On the Measurement of Expectations, Uncertainty, and Preferences

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The article in this issue by Holden, McBride, and Perozek (1997) on expectations of nursing home use reflects an increasingly important phenomenon in the economics literature: the use of direct measures of expectations, uncertainty, and preferences to model economic behavior. Examination of the mainstream economics literature over the past several decades shows two important but essentially inconsistent lines of thought, and one relatively recent body of work designed to remedy the inconsistency.

One line of thought reflects the recognition that forward looking phenomena are increasingly important to understanding economic behavior, in that many of the recent models of saving, labor supply, schooling, occupational choices, insurance purchases, etc., are strongly affected by phenomena that are explicitly expectational. Yet until very recently expectations, which are critically important to the models, were not measured directly but typically were inferred from past behavior. For example, in the well-known and widely used permanent income model of saving behavior originating with Milton Friedman (1957), permanent income is defined in explicitly expectational and forward looking terms, but permanent income is operationalized in backward looking terms—estimates of expected future income are based solely on the trajectory of past income or other variables that can be observed both by the individual and by the analyst.

The explanation for this apparently inconsistent treatment lies in the deep suspicion with which economists have always viewed statements made about the future by economic actors. The fear is that expectational statements are either frivolous or self-serving, hence unreliable, while actual behavior reflects real constraints and opportunities. Thus, the economics tradition has been that the best way to model future behavior is to infer it from past behavior. There are a great many difficulties with this view of expectations data. Perhaps the most serious problems were pointed out by Manski (1990 and 1993), who notes that modeling income expectations by past income realizations essentially assumes that the process of forming expectations is identical for everyone in the population, and that the analyst knows the complete shape of the function relating information to expectations.

The traditional view has seemed to many an excessively restrictive view of how expectations are formed. As a result, there has been an emerging interest in modeling outcomes with the use of direct measures of expectations, as well as with direct measures of uncertainty and preferences. The interest in modeling with these "soft" subjective variables is due in part to the growing realization that these variables are needed for appropriately specified models, and also to the recognition that many such measures seem to yield unbiased (if noisy) estimates of actual behavior.

The Holden, McBride, and Perozek piece is very much in the mode of analysis of expectational phenomena using recently available survey measures of expectations. The findings are characteristic of the emerging literature on the role of subjective phenomena in behavior modeling. Holden and colleagues find that the mean probability of entering a nursing home in the Health and Retirement Study (HRS), based on a subjective probability scale ranging from zero (absolutely no chance) to 10 (absolutely certain), looks very much like the actual nursing home experience of a comparable population. They also find that, while some of the characteristics of those who project higher probabilities of nursing home entry are consistent with actual differences, others are not. For example, Blacks have lower subjective probabilities of nursing home entry than Whites, a difference reflected in the actual nursing home experience of Blacks and Whites. But females have a substantially higher likelihood of nursing home entry than males, while the subjective data show about the same mean expectation for men and women. Still, Holden and colleagues find that many of the characteristics that ought to be associated with higher or lower probabilities of nursing home entry are consistent with actual differences, others are not. For example, Blacks have a substantially higher likelihood of nursing home entry than Whites, a difference reflected in the actual nursing home experience of Blacks and Whites. But females have a substantially higher likelihood of nursing home entry than males, while the subjective data show about the same mean expectation for men and women. Still, Holden and colleagues find that many of the characteristics that ought to be associated with higher or lower probabilities of nursing home entry (above average mortality, the likelihood of disability given low mortality, experiences of parents, the presence of children, marital status, etc.) show a strong association between the subjective distribution of probabilities of nursing home entry and the actual pattern of nursing home entry. In short, the subjective probability data look as if they represent largely valid and unbiased estimates of future outcomes.

One can find much the same characteristics in other studies that focus on the subjective probabilities of future events, as well as in measures that focus on the uncertainty
of future outcomes or on preference structure. For example, Hurd and McGarry (1993) find that respondent reports of the subjective probability of survival to ages 62 and 65 look much like estimates of population survival based on life tables. The probability data show differences in survival probabilities by sex, marital status, self-reported health status, and self-reported disease conditions that look much like observed differences in mortality. These probability data come from the HRS; similar data with much the same characteristics come from the Asset and Health Dynamics Among the Oldest Old (AHEAD) study.

Hurd and McGarry also find some features of these subjective probability data that do not necessarily accord with actual events. One of the most interesting is the relationship between the respondent’s subjective probability of survival and the mortality history of his or her parents. There is clearly a genetic link here. It is plausible (although not proven) that the right link will generally be between the respondent’s expected mortality and the mortality experience of both parents, while the link in the survey data is between the respondent’s probability of survival and the survival of the same-sex parent. That is, males gauge their survival probability as a function of their fathers’ survival history, women by their mothers.

In a related piece, Hurd and McGarry (1993) look at the probabilities of full-time employment past the age of 62 and 65, again using data from the HRS. Again, the main features of the probability data are consistent with what is known to be objectively true in the real world: Respondents with pension plans report lower probability of full-time work at ages 62 or 65, and respondents with severe health problems report lower probability of full-time work at these ages, and so on.

In a similar line of inquiry, Manski and Dominitz (forthcoming) have used subjective probability techniques to calculate a distribution function for expected future income. The technique here is a bit different than in the studies of Holden et al., Hurd and McGarry, or other studies that use the subjective probability data from HRS or AHEAD. The HRS/AHEAD studies are all concerned with discrete events — one is retired or not, enters a nursing home or not, is working full-time at age 62 or not, lives to age 75 or not, etc. The expected income functions examined by Manski and Dominitz are continuous — respondents report a specific probability of reaching an income level of at least $x$, and a second (usually lower) specific probability of reaching an income level of $x + \Delta x$, etc. The basic idea is the same, but the actual question sequence asks about the subjective probability that the respondent’s income will reach or exceed a specific threshold, and a series of threshold questions are asked. Manski and Dominitz find that the subjective interquartile range (IQR) rises with the subjective median, but contrary to the usual assumption, less than in proportion. Moreover, there is substantial variation in the IQR among respondents with the same median, suggesting substantial heterogeneity in income uncertainty.

In addition, recent studies have used subjective preference measures in modeling portfolio behavior. Standard models of portfolio choice argue that risk aversion plays a critical role, but risk aversion is ordinarily not measured directly. In recent years explicit measures of risk aversion have become available. For example, Barsky, Juster, Kimball, and Shapiro (1995) look at a measure of risk aversion obtained on the HRS and relate it to a variety of characteristics where one would expect risk aversion to differ (i.e., migration behavior, smoking behavior, the fraction of a portfolio held in risky assets, etc.). They find that many of the expected characteristics show up, although the risk aversion measure is quite noisy (Kimball and Shapiro, 1997).

Finally, there is some basic methodological literature that lends strong support to the notion that useful measures of subjective probabilities, uncertainty, and preferences can be obtained from respondents and that these measures have characteristics consistent with their effective use in empirical models of behavior.

One of the earliest such studies was conducted by Juster (1966). He looked at the relationship between qualitative purchase intentions (certain to buy, probably buy, etc.), the subjective probability of purchase obtained from a quantitative scale, and actual purchase behavior. The conclusions were straightforward: while there was a strong relationship between the qualitative measure of purchase intentions and actual purchase behavior, if one standardized for the subjective probability of purchase, the qualitative intentions measure dropped out of the model entirely. That is, within each qualitative intentions cell there was significant explanatory power in the reported purchase probabilities, but within the reported probability categories, qualitative intentions were unable to explain any of the variation.

Another important methodological insight is documented in recent work by Juster and Suzman (1995). They examine the level of uncertainty associated with various forward looking events, as well as with the age of the respondent. The pattern that emerges is strongly consistent with the common-sense notion that probability measures reflect real behavior, and are not a random response without behavioral content.

For this analysis, uncertainty is measured by the degree to which respondents report neither zero (absolutely no chance at all) nor 10 (absolutely certain). The idea is that respondents giving zero or 10 answers to a probability-scale question must be indicating a high degree of certainty about the outcome — otherwise, an intermediate response between zero and 10 would be selected. The expectation is that a high proportion of uncertainty responses would be found for events that the respondent could not easily predict and for events where the respondent had no influence over the outcome.

It turns out that the probability variables with the largest proportion of uncertain responses were questions about macroeconomic events — the probability of double-digit inflation during the next 10 years, and the probability of a major depression over the next 10 years. For both measures, approximately 85 percent of the sample reported an uncertainty response (neither 0 nor 10). Moreover, neither of these responses had any age pattern. Next in terms of the frequency of uncertain responses were questions about the probability of living to age 75 and the probability that housing prices would rise relative to other prices during the next
decade. For both of these variables, uncertainty responses comprised roughly 80 percent of the total, again with no age trajectory. Uncertainties should be lower for these two variables than for the macro variables, since in the case of longevity the respondent has some control over the outcome and some knowledge of the model, whereas in the case of housing prices at least some respondents must have a fair knowledge of the likely trajectory of local housing prices. The presumption is that respondents neither understand nor can influence the macroeconomic process.

The two variables with the smallest proportion of uncertainty responses (about 50% of the total) were measures reflecting the probability of full-time work at ages 62 and 65. Respondents know quite a lot about the relevant models here, and respondent decisions largely determine the outcome. Moreover, the level of uncertainty associated with responses to the probability of full-time work at age 62 showed a very sharp downward trajectory with age — respondents who were age 51 or 52 had much more uncertainty about the probability of being employed full-time at age 62 than respondents who were age 60 or 61. A similar story holds for the level of uncertainty associated with the probability of full-time work at age 65, although the age 62 uncertainty levels were much lower at the higher ages.

All of these results seem to be exactly what should have been expected, assuming that the probability measures represent serious attempts on the part of respondents to assess uncertain future events. We can expect to see increasing attention paid to these measures in ongoing surveys, and increasing analytic development of the expectations, uncertainty, and preference measures that are currently available. This should be especially true of research on older populations, since the transitions that are characteristic of the life-cycle changes associated with aging (retirement, changing health and disability status, the changing dependency roles of children and parents, changes in consumption and saving behavior, changes in patterns of volunteer and leisure activities, etc.) can be more accurately modeled with the help of these subjective variables.

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REFERENCES


