Theoretical foundations

Microeconomic consumer theory

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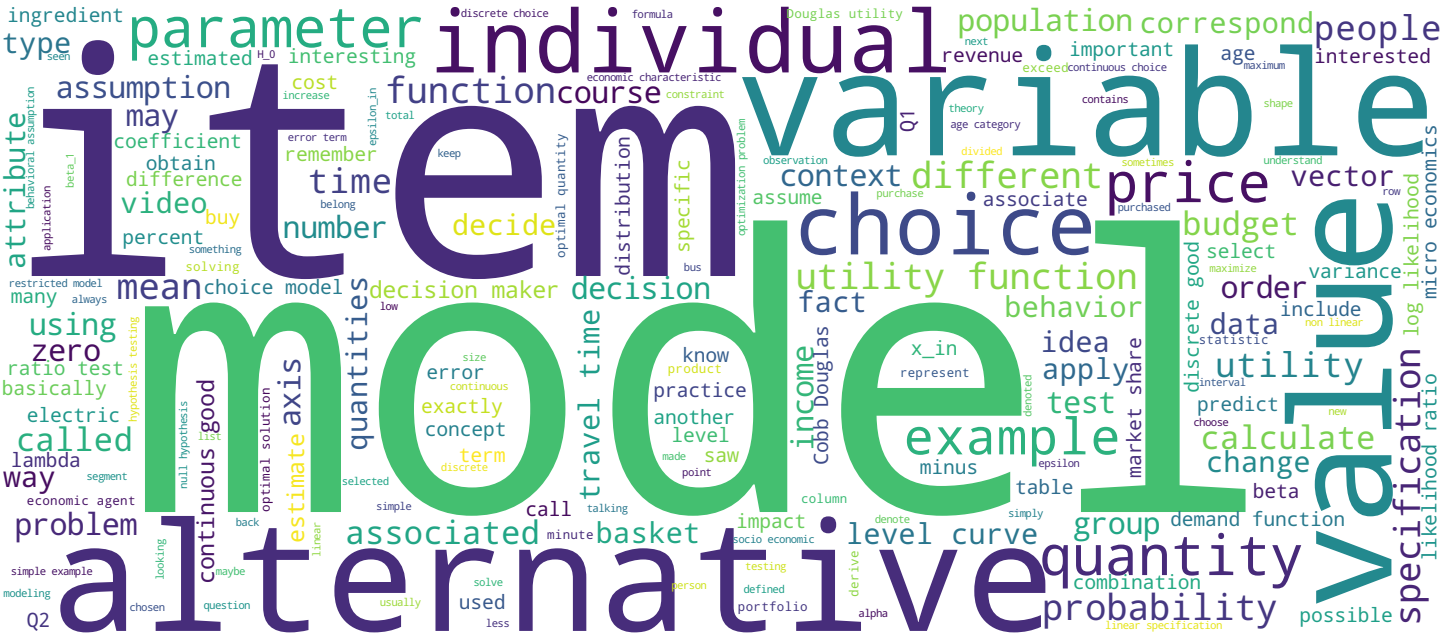
Introduction to choice models

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



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Video

EPFL

The case of continuous goods

In this video, we will do a quick reminder of the basics of micro-economics associated with the case of continuous goods, to remember these concepts that will be extended afterwards for the case of discrete goods.

Notes

Summary

0m 04s

Continuous choice set

- Consumption bundle

$$Q = \begin{pmatrix} q_1 \\ \vdots \\ q_J \end{pmatrix} \quad p = \begin{pmatrix} p_1 \\ \vdots \\ p_J \end{pmatrix}$$

- Budget constraint

$$p^T Q = \sum_{\ell=1}^{J} p_\ell q_\ell \leq I.$$

- No attributes, just quantities and prices

So in the context of a continuous choice set, we assume that we have a portfolio of J items, and each item is associated with a price, a unit price p_i, and we have to decide for each item the quantity that will be purchased. So, we consider two vectors: capital Q will be the vector of quantities, that will be basically the decision variables of the decision maker, and p, which is the vector of price, which corresponds to the price of each alternative in the portfolio. Now given a decision Q, so a value for each Q, we can calculate the total price that will be spent for this basket of items. And this price, which is represented by this sum here, may not exceed the budget. And the budget here is denoted by I. So remember, we discussed the ingredients of choice theory before. In this case, we have no attribute. The only thing we have are quantities and prices, in the case of continuous goods.

Notes

Summary

0m 19s

Choice

Solution of an optimization problem

$$\max_{Q} \widetilde{U}(Q)$$

subject to

$$p^T Q \leq I, \; Q \geq 0.$$

Demand function

- Solution of the optimization problem
- Quantity as a function of prices and budget

$$Q^* = \text{demand}(I, p)$$

Now the assumption is that the decision maker is an optimizer, and is solving the following optimization problem. There is a utility function (as we saw) that associates each vector Q, so each type of decision, with a utility. And the idea is that we would like to select the vector Q that maximizes this utility. But there are some constraints. We cannot exceed the budget. And, of course, we need to select positive quantities of each item. So the assumption, the behavioral assumption, is that each economic agent is solving that problem in order to make decisions. Now if you change the parameters of this problem. So if you change the budget for example or if you change the prices of the items, the optimal solution will be different. Indeed, if the price of one item decreases, maybe I want to buy more of that item. So it means that for each value of I and each value of p, you can solve the problem and obtain Q star, the associated optimal solution. The relationship between these quantities, so how to get the optimal quantity as a function of I and p, is called a demand function. It gives the quantity of each item as a function of prices and budget. This is called a demand function.

Notes

Summary

1m 26s

Example: Cobb-Douglas

$$\widetilde{U}(Q) = \theta_0 \prod_{\ell=1}^{J} q_\ell^{\theta_\ell}$$

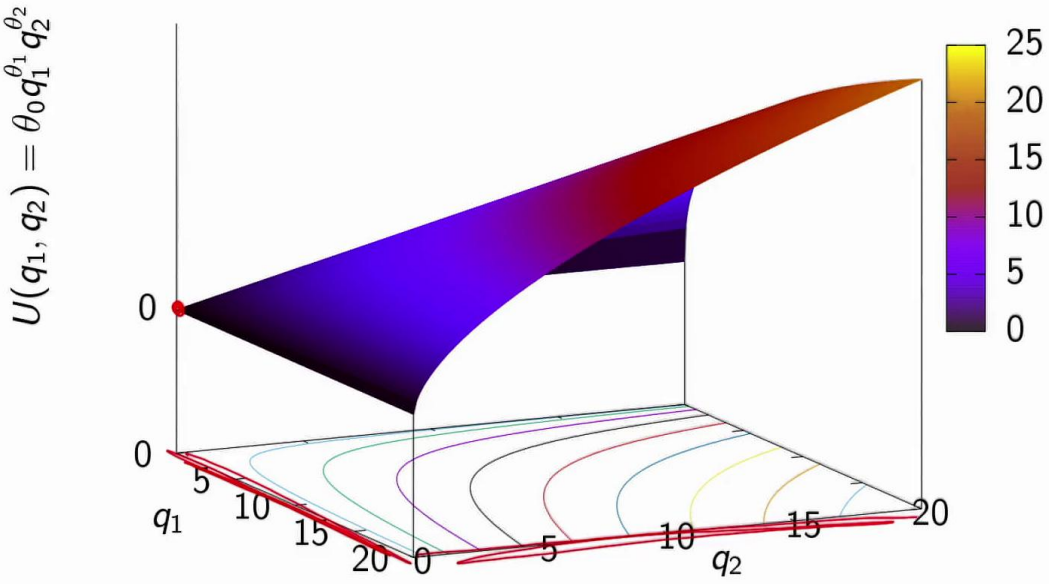
As a concrete example, we can use the following utility function. It's called the Cobb-Douglas. So it's the utility function that is usually used in a textbook in micro-economics.

Notes

Summary

2m 53s

Example: Cobb-Douglas



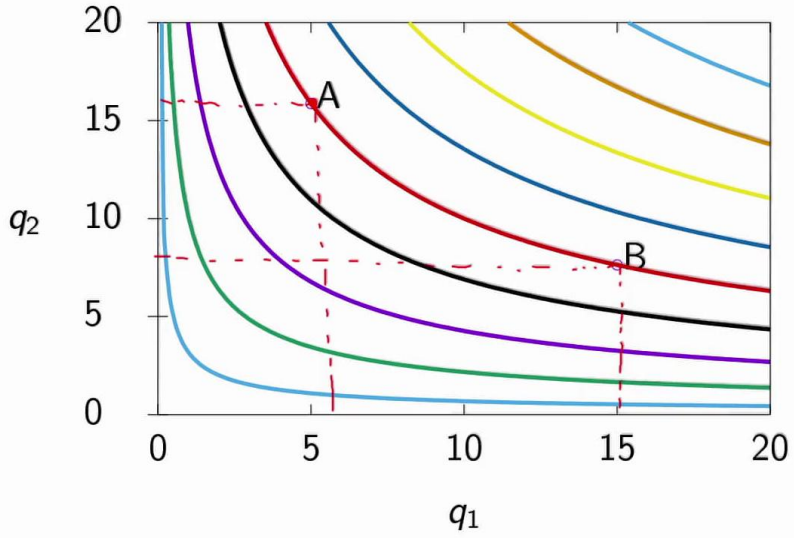
This is the shape of this Cobb-Douglas utility function for two items. So in this axis, we have the quantity of item 1. In this axis, we have the quantity of item 2. And the z-axis, the altitude represents the value of the utility corresponding to the combination of Q1 and Q2. So when you purchase no Q1 and no Q2, the utility is zero. And then as you increase the quantity of each of these ingredients, the utility is increasing.

Notes

Summary

3m 05s

Example



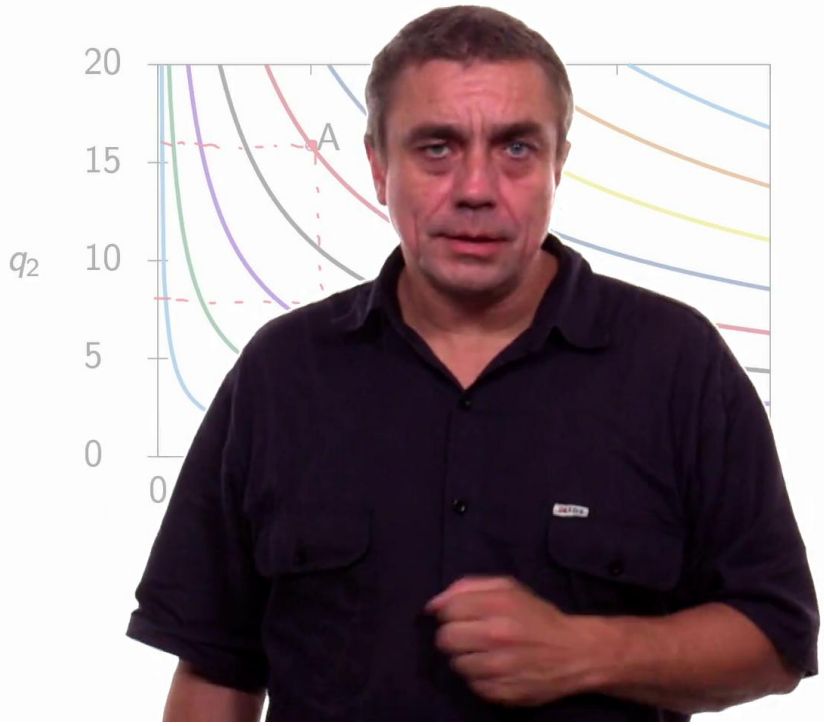
It's interesting to look at the level curves of this function. So here the x-axis is the quantity of item 1 and the y-axis is the quantity of item 2. And each of the combination is associated to an altitude represented by the level curve. Okay so the level curves go increasingly into this direction. If you look at two baskets on the same level curve, it represents an indifference. In this example, basket A, which corresponds to a quantity of 6 of item one, and a quantity of 16 of item 2, and basket B which corresponds to a quantity of 15 of item 1, and a quantity of 7 of item 2, these two baskets have exactly the same utility. So it means that the economic agent is completely indifferent between purchasing item A or item B because both will be associated with the same utility.

Notes

Summary

3m 38s

Example



So now, what would be interesting to do is to actually derive the demand function that I was talking about, the one that predicts the optimal quantity as a function of budget and prices, using the specific case of the Cobb-Douglas utility function. I let you do this as an exercise.

Notes

Summary

4m 36s