CHAPTER 5
Measuring Option Value

5.1 INTRODUCTION

The option value concept can be traced to Weisbrod's [1964] short paper that suggested conventional benefits analysis may understate the value of certain types of facilities. Examples include parks, hospitals, mass transit systems, and other facilities that would be difficult or costly to replace. The rationale underlying Weisbrod's conception is straightforward. When prospective users are uncertain about their future demand for one of these facilities, they would be willing to pay some constant amount, regardless of their actual use, to ensure access to it. Three years later, Krutilla's [1967] seminal paper identified the special role option value might play in decisions involving the valuation of unique natural environments. As our discussion in Chapter 2 suggested, these two papers spawned an extensive, and complex, theoretical literature.

Our conceptual analysis of welfare measurement under uncertainty, summarized in Chapter 2, suggested that the original view of option value as a distinct component of nonuse values was misleading. Instead, we have argued that option value reflects differences between two perspectives--the ex ante and ex post--for welfare analysis under uncertainty. With an ex ante perspective that measures welfare changes before the outcomes of any change are known, option values cannot arise. However, an ex post perspective that measures welfare after uncertain outcomes are known may yield quite different measures. When the two perspectives yield different measures, the difference is option value. Of course, we still do not fully understand the behavioral and institutional factors that may affect the welfare valuation perspective and also have implications for welfare measurement itself.

The basic message of all of the work about welfare measurement under uncertainty is that it is an important generalization to Hicks' [1939] original work on welfare measurement. The generalization involves three considerations:

- The need to specify preferences as state dependent--i.e., the utility function differs in each state--to describe many problems that involve uncertainty such as unique natural environments.
- The importance of state dependency to welfare analysis if it implies differing marginal utilities of income over the states of nature.
The potential influence of formal and informal institutions that affect individuals' opportunities to change the uncertainty.

The marginal utility of income plays a crucial role in the development of dollar measures of utility change. In the conventional case, compensating and equivalent variation measures imply that the same utility function is evaluated at different reference income levels. When the marginal utility of income is not constant, the Marshallian consumer surplus is unsuitable as a dollar index of a utility change. A constant marginal utility of income eliminates any differences between the Hicksian and Marshallian welfare measures.

Allowing for uncertainty and with it a contingent claims framework complicates the definition of welfare measures. This complication is especially true of state-dependent preferences that allow the marginal utility of income to vary with state and income level. In these cases, there is not just one marginal utility to contend with, but one for each state. Moreover, the opportunities to adjust to the uncertainty, independent of whatever policy action is under evaluation, affect the relationship we can expect between these state-specific marginal utilities.

Of course, these statements simply expand on several aspects of the arguments developed more briefly in Chapter 2. We review them here because they provide the basis for our attempt to measure option value. They motivate the definition implicitly used in our questionnaire and explain why it is reasonable to measure option value, even when it is recognized that it is not a distinct component of nonuse values.

When we completed our survey in the fall of 1981, few empirical studies of nonuse values existed. Recently, however, researchers have completed several studies, both published and unpublished. Many, if not most, of these studies consider option value to be a distinct component of an individual's valuation of a natural resource, following the lines of the early Weisbrod [1964] work. Of course, this view affects how the researchers attempted to measure nonuse values and how they reported their findings. Inconsistencies between the current theoretical view of option value (as defined in the timeless framework) and the principles underlying the empirical studies are inevitable because of the extensive research during the past 5 years. In fact, all of these empirical studies preceded this theoretical work. In some respects, the empirical findings stimulated the theoretical research, with Freeman's [1984] paper on the size and sign of option value a case in point. Our review of the recent studies in Section 5.2 identifies potential problems that might result from such inconsistencies when interpreting these empirical studies' findings. In Section 5.3 we describe the design of the option value section of our survey questionnaire, and in Section 5.4 we present the empirical results. In Section 5.6 we summarize the chapter's main points. Finally, Section 5.7 presents the references used in this chapter.

5.2 RECENT ESTIMATES OF OPTION VALUES

One of the first option value studies, by Greenley, Walsh, and Young [1981], has proved to be one of the most controversial. The controversy demonstrates the difficulty of both conveying the option price,