Module 4: Markets: Elasticity

Introduction

The material in this unit covers an extension supply and demand model used in economics. After a basic understanding of supply and demand, it is necessary to go further. Here we learn about the relative shapes of these curves. The unit introduces how much quantity (demanded and supplied) changes due to a price change. The module explains and illustrates the concept of elasticity and its effects on total revenue and expenditure. Here we go!

Learning objectives

When you are done with this lesson, you should be able to:

1. Defined, calculate and interpret the price elasticity of demand.
2. Differentiate elastic, unit elastic, and inelastic demand; apply total revenue and expenditure and explain their determinants.
3. Define, measure, and interpret income elasticity, cross-price elasticity, and elasticity of supply.

Image 1: Are you a dog person?

Image 2: Are you a cat person?

Q4.1

Dogs, Cats, or another pet?
A) Cats
B) Dogs
C) Other

Your Answer

B

Q4.2

How much would you be willing to spend on your beloved pet to extend their life by three months?
A) Less than $100
B) Between $101 and $500
C) More than $500

Your Answer

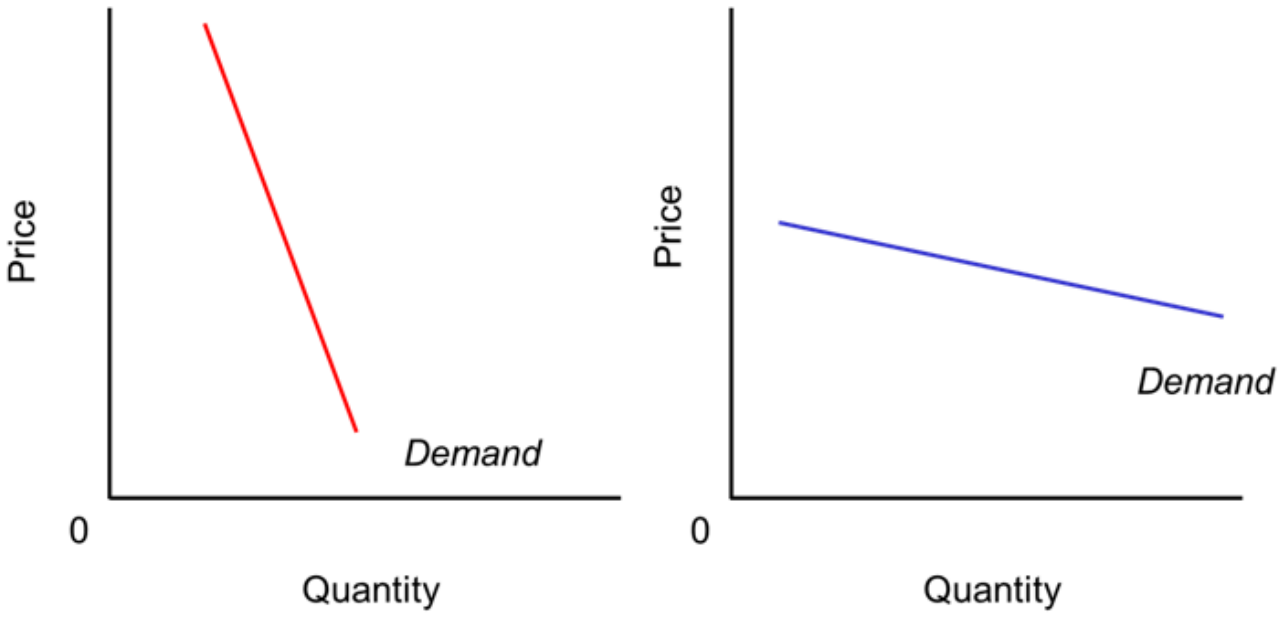
C

Have you ever wondered why people spend thousands of dollars on cancer and other medical treatments for their pets? Why is the price of a gallon of milk at a convenience store relatively higher than a gallon of milk at a regular grocery store? If you are a business owner and want to increase your total revenue, should you raise the price of a service you provide? If you did, would it surprise you if your total revenue decreased? One word can answer these questions, and others: elasticity.

The primary focus of this module is the price elasticity of demand. Although the price elasticity of demand can be challenging to calculate, the interpretation and application of the price elasticity of demand (and supply) are critical. The rest of this module discusses the three other types of price elasticity.

4.1 Define, calculate and interpret the price elasticity of demand.

Introduction to Elasticity of Demand and Supply



Can you tell the difference between these two curves?

Do you see the difference between the two demand curves? Obviously, one is relatively steep, and the other is relatively flat. Even though both curves illustrate the law of demand, they differ by how much the quantity demanded changes from a price change. Mathematically and graphically, we see these two curves have different slopes related to elasticity. But we will see elasticity is more than just the slope of a line.

Image 3: Smallpox vaccine

Economically the price elasticity of demand measures *how much* the quantity demanded changes due to a specific change in the price. If the price of a vaccine or another lifesaving medicine increases by 10%, how much would you decrease your medicine's quantity demanded?

The **price elasticity of demand** measures the responsiveness of quantity demanded of a good or service to changes in price; also described as the price sensitivity of quantity demanded. Since the price elasticity of demand uses percentages instead of changes, it is unaffected by units of measurement, such as gallons versus ounces or dollars versus cents. Below is the general formula for the price elasticity of demand E_p.

$$E_p = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

The general price elasticity of demand formula

The price elasticity of demand measures the percentage change in quantity demanded divided by the percentage change in price. A good or service price is the independent variable, while quantity demanded is the dependent variable. Although this may look like the formula for the slope of the demand curve, the price elasticity of demand is more than the slope of the demand curve.

Typically, the price elasticity of demand measures two points along the demand curve. Since the percentage change is different depending on which of the two points we start from, the price elasticity of demand uses the percentage change of the *average* price between these two points and the *average* of the percentage change in quantity demanded of those same two points. Using the average price and average quantity, we find the exact price elasticity value, whether the good or service price increases or decreases.

The percentage change, such as 1% or 10%, in quantity demanded is relative to the corresponding percentage change in price. Also, the law of demand represents an inverse relationship between price and quantity demanded. So, the value is negative. However, we drop the negative sign when we interpret the number generated by the price elasticity of demand formula. In other words, mathematically, we will use the absolute value to measure how sensitive the quantity demanded is to a price change.

Also, the price elasticity of demand is a unit-free number. The value is unit-free because the price elasticity of demand is a ratio of two percentage changes and the percentages cancel out. In other words, we do not care how many dozens of cookies or how many pairs of black shoes we will measure. All we are interpreting is the number.

The Midpoint Formula

$$E_p = \frac{(Q_2 - Q_1)}{(Q_1 + Q_2)/2} \Big/ \frac{(P_2 - P_1)}{(P_1 + P_2)/2}$$

Measuring the price elasticity of demand between two points (Q_1, P_1) and (Q_2, P_2)

The primary formula used to measure price elasticity is the midpoint formula. The midpoint formula determines the price elasticity of demand between two points. By using the midpoint formula, the average quantity demanded is divided by the average price. It calculates the price elasticity of demand at a point midway between the two relevant points on the demand curve. The midpoint formula does not require which point (Q_1, P_1) or (Q_2, P_2) is the initial point and which is the new point. In other words, the price elasticity of demand is the same whether the price increases or decreases.

Also, firms use this formula to determine their optimal pricing to maximize revenue since total revenue changes when price changes. Also, consumers may use this formula to calculate the change in their expenditures when the price of a good (gasoline) or service (haircut) changes.

Calculating the Price Elasticity of Demand

Q4.3 Mark as: None

If the equation for demand is Q = 10 - 2P, using the midpoint formula, what is the price elasticity of demand between the price (P) of $1 & $2? **(Rounded two decimal points and remember to use the absolute value of the number you get with the elasticity formula)**

Type your numeric answer and submit

You are correct

Show submitted answer | Show correct answer | Check My Answer

Let us try an example with the mid-point formula. If the formula for demand is Q = 10 -2P, where P is price and Q is the quantity demanded, we can measure the price elasticity of demand between $1.00 and $2.00.

Before we do that, we need to find a corresponding quantity demanded. By plugging in the price of $1.00 into the formula for demand, we see the quantity demanded is eight. When the price is $2.00, then the quantity demanded is six. The table below shows both sets of prices and quantities.

Price	Quantity
$1	8
2	6

Using both sets of prices and quantities, we can use the midpoint formula to calculate the price elasticity of demand. The change in quantity demanded: six minus eight, divided by its average: six plus eight divided by two, equals two sevenths (2/7) and entered in the numerator. The price change: two minus one, divided by the average: two plus one divided by two, equals two-thirds (2/3) and is placed in the denominator. As a result, the price elasticity of demand is -3/7. This minus sign illustrates the inverse relationship between price and quantity demanded, representing the law of demand.

If you did not get the answer, double-check your math. Sometimes a simple mistake is all it takes to mess up the calculations. Also, you may have found the correct answer but switched the numbers. For example, if you subtracted six from eight for the numerator, then one minus two for the denominator, that is OK. It does not matter which set of values you use if you use the right price and quantity pairs, P1 and Q_1, along with P_2 and Q_2. In other words, if P_1 represents $1, then Q_1 should represent a quantity

demanded of eight. Also, then P_2 should represent $2, and Q_2 should correspond to a quantity demanded of six.

Q4.4 Mark as: None

If the price elasticity of demand is 0.43, what's the meaning of this value?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	For every 1% increase in price, quantity demanded decreases by 0.43%.
b	For every 1% increase in price, quantity demanded increases by 0.43%.
c	For every 0.43% increase in price, quantity demanded decreases by 1%.
d	For every 0.43% increase in price, quantity demanded increases by 1%.

Show submitted answer | Show correct answer | Check My Answer

Now, we will interpret the absolute value of a -3/7 we just estimated using the midpoint formula. The interpretation is if the price changes by 1%, then the quantity demanded must change by 3/7. Specifically, an increase in the price of 1% leads to a 3/7% (0.429%) decrease in quantity demanded (law of demand). Furthermore, if the price increases by 10%, the quantity demanded will decrease by 4.29%, or 10 times 3/7. The price elasticity of demand value is a relative measure. But the number we generate from the midpoint formula is always represented by a 1% change in price.

Q4.5 Mark as: None

If the equation for demand is Q = 10 - 2P, using the midpoint formula, what is the price elasticity of demand between the price (P) of $3 & $4? (Rounded two decimal points)

Type your numeric answer and submit

You are correct

Show submitted answer | Show correct answer | Check My Answer

Let us try the other one. Using the same formula as before, let us apply the midpoint formula to estimate the price elasticity of demand between $3.00 and $4.00. Before we do that, we need to determine the quantity demanded for these two prices. At $3.00, the amount demanded is four. At $4.00, the quantity demanded is two. The table below shows both sets of prices and quantities.

Price	Quantity
$3	4
4	2

In the numerator of the midpoint formula for the price elasticity of demand, the change in quantity demanded is two minus four, divided by three (the average of the two quantities: 2 and 4). That negative two-thirds (-2/3) in the numerator divided by the change in price: four minus three divided by the average of the two prices, 7/2 equals 2/7. So, the price elasticity of demand between $3.00 and $4.00 is -2/3 divided by 2/7 or -7/3. Notice the price elasticity of demand has changed along a linear demand curve, which has a constant slope. So, we see the difference between elasticity and slope.

Once again, we can interpret the value for this price elasticity of demand. If the price changes by 1%, then the quantity demanded changes by more than 1%, in this case, 7/3.

When we measure the price elasticity of demand to determine the sensitivity or responsiveness quantity demanded, the magnitude of a price change matters matters. Using the midpoint formula to calculate the price elasticity of demand, we do not worry about which point we label as P_1 and Q_1 and which we label P_2 and Q_2 since we are taking the average between these two points. Also, using the absolute value for the midpoint formula.

By drawing the entire demand curve from the last equation for demand: Q = 10 – 2P, we can show how the price elasticity of demand decreases as we move down along a linear demand curve. First, as the quantity demanded increases, the percentage change in quantity demanded decreases for equal changes in quantity. For example, when the quantity demanded increases from 2 to 4, the percentage change in quantity demanded is 100% ((4 - 2)/2). When the quantity demanded increases from 6 to 8, the percentage change in quantity demanded is 33.3% ((8 - 6)/6). As the price decreases, the percentage change in price increases for equal changes in price. For example, when price decreases from $4 to $3, the percentage change (in absolute value) is 25% (($3 - $4)/$4). When price decreases from $2 to $1, the percentage change in (absolute value) is 50% (($1 -$2)/$2). Combined, as we move down along the demand curve, the percentage change in quantity is getting smaller while the percentage change in price is growing larger. So, the price elasticity of demand, the ratio of the percentage change in quantity to the percentage change in price, decreases as we move down along the demand curve.

4.2 Differentiate elastic, unit elastic, and inelastic demand; apply total revenue and expenditure and explain their determinants.

Q4.6 Mark as: None

How would you describe two price elasticities of demand of 1.80 & 5.20?

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	Both are inelastic, but the second is more elastic.
b	Both are elastic, but the second is more elastic
c	Both are elastic, but the first is more inelastic.
d	The first is inelastic, but the second is elastic.
e	The first is elastic, but the second is inelastic.

Show submitted answer Show correct answer Check My Answer

Three Types of Price Elasticity of Demand

Hopefully, you are comfortable calculating the price elasticity of demand using the midpoint formula. If not, practice using the midpoint formula with different price and quantity pairs.

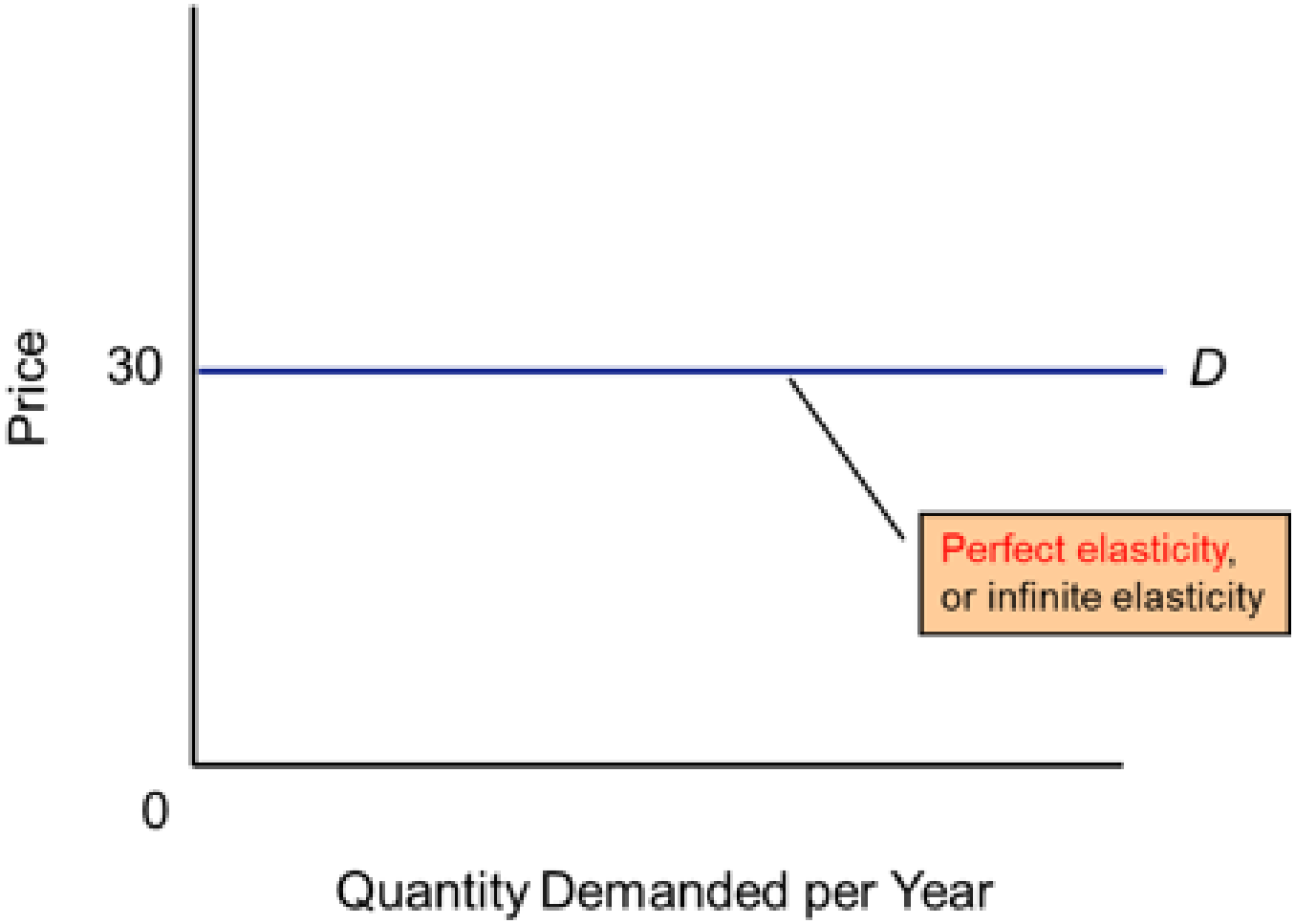
What do these values mean? 3/7? 7/3? We will use these (and other values) to determine the three different types of price elasticity of demand.

Elastic

Demand is said to be **elastic** when the percentage change in quantity demanded is greater than the percentage change in price. In other words, the value of the numerator is greater than the value of the denominator, like 7/3 or 2.33. Since this value is greater than one but less than infinity, this portion of the demand curve is labeled elastic.

$$\text{Elastic} : \infty \geq E_p > 1$$

Suppose the value of the price elasticity of demand is equal to infinity. In that case, the demand curve is **perfectly elastic**. Even if a good or service price increases by a fraction of a cent, the quantity demanded decreases to 0. So, the flatter the demand curve, the more price elastic the demand. Since a perfectly elastic demand curve has only one price for every quantity, the graphical representation of perfectly elastic demand is shown below as a perfectly horizontal demand curve.



A perfectly elastic demand curve

Study Tip: One way to remember if a demand curve is (perfectly) elastic is to draw a horizontal line from the tip of the vertical axis to the right. It looks like the letter "E" doesn't it? "E" for elastic.

Unit Elastic

The second type of price elasticity of demand is **unit elastic**. When demand is unit elastic, the percentage change in quantity demanded equals the percentage change in price. In other words, the number in the numerator and the number in the denominator are precisely equal, yielding the price elasticity of demand equaling one.

$$\text{Unit Elastic}: E_p = 1$$

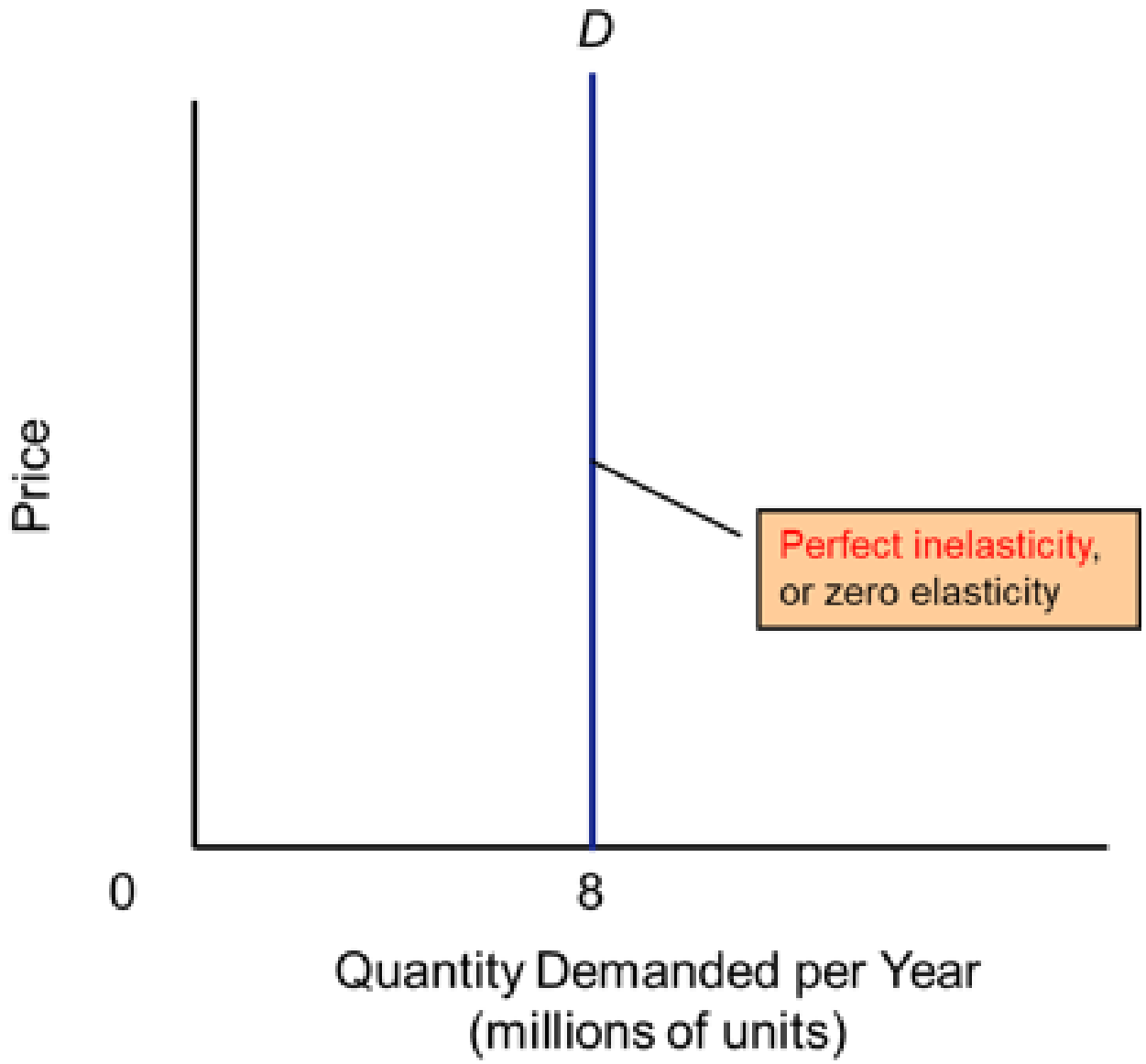
Along a linear demand curve, the unitary elastic part is typically a point or a small range around the middle of the demand curve.

Inelastic

Demand is **inelastic** when the percentage change in quantity demanded is less than the percentage change in price. The value of the numerator from the midpoint formula is less than the value of the denominator, like 3/7 or 0.43. Since this value is greater than zero but less than one, this portion of the demand curve is labeled inelastic.

$$\text{Inelastic}: \ 0 \leq E_p < 1$$

Suppose the value of the price elasticity of demand is equal to zero. In that case, the demand curve is **perfectly inelastic**. In other words, there is only one quantity demanded at any price. Since the quantity demanded does not change when the price changes, the graphical representation of perfectly elastic demand is shown below as a perfectly vertical demand curve. So, the steeper the demand curve, the more price inelastic the demand.



A perfectly inelastic demand curve

Study Tip: One way to remember if a demand curve is (perfectly) inelastic is if you draw a horizontal line to balance on top of the tip of the demand curve, it looks like the letter "I" doesn't it? "I" for inelastic.

When differentiating the three types of elasticity, it helps to emphasize the percentage change in quantity demanded (Q) relative to the percentage change in price (P). Remember, if demand is price elastic, the percentage change in quantity demanded is greater than the percentage change in price. For unit elastic, the percentage changes are equal. For inelastic demand, the percentage change in quantity demanded is less than the percentage change in price.

Elastic Demand: % change in Q > % change in P; $E_p > 1$

Unit Elastic Demand: % change in Q = % change in P; $E_p = 1$

Inelastic Demand: % change in Q < % change in P; $E_D < 1$

Knowing how these relative percentage changes relate to the price elasticity of demand helps us apply the price elasticity of demand to total revenue and total expenditure.

Elasticity and Total Revenue

Q4.7 Mark as: None

If the owner of a pizzeria wants to increase her total revenue, then she should

Select an answer and submit. For keyboard navigation, use the up/down arrow keys to select an answer.

a	increase the price.
b	decrease the price.
c	hire more salespeople.
d	hire fewer salespeople.
e	either increase or decrease the price.

Show submitted answer | Show correct answer | Check My Answer

Image 4: Pizza from a pizzeria

Say you own a pizzeria and are thinking about increasing the price of the pizzas you sell hoping to increase your **total revenue**. Will this work? Maybe. It depends on the price elasticity of demand for your pizza and other pizzas in your area.

Total revenue is price times quantity (demanded) or the number of pizzas you sell times the price of each pizza.

Total Revenue = Price * Quantity

When the price changes, total revenue changes. Also, when the price changes (increases), the quantity demanded changes (decreases). So, will total revenue increase, decrease, or remain unchanged when the price increases? The price elasticity of demand will answer this question.

When demand is elastic, there is an inverse (negative) relationship between a price change and total revenue change. The percentage change in quantity demanded is greater than the percentage change in price. So, if the price elasticity of demand for your pizza is elastic, increasing the pizza price at your pizzeria will decrease your total revenue.

If demand is unit elastic, then increasing the price of pizza at your pizzeria will not change your total revenue since a 10% increase in the price of your pizza will decrease your sales (quantity demanded) by10%. So, your total revenue does not change.

When demand is inelastic, there is a direct (positive) relationship between a price change and total revenue change. The percentage change in quantity demanded is less than the percentage change in price. So, if the price elasticity of demand for your pizza is inelastic, increasing the pizza price at your pizzeria will increase your total revenue.

As the pizza shop owner, if your goal is to increase total revenue, you should increase your pizza price if the demand for your pizza is inelastic. Otherwise, you should decrease the price of your pizza if you want to increase your total revenue when the demand for your pizza is elastic.

Food for Thought

Although we apply the price elasticity of demand to the firm's total revenue, the price elasticity of demand also applies to the total expenditures of a customer (buyer). If you prefer to consume pizzas and your favorite pizza joint decides to increase the price of their pizzas, then what will happen to your total expenditures on pizzas? It also depends on your price elasticity of demand for pizza at your favorite pizzeria.

We have a third way to determine the price elasticity of demand based on the relationship between the price and total revenue. It is known as the **total revenue test**. Demand is elastic if a decrease in a good

or service price increases total revenue. Demand is unit elastic if a decrease in a good or service price does not change total revenue. On the other hand, if a good or service price reduction decreases total revenue, demand is inelastic.

What determines your sensitivity to gasoline, pizza, or car price changes? The following section will help explain your price elasticity of demand for various goods and services.

Three Determinants of Price Elasticity of Demand

What explains why the price elasticity of demand for food and gasoline, especially at a convenience store, is inelastic, while the price elasticity of demand for automobiles is more elastic? There are three determinants for the price elasticity of demand to explain how the price elasticity of demand varies among goods and services.

Image 5: A convenience store selling gasoline and snacks

Availability of Substitutes

First, how close and how many substitutes exist for a good or service determine the price elasticity of demand. Food is a necessity, good and crucial for our survival. So, the price elasticity of demand for food is inelastic. Also, think about a road trip. You are driving your car a long distance on a highway. You suddenly become hungry for a quick snack or realize you are almost out of gasoline. You see a sign showing only one convenience store selling gas and snacks at the next exit. As a result, you are not likely to spend the time and effort to search for the cheapest gas or snack food, even with the latest phone

application. If you are not willing to even look for a close substitute for those items, then your price elasticity of demand for gas and snack food on your road trip is likely very inelastic.

Image 6: A Ferrari sports car

Image 7: A pack of gum

Share of your Budget

Second, the price of a good relative to your income level determines the price elasticity of demand. Since the price of a car consumes a large portion of your budget (income), your price elasticity of demand is very high (elastic) compared to your price elasticity of demand for a pack of gum. The demand for gum is more inelastic because even if the price of gum doubles, it is a relatively small proportion of your income. So, the price elasticity of demand for a pack of gum is inelastic.

Time

Third, time is another determinant of the price elasticity of demand. The more time we have, the more price-sensitive (elastic) we are because we increase our chances of finding other substitute goods and services or earning additional income. Think about when you travel. If you are going on a vacation, chances are you will take the time to find the cheapest flight, hotel, and other goods and services you will consume on your vacation. So, you are likely more price sensitive (elastic) to the price of a flight when you have the time to plan your trip. However, if a family emergency arises, your price elasticity of travel demand is likely very inelastic. You simply do not have the time to price shop. The price elasticity of demand is more significant in the long-run than in the short run.

Here are some examples of the price elasticity based on time.

	Estimated Elasticity	
Category	Short Run	Long Run
Air travel (business)	0.4	1.2
Air travel (vacation)	1.1	2.7
Beef	0.6	N.A.
Cheese	0.3	N.A.
Electricity	0.1	1.7
Fresh tomatoes	4.6	N.A.
Gasoline	0.2	0.5
Hospital services	0.1	0.7
Intercity bus service	0.6	2.2
Physician services	0.1	0.6
Private education	1.1	1.9
Restaurant meals	2.3	N.A.
Tires	0.9	1.2

4.3 Define, measure, and interpret income elasticity, cross-price elasticity, and elasticity of supply.




Image 8: Chocolate cake Image 9: Apple pie Image 10: Vanilla ice cream Image 11: Brussels sprouts

Cross-Price Elasticity of Demand

Is there a relationship between cake and pie, pie and ice cream, or maybe ice cream and Brussels sprouts? We can use the **cross-price elasticity of demand** to determine if such a relationship exists. Precisely, the cross-price elasticity of demand measures the responsiveness of a change in demand of one good to the change in the price of another related (or unrelated) good.

Recall, one of the determinants of demand is the prices of related goods, specifically **substitutes** and **complements**. The cross-price elasticity of demand determines if any relationship exists between two goods or services by changing the price of one good and seeing if the quantity demanded changes for another good.

$$E_{xy} = \frac{\%\text{ change in quantity demanded for good } X}{\%\text{ change in price of good } Y}$$

The cross-price elasticity of demand formula

Like the price elasticity of demand, there is a formula for the cross-price elasticity of demand. However, there are two significant differences. First, we change the price of one good to measure the responsiveness of a change in demand (and quantity demanded) of another good. Second, we do not use the absolute value for cross-price elasticity of demand because now, the positive or negative value determined by the cross-price elasticity of demand formula matters.

Substitute Goods

If the value calculated by the cross-price elasticity of demand between the price of one good and the demand of another good is positive, these two goods are substitute goods.

$$\text{Substitutes}: \ E_{xy} > 0$$

For example, if the price of a cake increases, causing the demand for a pie to increase, then the cross-price elasticity of demand between the price of a cake and the demand for a pie would be positive. Thus, cake and pie are substitute goods.

Complementary Goods

Image 12: A slice of apple pie and a scoop of ice cream

If the cross-price elasticity of demand between two goods (or services) is negative, these two goods are complementary goods.

$$\text{Complements} : E_{xy} < 0$$

For example, if the price of pie increases, causing the demand for ice cream to decrease, the cross-price elasticity of demand between pie and ice cream is negative. In other words, these two goods are complements.

Unrelated Goods

If the price of ice cream changes but there is no change in the demand for Brussels sprouts, then the cross-price elasticity of demand between these two goods is zero.

$$\text{Unrelated} : E_{xy} = 0$$

So, there is no relationship between ice cream and Brussels sprouts.

Income Elasticity of Demand

Income elasticity measures the responsiveness of a change in demand to the change in income while holding the price constant. Recall income is also a determinant of demand. When income changes, how demand changes determine the type of good or service.

Like the cross-price elasticity of demand, we keep the plus or minus sign when calculating the income elasticity of demand. By holding prices constant, we measure the responsiveness of demand to changes in income.

$$E_i = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}$$

The income elasticity of demand formula

Income elasticity measures the percentage change quantity demanded divided by the percentage change and income (not price).

Normal Goods: Luxury and Necessity

Image 6: A Ferrari sports car

If the income elasticity of demand for a good is positive, then that good is a **normal good**. But we can now differentiate between two types of normal goods: luxury goods and necessity goods. Specifically, if the income elasticity of demand is greater than one, it is described as income elastic or a **luxury good** like a sports car.

$$\text{Luxury} : E_i > 1$$

For example, if your income increases and your demand for a sports car (ex. Ferrari) increases significantly, then the income elasticity of demand between income and a Ferrari would be greater than one, and the Ferrari is a luxury good.

Image 13: Electricity wires

If the income elasticity of demand for a good is between zero and one, it is labeled a **necessity good** and described as income inelastic. An excellent example of a necessity good is electricity or another utility.

$$\text{Necessity} : 0 < E_i < 1$$

If your income increases and your demand for electricity increases modestly, then the income elasticity of demand between income and electricity would be between zero and one, and electricity is a necessity good.

What about beef? Is it a necessity or a luxury? It would depend on one's relative income level.

Inferior Goods

Image 14: Macaroni and cheese

If the income elasticity of demand is negative, then the good is an **inferior good**, like macaroni and cheese.

$$\text{Inferior}: E_i < 0$$

Suppose your income increases and your demand for macaroni and cheese decreases, then the income elasticity of demand between income and macaroni and cheese would be negative. Accordingly, macaroni and cheese is an inferior good.

Elasticity of Supply

Does the **price elasticity of supply** differ for a farmer, a seller of exotic cars, or a concert promoter? How would these producers change their quantity supplied when the price changes for their good or service? We can answer these questions by calculating the price elasticity of supply. Like the price elasticity of demand, we can determine the price elasticity of supply. Explicitly, the price elasticity of

supply measures the percentage change in quantity supplied of a good or service divided by the percentage change in price. It measures the responsiveness of the quantity supplied of a good or service to a change in its price.

$$E_S = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}}$$

Typically, we use the midpoint formula to measure the price elasticity of supply, as we did with the price elasticity of demand.

Interpreting the price elasticity of supply value generated by the price elasticity of supply formula is identical to the interpretation of the price elasticity of demand number.

Supply is **inelastic** if the price elasticity of supply is between zero and one. In other words, the percentage change in quantity supplied is less than the percentage change in price. The value of the numerator is less than the value of the denominator. Since this value is greater than zero but less than one, this portion of the supply curve is labeled inelastic.

$$\text{Inelastic} : 0 \leq E_s < 1$$

A **perfectly price inelastic supply** is zero. A vertical line illustrates a perfectly inelastic supply curve, like a perfectly inelastic demand curve. A perfectly inelastic supply curve is fixed. So, when the price changes, the quantity supplied does not change. The steeper the supply curve results in a more price inelastic supply.

When supply is **unit elastic**, the price elasticity of supply is one. The percentage change in quantity supplied equals the percentage change in price. In other words, the number in the numerator and the number in the denominator are equal. Also, the supply curve must pass through the origin.

$$\text{Unit Elastic} : E_s = 1$$

Supply is **elastic** if the price elasticity of supply is greater than one. The percentage change in quantity supplied is greater than the percentage change in price. In other words, the value of the numerator is greater than the value of the denominator. Since this value is greater than one but less than infinity, this portion of the supply curve is labeled elastic.

$$\text{Elastic} : \infty \geq E_s > 1$$

A **perfectly price elastic supply** is infinite. When the price changes, the quantity supplied changes infinitely. Even if a good or service price decreases by a fraction of a cent, the quantity supplied decreases to 0. So, the flatter the supply curve, the more price elastic the supply. Since a perfectly elastic

supply curve has only one price for every quantity, the graphical representation of a perfectly horizontal supply curve illustrates a perfectly elastic supply, like a perfectly elastic demand curve

Two Determinants of Price Elasticity of Supply