**W4 V2 Calculating Elasticity**

0:10  
Now that we've motivated why we need to use elasticities, let's talk about calculations.

0:14  
And I'm going to show you 2 formulas, the midpoint method and the point method, and we'll talk about when we use it and why.

0:24  
So as we've talked about earlier, elasticity requires a percentage change.

0:29  
So change is pretty straightforward because it's just saying, what do you have at the end, What do you have now?

0:34  
And then the difference will just give you the change.

0:37  
The problem comes in when I want to talk about the percentage change, because the numerator is just going to be the change in quantity, but what do I put in the denominator?

0:48  
So if you're used to kind of calculating an elasticity, you'd say, OK, I'll just put the change and then at the bottom, I'm gonna put the initial quantity in there and I'm gonna show you on the next slide that this can be a problem, right.

1:01  
It can bias the results we get and it can leave U.S.

1:06  
Open to data manipulation.

1:07  
OK.

1:08  
So we have a way around this and that way around it is to use what we call the midpoint method.

1:15  
OK.

1:16  
So suppose I'm given data on two points, right?

1:19  
And there's an example where we, as we've talked about earlier, discrete data, two points on the thing where for a given price A, here's a quantity bot and for a given price B, here's the quantity bot.

1:31  
All else held fixed two points on a given on the same given demand curve.

1:37  
OK, I could also alternatively be given continuous data, right?

1:41  
If it's approximated, I've got a nice equation and I I know the quantity bought at every price, even if it's .00010.

1:52  
OK, so if I have discrete data, just two points, I'm not going to do a calculation for both here.

2:02  
I'm just going to do the calculation for quantity.

2:04  
So at price A, the quantity demanded is 8.

2:07  
At price B, quantity demanded is 10.

2:10  
So the change is pretty straightforward.

2:12  
The change is a change of two units, but is it an increase of two units or a decrease of two units?

2:17  
Well, it kind of depends on what your starting point is.

2:21  
So if you're starting out at A and going to 10, then you'd say, well, it's increasing by two.

2:26  
And if you were following the original or the way that we typically calculate percentages, you'd put the initial price at the bottom, right?

2:35  
This thing is going up at 2 units.

2:36  
We started at 8, I'd put that there.

2:39  
Alternatively, if you were starting out at 10 and moving to 8, why do we do that?

2:44  
Well, it just depends on the third experiment that you're doing, right?

2:47  
If the third experiment is over, starting out at the quantity of 10 and we want to move to 8, you'll be in this case.

2:52  
Or you can say I'm starting out at 10 and I want to go through eight and I want to go to 10.

2:57  
OK, either one of these, both of these are going to give me a change of two units.

3:04  
Now one's going to be an increase of two units, one's going to be a decrease.

3:07  
But when we're looking at the absolute values, it's fine.

3:10  
But what is going to be different is the initial value at the bottom.

3:13  
So if I'm going to use an 8 and if I'm going to use A10, I'm going to get two very different values for the percentage change.

3:20  
And that's not good because you know, now I have the option of manipulating data.

3:24  
If I want to say, if I want to make this number look really big, then I'm going to choose the 8 as my starting point.

3:29  
If I want to make it look small, I can choose 10.

3:32  
So the way we get around this and we try and kind of balance out this effect is we use the average quantity.

3:41  
So instead of using just eight or instead of using just ten, I average out eight and 10 to get 9 and I put that at the bottom.

3:49  
That's it.

3:50  
That's literally what the midpoint method is.

3:52  
It's saying don't let your initial or final starting point bias your results.

3:56  
Use the average quantity.

3:57  
Similarly for price, use the average price in that your in your calculations.

4:02  
Now, if we're going to do that, then I know how to proceed, right?

4:05  
Going from a quantity of age to a quantity of 10 and an associated price change given there.

4:13  
All you're going to do here is fill in the numbers that we're looking at, OK?

4:18  
I don't care what direction you move, Pick either one because we're using the average to get around your starting point.

4:25  
But from a thought experiment point of view, it's always easier for you to pick mentally which direction you're moving in.

4:33  
So I'm going to pick this direction.

4:34  
I encourage you to go the other way and see if it changes any of your results.

4:38  
Change in quantity.

4:39  
So what's the change in quantity?

4:40  
Well, if I'm moving in this direction, it's 8 to 10.

4:47  
If I'm moving in that direction with prices, I'm moving from 2.5 to 3.5, notice, right.

4:55  
One is going to be an increase, the other is going to be decrease because I'm moving along the demand curve.

5:00  
So in this case it's going to be an increase of two.

5:03  
In this case it's going to be decrease of one.

5:07  
Now at the bottom I'm going to put the average right because I don't want to be biased by the starting point.

5:12  
So in this case I'm going to get an average of 8 and 10 is 9 and an average of 2.5 and 3.5 is going to be 3.

5:23  
OK.

5:25  
I'm going to look at the absolute values because I don't want to have to deal with negative signs in there.

5:31  
But I'm noticing at the back of my head we're good because pricing quantity, I'm moving in the opposite directions.

5:38  
That matches what I remember from my demand curve and I'm mentally keeping track of all of that.

5:42  
OK.

5:43  
Now if I want the absolute elasticity of demand, I'm basically going to put the percentage change of quantity up here, the percentage change in price down here and proceed.

5:55  
This is when, if you're not comfortable with your math, you could make some errors.

5:58  
So fix this if math is going to be an issue for you, so this I can rewrite as 2 / 9 \* 1 / 3.

6:06  
I'm just going to give me an absolute elasticity of demand of 2/3.

6:19  
That's it.

6:19  
That's it, right.

6:20  
So there's nothing fancy in here if you understand the concept of elasticity.

6:23  
The only thing I want you to keep track of is this idea of an average in the denominator.

6:28  
And if you know why we use it, hopefully you won't forget it.

6:31  
Now let's think about the point method that we have in here.

6:34  
It's going to be the same general concept, percentage change in quantity by percentage change in price.

6:39  
But how do we interpret percentage change in quantity?

6:43  
When I have an equation?

6:45  
So I'm going to hold up on that for now and say, look, I don't know what change in quantity is when I don't have an 8 and a 10.

6:51  
So let's keep that as it is and let's think about the denominator because that was the problem last time.

6:56  
Do we have the same problem here?

6:57  
The answer is no, right?

6:59  
I don't need to worry about 10 or 8 biasing my thing because this is a point elasticity.

7:03  
I know the information at exactly the point that I need via the demand equation that I'm given.

7:09  
OK, either form is fine.

7:11  
Sometimes you need to convert 1 to the other, but get comfortable with that.

7:14  
So here the denominator is not going to be the problem because that's the point that I'm looking at.

7:18  
The problem is going to be the numerator, right?

7:21  
What is a change mean in this world?

7:23  
So first, let's postpone that a little bit and then say effectively elasticity of demand is going to be changed divided by the point change divided by the point moving stuff around.

7:35  
I'm going to get the point here, which is great because I know how they're related through the equation and I'm going to get this term here and I got to figure out what that is.

7:46  
So let me think about how to figure out what that is.

7:48  
So what is the percentage change in quantity?

7:52  
Is a change in quantity?

7:53  
First, what's a change in quantity?

7:55  
Quantity 2 minus quantity one?

7:58  
Either way pick, it doesn't matter, right?

8:00  
In this case, what is it here?

8:02  
Well, I know what the quantity is for a given price via the demand equation.

8:07  
So this is going to be 100 -, 0 P 2 minus what it is at price P1.

8:18  
Open that out.

8:25  
OK, these two will cancel out.

8:28  
Let's take the 0.5 out common P 2 -, P one.

8:34  
So here's what's happening.

8:35  
Quantity is going from 2:00 to 1:00 in the equation.

8:38  
The difference 2 to one price is changing 2 to one.

8:42  
Same direction, same everything.

8:44  
So we're good.

8:45  
I can replace this with a change in price.

8:48  
So now I have an equation that's saying quantity change in quantity is related to the change in price.

8:58  
Take the price over to the other side and I'm going to get this 0.5.

9:05  
Now this is exactly what I needed because that's what I was looking for when I had this equation.

9:10  
This is exactly the same thing up there.

9:13  
So I can just go ahead directly and plug it in for that number in there.

9:19  
Does that number come out of and nowhere.

9:21  
It actually comes straight from the demand equation.

9:23  
If you look at the demand equation, the 0.5 here is the slope of the demand equation.

9:29  
As long as your demand equation is written as quantity, as a function of price, right?

9:34  
I would encourage you the beginning not to remember that it's the slope, because if I rewrite it this way, it's not the slope, right?

9:40  
It's one over the slopes.

9:41  
Pay attention to that.

9:43  
Get comfortable with this.

9:44  
This is a quick way, if you're stressed on the exam, to figure out what number to plug in over there.

9:50  
OK, so based on that calculation, I know that the change in quantity demanded here is going to be -0.5, the change in price.

10:00  
Plug that information in to calculate your elasticity of demand.

10:06  
So I'm going to do here, this is 0.5, right, because I'm going to bring the price over on to this side as we did on the previous slide and that's what it's going to be.

10:19  
So that's good.

10:21  
But now what do I plug in here?

10:22  
I've got the price and I've got a quantity, but what price and quantity do I plug in?

10:28  
Well, it's just you plug in the price and quantity that at the point that you're looking at sometimes will give you a price, and then you plug in that price and you back out quantity as a function of that price using this equation.

10:43  
Sometimes you're given quantity and you do exactly the same thing, except you're going to back out what the price of that quantity is given the equation that you have using this information.

10:58  
Notice the slope doesn't change.

11:00  
The .5 and the .5 are still the same, it's just plugging in what information you have on either side.

11:06  
Notice also that as you change the price and quantity, the slope is staying the same, right?

11:12  
Price of 10, price of 20.

11:14  
The slope is staying the same, but the ratio of price and quantity is going to change.

11:19  
This is going to be important when we're talking about elasticity changing along a linear demand curve.

11:25  
So to summarize, we've got two methods, discrete data, we use a midpoint method, continuous data, we use the point method.

11:32  
So if you're going to ask me which point, which method to use, the answer I'm going to say depends on what data you have.

11:38  
If you have discrete data, you have only two points of data you have to use that.

11:41  
You cannot make up stuff in here, so use the midpoint method.

11:45  
If you have continuous data, then you must use the point method because that's the information you have.

11:50  
Get comfortable using both.

11:51  
You will be tested on both.

11:54  
Now why is this?

11:56  
Because a lot of students come in here and they say I don't want to do this extra method.

11:59  
Why?

11:59  
So let's take a few minutes to talk about why.

12:02  
OK, continuous data.

12:03  
Again, I have information on all of these little price and quantity relationships.

12:10  
I don't need to estimate anything.

12:12  
I just have the point that I'm interested in and I plug that in and all I need is the slope of the demand curve which is coming from the equation.

12:20  
On the other hand, if I have discrete data, I have two points, I have the black point and I have this black point and I have no information in between.

12:28  
And now I'm faced with this problem that if I use this as my starting point I'm going to get a different number and if I use this as a starting point, I'm going to get a different number.

12:36  
So the way we get around that is in order not to bias it is we pretend as if there is a line and then we're going to average it out so as not to let this starting point, elasticity starting point determine the elasticity that we calculate, right?

12:55  
Because if this is here, I'm going to get a different number and if I just use this as a starting point, I'm going to get a different number.

13:03  
So please look at the data that you have because your data tells you which method to use.

13:08  
Don't ask us.

13:09  
We expect you to know this and use the midpoint method, paying attention to the averages.

13:13  
Use the point method, paying attention to the equation.

13:16  
Think about what you're doing.

13:17  
Don't memorize equations.

13:19  
You don't need to do any of that if you understand what's happening here.