hope is" (page 18), leaving the reader quite puzzled concerning the probabilities the authors intend to imply.

ADDITIONAL REFERENCE

WOLF, C. (1987). Scoring the economic forecasters. *The Public Interest* No. 88 Summer.

Rejoinder

Frederick Mosteller and Cleo Youtz

Because our work on codification is still developing, we are most grateful to Carl Morris for arranging discussion by experts from various fields so that we can benefit from their suggestions and criticisms before we firm up our plans. (In what follows, "we" refers to Mosteller and Youtz.) We much appreciate the efforts of the discussants to help us avoid pitfalls and guide us to further material relevant to this work. In this paper we do not propose a codification but organize some material that may be useful in producing one. To treat all the issues raised by the discussants would require much more research than has been done in this field so far. We will, however, respond to the central issues.

We have no problem with the idea of including variability as part of the codification. For example, the data suggest that *even chance* has very little variability associated with it, whereas *possible* has huge variability. Some measures of properties of the acceptability function or of variability built up from variation within individuals, between individuals, and contextual sources offer options for presenting variability along with location (average value). How that information can be profitably communicated poses a question we have not yet settled. We illustrate one option when we discuss Kadane's comments.

Most of the discussants wish to emphasize the effects of context on meaning, and they do this in various ways. We will take up these matters as we go through the comments individually.

Wallsten and Budescu make four main points about the difficulties in trying to produce a codification, and they make some suggestions about such a program. "First, individual differences in the use and understanding of linguistic probability expressions are large, reliable, and probably very resistant to change." For us this offers a reason for including information about variability in a codification, and it explains why it may be important to know what sort of variability people trying to communicate need to face. Part of the effort in codification then should be to inform people about variation. "Second, probability phrases have vague meanings to individuals. Any attempt to render them precise will of necessity overlook the important semantic role of this vagueness." This additional variability again is something that has to be included in a plan to create a codification. "Third, context effects on the meanings of probability phrases are substantial and probably cannot be eliminated." As these authors suggest later in their discussion, "it is possible that a subset of phrases can be selected whose meanings are more or less agreed upon." Possibly some phrases are relatively resistant to context or perhaps we can get people to learn to standardize them. The procedure would still have to face the variability associated with individuals, and so it may well be that we have to learn how little can be communicated with probabilistic phrases because they often have broad ranges (considerable variability). We have not decided on a way to communicate these distributions, though we have used the interquartile range here as one method. "Finally, there is often a need to communicate not only a best probability estimate, but also information about the amount and nature of supporting evidence." Although this is true, it may represent a need that goes beyond the notion of a codification, just as a whole theory of probability and risk assessment may be required. Wallsten and Budescu suggest that a program that uncovers the various communication roles for probability phrases together with numerical techniques could make it possible for people to express information about the state of evidence and precision of their opinion. Such a substantial program goes beyond what we have in mind.

Winkler also mentions such an idea in his discussion. We like such a program, indeed, statisticians and psychologists and others have this program in mind in their teaching and research. After 100 years or so of work on it, we all have a long way to go. Our idea is much less ambitious.

Cliff, like Wallsten and Budescu, encourages us to pay more attention to the variability of the meanings of expressions and less to measures of location. As we mentioned above, we do not find this inconsistent with codification.

Cliff suggests that, first, isolation of communicators and, second, specificity of referent will be needed if we are to be successful. We discuss the first point because the second falls under the general heading of context. Because nearly everyone is a statistician some

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