風險管理與保險 **109-2**

Problem Set II – Due 5/10 11:59pm (20%)
You are welcome to discuss with your peers. But do submit your own files.
The purpose of this Assignment is to train you to identify database for agricultural crops on your own, and for now the focus is on the U.S. market. You will learn to clean, organize and input the data into STATA. Use STATA to do some simulation and distribution-creating techniques to understand agricultural production patterns, which involves risk attitudes among farmers, various risk conditions across geographies and time.

Requirement: You have to upload the excel files you are brining into Stata, do-file showing all your work from beginning to the end, and the write-up showing your answers in words and figure. **Do file** – you need to provide a complete coding file that documents all the results, tables, and figures you put in your word document, in the right sequence. I will need to successfully run through your do file, and know how you reach your answers.

Step 0: Locate dataset and clean data (You have to be on the right track starting at Step 0)
Go to the USDA ERS website: https://www.ers.usda.gov. Locate the time-series production and market data on Citrus fruits.
Question 1: Background - What are the varieties in Citrus fruit category? What are the primary production states?
Question 2: Derive returns per acre for each Citrus fruit for each state – Pay attention to the footnotes under Tables, you will be able to derive this value. One Annual Summary is in the Folder, which you can use to double check your answer. Next, divide this returns by usage purpose, fresh and processing, by using the data on utilization (Think how you can do it). Run simple regression of returns per acre on years and states. Concisely explain the potential year and state effects on revenues, albeit it's not the farm level.

Hint: What do you need to do in cleaning data given prices across years? Because this is the supply-side information, what's the inflation adjustment base for agricultural commodities compared to the common Consumer Price Index? Use 2015 as the base year. Here we assume fresh fruit is dominant in the marketplace, use category rather than single variety as your reference, and match with the starting year in the production information. Locate data on US Bureau of Labor Statistics: https://www.bls.gov. Specify clearly what data you choose to use to COMBINE with the Citrus Fruits production data from Question 1. Argue why we cannot simply draw the data from the same source on ERS, at the Food Prices Outlook section: https://www.ers.usda.gov/data-products/food-price-outlook/

Question 3: Derive utility levels for each Citrus fruit in each producing State, including US as a whole, using functions exhibiting CARA (one function) and CRRA (two functions). First to derive utilities, what might be the first assumption here given the available data at hand? For the CARA function, assume absolute risk aversion coefficient is 0.003, 0.001, 0.005. For CRRA function, assume r=0.1, 0.5, 0.9 for the function with a non-deterministic value for risk aversion coefficient. Use command *twoway* to compare utilities across different risk aversion levels under same function, and explain the graph if it makes sense. Under what production technologies, can we examine the utility levels with different levels of risk aversion? If functions represent

production techniques, can we compare different technologies for the same fruit in one state or across states?

Question 4: As a thinking practice, if both Junior and Senior have the capital to choose their planting location, to choose which variety of Citrus fruit, and to choose which utilization will give the best economic performance. Suppose now the preferences are unknown and there is no best function to be used to characterize the production phase. What kind of graph will we need to generate to show the comparison across different risky prospects to aim for a stochastic dominance analysis, either it's first- or second-degree? Use command *cumul* to generate the probabilistic distribution of the outcome variable. Put down your graphs, as accurately as you can, and identify the likely choices facing Junior and Senior. Briefly state your reason, and list out all the possible scenarios that you think most relevant for discussion.

Question 5: Seasonal prices for fruits is critical - Go to the data on per-box monthly equivalent-on-tree returns: Focus on *grapefruit in California*, given the fact that the marketing season start from 11/1 in previous year to 10/31 in the next year, what could it imply for fluctuation in prices? Compared with its yield data, which month(s) most accurately depict the classic relationship between supply price and quantity? What are the possible risks facing citrus fruit growers? Could we locate the risk corresponding to the dropping yields at certain point of time?

Set up a simulation program to simulate the price given 100 observations, following a lognormal distribution. Show the summary statistics from your experiment. Can we truly replicate the original price series pattern from September to December by performing the experiment 1000 times? (Play some try-and-error.)

Question 6: Price ratio - Go back to production data: First locate the new piece of information on grower price at the same place where you find the data for your Citrus Fruit study. Derive ratio of equivalent-on-tree returns and grower price. Several things to keep in mind: be aware of the difference between these two datasets, and find their common ground to generate this ratio. (You will need to look at the datasets closely to make things go smoothly.) What's the type of ratio that can be derived to achieve the objective here? Refer to the Annual Report in the Folder again, interpret the ratio and its change over time.

Set up a simulation program to simulate the ratio of prices from two datasets, suppose each sample comes from a lognormal distribution. The program requires six arguments as inputs. Set each sample observations of 100, use the mean and variance from actual data on the two price series stated above in your simulation. Simulate three types of ratio: Ratio of 10^{th} percentile, ratio of mean, ratio of 90^{th} percentile, with a 1000-times experiment. Show the summary statistics. Does the result change when we select new values for arguments for mean and variance for these two datasets, 0.7, 0.85, 0.08, 0.09?