law of supply results from the general tendency for the marginal cost of producing a good or service to increase as the quantity produced increases. Producers are willing to supply only if they at least cover their marginal cost of production.
- ✧ Because of the law of supply, supply curve has positive slope (is upward sloping.)

### Change in Quantity Supplied vs. Change in Supply (Movements vs. Shifts)

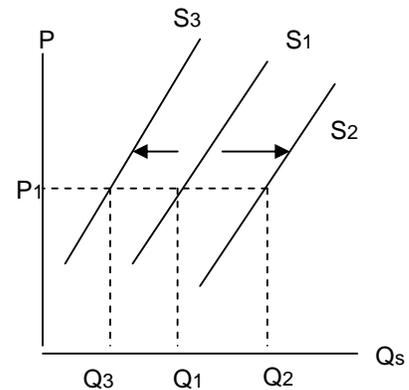
#### Change in the quantity supplied

- ✧ Quantity supplied changes as a result of the change in the good own price and referred to as movement along the same supply curve.
- ✧ Price is not constant along a given supply curve. An increase in price from  $P_1$  to  $P_2$  increases the quantity supplied from  $Q_1$  to  $Q_2$ . A decrease in quantity supplied would be caused by the price decreasing, say from  $P_1$  to  $P_3$



### Changes in supply

- ✧ Change in supply exists because of changes in one or some of non-price determinants of supply, which results in shifting the supply curve.
- ✧ An increase in supply results in a rightward shift and a decrease in the supply results in a leftward shift.
- ✧ At a price of  $P_1$  in the graph, when the supply curve shifts right from  $S_1$  to  $S_2$ , then quantity increases from  $Q_1$  to  $Q_2$ .
- ✧ When the other factors cause the supply curve to shift left, from  $S_1$  to  $S_3$ , the amount supplied decreases from  $Q_1$  to  $Q_3$ .



### Factors Affecting Supply

- ✧ Aside from the price of the good, there are other factors, which affect the suppliers' willingness and ability to supply a good or service. Determinants of market supply include:

#### 1. Change in the Cost of Factors of Production

- A supplier combines raw materials, capital, and labor to produce the output. The costs of production are the primary determinant of supply.
- If the price of resource used to produce a good rises, the minimum price that a supplier is willing to accept for producing each quantity of that good rises. So a rise in the price of productive resources decreases supply and shifts the supply curve leftward.
- Conversely, if input costs decline, firms respond by increasing output, which will in turn increase supply (supply curve shifts rightward).

#### 2. Changes in Technology

- New technologies means that either production increases with the same level of resources or that fewer resources are needed to produce the same

level of output. If fewer resources are needed to produce the same level of output when technology increases then production costs will fall causing supply to increase (shift right).

- Computer prices, for example, have declined radically as technology has improved, lowering their cost of production. Advances in communications technology have lowered the telecommunications costs over time. With the advancement of technology, the supply curve for goods and services shifts to the right.

### **3. Changes in the Price of Related Goods:**

- ✧ Similar to demand where goods are related in consumption, goods are also often related in production. The prices of related goods or services that firms produce influence supply. It depends on whether the goods are substitutes or complements.
- ✧ **Substitutes in production:**
  - The two goods are substitutes in production when both goods can be produced using the same resources. For example, corn and wheat, leather built and leather shoes.
  - A rise in the price of corn will increase the quantity supplied of corn and, as a result, decrease the supply of wheat and shift its supply curve leftward.
- ✧ **Complements in production:**
  - The two goods are complements in production if one good is produced as a by-product of the other good.
  - For example, an increase in the production of gasoline will increase the production of other goods, like kerosene and motor oil. This is because gasoline is produced by refining crude oil. The refining process produces a fixed proportion of a number of products including gasoline, kerosene and motor oil.

- Another example is beef and cowhide. If the price of beef rises the quantity supplied of beef will increase and as a result the supply of cowhide will increase and its supply curve will shift rightward.

	P (X)	S(Y)	Relationship
Substitutes	↑	↓	-
Complements	↑	↑	+

#### 4. Expectations about the Future:

- ✧ If the price of a good is expected to fall in the future, current supply increases and the supply curve shifts rightward.
- ✧ If firms anticipate a rise in price, they may choose to hold back the current supply to take advantage of the higher future price, thus decreasing market supply and the supply curve will shift leftward.

#### 5. Number of Sellers:

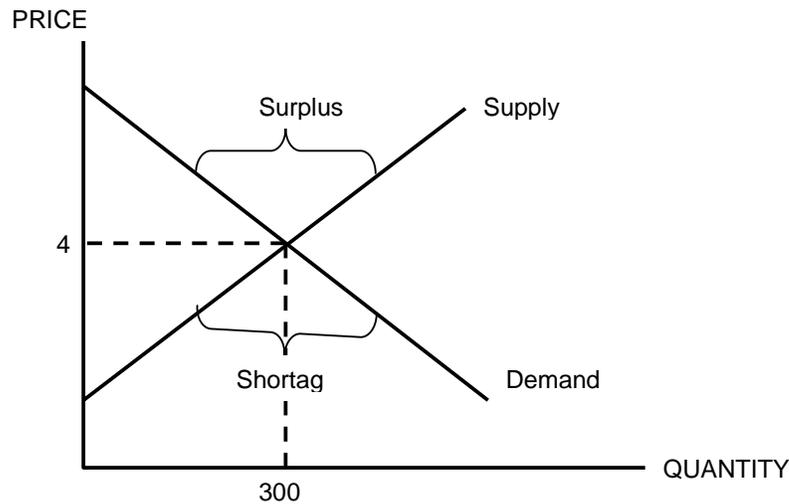
- ✧ The larger the number of suppliers of a good, the greater is the supply of the good. An increase in the number of suppliers shifts the supply curve rightward.

## EQUILIBRIUM: DETERMINATION OF PRICE AND QUANTITY

- ✧ **Equilibrium** is a situation in which opposing forces balance each other.
- ✧ **A market equilibrium** is a situation in which:
  - quantity demanded equals quantity supplied at a single price called market (equilibrium) price ( $P^*$ ). Price adjusts when plans do not match.
  - demand curve intersects supply curve, and
  - the market just clears and there is no tendency to change since the price balances the plans of buyers and sellers.
  - At the market equilibrium, the price accepted by producers for the last unit (marginal cost) is equivalent to the price the last consumer is willing and able to pay (marginal benefit).
- ✧ The equilibrium price ( $P^*$ ) is the price at which the quantity demanded equals the quantity supplied. Price regulates buying and selling plans. Equilibrium quantity ( $Q^*$ ) is the amount bought and sold at the equilibrium price  $P^*$ .
- ✧ The interaction between buyers and sellers through price adjustment, which results in equilibrium quantity, determine the answer to “what to produce.”
- ✧ "How we produce" is determined by profit seeking behavior and using resources efficiently (using the least-cost methods of production).
- ✧ The answer to "for whom" question includes only those people willing and able to pay market price ( $P^*$ ).
- ✧ Market equilibrium does not make everyone fully satisfied but it is efficient. (optimal but not perfect)
- ✧ We will analyze the equilibrium using tables, diagrams and mathematical equations through the following example.

**A. Tabular Illustration of Equilibrium, Surplus, and Shortage**

<u>P</u>	<u>Q<sub>d</sub></u>	<u>Q<sub>s</sub></u>	<u>(Q<sub>s</sub> – Q<sub>d</sub>)</u>	<u>Market situation</u>
7	0	600	600	surplus
6	100	500	400	surplus
5	200	400	200	surplus
<b>4</b>	<b>300</b>	<b>300</b>	<b>0</b>	<b>equilibrium</b>
3	400	200	-200	shortage
2	500	100	-400	shortage
1	600	0	-600	shortage

**B. Graphical Illustration of Equilibrium, Surplus, and Shortage**

- ✧ The market is at equilibrium (i.e., clear) at market price of  $P^* = 4$  and equilibrium quantity of  $Q^* = Q_d = Q_s = 300$  and there is no surpluses or shortages.
- ✧ Whenever the market price is set above or below the equilibrium price, either a market surplus or a market shortage will emerge.
- ✧ **Surplus:**
  - If  $P > P^* \Rightarrow Q_s > Q_d$ , surplus  $\Rightarrow$  producers  $\downarrow P$  in attempt to  $\downarrow$  excess inventory;  $Q_s \downarrow$  and  $Q_d \uparrow$ .
- ✧ **Shortage:**
  - If  $P < P^* \Rightarrow Q_d > Q_s$ , shortage  $\Rightarrow$  producers  $\uparrow P$  and  $Q_s \uparrow$  while  $Q_d \downarrow$ .

- ✧ To overcome a surplus or shortage, buyers and sellers will change their behavior.
- ✧ It is the price competition, by firms when a surplus exists and by consumers when a shortage exists, that moves a market back to the equilibrium.
- ✧ Price adjustments serve to clear the market of the imbalances. The clearing process continues until equilibrium is achieved.
- ✧ Only at the equilibrium price will be no further adjustments required.

### C. Mathematical Illustration of Equilibrium, Surplus, and Shortage

- ✧ Our first step is to build the demand curve equation and the supply curve equation
  - The law of demand states that there is an inverse relationship between price and quantity demanded. Assuming a straight-line demand curve, it can be described by the following equation:

$$P = a - b Q_d$$

- $a$  and  $b$  are positive numbers
- $a$  is the intercept on y-axis (where  $Q_d = 0$  and  $P = a$ ).  
If  $Q_d > 0$ ,  $P < a$ .
- $b$  is the slope of the demand curve. It has negative sign to reflect the inverse relationship between price and quantity demanded.

- The law of supply states that there is a positive relationship between price and quantity supplied. Assuming a straight-line supply curve, it can be described by the following equation:

$$P = c + d Q_s$$

- $c$  and  $d$  are positive numbers
- $c$  is the intercept on y-axis (where  $Q_s = 0$  and  $P = c$ ).  
If  $Q_s > 0$ ,  $P > c$ .
- $d$  is the slope of the supply curve. It has positive sign to reflect the direct relationship between price and quantity supplied.

✧ Demand and supply determine the market equilibrium. We can use these equations to find the equilibrium price ( $P^*$ ) and equilibrium quantity ( $Q^* = Q_d = Q_s$ ).

✧ So,  $P^* = a - b Q^*$

$$P^* = c + d Q^*$$

✧ Since the left-hand side is equal, the right-hand side must be equal

$$a - b Q^* = c + d Q^*$$

Solve for  $Q^*$

$$a - c = b Q^* + d Q^*$$

$$a - c = (b + d) Q^*$$

$$Q^* = \frac{a - c}{b + d}$$

✧ To find  $P^*$  substitute  $Q^*$  in either demand or supply equation

$$P^* = a - b Q^*$$

$$= a - b \left( \frac{a - c}{b + d} \right) = a - \frac{b(a - c)}{b + d} = \frac{a(b + d) - b(a - c)}{b + d}$$

$$= \frac{ab + ad - ab + bc}{b + d}$$

$$= \frac{ad + bc}{b + d}$$

✧ Example:

Suppose the demand equation is  $P = 7 - 0.01 Q_d$ ,

and the supply equation is  $P = 1 + 0.01 Q_s$

(a) Find  $Q^*$  and  $P^*$

Since at equilibrium there is only one market price accepted by buyers and sellers and since  $Q_d = Q_s = Q^*$ , then we rewrite these two equations as

$$P^* = 7 - 0.01 Q^*$$

$$P^* = 1 + 0.01 Q^*$$

Since the left-hand side in both equations is equal the right-hand side must be equal. So equate the right-hand side of the two equations

$$7 - 0.01 Q^* = 1 + 0.01 Q^*$$

$$7 - 1 = 0.01 Q^* + 0.01 Q^*$$

$$6 = 0.02 Q^*$$

$$Q^* = \frac{6}{0.02} = 300$$

To get the equilibrium price substitute the equilibrium quantity in either demand or supply equation

So,  $P^* = 7 - 0.01 (300) = 4$  (using demand equation),

or  $P^* = 1 + 0.01 (300) = 4$  (using supply equation)

(b) Find Q if P = 5

Using demand equation:  $5 = 7 - 0.01 Q_d$

$$-0.01 Q_d = -2$$

$$Q_d = \frac{-2}{-0.01} = 200$$

Using supply equation:  $5 = 1 + 0.01 Q_s$

$$0.01 Q_s = 4$$

$$Q_s = 400$$

Since  $Q_s > Q_d \Rightarrow$  surplus

(c) Find Q if P = 2

Using demand equation:  $2 = 7 - 0.01 Q_d$

$$0.01 Q_d = 5$$

$$Q_d = \frac{5}{0.01} = 500$$

Using supply equation:  $2 = 1 + 0.01 Q_s$

$$0.01 Q_s = 1$$

$$Q_s = 100$$

Since  $Q_s < Q_d \Rightarrow$  shortage

✧ Exercises:

1. Suppose the demand curve for a good is

$$Q_d = 700 - 100P$$

And the supply curve is

$$Q_s = -100 + 100P$$

- Determine the equilibrium price and quantity of the good
- Determine whether there is a surplus or shortage at  $P = 5$
- Determine whether there is a surplus or shortage at  $P = 2$

2. Suppose the demand curve for a good is

$$Q_d = 16 - 2P$$

And the supply curve is

$$Q_s = -8 + 4P$$

- Determine the equilibrium price and quantity of the good
- Determine whether there is a surplus or shortage at  $P = 3$
- Determine whether there is a surplus or shortage at  $P = 6$

3. Suppose demand and supply equations are

$$P = 10 - 0.02Q_d$$

$$P = 1 + 0.01Q_s$$

- Determine the equilibrium price and quantity of the good
- Determine whether there is a surplus or shortage at  $P = 5$
- Determine whether there is a surplus or shortage at  $P = 2$

### CHANGES IN EQUILIBRIUM (Shifts in Demand and Supply Curves)

- ✧ No equilibrium price is permanent. The equilibrium price and quantity change whenever the supply and / or demand change.
- ✧ The change in supply and / or demand results in shifts of demand and / or supply curve. A shift in a demand or supply curve occurs when a good's quantity demanded or supplied changes even though price remains the same.
- ✧ The different types of shifts in demand curve, supply curve, or both curves are listed below with their impacts on the equilibrium price and quantity.
- ✧ An increase in demand shifts the demand curve rightward and creates a shortage at the original price. The price rises and the quantity supplied increases.
- ✧ An increase in supply shifts the supply curve rightward and creates a surplus at the original price. The price falls and the quantity demanded increases.
- ✧ A change both demand and supply changes the equilibrium price and the equilibrium quantity but we need to know the relative magnitudes of the changes to predict some of the consequences.
- ✧ An increase in both demand and supply increases the equilibrium quantity but has an uncertain effect on the equilibrium price.
- ✧ An increase in supply and a decrease in demand lower the equilibrium price but have an uncertain effect on the equilibrium quantity.
- ✧ By now, you should be able to draw the graph, show the shifts and compare between the old and the new equilibriums.

<b>Shift</b>	<b>P*</b>	<b>Q*</b>	<b>Remarks</b>
D↑	↑	↑	SR shifts (shortage at old P*)
D↓	↓	↓	SR shifts (surplus at old P*)
S↑	↓	↑	SR shifts (surplus at old P*)
S↓	↑	↓	SR shifts (shortage at old P*)
D↑ & S↑	↑↓-	↑	LR allocation of resources
D↓ & S↓	↑↓-	↓	LR allocation of resources
D↑ & S↓	↑	↑↓-	LR allocation of resources
D↓ & S↑	↓	↑↓-	LR allocation of resources

**EXERCISES**

1. Suppose during 2003/04 the number of cars sold in Bahrain increases despite an increase in cars prices. How can this be explained?  $D \uparrow$  while  $S$  remained constant.
2. Because of health awareness many people reduces their consumption of animal oil and increase their consumption of vegetable oil to reduce cholesterol problems. What will happen to DC of both products?
3. Suppose you have the following data about the price, quantity demanded and, quantity supplied of a specific good

<u>P</u>	<u>Q<sub>d</sub></u>	<u>Q<sub>s</sub></u>
5	70	0
10	55	20
15	40	40
20	25	60
25	10	80

- a. What is the equilibrium price and quantity?
- b. Is there a surplus or shortage when  $P = 10$ ? Why?
- c. Is there a surplus or shortage when  $P = 20$ ? Why?
- d. What is the highest price at which buyers are willing and able to buy 55 units?
- e. What is the minimum price at which sellers are willing and able to sell 60 units?
- f. What will happen in the market if price ceiling of 10 was in effect?
- g. What will happen to demand curve, supply curve and  $P^*$  and  $Q^*$  if
  - i. An increase in the price of a substitute good
  - ii. A decrease in consumers' income
  - iii. An increase in the cost of factors of production
- h. Suppose a new technology has been discovered to reduce the cost of the good, but the demand for this good has decreased because of a new substitute. What is the impact on  $P^*$ ,  $Q^*$ , other things remain the same?
- i. Suppose some unfavorable conditions severely affected the supply of this good while its demand increased because of the decrease in the price of a complement, what will happen to  $P^*$  and  $Q^*$ ?