QUANTIFYING LONG RUN AGRICULTURAL RISKS AND EVALUATING FARMER RESPONSES TO RISK

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The Effects of Land Unit Size on Crop Yield Variability: Discussion

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This crop insurance study is interesting in several respects. One is the relevance to FCIC of the relationships between yield risk and a structural characteristic of farm businesses--farm size in this case. Tailoring insurance terms to known relationships between yield risk and farm size presumably leads to more efficient and equitable insurance pricing. Another area of interest is the general insight offered about agricultural risk management-- that is, the extent to which improved knowledge about levels of risk and farm characteristics will lead to more precise understanding of risk attitudes, and the feasibility and payoffs of alternative risk management techniques.

The paper was clearly presented for the most, although I did come away with several questions that basically seek clarification and perhaps elaboration on various points. I also have some observations about a couple of studies at Illinois that are related to the analysis of this paper.

The heart of the paper involves a regression analysis of relative farm size against a measure of relative variance--if I properly understand the specifications outlined in the paper. That is, at least a four-year time series of a ratio of county acres to farm acres is regressed against a ratio of farm variance to county variance. The expectation is that the larger is the farm level variance, the greater is the ratio of county acres to farm acres, implying that farm level variances increase as average farm size is smaller. The numerical estimates are consistent with these expectations.

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Questions are as follows:

- Why is farm size made a function of relative variance? Why not the opposite, which seems more plausible? The results will not be affected much, but the model specification will be less distracting.

- What exactly are the data sources? Do they only involve farmers using crop insurance--apparently so.

- How many years of data were used in generating the regression results? At least, how were the number of years above four distributed across the observations in the data base?

- How many farms?

- What was the size distribution of farms?

- How were changes in farm size over time handled?

- How were changes in crop mixes and fertility practices handled?

- What was the degree of geographic dispersion of the farm units?

- Does the functional relationship between size and variability suggest that some systematic level of yield risk is eventually reached as size increases so that yield risk cannot be completely diversified away?

- The second application involving unit discounts was difficult to follow, perhaps because of the terminology. What exactly are a unit discount and an optional unit? Is the basic point that a discount in the insurance premium can be offered if a farm is insured as an entire unit versus insuring separate tracts which comprise the unit?

We are starting a study at Illinois that utilizes the same relationships as this study, but with a different motivation. The St. Louis Farm Credit Bank is interested in whether grain farmers operating larger, more geographically dispersed farm units can carry higher debt loads due to the risk reduction from having farm tracts spread out over wide areas. The analysis is addressing the combined effects of yield risk reduction from geographic dispersion and higher transportation and monitoring costs. We are considering a portfolio modelling approach in which different farm tracts would resemble different farm assets, with gains in risk efficiency depending upon the number of tracts and the correlation among yields of the geographically dispersed tracts. ASCS data for several Illinois counties indicate the growing incidence of larger farms and multiple tracts of land. For example, in 1989, 8 counties in Central and Southern Illinois, 2,302 farms enrolled in the government program had more than 500 acres while 651 of these farms exceeded 1,000 acres. 62% of these farms operated more than 3 tracts of land, 18% operated more than six tracts, and 5% operated more than 10 tracts. Plat books are being used for some of the counties to locate the tracts and measure geographic dispersion. The intent is to estimate yield variances and spatial correlations using historic yield data for a group of farms, although the type of approach followed in the crop insurance study warrants consideration too. The anticipated gains in risk efficiency could reflect various ways in which farmers could utilize the results: higher debt carrying capacity, reduced demand for crop insurance, or greater bids for purchasing or renting additional farmland. Clearly, the issues involved are closely related to the yield risk and farm size issues addressed in the crop insurance study.

Another study is exploring the use of the single index model to estimate a relationship between county yields and farm level yields, in which the county average is considered to represent a diversification away of some or all of the nonsystematic risk associated with farm level yields. For example, the results of regressing a 17 year series of farm level yields against county yields yielded beta coefficients of 1.174 for corn and 1.345 for soybeans. Experimental analysis of aggregate and farm level yield data then indicated an increase in the coefficient of variation for corn yields of about 18% in going from county level to farm level data. While the single index approach does not explicitly account for farm size relationships and is using a much narrower geographic scope, it does represent a type of analysis and results that are similar to the crop insurance study.

Thus, the types of issues considered in the crop insurance study are not only relevant to crop insurance, but have other interesting implications as well.