QUANTIFYING LONG RUN AGRICULTURAL RISKS AND EVALUATING FARMER RESPONSES TO RISK

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Potential Uses for the Yield Variability Dataset

by

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We have devoted a large effort to collecting data on yields at the county, crop reporting district, and state levels in order to study variability of yields. This enormous database will provide the opportunity for a lot of "rabbit hunting". However, indiscriminate "rabbit blasting" is not an efficient use of resources. The hunt must be well planned in order to be successful. This short paper outlines some possible trophy rabbits as well as some "wild hares".

Models could be developed to attempt to estimate several variables. Some of the variables which we could attempt to estimate are discussed below.

1. Estimate a general variability measure for all crops and all locations.
   This is a ridiculous possibility since crops have different variabilities, and areas have different variabilities. This variable lacks usefulness from any standpoint.
2. Estimate a general variability measure for each crop.
   This would allow crop variabilities to be different, but the crop would have the same variability across all regions. This is not a good idea because we know crop variability varies across regions. (Crop insurance rates are very localized due to differences in variability across locations).
3. Estimate the impact of detrending method on variability measurement.
   Detrending method has a significant impact on variability measures.

There are several trend adjustment procedures which can be used to remove systematic variability from yield series. These procedures include moving average adjustments, regression estimates of linear and curvalinear form, maximum likelihood estimates and other more sophisticated techniques. All of these techniques have advantages and disadvantages regarding removal of the systematic component of the variance of time series data. Of overriding concern is the fact that the data series are not long by statistical standards and there is substantial variability in some of the series, particularly the less aggregated series. This limits the value of highly sophisticated techniques since the data simply do not support the sophistication of the analysis. Some evidence presented at the meeting suggested that quadratic regression estimation "over fit" the data. With less aggregated and shorter time-series data like farm data, even linear regression estimation will frequently "over fit" the data. Each method has advantages and disadvantages and each method will impact the measure of remaining variability.

4. Estimate variability parameters as inputs for models.

a) Regional models require aggregate variability measures. McCarl and Boisvert's subcommittee is looking into the parameters that are needed to run the aggregate models. b) Farm level models also are in need of input for risk analysis. Providing input on how to convert county variability to farm variability may be quite useful. This could be a subgoal of the following estimation objective.

5. Estimate the impact of size on variability.

Aggregation measured as acres would allow inclusion of different

aggregation units into the same model. A general "aggregation" impact variable would be one step in the direction of recognizing the impact of size on business risk. However, the aggregation impact will likely be different for different regions, and for different crops. Nevertheless, this could be useful as a first step in identifying the impact of size on risk.

6. Estimate the relationship between average yield and yield variability for selected crops.

There are three schools of thought on the possible relationship between average yield and yield variability. One possible relationship is that the variability of yield is higher when the average yield is higher. That is, operating at higher average yield allows greater variability around that average. The second possible relationship is that lower average yields are associated with greater variability. The reasoning being that poor yields both reduce the average yield and increase the variability. Of course a third possibility is that the coefficient of variation could be constant for different average yields. This relationship has significant implications for risk analysis.

In summarizing the possible relationships that could be estimated, it appears that estimating the impact of size (aggregation) on variability could be the most fruitful additional effort that could be made. Exploring relationships between average yield and yield variability could also provide input into understanding risk sources and differences in risk associated with yield level. Of course, supplying parameters for risk models has always been the objective of the data collection effort.

Model Specification

In order to address the reasonable objectives outlined above, one possible model might be:

Variability = f(crop type, location, size of unit, average yield, detrending method, length of series, time period of data series).

Crop type would be represented by dummy variables.

Location would be represented by dummy variables.

Size of unit would be in acres.

Detrending method would be represented by dummy variables.

Length and time period could be dummies representing broad categories such as "short" and "long" and before 1960 and after 1960, for example.

A major issue is what data should be put into this model. One can envision it being used in Kansas with farm level variability, county level variability, crop reporting district variability and state variability. Location might be tough to assign. There may be other farm-level datasets around that we could match with parts of the big dataset we have compiled as a group.

One can also envision this being used with county, state, regional, and national data. In other words, we could attempt to estimate parameters of this model (or a relevant subset of the variables) using the big dataset.

A third thing we want to try would be to estimate parameters of the model using the results of other studies as observations. This approach has been taken by Kerry Smith in his May, 1990 AJAE article on metanalysis of consumer surplus measures from travel cost studies. The objective of such a study in the context of variability measures would be to account for factors

other than the level of aggregation that contribute to differences in yield variability measures so that, if there is some systematic aggregation parameter, it can be recovered. It is likely that any aggregation parameter will not be constant, but depend on the crop, location, etc., but these interactive effects also can be tested with this approach. Since farm level yield information over time is scarce and many studies involving risk are based on farm level decision models, a way to systematically adjust aggregate data to the farm level would prove useful. This approach requires hunting a lot of rabbits, but might be worthwhile. If we can't bag enough rabbits for a "meat" a - analysis, we could, at least, provide a systematic presentation of past study results in tabular form. We envision this to be an expansion of the table presented by Doug Young in his W-149 article on this subject.

We would like to conclude these introductory thoughts with an appeal to the group for help in collecting studies and/or farm level datasets that could be used for our proposed approaches. We hope to have some preliminary results to report at the next meeting. A listing of the studies we've collected to date begins on the following page. For now, we'll hop to it. Wish us good hunting!

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