Lecture 3(ii)

Announcements

Office hours today at usual time: Wed 1:30-3:25

Office is 4-135 Hanson

Lecture

1. Elasticity special cases:
   - perfectly inelastic
   - perfectly elastic

2. Reading 2: Apply to midpoint formula to estimate short-run elasticity for gasoline

3. Estimate of long-run: compare Europe with US

Get units out by using percentages

"Δ" means change

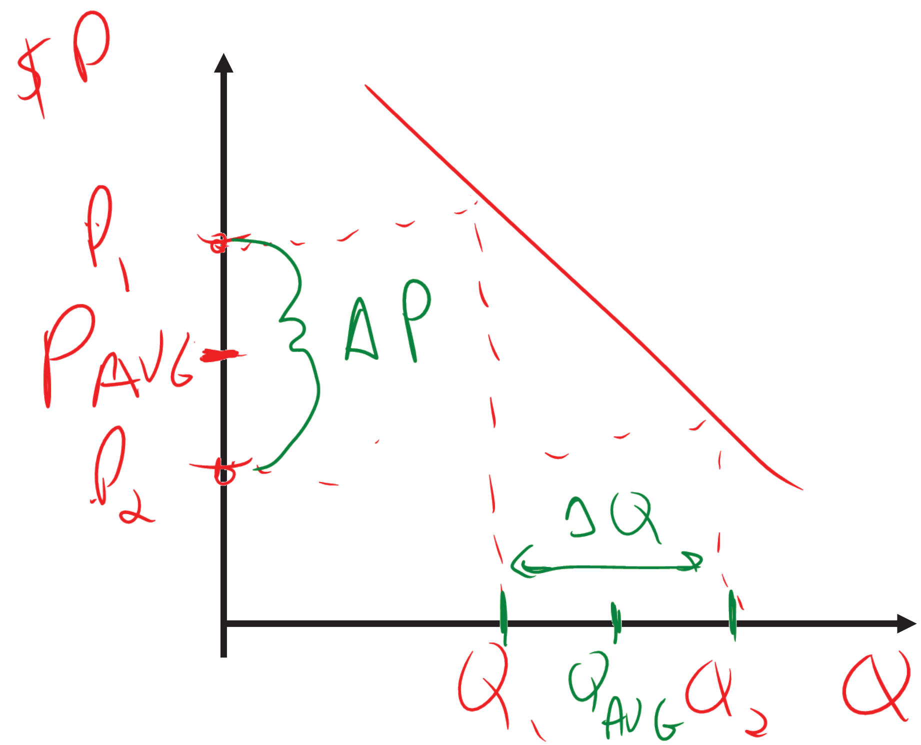
Price elasticity of Demand (midpoint method)

Pavg at midpoint between P1 and P2

$$= e^D$$

$$-\frac{\%\Delta Q^D}{\%\Delta P}$$

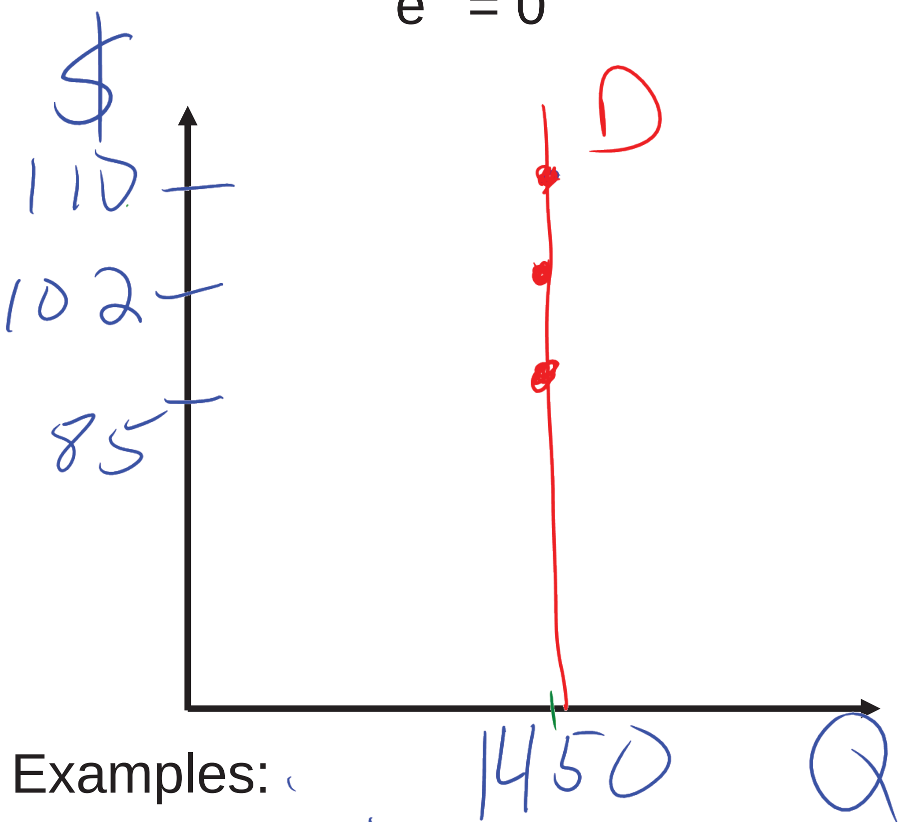
$$= -\frac{\dfrac{Q_2 - Q_1}{\frac{1}{2}(Q_2 + Q_1)}}{\dfrac{P_2 - P_1}{\frac{1}{2}(P_2 + P_1)}} = \frac{\dfrac{\Delta Q}{Q_{AVG}}}{\dfrac{\Delta P}{P_{AVG}}}$$



Special Cases

Perfectly Inelastic Demand

$e^D = 0$



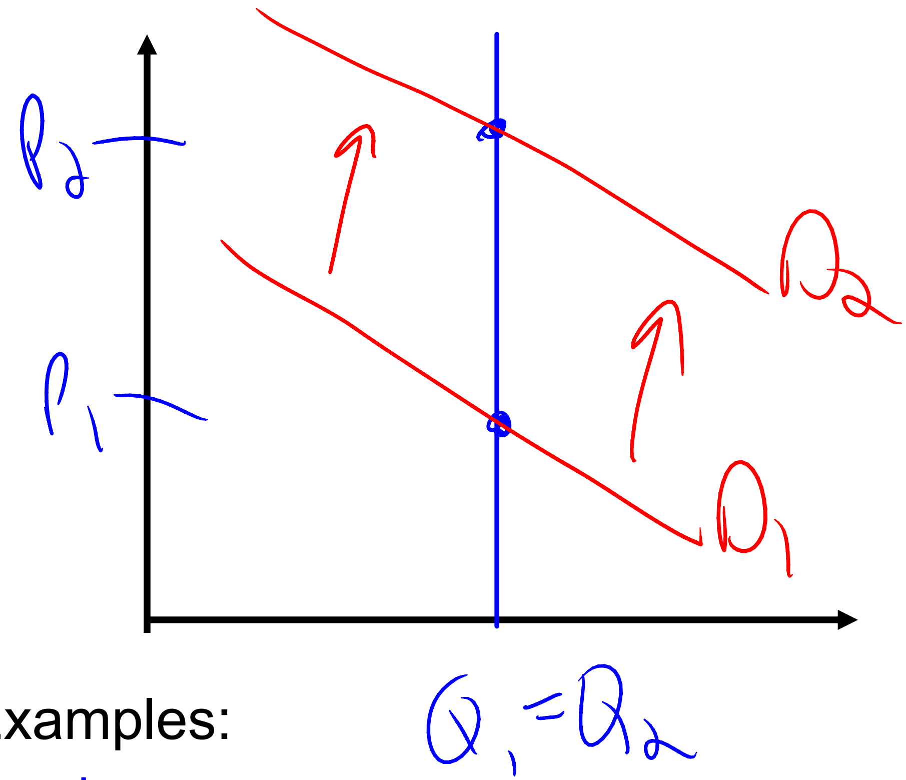
Examples: Aplia in this class

There are 1450 registered this fall in Econ 1101 across all the different lectures. Students need Aplia to do the homework. At the actual price of $102, all 1450 students buy one copy each. If the price falls to $85, each student will still buy one copy. So the elasticity of demand is zero. (And if the price is raised to $110, each student will still buy just one copy.)

Note the concept of perfectly inelastic demand is a theoretical ideal that may be a useful approximation in some cases, but in reality will never be exact. For example, if the price of Aplia were raised to a million dollars a copy, I am pretty sure there would be an impact on demand! If the price were lowered to 10 cents, maybe some would buy multiple copies, to play different people in the experiment and keep the best.

Perfectly Inelastic Supply

$e^S = 0$



Examples:

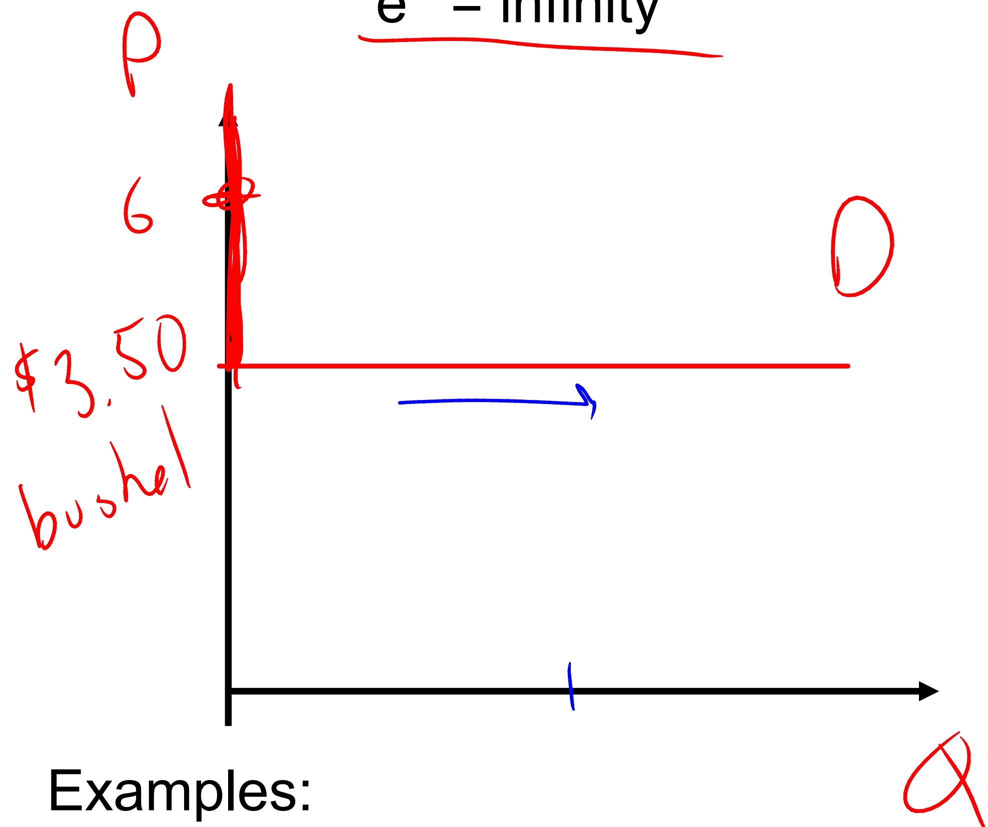
Land,

Lakeshore on Minnetonka

Picassos

Perfectly Elastic Demand

e^D = infinity



Examples:

The demand for Farmer Tom's corn.

In Between Cases

(1) When $e^D < 1$ we say
Demand is Inelastic

Total Spending = P*Q increases as P increases.

(2) When $e^D > 1$ we say
Demand is Elastic

Total Spending = P*Q decreases as P increases.

(3) When $e^D = 1$ we say
Demand is Unit Elastic

Apply midpoint formula to example

Gasoline Market in the US
June 2007 and June 2008

Time Period	Per Capita Daily Consumption of Motor Gasoline	Average Price Per Gallon in Dollars
June 2007	1.32	3.05
June 2008	1.26	4.07
Δ	–0.06	1.02
Average of Both Years	1.29	3.56
%Δ	–0.05	0.28

$$\Delta P = 4.07 - 3.05 = 1.02$$

$$P_{AVG} = \frac{1}{2}(3.05 + 4.07) = 3.56$$

So

$$e^D = -\frac{\%\Delta Q^D}{\%\Delta P} = \frac{.05}{.28} = .16$$

Short-Run Demand is Inelastic

As price goes up,

Total Spending = P*Q increases.

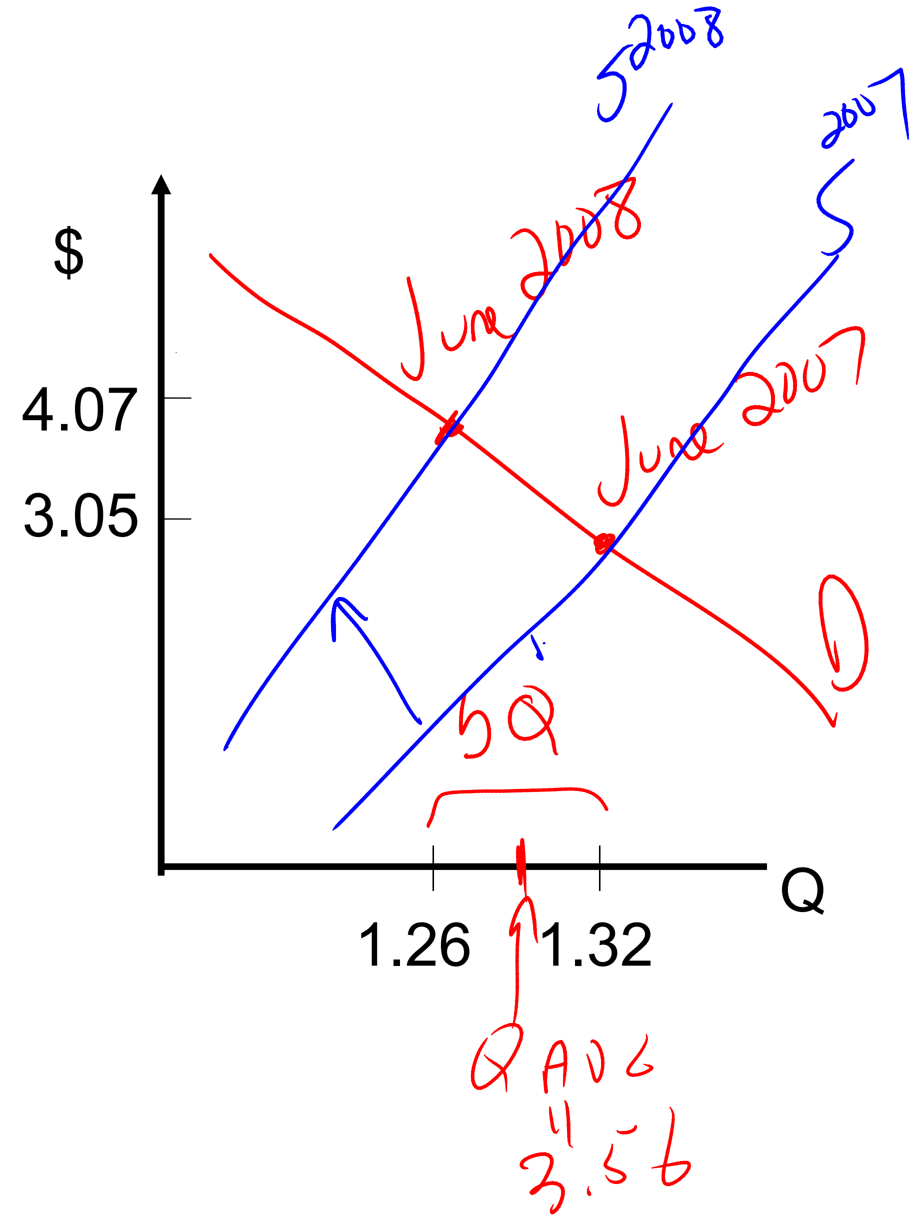
$$\%\Delta_P = \frac{\Delta P}{P_{AVG}} = \frac{1.02}{3.56} = .28$$

Let's get back and talk about this back-of-the-envelope calculation.

When estimating demand elasticity, need to hold fixed other determinants of demand isolate impact of change in price.

Also need to take into account supply. Some of you might be thinking: "Why is what we calculated the elasticity of demand and not the elasticity of supply?"

Great Question!



Make Case:

Supply curve for **US market** did shift

Price of a barrel of oil increased from $65 to $121. Important input into gasoline, shifting supply curve up and to left. Importantly, the oil price increase was driven by developments ouside the US. (China)

US Demand Curve Did Not Shift (So movement along US Demand)

Have to argue that the determinants of demand (the things that make it shift) remained unchanged.

We can to more (with more work, more data, and more advanced econometric techniques).

But what we are doing here is sensible for a simple classroom example.

Let's go through the determinants of demand

1) Tastes of consumers

Taste for driving is higher in the summer months than the rest of the rear. Take this into account by comparing June to June

2) Number of consumers

Population grows 1% a year. Take this into account by using per capita.

Gasoline is a normal good. So in order for demand not to shift ,income can't change

3) Income

Income in June 2007 not that much different from June 2008 (but later in 2008 economy fell off the cliff.

4) Prices of substitutes and complements.

Didn't change much over this time period.

With the help of the shale oil in North Dakota (and other new unconventional sources of oil), we have a chance to see how things go the other direction.

Let's look at a map of the wells in the Bakken
https://www.dmr.nd.gov/ndgs/bakken/GI%20SERIES/GI%20_149_Apr2015_36.pdf

Let's compare 2014 and 2015

Gasoline Market in the US
June 2014 and June 2015

Time Period	Per Capita Daily Consumption of Motor Gasoline	Average Price Per Gallon in Dollars
June 2014	1.18	3.70
June 2015	1.25	2.78
Δ	0.07	–0.92
Average of Both Years	1.22	3.24
%Δ	0.06	–0.28

$$e^D = -\frac{\%\Delta Q^D}{\%\Delta P} = \frac{.06}{.28} = .20$$

Pretty good stuff for a back of the envelope calculation!

Elasticity we have estimated is a short-run elasticity

Consumers have not had much time to make a response.

Over a long period of time, is gas is significantly higher in price:

- Consumers will buy different cars
- Might live different places
- Society might change laws, like lower the speed limit.

For the long-run elasticity, need to compare cases where prices have been different a long time.

Enter Reading 2

"Fuel Consumption in Europe and the U.S."

Europe has long taxed gasoline. What we pay here at the pump for the gas, wouldn't pay the tax in the Europe.

The tax here is (per gallon):

Federal	18.4 cents
State (MN)	28.5
Total (MN)	46.9

(24 cents more in CA)

Country	Average Price $US per Gallon	Consumption Per Capita Gallons Per Day
United States	2.80	1.29
Selected Countries in Europe		
Norway	7.00*	.30
United Kingdom	6.90	.28
Germany	6.88	.25
France	6.37	.15
Spain	5.13	.15
Italy	6.50	.21
Some Other Countries		
Japan	4.49	.33
Mexico	2.45	.29
China	2.29	.04

Country	Per Capita GDP ($1,000)
United States	45.5
Selected Countries in Europe	
Norway	51.9
United Kingdom	35.7
Germany	34.3
France	32.7
Spain	31.6
Italy	30.4
Some Other Countries	
Japan	33.6
Mexico	14.0
China	5.3

Table 3: Price and Per Capita Quantity Consumed of Gasoline
The United States and Norway in 2007

Time Period	Per Capita Daily Consumption of Motor Gasoline	Average Price Per Gallon in Dollars
United States	1.29	2.80
Norway	.30	7.00
Δ	-.99	4.20
Average of Both Years	.80	4.90
%Δ	-1.24	.86

So: Elasticity(long run) =
$\%\Delta Q / \%\Delta P = 1.24/.86 = 1.44$

Is this valid?

1) Is Supply Curve is shifting between these two countries?

Certainly. The gas tax is much higher in Norway. This shifts up suppliers' costs, and shifts up the supply curve.

2) Is Demand Curve staying fixed?

A) Income

Average income in Norway is similar to the U.S. So in the comparison, we can regard income as being held fixed.

We fill finish this on Friday during Lec 3(iii)

B) Price of Substitutes

Here is a big difference. Public transit is much better in Norway than in the U.S. So there are really two main differences: (1) gas prices are lower and (2) public transit options are better. Both contribute to the lower consumption of gas in Norway

C) Other Factors

Population density impacts gasoline demand. Wyoming consumes substantially more gas per capita than New York state, because people in Wyoming are more likely to drive 30 miles to a Wal-Mart to purchase a gallon of milk compared to people who live in New York City

The U.S. as a whole is less densely populated than Europe, and the lower population density is one factor behind why gas consumption is higher in the U.S. than Europe. Norway is less densely populated than Europe as a whole, so that is one reason we picked Norway to make the comparison.

An important point is that rather than treat population density as something to be controlled for (i.e. held fixed), we should really think of it as potentially impacted by high gas prices. With high gas prices, people have an economic incentive to concentrate in high density areas where they can live, work and shop.