

shadow price, which reflects the value to society of the marginal use of the crop. If the marginal use is for exports, you should use the world price. If the marginal use is to add to very large surplus stockpiles, you should use the value of the last units released from storage minus storage cost. If stockpiles are large and growing, the shadow price may be low or even negative.

#### 4. Indirect Uses of Market Data

Some benefits or costs correspond to goods or services that are indirectly traded in the marketplace. Their value is reflected in the prices of related goods that are directly traded. Examples include reductions in health and safety risks, the use-values of environmental amenities (for example, recreational fishing or hiking and camping), and the value of improved scenic visibility. You should use willingness-to-pay measures as the basis for estimating the monetary value of such indirectly traded goods. When practical obstacles prevent the use of direct "revealed preference" methods based on actual market behavior to measure willingness-to-pay, you may consider the use of alternative "stated preference" methods based on survey techniques. As discussed below, you may use alternative methods where there are practical obstacles to the accurate application of direct willingness-to-pay methodologies.

A variety of methods have been developed for estimating indirectly traded goods or services. Examples include estimates of the value of environmental amenities derived from travel-cost studies, hedonic price models that measure differences or changes in the value of land, and statistical studies of occupational-risk premiums in wage rates. Under each of these methods, care is needed in designing protocols for reliably estimating the value of these attributes. For example, the use of occupational-risk premiums can be a source of bias because the risks, when recognized, may be voluntarily rather than involuntarily assumed,<sup>20</sup> and the sample of individuals upon which premium estimates are based may be skewed toward more risk-tolerant people.

Many goods that are affected by regulation—such as preserving environmental or cultural amenities—are not traded directly in markets. These "non-market" values arise both from use and non-use. Estimation of these values is difficult because of the absence of an organized market. However, overlooking or ignoring these values in your regulatory analysis may significantly understate the benefits of regulatory actions.

a. Use Values—the value an individual derives from directly using the resource now (or in the future). Use values are associated with activities such as swimming, hunting, and hiking where the individual comes into direct contact with the environment. These values also include commercial uses of natural resources, such as fishing, and consumptive uses, such as clean air and drinking water.

b. Nonuse Values—the value an individual places on an environmental resource even though the individual will not use the resources now or in the future. Non-use value includes bequest, existence and option values.

Use values are typically estimated through "revealed" preference models, which rely on observed behavior. It is important that you utilize revealed preference models that adhere to economic criteria that are consistent with utility maximizing behavior [example of RUM study]. Examining averting or defensive expenditures (as distinct from avoided cost of compliance with other regulatory requirements) is another way to estimate use values. This approach may reveal a minimum willingness to pay, particularly if there is reason to believe the market for averting behavior is not in equilibrium.

#### 5. Contingent Valuation

Contingent valuation (CV) methods have become increasingly common for estimating indirectly traded benefits. However, the reliance of these methods on stated preferences regarding hypothetical scenarios and the complexities of the goods being valued by this technique raise issues about its accuracy in estimating willingness to pay compared to methods based on (indirect) revealed preferences. Accordingly, value estimates derived from contingent-valuation studies require greater analytical care than studies based on observable behavior. For example, the contingent valuation instrument must portray a realistic choice situation for respondents—where the hypothetical choice situation corresponds closely with the policy context to which the estimates will be applied. Below we provide a more complete list of important criteria that affect the reliability of results from contingent valuation surveys. The practice of contingent valuation is rapidly evolving, and agencies relying upon this tool for valuation should judge the reliability of their estimates using this technique in light of advances in the state of the art.

Some types of goods, such as preserving environmental or cultural amenities apart from their use and direct enjoyment by people, are not traded directly or indirectly in markets. The practical obstacles to accurate measurement are similar to (but generally more severe than) those arising with respect to indirectly traded goods and services, principally because there are no related market transactions to provide data for willingness-to-pay estimates.

For many of these goods, particularly goods providing a substantial "nonuse" component of value, contingent-valuation methods may provide the only analytical approaches currently available for estimating values. The absence of observable and replicable behavior with respect to the good or service, combined with the complex and often unfamiliar nature of the goods being valued, argues for great care in the design and execution of surveys, rigorous analysis of the results, and a full characterization of the uncertainties in the estimates to meet best practices in the use of this method. Current "best practices" for CV surveys include the following:

*Sampling, etc.*

- Probability sampling: this usually requires the guidance of a professional sampling statistician;
- Low non-response rate: high non-response rates would make the results unreliable;
- Personal interview: face-to-face and telephone interviews may elicit more reliable information.

#### *Survey Instrument Design*

- Accurate description: adequate information must be provided to respondents about the good or amenity they are being asked to value;
- Reminder of substitute commodities: respondents must be reminded of substitute commodities, and this reminder should be introduced forcefully and directly prior to the main valuation question;
- Reminder of alternative expenditure possibilities: respondents must be reminded that their willingness to pay would reduce their expenditures for other goods;
- Deflection of transaction value: the survey should be designed to deflect the general "warm glow" of giving or a particular dislike of the source of the problem being addressed.

#### *Transparency and Replicability of Results*

- Reporting: CV studies should make clear the definition of population sampled, sampling frame used, overall sample non-response rate, and item non-response rate on all important questions; the report should also include the exact wording and sequence of questionnaire and other communications to respondents;
- Data quality: special care should be taken to ensure compliance with OMB's "Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies" ("data quality guidelines") <http://www.whitehouse.gov/omb/fedreg/reproducible.html>;
- Since there is no economic theory that can describe hypothetical behavior, it is important to assure the respondents that their decisions are consequential and may influence policy.

As with all other estimates of benefits and costs, your CV results should be consistent with economic theory. First, as price increases and the amount of the good is held constant, the number of respondents willing to pay a particular price should fall. This is akin to negative own-price elasticity for a marketed good. Second, respondents should be willing to pay more for a larger amount (or higher quality) of the good. This is often referred to as being sensitive to scope. If your only test of consistency with economic theory is a scope test, it should be an external (split sample) test rather than an internal (within sample) test.

#### 6. Benefit Transfer Methods

In many cases, conducting an original study may not be possible due to the time and expense involved. The alternative to an original study is the use of benefit transfer methods. Benefit transfer is defined as the practice of transferring existing estimates of

<sup>20</sup> Distinctions between "voluntary" and "involuntary" are arbitrary and should be treated with care. These terms are merely a proxy for differences in the cost of avoiding risks.