2 Literature Review

Contingent valuation method(CVM) has been widely used to elicit information on people's willingness to pay for non-market goods or services. Several questionnaire designs, such as payment card, bidding game, closed-ended question,..., have been presented. However, none of them dominates the other, each of these techniques has its advantages and disadvantages. Single-bounded dichotomous choice approach, proposed by Bishop and Heberlein in 1979, has become one of the most commonly adapted techniques in questionnaire design. It provides the respondents with a threshold price and ask them if they are willing to pay that amount. Such Yes-No qualitative type of questions are much easier to answer than those quantitative ones in the open-ended questions.

Easy to answer as it is, single-bounded design is deficient in providing adequate information and precision. What the researcher can infer is whether the respondent's willingness-to-pay is greater than or less than the threshold price. Consequently, this design necessitates a considerable number of observations to attain desirable precision. Hanenmann, Loomis, and Kanninen (1991) recommended a modified version to ameliorate the inefficiency issue by introducing a follow-up question and named it double-bounded dichotomous choice elicitation method. This method requests respondents to answer two-staged contingent questions. At the first stage, a randomly selected price, an initial bid B^0, is presented to a respondent and the respondent has to decide if he/she is willing to pay that amount to purchase the hypothetical product. At the second stage, a respondent answering *Yes* at the first stage is asked if he/she is willing to pay a higher amount, say B^u, whereas a respondent answering *No* at first stage is asked if he/she is willing to pay a lower amount, say B^l.

Double-bounded design enlightened the inefficiency problem without the cost of sample size increment, other researches, though, revealed that respondents might answer inconsistently due to some biases (Herriges and Shogren, 1996). Even though double-bounded design is not impeccable, Alberini (1995) showed that this design was robust for estimating mean and median.

Two distinct philosophies, utility based and price oriented, are presented to analyze such CVM survey data. The former method tries to measure willingness to pay through modeling indirect utility function and subsequently derive the willingness to pay function, while the latter attempts to model the functional form of willingness to pay directly. Only when some suitable assumptions are imposed will these two methods be equivalent (Bateman, 2002). In the following, these two philosophies will be discussed profoundly.

Hanemann's (1984) *random utility model* best delineates how to measure willingness to pay in terms of utility difference. His model is appealing for its solid economic theory. It had been proven that this framework is fully compatible with the usual economic assumption, pursuit of utility maximization. However, that some assumptions, such as linearity and normality, are made without due reasoning is its Achilles' heel. Eom (1994) made Hanemann's random utility model more complicated by introducing the concept of expected utility function rather than traditional utility function. Despite its deficiency in theoretical buttress, random utility model or its revised vision are still used extensively in applied economics studies, such as Fu *et al.*(2004) and Jan *et al.* (2005).

On the other hand, not needing further transformation or arrangement, modeling willingness to pay function directly is appealing for its limpid structure. This

method would be more preferred if the domain of willingness to pay is restrained, e.g. willingness to pay is greater than zero or fall into a compact set. A delicately tailored function would help meet such assumption. Bateman (2002) exemplifies several commonly-used functional forms and concludes that both functional form and distribution of stochastic component influence estimation of WTP greatly.[1] Linear and exponential functions, for instance, are two simple but most extensively applied forms among these commonly-used functional forms.

Like random utility model, modeling willingness to pay directly is also questioned for the absence of theoretical buttresses. To some extent, without due evidence to reprehend these two methods, adopting either philosophy to investigate such CVM data is justified. However, the development of some more general and more robust methods are presumably an ongoing topic.

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[1]Intuitively, the estimation of median is more robust than that of mean. In later chapter of this thesis, similar argument will also be discussed in depth.