Climate Change and Its Impact on the Determination of Agricultural Commodity Prices

Weber State University
Inkyung Kim
Instructor: Rong Rong

Abstract
This paper examines the possible effects of climate change on agricultural commodity prices such as changes in global temperature anomaly and CO2 emission. Climate is one of the important determinants of agricultural productivity and this agricultural productivity would impact on food price in addition to the world economy. For this reason, time series data sets have been used for the period from 1985 to 2012. OLS regression has been used for analysis and evaluated five products’ price in separate regression with quadratic equations. The analysis shows that the effect of climate change on agricultural commodity prices varies depending on the kind of agricultural product. However, the impact of climate change is same on both wheat and corn.

Literature
- There is a statistically significant relationship between weather fluctuations and the prices of wheat and potatoes in Central Asia (Mizrabaev & Tsegai, 2012).
- Unfavorable weather while harvesting reduced production of grains in 2006 and 2007, thus resulting in world record raised prices (Trostle, 2008).
- Climate change, especially those caused by increased greenhouse gases, was more likely to have less of an adverse impact on crop yields in mid and high latitude regions than crop yields in low latitude regions (Rosenzweig et al., 1993).
- When the concentration of atmospheric CO2 is doubling on crop yield, it would cause to increase biomass and potential crop yield while an increase in air temperature would lead to decrease potential grain yield in Australia (Wang et al., 1992).

Theory
- Theory of Demand and Supply

Empirical Model
Hypothesis
\( \text{GLOTEMPA} \): Global temperature anomaly has no impact on agricultural commodity price
\( \text{CO2} \): Global temperature anomaly has impact on agricultural commodity price
\( \text{GLOTEMPA} \times \text{CO2} \): CO2 emission has no impact on agricultural commodity price
\( \text{GLOTEMPA} \times \text{CO2} \): CO2 emission has impact on agricultural commodity price

Econometric Model
- Multiple Curvilinear Regression Model (Quadratic)

Data Methods
- 336 observation
- 5 agricultural products
- Monthly data (1985-2012)

Global temperature anomaly
- A deviation from a reference value (base year is from 1951 to 1980)
- For this data, two datasets are used
- Datasets of Land-surface temperatures from the Global Historical Climate Network-Monthly / sea surface temperatures
- (+) anomaly is warmer than the reference value
- (-) anomaly is cooler than the reference value

Global Temperature Anomaly
(Jan 1880-Mar 2015)

Conclusion
- Equation 1
  - Global temperature anomaly
    - The trend of GLOTEMPA's effect on the price of wheat, corn, cotton, and banana is decreasing as GLOTEMPA gets larger while the orange price is insignificantly correlated with GLOTEMPA.
  - CO2 emission
    - The trend of CO2 emissions' effect on the price of wheat, corn, cotton, banana, and orange is decreasing as CO2 emission gets larger.

- Equation 2
  - Global temperature anomaly
    - The price of wheat, corn, and banana is insignificantly correlated with GLOTEMPA while the trend of GLOTEMPA's effect on the price of orange and cotton is decreasing at GLOTEMPA gets larger.
  - CO2 emission
    - The trend of CO2 emission on the price of wheat, corn and banana is decreasing as CO2 emission gets larger while the price of cotton and orange is insignificantly correlated with CO2 emission.

Reference