

Economic Valuation of Environmental Goods by Contingent Valuation Method (CVM)

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Abstract

Contingent valuation method (CVM) is a direct approach - it directly asks people what they are willing to pay for a benefit and/or what they are willing to receive by way of compensation to tolerate a cost in a hypothetical market for environmental goods/services. Although CVM has been widely used for the past two decades, there is considerable controversy over whether it adequately measures people's willingness to pay for environmental quality. In this article an attempt is made to analysis the full economic value of the natural resource using CVM and also to identify determinants of willingness to pay of a household for this natural resource. Generally non-commercial economic value of environmental goods has been neglected in policy designs. The policy implication of this article is that since net social benefit could be achieved from multi-purpose environmental goods at a community level, the government should give more emphasis for such kinds of projects in its policies and projects. Moreover, specific agro-ecology and socio-economic factors should also be considered while designing a project/policy concerning environmental goods.

Keywords

Contingent valuation method; environmental goods; willingness to pay, willing to accept.

1. Introduction

The contingent valuation method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. It can be used to estimate both use and non use values, and it is the most widely used method for estimating non-use values. It is also the most controversial of the non-market valuation methods.

The contingent valuation method involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called "contingent" valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service.

The contingent valuation method is referred to as a "stated preference" method, because it asks people to directly state their values, rather than inferring values from actual choices, as the "revealed preference" methods do. The fact that CVM is based on what people say they would do, as opposed to what people are observed to do, is the source of its greatest strengths and its greatest weaknesses.

Contingent valuation is one of the only ways to assign dollar values to non-use values of the environment values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as "passive use" values. They include everything from the basic life support functions associated with ecosystem health or biodiversity to the enjoyment of a scenic vista or a wilderness experience, to appreciating the option to fish or bird watch in the future, or the right to bequest those options to your grandchildren. It also includes the value people place on simply knowing that giant pandas or whales exist.

It is clear that people are willing to pay for non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated.

So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behaviour, the only option for estimating a value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behaviour, is the source of enormous controversy. The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature. CVM researchers are attempting to address these problems, but they are far from finished. Meanwhile, many economists, as well as many psychologists and sociologists, for many different reasons, do not believe the dollar estimates that result from CVM are valid. More importantly, many jurists and policy-makers will not accept the results of CVM. Because of its controversial nature, users must be extremely cautious about spending money on CVM studies and about using the results of CVM studies.

2. Review of Literatures

The contingent valuation method is said to have come in to use first in the early 1960's when economist Robert K. Davis used questionnaires to estimate the benefits of outdoor recreation in a Maine backwoods area. Particularly since the early 1970s the contingent valuation technique has been used by economists to measure the benefits of a wide variety of goods. CVM circumvents the absence of markets for public goods by presenting consumers with hypothetical markets in which they have the opportunity to buy the good in question. Because the elicited willingness to pay (WTP) values are contingent upon the particular hypothetical market described to the respondent, this approach came to be called the contingent valuation method (Mitchell & Carson, 1989)

Navrud & et.al (1992) notes, after more than 30 years of CVM research the method has passed the experimental prototype stage, but has still not reached the routine application stage. There are no general guidelines for constructing reliable CVM studies, although Mitchell & Carson (1989) provide some check points for evaluating CVM survey. However, they emphasize that the presence of criteria for a good CVM study may create overconfidence in those studies that meet those. Field application should, therefore, always be combined with methodological tests. Since the CVM method at first sight seems very easy to use, it is vulnerable to misuse, which can easily undermine confidence in the method. The construction and framing of a CVM survey should therefore be carefully examined before the results from it are used for policy purpose. It has many critics concerning inconsistency with rational choice, implausibility of responses, absence of a meaningful budget constraint, and information provision and acceptance extent of the market (Arrow *et al*, 1993).

The contingent valuation method (CVM) is the most well-known monetary valuation method and very popular among valuation researchers. CVM is big business, involving large amounts of money. Its uses, and the fee for carrying out such a study, continue to increase at a rapid pace (Knetsch, 1994). Also, the social and financial stakes in the use and abuse of the CVM are very high. CVM possesses some kind of monopoly in the world of monetary valuation methods. As the above quote suggests, like all goods produced by monopolies the CVM is not as perfect as it could have been if competition had been present. Indeed, the method is not at all trouble-free. The popularity and the troubles surrounding the CVM have led to a fierce debate between proponents and opponents of the CVM.

Various valuation methods are available to put an economic value on environmental goods. Also, various classifications of these methods exist. Bateman & Turner (1993) distinguish two basic approaches, viz. that which values a commodity via a demand curve and that which does not and therefore fails to provide 'true' valuation information and welfare measures. Another classification comes from Mitchell & Carson (1989) and is based on two characteristics, namely direct versus indirect methods and hypothetical versus observed behaviour methods. Here, a classification is presented that is a combination of the classifications given by the Australian Department of the Environment, Sport and Territories (1995) and by Hoevenagel (1994). Hoevenagel categorises

groups of valuation methods on the basis of the process by which these methods retrieve environmental preferences of individuals, viz. stated preference methods and revealed preference methods. Although these methods are not really market approaches in the sense that goods are offered to be valued, yet they are classified under simulated market approaches, since the goods 'income position' and 'well-being' are valued. In the case of the welfare evaluation method, the respondents are asked to evaluate their income, and a price can be derived by linking this evaluation to environmental variables relevant to the respondent (Praag, 1988). The Cantril (1965) question asks respondents to evaluate their personal position on a ladder of life with a scale from 0 to 10. This position represents the respondent's wellbeing, not his or her welfare. Subsequently, the position on the ladder is related to environmental variables relevant to the respondent.

This method is based on a survey of respondents using hypothetical questions. Due to the unavailability of data in the other valuation methods CVM, which is appropriate for this study, is used and is discussed in detail below. For example, the method will ask what people are willing to pay (WTP) for preservation of native forests, what are willing to pay for access to clean water, or what compensation they are willing to accept (WTA) if they are to lose the access to clean water.

3. Objective and Methodology

The main objective of the paper is to critically review the CVM and its theoretical basis and assumptions. The Descriptive analysis is used for the critical analysis to draw the conclusion regarding the objectives.

4. Theoretical Background of CVM

Each of the mainstream of non-market valuation has its theoretical framework Carson (1991) explains the theoretical foundation of using hypothetical market for welfare measurement and how to incorporate WTP and WTA by using the idea of "Constructed markets". Moreover, Randall (1987) discussed this theoretical framework more rigorously and clearly. According to him the theoretical frameworks for the various methods are developed to different degrees and in different directions. Nevertheless, they all share one basic concept. Non marketed goods are represented in the utility function just as other goods are, and were it not for conditions of non rivalry, non exclusiveness or a political decision to provide and ration them independently of the market that distinguish them from ordinary goods they would be traded and valued in the same manner as market goods are.

Introducing some non market good, Q, there are two ways to express the utility function. First, $U = U(Q, Y)$, where Y is the value of all goods and services other than Q. This is the formulation implicit in the general value model. Second, we may write the alternative form: $U = U(Q, Z)$, where Z is a vector of ordinary goods. An equivalent formulation is,

$U = U(P, Q, Y)$, where P is a vector of prices of Z and Y is money income.

These two ways to express the utility function suggest two different avenues to estimating the value of Q and thus the benefits (costs) of increments (decrements) in Q. One may attempt to estimate directly the total value curve. Alternatively one may use the second formulation of the utility function to extract indirectly information about the value of Q from observations of markets in Z.

The total value curve is an indifference curve. For an individual initially enjoying Q^0 and Y^0 , the total value curve indicates the benefit (cost) of increment (decrement) in Q as follows.

$$U(Q^0, Y^0) = U(Q^-, Y^+) = U(Q^+, Y^-) \\ = U(Q^-, Y + WTA) = U(Q^+, Y - WTP)$$

Contingent valuation methods (CVM) attempt to determine the amount of compensation paid (WTP) or received (WTA) that will restore the initial utility level of an individual who experiences an increment or decrement in the level of Q. Because indifference curves are not observable, estimation methods using this approach usually make the searcher contrive situations in which experimental subjects or survey respondents reveal relevant points on their indifference surfaces. The researcher

creates hypothetical or experimental markets. The level of Q is varied and the values recorded in these markets are treated as contingent values. Among economists there is an old belief which, in an extreme form, makes them feel convinced of having the truth. Others are willing to settle for less, but, even in the opposite extreme, in their wavering minds they have the shimmering idea that they are on a very special road. Which of course is true? This belief, of which no one needs to be ashamed, is the belief in the 'scientific nature' of economics." (Klant, 1987). This quote exemplifies the search for the truth or for true values that is also apparent in the CVM. One of the principal assumptions underlying the CVM is that people have true, but hidden, economic values for environmental goods which can be revealed through the creation of a hypothetical market. The question is whether these true values exist, or whether several true values exist. Several true values might exist if existing costs and benefits are the product of a set of property rights, the economic system, and income- distribution and so on. If you change the starting point, a different value will result (Schmid, 1995). A second question is whether the CVM can elicit true values. CVM believers assume that, if procedural biases are absent, a neutral survey could convert subjective feelings into scientifically viable expressions of value (Harris et al., 1989). For example, the NOAA panel concluded that, if conducted under appropriate conditions specified by the panel. CVM studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive use values," (Arrow et al., 1993). Although the CVM pretends to obtain these scientific estimates (since they are related too theoretical concepts like compensating variation and equivalent variation), I do not think that the CVM -or any other stated preference method for that matter- is capable of eliciting an unambiguous, theoretically correct value. The WTP principle on which such estimates are (supposedly) based, is elastic enough to allow a huge range of estimates.. Apart from anything else, it shows that different assumptions and procedures will lead to widely different results. For instance, the implication of several biases, framing effects, embedding effects and endowment effects is that the CVM is open to political influence: by framing the questions in a certain way, by embedding the good in a larger context or by using a WTPP measure instead of a WTA measure, CVM practitioners can deliberately influence the results so as to please themselves or their sponsors. In other words, the method appears to be susceptible to serious manipulation, which is not a good feature for a method on which damage awards and allocation decisions are to be based and which claims to be scientific (unambiguous). Some people even suggest that it seems to be a case of 'tell me the figure you'd like, and I'll provide a justification' (Diamond & Hausman, 1994). This latter remark goes too far in its sarcasm towards the CVM.

5. Application of the Contingent Valuation Method

To apply this method we have to use following steps:

Step 1: The first step is to define the valuation problem. This would include determining exactly what services are being valued, and who the relevant population is. In this case, the resource to be valued is a specific site and the services it provides.

Step 2: The second step is to make preliminary decisions about the survey itself, including whether it will be conducted by mail, phone or in person, how large the sample size will be, who will be surveyed, and other related questions. The answers will depend, among other things, on the importance of the valuation issue, the complexity of the question being asked, and the size of the budget.

In-person interviews are generally the most effective for complex questions, because it is often easier to explain the required background information to respondents in person, and people are more likely to complete a long survey when they are interviewed in person. In some cases, visual aids such as videos or colour photographs may be presented to help respondents understand the conditions of the scenario that they are being asked to value.

In-person interviews are generally the most expensive type of survey. However, mail surveys that follow procedures that aim to obtain high response rates can also be quite expensive. Mail and

telephone surveys must be kept fairly short, or response rates are likely to drop dramatically. Telephone surveys may be less expensive, but it is often difficult to ask contingent valuation questions over the telephone, because of the amount of background information required.

In this hypothetical case, the researchers have decided to conduct a mail survey, because they want to survey a large sample, over a large geographical area, and are asking questions about a specific site and its benefits, which should be relatively easy to describe in writing in a relatively short survey.

Step 3: The next step is the actual survey design. This is the most important and difficult part of the process, and may take six months or more to complete. It is accomplished in several steps. The survey design process usually starts with initial interviews and/or focus groups with the types of people who will be receiving the final survey, in this case the general public. In the initial focus groups, the researchers would ask general questions, including questions about peoples' understanding of the issues related to the site, whether they are familiar with the site and its wildlife, whether and how they value this site and the habitat services it provides.

In later focus groups, the questions would get more detailed and specific, to help develop specific questions for the survey, as well as decide what kind of background information is needed and how to present it. For example, people might need information on the location and characteristics of the site, the uniqueness of species that have important habitat there, and whether there are any substitute sites that provide similar habitat. The researchers would also want to learn about peoples' knowledge of mining and its impacts, and whether mining is a controversial use of the site. If people are opposed to mining, they may answer the valuation questions with this in mind, rather than expressing their value for the services of the site. At this stage, test different approaches to the valuation question and different payment mechanisms would be tested. Questions that can identify any "protest" bids or other answers that do not reveal peoples' values for the services of interest would also be developed and tested at this stage.

After a number of focus groups have been conducted, and the researchers have reached a point where they have an idea of how to provide background information, describe the hypothetical scenario, and ask the valuation question, they will start pre-testing the survey. Because the survey will be conducted by mail, it should be pretested with as little interaction with the researchers as possible. People would be asked to assume that they've received the survey in the mail and to fill it out. Then the researchers would ask respondents about how they filled it out, and let them ask questions about anything they found confusing. Eventually, a mail pretest might be conducted. The researchers continue this process until they've developed a survey that people seem to understand and answer in a way that makes sense and reveals their values for the services of the site.

Step 4: The next step is the actual survey implementation. The first task is to select the survey sample. Ideally, the sample should be a randomly selected sample of the relevant population, using standard statistical sampling methods. In the case of a mail survey, the researchers must obtain a mailing list of randomly sampled people. They would then use a standard repeat-mailing and reminder method, in order to get the greatest possible response rate for the survey. Telephone surveys are carried out in a similar way, with a certain number of calls to try to reach the selected respondents. In-person surveys may be conducted with random samples of respondents, or may use "convenience" samples – asking people in public places to fill out the survey.

Step 5: The final step is to compile, analyze and report the results. The data must be entered and analyzed using statistical techniques appropriate for the type of question. In the data analysis, the researchers also attempt to identify any responses that may not express the respondent's value for the services of the site. In addition, they can deal with possible non-response bias in a number of ways. The most conservative way is to assume that those who did not respond have zero value.

6. Questionnaire Design for Contingent Valuation Method

Each component in the questionnaire fulfils an important role taken together, they introduce the respondent to the context and relevant background in progressively more detail, and also gather

information about the respondent and their understanding of the scenario which are needed to report the results or to establish the validity of the response. Some questions may test whether key aspects of the scenario have been understood, while other questions about the degree of familiarity with the good in question will reveal whether the respondent is a user or a non-user. The questionnaire must ensure that three specific conditions are upheld in order to ensure a validity of the results: the non-market good must be carefully defined; the scenario must provide a plausible means of payment; and there must be a plausible mechanism for making the trade off-between consumption of private goods and the good in question (Arrow et. al, 1993). For example, the method will ask what people are willing to pay (WTP) for preservation of native forests, what are willing to pay for access to clean water, or what compensation they are willing to accept (WTA) if they are to lose the access to clean water.

The following table sets out the structure of a typical contingent valuation questionnaire and each stage is discussed below.

Purpose: It is essential to state the purpose of the CVM questionnaire to ensure that respondents understand the contexts, are motivated to cooperate, and are able to participate in an informed manner. The context should be as realistic as possible in order to encourage realistic and truthful responses (but not to bias the answers). The interviewers should explain who they are (e.g. conducting a survey on behalf of what organization), and should assure the respondents that their answers will be confidential.

Attitudinal Questions: The next stage seeks the respondent's attitudes to general issues concerning the good then to the good in question.

Use of the Good: The next stage determines the use of the good or service in question. The aim is to determine what use the respondent makes of the good in order to test the familiarity with it and to distinguish users from non-users.

The Valuation Scenario: The valuation scenario defines the good in question and the nature of the change in the provision of that good. This information makes up a scenario and it is this scenario that respondents will value. Several scenarios may be presented but care has to be taken not to 'overload' respondents so that they become confused about what they are being asked to value. The design of the scenario is a critical feature of a questionnaire. The scenario defines the good and the institution that is responsible for providing the good. It is important that respondents should have some belief that what they say will influence the decision and that the good will not be provided regardless of what they say. So they must believe the institution in question has the capacity to provide the good. These conditions contribute to the credibility to the questionnaire and the scenarios in the questionnaire.

The payment vehicle: The payment vehicle describes the way in which the respondent is (hypothetically) expected to pay for the good. National tax, local tax, fee/charge, price increase, donation to trust fund and others could be used based on the nature of the good evaluated.

Eliciting value: The value elicitation question is designed to draw out peoples' willingness to trade goods (or impacts) for money. In this process it is essential to elicit either the maximum WTP or the minimum WTA in order to be consistent with the underlying theory of economic valuation. The most widely used elicitation formats are: open ended, binding game, payment card, and single bounded or double bounded dichotomous choice (Hanley *et.al.*, 1997). In all approaches, respondents must be reminded of substitute goods as well as the need to trade off money for benefits. Respondents must also be reminded of their budget constraints and hence the consequent need to make compensating adjustments in other types of expenditure to accommodate the additional financial transaction implied by the survey.

Follow-up questions: It is important to follow-up the answers to WTP or WTA elicitation questions in order to understand the motives behind these answers. Follow up questions are especially useful where there is some form of protest or unwillingness to pay for the good in question.

Socio-Economic Characteristics: The final section of the questionnaire asks for the socio-economic characteristics of the respondents. This information is used to test whether the WTP answers conform to theoretical expectations.

7. Problems of Contingent Valuation Method

There are two main problem areas associated with CVM (Bateman & Turner, 1993; Hanley & Spash, 1993).

7.1 Biased estimates of values

A number of biases are identified in CVM studies which include the following. Some of the examples of biases in CVM are:

Strategic Bias: If respondents believe that bids will be collected, they may understate their WTP for a welfare improving change because environmental goods are typically non-excludable in consumption (the free-ride problem). Mitchell and Carson (1989) suggest four steps for minimizing strategic bias. These are: Remove all outliers; stress that payment by others is guaranteed; conceal other bids; make the environmental change dependent on the bid (that is, prevent the respondents from taking the change as automatically forthcoming irrespective of their bids).

Design Bias: The design of the CVM study includes the way information is presented to individuals, the order in which it is presented, the question format and the amount and type of information presented. Choice of payment vehicle, starting point bias and nature of information provided are the main sources in the design bias problem of CVM.

Mental Account Bias: This issue raises one of the most potentially damaging criticisms of CVM. Call the total environment “budget” B , and the amount allocated to any asset i , B_i . Suppose we seek a CVM estimate of mean value for i . Mental account bias exists for an individual if he/she bias an amount B^* where $B > B^* > B_i$. At the limit, $B_i = B$ that the whole budget is spent. Either case results in the CVM bid overstating true value. The possibility of its presence should always be taken into account.

Hypothetical Market Error: This is said to occur if the very fact that respondents are asked to value in a hypothetical market makes their responses differ systematically from true values. If the effect leads to both over and under statement, then it is not bias we are faced with, but a random error.

7.2 Choice of welfare measure

The choice of using WTA or WTP is another problem area in CVM. Empirical work showed that WTA formats gave a proportionately high number of protest bids and that in most cases; stated WTP was significantly lower than stated WTA. The frequently mentioned reasons why WTA is greater than WTP are:

Loss Aversion: Actual WTA is greater than actual WTP because of “loss aversion”. Individuals value a given reduction in entitlements more highly than an equivalent increase in entitlement.

Income and Substitution Effects: Income constrains WTP whereas WTA are unconstrained

Risk Aversion: Consumers who are given any one chance to value the good (rather than the repeated valuation that occurs in a normal market) will on average overstate WTA and understate WTP, since they are unsure how much they value the good and so wish to avoid bidding an amount greater than its true value may turn out to be.

8. Summary and Conclusion

The contingent valuation method (CVM) is used to estimate economic values for all kinds of ecosystem and environmental services. The method has great flexibility, allowing valuation of a wider variety of non-market goods and services than is possible with any other non-market valuation technique. It can be used to estimate both use and non-use values, and it is the most widely used method for estimating non-use values. It is also the most controversial of the non-market valuation methods.

The contingent valuation method involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. In some cases, people are asked for the amount of compensation they would be willing to accept to give up specific environmental services. It is called “contingent” valuation, because people are asked to state their willingness to pay, contingent on a specific hypothetical scenario and description of the environmental service.

The contingent valuation method is referred to as a “stated preference” method, because it asks people to directly state their values, rather than inferring values from actual choices, as the “revealed preference” methods do. It circumvents the absence of markets for environmental goods by presenting consumers with hypothetical markets in which they have the opportunity to pay for the good in question. The hypothetical market may be modelled after either a private goods market or a political market.

The fact that contingent valuation is based on what people say they would do, as opposed to what people are observed to do, is the source of its greatest strengths and its greatest weaknesses. Contingent valuation is one of the only ways to assign dollar values to non-use values of the environment—values that do not involve market purchases and may not involve direct participation. These values are sometimes referred to as “passive use” values. They include everything from the basic life support functions associated with ecosystem health or biodiversity, to the enjoyment of a scenic vista or a wilderness experience, to appreciating the option to fish or bird watch in the future, or the right to bequest those options to your grandchildren. It also includes the value people place on simply knowing that giant pandas or whales exist.

It is clear that people value non-use, or passive use, environmental benefits. However, these benefits are likely to be implicitly treated as zero unless their dollar value is somehow estimated. So, how much are they worth? Since people do not reveal their willingness to pay for them through their purchases or by their behaviour, the only option for estimating a value is by asking them questions.

However, the fact that the contingent valuation method is based on asking people questions, as opposed to observing their actual behaviour, is the source of enormous controversy. The conceptual, empirical, and practical problems associated with developing dollar estimates of economic value on the basis of how people respond to hypothetical questions about hypothetical market situations are debated constantly in the economics literature. CVM researchers are attempting to address these problems, but they are far from finished. Meanwhile, many economists, psychologists and sociologists, for many different reasons, do not believe the dollar estimates that result from CVM are valid. More importantly, many jurists and policy-makers will not accept the results of CVM. Because of its controversial nature, users must be extremely cautious about spending money on CVM studies and about using the results of CVM studies.

The contingent valuation method (CVM) is a simple, flexible non-market valuation method that is widely used in cost–benefit analysis and environmental impact assessment. However, this method is subject to severe criticism. The criticism revolves mainly around two aspects, namely, the validity and the reliability of the results, and the effects of various biases and errors. The major objective of this paper is to review the recent developments on measures to address the validity and reliability issues arising out of different kinds of biases/errors and other related empirical and methodological issues concerning contingent valuation method. In short, the main benefit of the CVM and other monetary valuation methods lies in the discipline it imposes, not in the bottom line that creative practitioners are able to squeeze out of it. The CVM is not science, *per se*, in the sense that it measures unambiguous or true values, but rather a systematic procedure for collecting and organizing information that can be used to make decisions. It is a decision tool. So, instead of using the CVM as an analytical tool to provide scientific values, the CVM should be used as a policy decision method. In that case, the primary purpose of the CVM is not to consider what the true price of a particular environmental good would be, but to estimate the subjective values for the good in question. It should be noted that nowadays the CVM method has become an integral part of environmental assessment of developmental and basic infrastructural projects.

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