Subjective Measure: Budget Constraint and Homogeneity of Degree Zero

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The objective and subjective measures are two essentially distinct descriptions. It is quite harmful to mix them, especially in experimental or empirical analyses, in which they usually appear together.

As well known, homogeneity of degree zero is addressed in terms of the objective measure: if the prices-budget set (p, B) is multiplied through by a constant t, becomes (tp, tB), it will not change the original budget constraint $B = \sum p_i q_i$ in a consumer's commodity choices q_i and will not change the choices q_i itself, because $tB = \sum tp_i q_i$ is equivalent to $B = \sum p_i q_i$ mathematically.

Now we introduce a subjective measure to analyze homogeneity of degree zero.

He, 2012, has verified that $Q = \sum q_i$ in one's subjective utility measure implies

$$c \ln(Q - a) + C = \sum b_i \ln(q_i - r_i), \tag{1}$$

where c, a, C, b_i, and r_i are parameters that can be determined by the psychophysical measure. That is, one's subjective utility measures on a total quantity Q and its composed parts q_i follow the form of psychophysical sensation scale, the left-hand side in (1), indentified with a Klein-Rubin utility function (Klein and Rubin, 1954; Geary, 1950) , the right-hand side in (1).

He, 2012 points out that to extend (1) to general situations, we only need to count Q and q_i by their monetary amounts. Multiplying q_i by p_i in the right-hand side in $Q = \sum q_i$, Q is naturally changed into B, a total money amount corresponding to Q. $Q = \sum q_i$ becomes the budget constraint $B = \sum p_i q_i$, and (1) naturally becomes

$$c \ln(B - A) + C = \sum b_i \ln[p_i (q_i - r_i)], \tag{2}$$

where A is a money amount corresponding to a. (2) represents the subjective measure to the budget constraint $B = \sum p_i q_i$.

If the prices-budget set (p, B) is multiplied by a constant t, becomes (tp, tB), we shall obtain in (2),

$$\begin{aligned} \text{the left-hand side} &= c \ln t(B - A) + C \\ &= c \ln t + c \ln(B - A) + C ; \end{aligned}$$

while

$$\begin{aligned} \text{the right-hand side} &= \sum b_i \ln[tp_i (q_i - r_i)] \\ &= \sum b_i \ln t + \sum b_i \ln[p_i (q_i - r_i)] \\ &= \ln t \sum b_i + \sum b_i \ln[p_i (q_i - r_i)] \\ &= \ln t + c \ln(B - A) + C \\ &\neq \text{the left-hand side.} \end{aligned}$$

The above results means that (2) is destroyed by multiplying a constant t on both sides of $B = \sum p_i q_i$. Namely, homogeneity of degree zero does not hold in the subjective measure to $B = \sum p_i q_i$. The subjective measure is essentially different from the objective measure.

To make (2) holds for (tp, tB), the parameters must be changed. That is, the subjective utility judgment will vary when (B, p) is changed into (tp, tB) and, thus, the commodity bundle chosen in (tp, tB) will be changed to deviate from the original one chosen in (p, B). Namely, the subjective measure must produce a different effect in a consumer's choice behaviors.

The above outcome is derived from associating the sensation scaling description with the multi-variable econometric model Klein-Rubin model.

Sippel (1997) tested homogeneity of degree zero experimentally in an eight-good bundle. He

designed two situations, the only difference of which was that prices and budget were 15% higher in one situation than they were in the other, then asked subjects to choose eight goods respectively in the two situations. The result revealed a considerable majority, occupying 91.7% in observations, violating homogeneity of degree zero. It indicates the unsuitability of objective budget measure in the description for realistic choice behaviors, and is obviously in favor of the explanation from subjective utility measure.

Reference

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