

Robert_M4_v10

Mon, 11/22 4:36PM 9:29

SUMMARY KEYWORDS

equal, equations, qd, price, supply, demand, excel, expression, graph, solve, inverse demand function, y axis, sides, economics, qs, subscript, 30p, divided, isolated, rewrite

SPEAKERS

Robert McKeown

Hello everyone. In this video, we're going to return to a system of equations. And we're going to learn how to solve a system of equations graphically. So it can be done using a graph, and we're going to create that graph using Excel. Before we do that, we're going to just look at the problem and solve it by hand. And then we can compare our solution by hand with a solution that we're going to get using in Excel. Take a moment to read the question carefully. We have a supply and demand question from economics. So without going into all the detail of a first year economics course, we essentially just have two equations, we have our demand, and we have our supply. And what we want to do is set supply equal to demand. So sometimes in economics, we say something like QD is equal to Q, which is equal to quantity supplied. And we can just replace the QD and the QS with just plain old Q.

Now we want to solve this system, and then graph it, and we're going to graph it. And we should find that our solution, when we solve this using either the substitution approach, or the elimination approach, will give us the same answer that we get when we graph it. Now since we have QD is equal to QS, and QD is equal to this thing here, QS is equal to this thing here, we can rewrite this as $4000 - 20P$, P is equal to $1000 + 30P$. I want to collect like terms, and I can do that by adding 20P to both sides of the expression and subtracting 1000 from both sides of the expression. So I could rewrite this as $4000 - 20P + 20P - 1000$ is equal to $1000 - 1000 + 30P + 20P$. And we can see, looking at the left hand side of the expression, that those two terms are going to sum to zero. And maybe I'll just write it over here, we're gonna have 3000 on the left hand side, and that's going to be equal to 50P. I'm going to have P is equal to 3000 divided by 50. And that's going to give us price is equal to 60, 60 times 50 is 3000. When the price is equal to 60, I could say well, the quantity supplied is equal to the quantity demanded. And if the price is equal to 60, what is the actual amount of quantity supplied? What is the actual amount of quantity demanded?

Well, we know they're equal. But what is the actual value? We can figure that out by taking the price and plugging it back into one of our original equations. And if we do that, we'll find that QD is just equal to Q, which is equal to 4000. We know that QD is equal to $4000 - 20P$. 4000 minus 20 times 30 times excuse me, times 60. 20 times 60. And our quantity supplied and our quantity demanded, our quantity when the price is equal to 60, is going to be equal to 2800. And we can

confirm that this is the right answer by plugging this into the quantity supplied equation, we have 1000 plus 30 times the price, it's going to give us 1000 plus 30 times 60. And that's going to be equal to 2800 as well.

Now there's one more thing I want us to go through before we move into Excel. And that is which variable is going to be on the Y axis and which is going to be on the X axis. Now for various reasons, in economics, and I am an economist, we like to have price on the Y axis. So we've got our two equations, we've got our demand and our supply equation right here. But notice the prices on the right hand side and it hasn't been isolated. So if we want to graph these functions on Excel in such a way that price is on the Y axis, we're going to have to rearrange them so that the price P is isolated on the right hand side of the expression. So to do that, and we'll start with the demand over here, I'm going to add $20P$ to both sides of the expression. And I'm going to subtract QD off both sides. So we're going to end up with QD minus QD plus, oops, that's $20P$ is equal to 4000 minus QD , those sum to zero or QD minus itself is just equal to zero. And we get $20P$ is equal to 4000 minus QD , and P is equal to 4000 minus QD divided by 20 , the whole thing divided by 20 .

And I'm just going to leave it like that, if we wanted to, we could put a little demand subscript on our price. So we know that it's the demand. Or it's, this is actually our inverse demand function that we saw in a previous video. And now let's work with our supply function, we want to also isolate P . So I'm going to start off with subtracting 1000 by both sides of the expression. And, if I want, I can just, you know, sometimes I'll just sort of switch, move the variables from one side to the other. So I've got $30P$ is equal to QS minus 1000 . And that's going to give us price is equal to quantity supplied minus 1000 divided by 30 . And I could add a little supply subscript to the price. I want to remember that, that's this expression came from the supply function and there is our inverse supply function. Now we've got the two equations that we want to graph in Excel. Now that we've solved the system of equations by hand, let's move over to Excel and see see if we can solve it graphically.