Analysis of contingent valuation data with self-selected rounded WTP-intervals collected by two-steps sampling plans

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In collecting contingent valuation data on Willingness To Pay (WTP-)points, rather than asking a respondent to state an estimate of his/her WTP-point or select one between given brackets, the respondent may freely self-select any interval of choice that contains the WTP-point. For the collected data, we found that presence of strong rounding is a typical feature. The self-selected intervals can be considered as censoring the true WTP-points. Usually in the Survival Analysis it is assumed that the censoring intervals are independent of such points and cover only some of them. But here these intervals can depend on the unobserved positions of their WTP-points, and all WTP-points are covered. Due to rounding many of the same self-selected intervals will be often stated by different respondents. We suppose that the true WTP-points corresponding different respondents can be considered as values of independent identically distributed random variables. It is useful to find consistent estimates related to the distribution of these WTP-points. We propose statistical models which admit dependency of the self- selected WTP-intervals on the positions of their WTP-points. Note that one has to distinguish between the probability to select an interval containing WTP-point and the probability of the different event that the interval contains the WTP-point.

We suggest a two-step plan of random sampling individuals from a population of interest that it would be possible consistently to estimate (identify) some of important characteristics of the unknown distribution of WTP-points. On the first step freely self-selected WTP-intervals are collected. It is possible to recognize weather the size of the first sample is large enough to guarantee be related to a desired majority of the population of interest. Based on the collected set U of different stated self-select intervals the collection V of division intervals is generated. Each interval in U is a union of related division intervals. Besides that two auxiliary subsets from U and V are calculated. On the second step new random selection of individuals continued. Each selected respondent is asked to state freely a self-selected WTP-interval containing true WTP-point. If the stated interval has already been registered in U then as soon as possible the respondent should be suggested to select, from the related division intervals, the interval containing the true WTP-point. In this case the pair of both, the initially stated WTP-interval and the more exact selected division interval has to be added to the second step sample. If the respondent was not able to select such division interval then the only single self-selected interval has to be added to the second step sample. The subset of pairs is used for estimation of conditional probabilities to state a self-selected interval given the division interval containing the true WTP-point.

The log likelihood function, which parameters are probabilities of divisions intervals containing the true WTP-points, given the list of all selected division intervals in the pairs, and the all single self-selected intervals, can be written. The maximum likelihood (ML-)estimates of the projection of WTP-distribution on the set of all

division intervals is obtained based on special recursion. The maximizing likelihood recursion is obtained by the method of Lagrange multipliers. The consistent lower and upper bounds of the mean WTP-value and the consistent estimate of medium mean WTP-distribution are calculated. Accuracy of these estimators can be characterized by the distributions of their deviations from the true unknown values. The distributions of deviations can be found by applying related resampling method. The detailed description of this research work, joint with Bengt Kriström, is given in [1].

References

[1] Belyaev, Yu. K., Kriström, B. (2011). Two-Step Approach to Self-Selected Interval Data in Elicitation Surveys, (in preparation).