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Does Climate Variability Affect the Financial Sustainability of Farmers in Florida? A Causality Analysis

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Abstract

- The purpose of this research is to present a framework to analyze if there is any statistical correlation between climate variability and commodity prices in Florida, and whether real causality exists.
- This assessment is significant because it could assist farmers in understanding the connection between the El Niño Southern Oscillation (ENSO) effect and commodity prices.
- Linear and logarithm models will be employed to test the hypothesis that ENSO effects commodity prices, potentially playing a crucial role in evaluating the importance of climate to farm prices, and how policy might be used to mitigate the effects of climate change.

Introduction

Generally, an ENSO phenomenon encompasses two major events (El Niño and La Niña):

- An El Niño event brings in debilitated winds in the Western and Central Pacific region, which is consequently followed by warmer sea surface temperatures.
- In the United States, El Niño causes abundant amounts of rainfall in the Southern region, less cold winter seasons in the Northeast, and a reduction in the amount of tornadoes that occur in the Midwest.
- On the contrary, La Niña results in cooler sea surface temperatures and increased drought in the Pacific region (Lausuthi et.al 2007).
- ENSO events usually occur every 3- 5 years, and is usually peak from December-April.
- Tomato, wheat, corn and soybeans are some of the commodities that will be assessed in the study.

Overall Impacts of ENSO

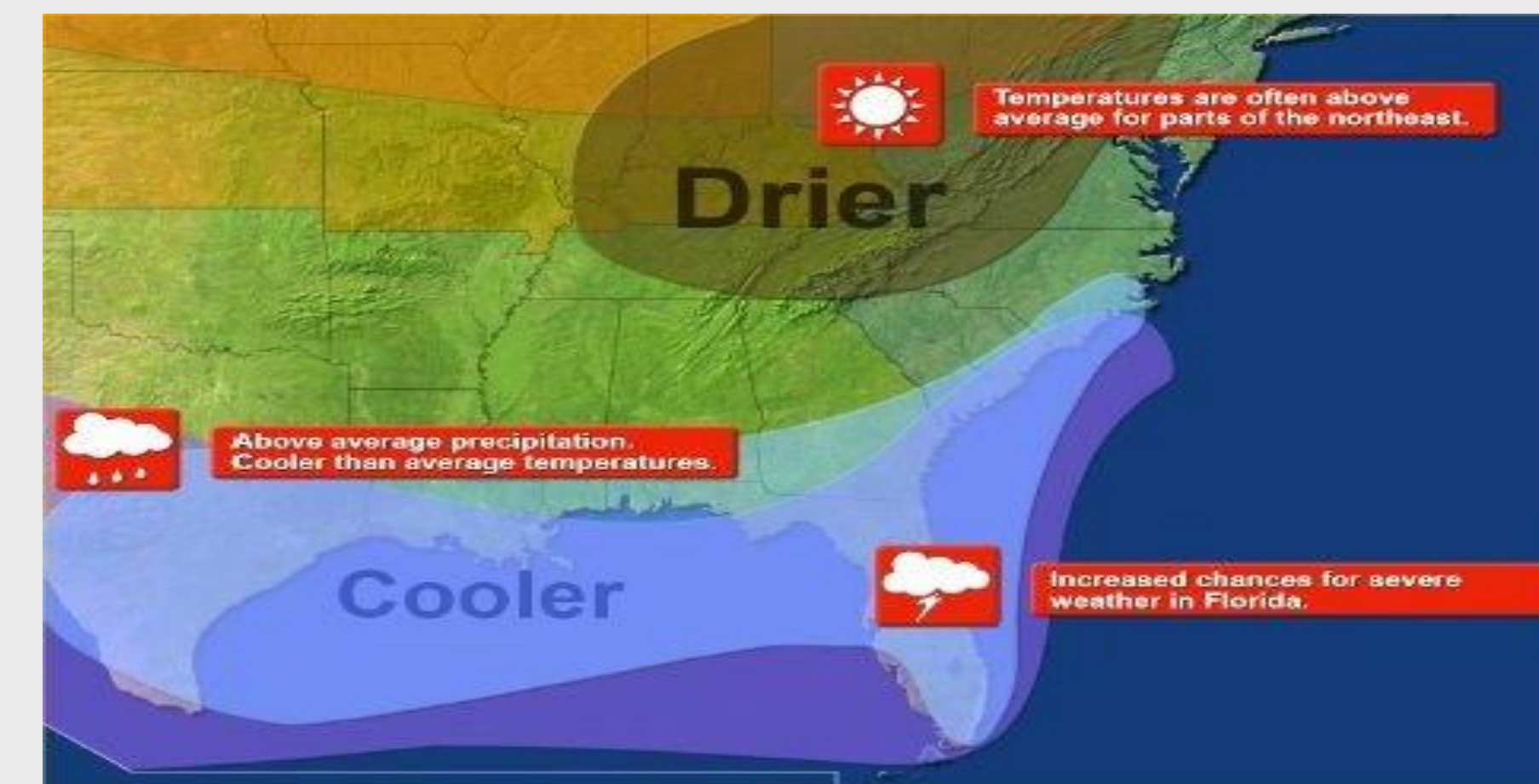


Figure 1. Overall El Niño Impacts of El Niño in the Southeast United States. Source: NOAA (www.srh.noaa.gov/tae/?n=enso.)

- Throughout El Niño, the state of Florida experiences very wet and cool seasonal temperatures (Figure 1); whereas La Niña (Figure 2) produces warm and dry temperatures.
- This process results in yearly weather inconsistencies and these fluctuations place a major risk to farmers and their crop production.



Figure 2. Overall impact of a typical La Niña event during winter months in the United States. (Source: NASA

(<http://www.nasa.gov/centers/goddard/news/topstory/2008/lanina.html>, last accessed November 10th, 2014)

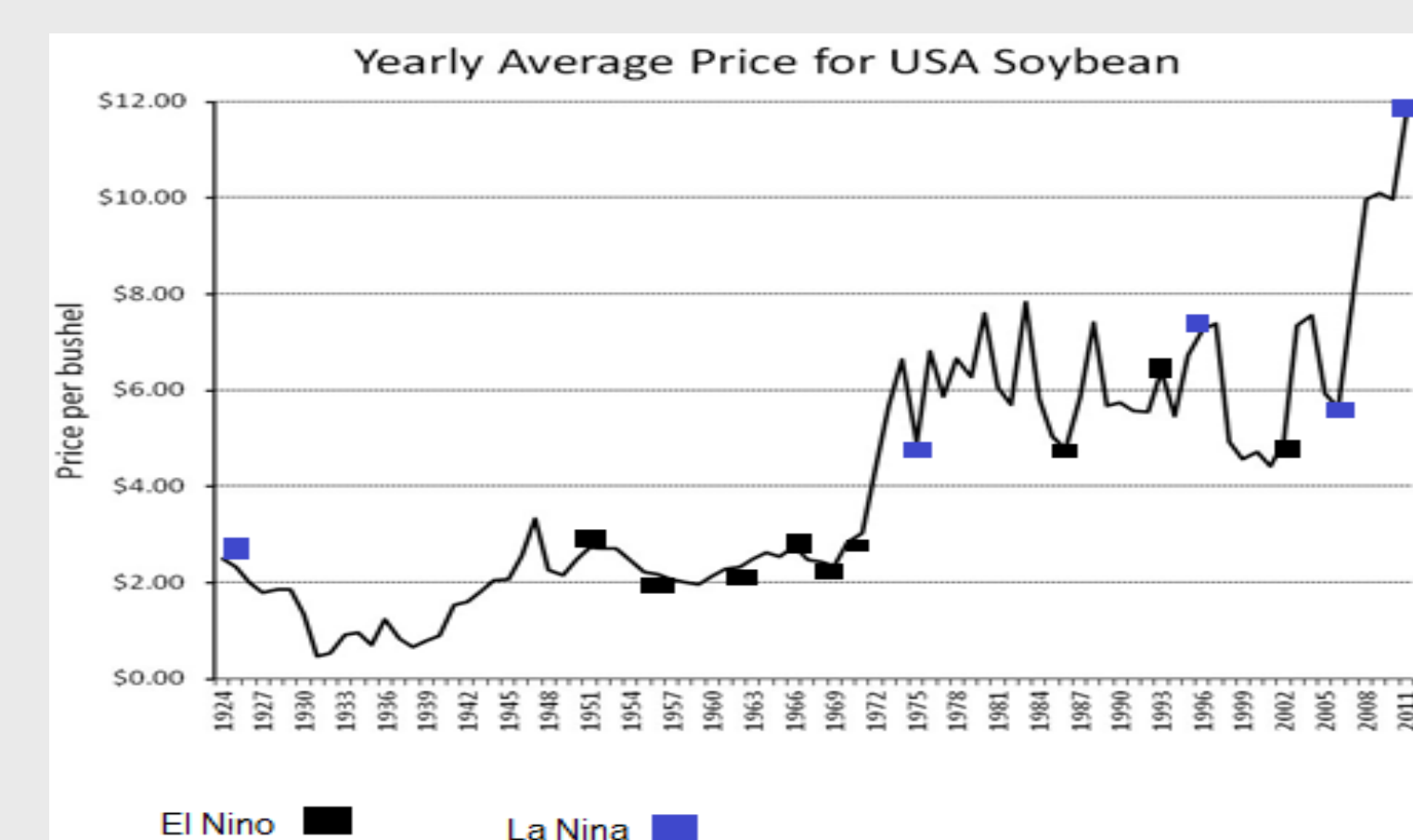


Figure 3. Depicts the overall impact of ENSO on U.S Soybean prices in millions of Bushels from 1924-2011. (Sources: USDA, 2015)

Methodology and Framework

- When monitoring the correlation process between commodity prices throughout the years, a time series analysis was conducted using STATA13.
- In addition to time series correlation effects, regression analyses was used to predict the change and correlation in Florida commodity prices throughout time
- The time series results displayed a clear correlation between the commodity prices and time. Therefore, granger causality tests for each commodity was conducted to determine if ENSO satisfies the assumption of causality.

Objectives

The overall aim of this research is to analyze how climate variability affects the financial sustainability of farmers in Florida. To obtain this goal, the following objectives are pursued:

- Test if there is a correlation between ENSO and commodity prices in Florida.
- Determine if a correlation exist, test for causality.

Effect of ENSO on Crop Prices



Results and Conclusion

Table 1. Correlations of Commodity Prices with SOI and Time (Annual Data: 1985-2014)

Commodity	Correlation with SOI (p-values)	Correlation with TIME (p-values)
Corn	+0.5399 (.008)	+0.0974 (.00)
Peanut	-0.0018 (.798)	-0.0021 (.016)
Potato	-0.0648 (.919)	+0.2466 (.001)
Soybean	+0.7564 (.050)	+0.1917 (.00)
Wheat	+0.5189 (.007)	+0.0983 (.00)

Preliminary results of the Granger Causality tests indicated that no causal relationship existed between ENSO and Corn, Peanut, Potato, Soybean and Wheat prices.

A correlation revealed to be existent between ENSO and Corn, Soybean and Wheat prices.

It can thus be said that although ENSO imposes a threat to prices, it cannot be determined that a casual relationship exists between.

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