THE EVALUATION OF PROBABILITY DISTRIBUTIONS WITH SPECIAL EMPHASIS ON PRICE DISTRIBUTION DERIVED FROM OPTION PREMIUMS: A DISCUSSION

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The applied researcher in risk will often find that research results are limited due to problems in estimating appropriate probability distributions. Many researchers would agree that the ideal situation is to have access to a decision maker's subjective estimates of probability (Savage; Anderson et al.). However, these estimates are frequently not available or are difficult to elicit accurately. As a result, objectively based probability estimates are often used as a proxy for subjective probabilities.

Much of the work using objectively based probabilities has involved the use of some time series of yield prices, and returns. Young provides an excellent discussion of the use of objective time series data to estimate price and/or return distributions. More than one technique for deriving time series based price distributions exist. As a result, the researcher may be uncertain as to which, if any, of the techniques is most appropriate for a given setting. The decision is further complicated by the fact that the use of time series data may be inappropriate if some fundamental change in the decision environment causes past events (or forecasting errors-see Young) to have limited use in constructing future forecasts. In such a setting the researcher may have no recourse but to use subjectively derived distributions.

In light of the above discussion, Fackler and King's paper is timely in at least two ways. The first is that they further develop a procedure for deriving objectively based price distributions. The procedure does not rely upon a time series but uses information implied by economic agents in the options market.

Fackler and King's second contribution is that they present statistical methods which can be used to test the reliability and accuracy of distribution forecasts. Although they specifically test the distributions derived from options markets, the procedures could be used to test any subjective or objective procedure of generating distribution estimations. In the following paragraphs each of these contributions will be briefly discussed. Some brief suggestions concerning future research efforts will conclude this comment.

As the authors indicate, Gardner discussed the possibility of deriving estimated price distributions in a 1977 AJAE article. The approach is particularly attractive in that markets will usually react to available information. The resulting strike prices can be viewed as a weighted average opinion of economic agents who actually risk money on their opinions. This is more attractive than hypothetical elicitation procedures in which a decision maker estimates probabilities of hypothetical events. Even if a given decision maker does not agree with the option-derived

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distributions, such information should prove valuable in estimating his own subjective probabilities. For the researcher who does not have access to subjective probabilities, the objectively derived (but market based) distributions should prove quite valuable.

The ability to extract price distribution estimates from options markets will not solve all problems for the applied researcher however. Options markets are not available for many commodities traded in agriculture. Obtaining estimated distributions for the prices of these commodities as well as other random variables such as yields, costs, and financial conditions will continue to be difficult. A further limitation results from the fact that, in general, the options markets procedure can not be used to generate multivariate distribution estimates. In many situations, estimating the correlation between price, yield, and cost random variables will be important in farm planning and/or risk modeling. Several of the objectively based approaches discussed by Young implicitly include correlations between random variables. Since the options derived price estimates are essentially marginal distributions, the researcher may be required to use these alternative methods if the estimation of joint distributions is desired.

Fackler and King's contribution concerning statistical testing of estimated distributions may prove to be more valuable than the options based distribution method. This is because the procedure can be used to test (and perhaps select from) alternative distribution estimating procedures for any random variable. If the decision maker or researcher must choose from more than one process of obtaining distribution forecasts, the ability to statistically examine both the reliability and the accuracy of the prediction process should prove quite useful. As Fackler and King indicate, with distribution forecasts (as with point forecasts), a decision maker will often be more concerned with accuracy than with reliability (or biasedness with point forecasts). They demonstrate that the accuracy of the option based price distributions was impressive for soybean and cattle prices. An interesting research project for a future researcher would be to determine whether the alternative objectively based methods discussed by Young would perform as well. It should not be too difficult to modify the continuous model discussed by Fackler and King to examine discrete price forecasting methods. If this could be done, the researcher would have a powerful tool in objectively analyzing the comparative performance of alternative distribution estimation procedures.

In conclusion the paper by Fackler and King is at once both theoretically interesting and of potential value to the applied researcher. One hopes that such a paper would stimulate the profession to more rigorously examine the methods currently used to derive estimated price distributions. Furthermore, the demonstrated capabilities of using options markets to obtain accurate price distributions should provide valuable information, both for the applied researcher as well as for the decision maker.

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