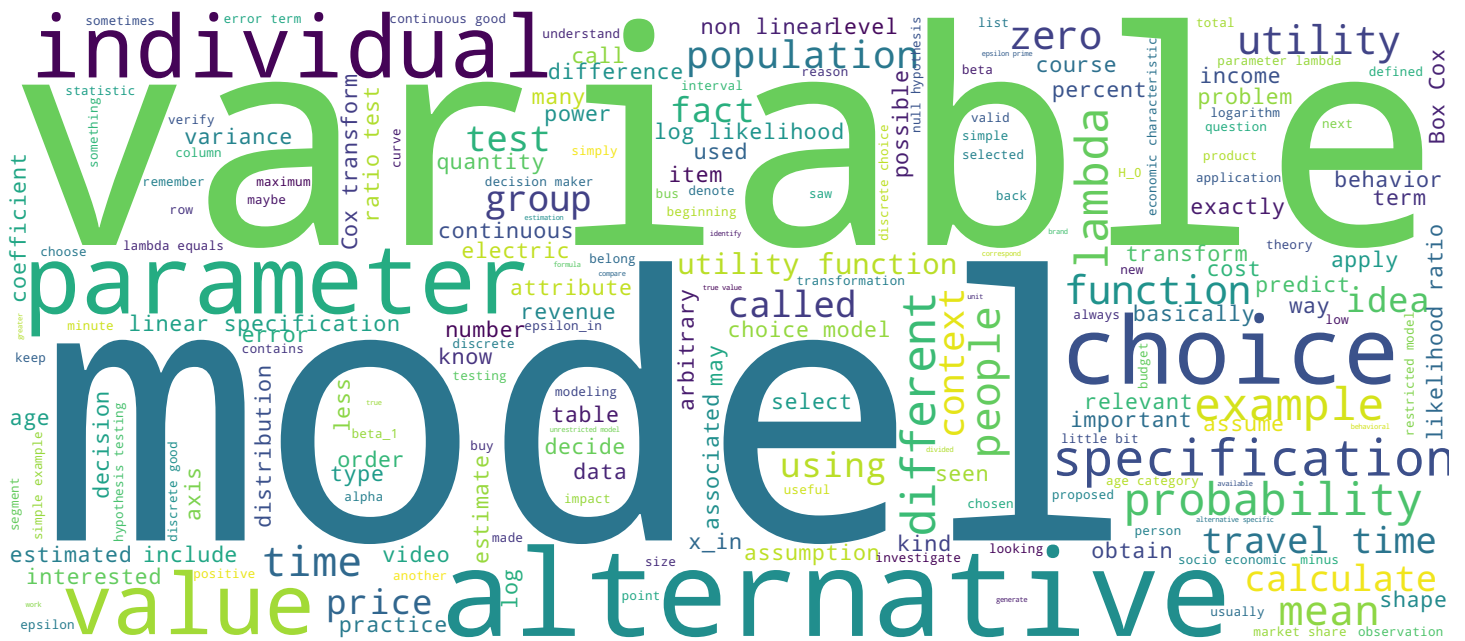


Specification of the deterministic part

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Introduction to choice models



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Video



Box-Cox transforms



The next non-linear specification that we will see is also motivated by the fact that the logarithm, although very useful, is kind of arbitrary. And we would like to investigate other possible specifications. Here, we would like to see if the power of the variable would be relevant in the model. But we don't want to be too arbitrary. So the idea would be to have a parameter that will decide which kind of non-linearity is actually relevant in this context. This is called a Box-Cox transform. Let's look at what it is.

Notes

Summary



0m 04s

Box-Cox transforms

Box and Cox (1964)

$$V_{in} = \beta x_{in}(\lambda) + \dots$$

where

$$x_{in}(\lambda) = \begin{cases} \frac{x_{in}^\lambda - 1}{\lambda} & \text{if } \lambda \neq 0 \\ \ln x_{in} & \text{if } \lambda = 0. \end{cases}$$

and $x_{in} > 0$.

This specification has been proposed in a paper written by Box and Cox in 1964. So the name. And the idea is that the variable x_{in} is transformed as a function of a parameter λ . If this parameter λ is equal to 0, we do the log transformation which is the one that we have seen in the very beginning of this video. If λ is not zero then we use a power law. So x_{in} to the λ . But what we do is that we transform a little bit this power using this formula: x_{in}^λ minus 1 divided by λ . The reason is that we would like this transformation to be continuous in λ . And you can verify that this quantity here when λ goes to zero, it converges to log of x , which makes the formulation continuous. So this is called the Box-Cox transform. It is valid only when x_{in} is positive. You cannot take the log of a negative number. And λ is a parameter that will be estimated from data. Obviously, in this specification because λ appears at the power, it is a non linear specification. It is not linear in parameters anymore.

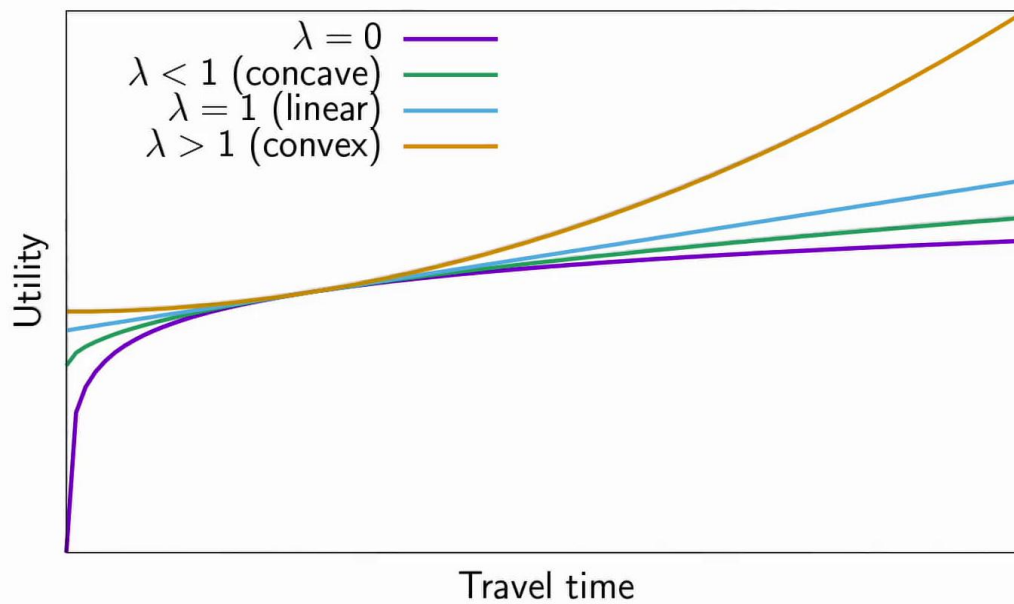
Notes

Summary



0m 39s

Box-Cox transforms



Actually the value of lambda will define the shape of this transform. So here I have again travel time as the x-axis, and the utility as the y axis. If you take lambda equals to zero, which is this curve, we have the logarithm that we have seen before. Now if lambda equals 1 we have a linear specification. And if we have values of lambda which are different from one, we distinguish between the case where they are greater than one, then we have a convex transformation, a convex function of the utility as a function of travel time, and if lambda is less than 1, then we obtain a concave function. So the lambda parameter that is estimated from data gives us information about the shape of the nonlinear transformation of the variable.

Notes

Summary



1m 57s