**W4 V1 Definining Elasticity**

0:10  
This module is all about elasticity, which is one of the most important concepts for economists.

0:14  
So let's spend a few minutes talking about why we use elasticity.

0:17  
We'll start off by a few motivating examples, and then we'll get into defining it and calculating and interpreting a few numbers.

0:25  
OK, so I'm going to give you a few thought experiments and explain to you why economists care about the size of people's response when we have something changing.

0:34  
So, for example, you work in a development agency and you want people to buy these preventive health products, right?

0:41  
The impact on their health is huge.

0:43  
Problem is, it's too expensive, so you want to lower the price.

0:48  
Now how much should you lower the price, right?

0:50  
How responsive people will be to a reduction in price will help you figure out whether you want to reduce the price by one dollar $2.00 or even just $0.50.

1:00  
So this is an example where an elasticity number would be useful.

1:04  
Here's another third experiment.

1:05  
You work for a microcredit agency and you want to charge the highest interest rate possible.

1:11  
But if you keep interest rates high, people are not going to take out loans.

1:14  
So you want to drop the interest rate, right?

1:17  
You want to change the interest rate, but but you don't want to change it too much.

1:20  
So you want to figure out if you want to hit a target of, for example, 10 extra borrowers, 2000 extra borrowers, what's the least amount of you can raise the OR lower the interest rate by, right.

1:31  
So these are examples of questions we can answer with elasticity, right?

1:37  
Sometimes there's a proposition, sometimes it's a bill like there was in California.

1:42  
And what it does is it increases the cost of producing pork.

1:46  
So in the demand and supply module, we've talked about, OK, we can predict the direction of change, but how large will this change be?

1:53  
When something in the environment happens, elasticity can help us think about how large that change will be.

1:59  
So these are some scenarios that we can use those elasticity numbers in.

2:05  
Why do we need a special concept to do that?

2:07  
Why can't we just calculate numbers, right?

2:09  
It's going to go up by 5000 units.

2:11  
Well, because that number, 5000 by itself doesn't mean much, right?

2:15  
Why?

2:15  
Because, you know, I could say price goes up by $1.00, but is that a big change?

2:20  
If I say I'm now going to denominate everything in Indian rupees and $1.00 is ₹61.00, then you know the same $1.00 change is going to show up as an increase in ₹61.00.

2:32  
And that's going to feel bigger.

2:34  
But is it really bigger?

2:35  
That's the question we have to think about, right?

2:38  
Similarly, if I want to make something seem really large when I'm thinking about gas consumption, I can change it from gallons to mill.

2:48  
And then it's going to seem like a really big change in quantity.

2:51  
So we want to be as agnostic as possible.

2:53  
And the way we do this is we think about percentage changes, right?

2:57  
What percentage changes will do is that they will get rid of the units in there.

3:01  
And then it's easy to compare across different markets, right?

3:06  
So you're saying prices go up by 1% and then we can compare the impact of a 1% increase in price on the gasoline market, on the market for granola bars or any market that we're interested in.

3:16  
We get rid of the units and it also becomes a unit free measure when we're talking about changes, OK.

3:24  
So given that we're going to think about elasticity's as a unit free measure, how exactly are we going to measure this?

3:32  
So I'm going to need a little bit of notation in here.

3:34  
So whenever I use the triangle sign, I'm really talking about change.

3:40  
It's a quick way of writing change without taking up too much space on my slides.

3:45  
And in the same way if I want to talk about percentage change because that's elasticity is all about percentages, lot of words to write but in symbolic form much shorter.

3:55  
So that's the notation that I'm going to be using consistently through just keep track of that.

4:01  
Now when we're trying to measure elasticity, we want responsiveness, we want responsiveness in quantity.

4:08  
So I'm going to have a change in quantity.

4:11  
I want to see how the quantity changes, but I want a unit free measure.

4:15  
So I'm going to think about the percentage change in quantity.

4:18  
Now, why is quantity changing?

4:21  
Well, because something in the environment is changing and that something can be anything else.

4:25  
We're going to talk about examples of the price of other goods changing, the price of your own good, changing income, changing whatever you're interested in.

4:33  
Put that in here in the denominator and then we can talk about how quantity responds to this.

4:39  
Change Signs are also going to be important in here.

4:42  
So I'm going to flag that here and we'll talk more about this when we do calculations because sign on the elasticity will tell you whether your numerator, which is your quantity, and your denominator, which is your percentage change in whatever else you're looking at, they move in the same direction or different directions.

4:58  
That's going to be a very important piece of information for us.

5:02  
OK.

5:03  
So I'm just flagging that for later.

5:06  
Now the 1st and most common elasticity measure that we're going to use a lot in one O 1 is this idea of elasticity of demand.

5:12  
So when the price changes and the price of that same product, right.

5:19  
So we would mean what we're talking about is own price elasticity.

5:23  
We don't often say own price elasticity because it's a mouthful and unless we're doing something different, that is the elasticity of demand we're looking for.

5:32  
So we are saying when your price changes by a given percentage, we're looking at the corresponding change in quantity demanded.

5:43  
That happens because people's choices change.

5:46  
OK, I just want to highlight in here again, all else is held fixed, right?

5:51  
Everything else except for prices held fixed and we change the price by a given percentage and we're looking at the quantity response for that price change.

6:01  
In a formula, we would write it down as this way, OK.

6:03  
We would have the percentage change of quantity in the numerator, that's typically where quantity goes and the something else in the denominator here the something else is the percentage change in price.

6:14  
And typically when we write elasticity of demand to keep track when we have multiple elasticity's, we put demand in the denominator, sorry, in the subscript.

6:24  
OK, now another jargon, anything that we're going to use a lot is I'm going to keep saying elasticity of demand and I'll say the absolute elasticity of demand.

6:36  
Now here's a problem with elasticity of demand.

6:39  
We have a downward sloping demand curve, most of the things in fact in one O 1, that's pretty much all we're looking at.

6:46  
When price and quantity change and we move along the demand curve, right, they're always going to move in opposite directions, which means that when I've got this elasticity calculation, I'm going to get a negative sign.

7:03  
But the negative sign is always going to be there because we're always looking at a downward sloping demand curve.

7:08  
So the fact that the negative sign is there is not really informative because it's always negative.

7:13  
But the problem with the negative sign there is that it can be really confusing.

7:17  
If I want to say something is more or less elastic, I'm going to compare those numbers, elasticity numbers, and then it becomes confusing, especially on an exam, to think about is -4 larger than -3 or smaller than -3?

7:31  
And that's an additional source of stress that we don't want you to deal with in one O 1, which is why just for the elasticity of demand, because for elasticity of demand in one O 1, the negative sign is not informative.

7:45  
We ignore that.

7:46  
We focus on the absolute value and that's why we'll often say absolute elasticity of demand.

7:52  
But as a general rule, you keep it because it's a general rule and we'll see as we go forward with more examples.

7:57  
The negative sign there is informative.

7:59  
So sometimes we want to, in general, we want to keep it, we just drop it for the elasticity of demand.

8:07  
OK, now suppose you've done your calculations and we'll work through some examples with how to calculate it.

8:11  
Exactly what does that number mean?

8:14  
Right.

8:14  
So suppose you've done your calculations and you get your elasticity of demand here as 0.8.

8:20  
What we've done in here notice is we've taken the absolute value because I don't want to be confused with the negative sign.

8:27  
So when I've done my calculations, I've given you this 0.8 as the elasticity of demand in absolute terms.

8:33  
What do you do with that number?

8:35  
Well, what you can do is thought experiments like this, right?

8:38  
We're going to say, well, prices go up by 1%, OK, Can we make a prediction about what's going to happen to the percentage change in quantity?

8:47  
We can do that really easily because we have the formula and we have some information which we can plug into the formula and back out what's missing.

8:57  
So what information do we have?

8:58  
Well, that's my formula.

9:00  
I know that the absolute version, the absolute value of elasticity of demand is 0.8.

9:06  
I also know that the percentage change in quantity is something that I don't know yet.

9:14  
I'm going to have to find that.

9:16  
But I do know that the percentage change in price is 1%.

9:20  
Now this is up to you how you want to write this.

9:23  
You can write this as 1%.

9:25  
Alternatively, you could write this as 0.01 because that's what 1% means.

9:32  
Pick whatever works for you, but be consistent and always interpreted in the same way.

9:37  
I want to save a little bit of space and I want to make it less confusing, so I'm going to just use 1% in here.

9:45  
Now keep track of the fact that this is the absolute version because we demand they move in opposite directions.

9:53  
So keeping that in mind, let me just rewrite this as 0.8 is the absolute percentage change in quantity demanded divided by 1%.

10:07  
OK, now 1%.

10:08  
I can put a negative or positive depending on what's happening to prices, but I do know here the prices are going up so I'm going to leave it as 1% because I know that the direction is increasing.

10:20  
OK, so now I'm just going to take this equation and solve for the percentage change in quantity.

10:28  
So the absolute percentage change in quantity is going to be 0.8 \* 1% or 0.8%.

10:41  
OK, now because I'm using the absolute thing or I'm solving for the absolute change in quantity, I've got to now make an additional mental step to say, OK, is this really +0.8 or is it -0.8?

10:56  
And that's when I'm going to go back to the data that's telling me if price goes up, then I know that a longer demand curve, quantity is going to go down.

11:05  
So first I'm going to go and put in the negative sign in there.

11:08  
I'm going to say quantity goes down because they move in opposite directions.

11:11  
How much does it go down by?

11:13  
Well, it goes down by 0.8 percent.

11:19  
OK, being consistent all the way through.

11:21  
Percent, percent, percent.

11:24  
OK, so that's one way we can use this, Fill in the information we have and back out the information we need.

11:30  
Let's do another example using the same numbers.

11:35  
Now over here I'm giving you market demand changing by 2%, and I want to figure out what the price change has to be in order to target this 2% change in the quantity demanded.

11:48  
So I'm going to take the same equation.

11:50  
I'm going to use the information I have, which is the absolute elasticity of demand is 2%.

11:56  
I know what the change in quantity is here, It's going down.

12:01  
So I'm going to put it in there.

12:03  
It's going down and it is going down by 2%.

12:08  
You can put it as 2%, you can put it as 0.02, doesn't matter.

12:13  
It's going to be in there.

12:14  
And then in the numerator, I kind of got the absolute value over there.

12:18  
And down here I'm solving for the absolute percentage change in prices, OK.

12:24  
Same thing as before.

12:29  
This means that the absolute change in price is going to be right.

12:40  
We've got that number down there.

12:42  
And now what I'm going to have to do is to solve for the price, which is pretty straightforward.

12:48  
But let me first, before I go any further, remember that look, price, quantity is going down.

12:54  
So before I go any further, let me just make sure price and quantity moving opposite directions, which means I need price to go up.

13:02  
OK, let's keep track of that.

13:04  
So then that's keeping track of this.

13:07  
OK, so now what is this going to be?

13:09  
This is going to mean we can plug in the numbers to get, I just don't have space here, so I'm moving down.

13:21  
OK.

13:22  
Now at this point, typically students will pull out their calculators and they're going to say, oh, look at this, this is rounding to 2 digits.

13:28  
What's going to happen?

13:30  
And they start to ask me, do we Round 2 digits or not?

13:34  
Now, why did I get this problem here and I didn't get it earlier?

13:36  
The reason I got this here and not earlier is because instead of plugging in 2%, I plugged in 0.02.

13:43  
So if this is a problem that you have and you find it confusing or you anticipate that this could be a problem for you because you're going to plug in numbers, another thing you could do is to just use 2% in here and then your calculation becomes 2% divided by 0.8.

14:04  
OK, so that's just a heads up so help you figure out which method you want to do.

14:08  
But Please remember, you're always being careful about this.

14:12  
OK, good.

14:13  
So now we can predict the percentage change in price given a percentage change in quantity.

14:22  
Either one of these exercises, whatever the exercise is, fill in the data you have, back out with data you need.

14:27  
Paying close attention to the fact that because we don't want to get confused, we always use the absolute values here.

14:36  
So here's what we've done.

14:38  
Elasticity's.

14:39  
We've told you why we use it because we want to get rid of the unit thing.

14:43  
A general formula, and we want to see more examples of this.

14:45  
Quantity goes up there, but that's our variable of interest.

14:48  
How responsive is quantity to change in the environment, making sure you've got percentage changes everywhere?

14:56  
And we use the elasticity of demand as an absolute version, just because it's the least confusing way to work with something like that without losing any information.

15:09  
OK.

15:09  
Please be careful about that because as we've seen in the previous slide, not keeping track of that could lead to problems with your calculations and your predictions, yeah.