Buttonwood Merchants

El Nino of 2015:
Effects on Commodity Pricing

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Key Points:

- Current forecasts are calling for the 2015/16 El Nino to become one of the strongest on record.
- China has increased corn production 119% since the 1997/98 El Nino to satiate much higher feed demand from increased meat consumption, a decrease in yields would impact pricing significantly as they would then have to import grain to satiate domestic demand.
- Australian wheat production declines 25% in El Nino years, they account for only 4% of world production but 12% of global exports.
- El Nino years typically result in swaths of warm weather across the major winter demand centers in the Midwest and Northeast corridor of the United States, should a similar pattern transpire this year the US will lack the demand required to drain already burgeoning inventories.

Weather patterns are notoriously unstable, however, a few longer term atmospheric conditions have altered normal patterns with such regularity that we have to modify our expectations around risk and correlation when they arise. El Nino is one such pattern and current forecasts are calling for the 2015/16 El Nino to become one of the strongest on record. This could potentially be exacerbated by a subsequent Kelvin wave in early 2016 that would further increase Pacific water temperatures. Figures 1 and 2 below show the historic oceanic index and this year's El Nino forecast for reference. This phenomenon reaches its peak effect in December through February as ocean surface temps rise above normal in the central and eastern pacific around the equator. The alteration of storm patterns and jet streams has a significant impact on precipitation and temperatures around the globe. The impact of dry or warm weather in certain areas of the world will result in material risk to a select few commodity markets. Some of these risks may be underrepresented by current market pricing given changes to the commodity production and distribution system since the last strong El-Nino of 1997-98.

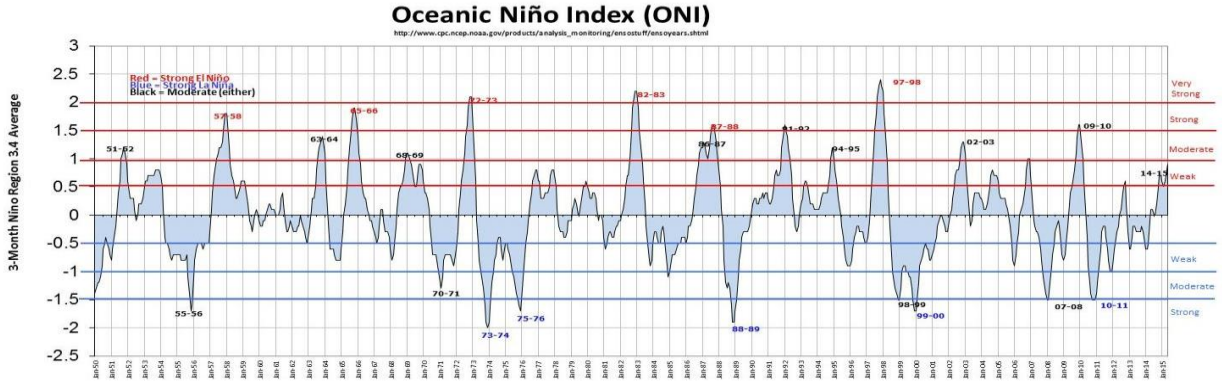

Figure 1: Historic Oceanic Index (El Nino)

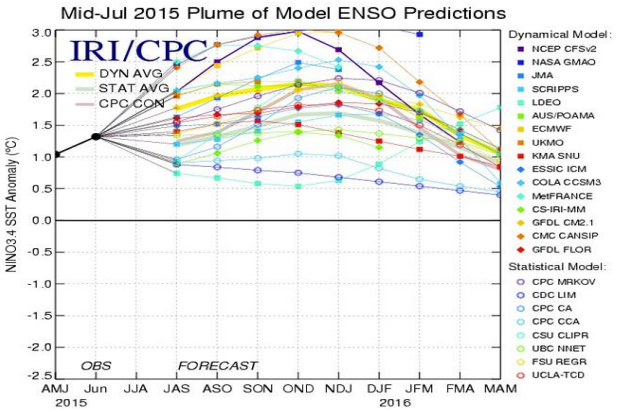

Figure 2: Forecast for the El Nino of 2015/2106

Chinese Corn

One of the most interesting and possibly unexpected effects (from the market's perspective) that this El Nino will have on commodity pricing is the higher likelihood of drought in Chinese regions that grow corn. The economic success of that country and the consequent burgeoning middle class has increased the population's consumption of meat. While it's a welcome indicator of economic success, the cultivation of single pound of beef requires about 6 pounds of grain and a pound of pork requires 3.5 pounds of grain[1]. As a result China has had to greatly increase their farming capacity. Corn production since 1997, the last very strong El Nino, is up 119%. China utilizes irrigation on much of its farmland; however, they have also depleted their water reserves as the water table has dropped by 300 meters in Beijing since the 1970s and the water that is available has pollution issues[2]. The depletion of water reserves will only be exacerbated by drought conditions that arise during strong El Nino years.

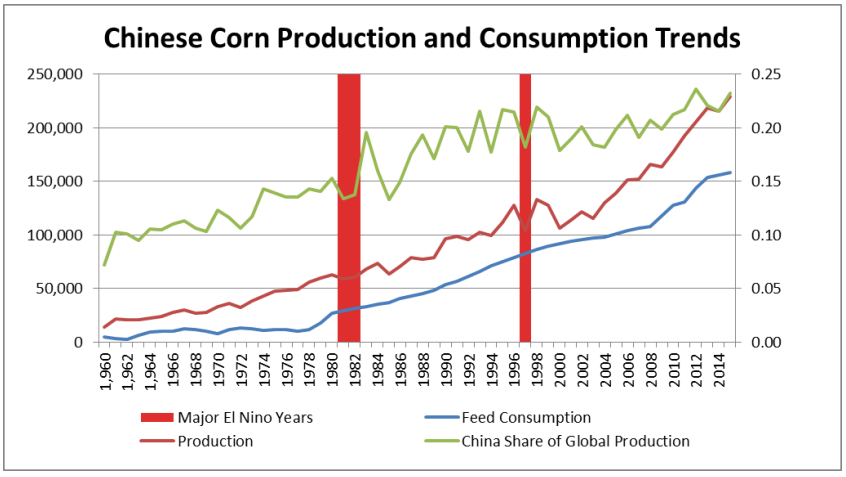

Figure 3: Chinese Corn Production and Consumption Trends

[1] The amount of grain required to rear an animal can vary significantly depending upon time spent grazing before entering the feedlot for cattle and the size at which the animal is marketed for both beef and pork.

[2] The Yellow River is often called the cradle of Chinese civilization. In 2007 the Yellow River Conservancy Commission, a government agency, surveyed 13,000 kilometres (8,000 miles) of the river and its tributaries and concluded that a third of the water is unfit even for agriculture.

Figure 3 above shows the increase in feed consumption and consummate increase in the size of China's corn harvest. The chart also shows the effects of previous El Nino periods on Chinese corn production relative to the rest of the globe. When Chinese production drops off they must import grain to satiate domestic demand; and in light of the massive increase in demand over the last 15 years, a poor growing season will have much greater effects on market pricing. Given the changes to their domestic market, both in composition and magnitude since the last El Nino, it is improbable that the market is properly assessing the risk that a severe drought will materialize and hinder the development of 2016's corn crop. At Buttonwood we incorporate the increased upside risk to corn into our strategy by increasing upside skew in our risk models and looking for low risk opportunities to enter into bullish structures.

Australian Wheat

Australian wheat yield has perhaps one of the most reliable relationships to El Nino periods, likely due to the proximity of that continent to the warm waters that result in the phenomena. On average, Australian wheat production declines 25% in El Nino years, as illustrated in figure 4 below. The strength and length of predictions for this year's event will likely result in a significant reduction to the high protein crop as dry weather and heat in Eastern Australia degrade crop conditions. With this year's crop already suffering from drier than normal conditions the crop is likely to wither further as dry weather turns into a drought. The decline in production has a material impact on the global wheat market as Australia is only 4% of world production but 12% of global exports. We account for this risk by modifying the skew of our probabilistic distributions for risk assessments and looking to enter into low risk bullish structures. However, the risks are slightly less due to the difference between the crop cycle and development of wheat relative to corn. Wheat is effectively a weed and small amounts of precipitation at any time in the crops development can resuscitate a field that is effectively dead. This actually occurred in the 1997 Australian El Nino period and saved that crop as can be seen in figure 4. Global production of wheat is also different as there is almost always a wheat harvest taking place. Therefore, the impact of a poor Australian wheat harvest would have possibly large but fleeting impact on the price structure of that market.

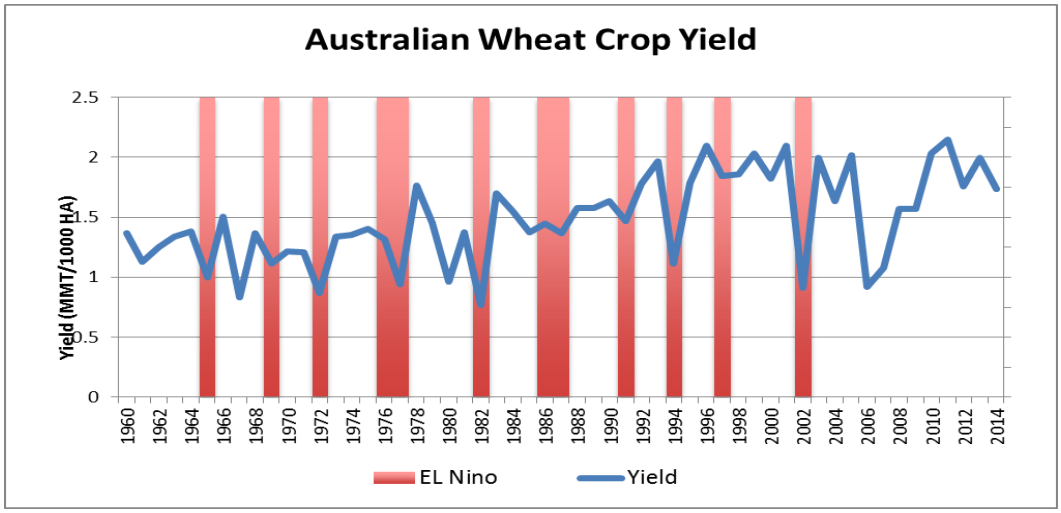

Figure 4: Australian Wheat Crop Yield

North American Natural Gas

A persistent and extended Pacific jet stream will help keep polar outbreaks into the lower 48 United States at bay. As a result El Nino years typically result in swaths of warm weather across the major winter demand centers in the Midwest and Northeast corridor. Should a similar pattern transpire this year, the US will lack the demand required to drain already burgeoning inventories. As a result it is likely that subsequent periods of warm weather forecasts this winter will result in material declines in natural gas price for delivery in the next 6 to 9 months. However, an opportuntity to trade spreads will arise as longer term demand factors will likely support the price of contracts for delivery in calendar year 2017 and beyond.

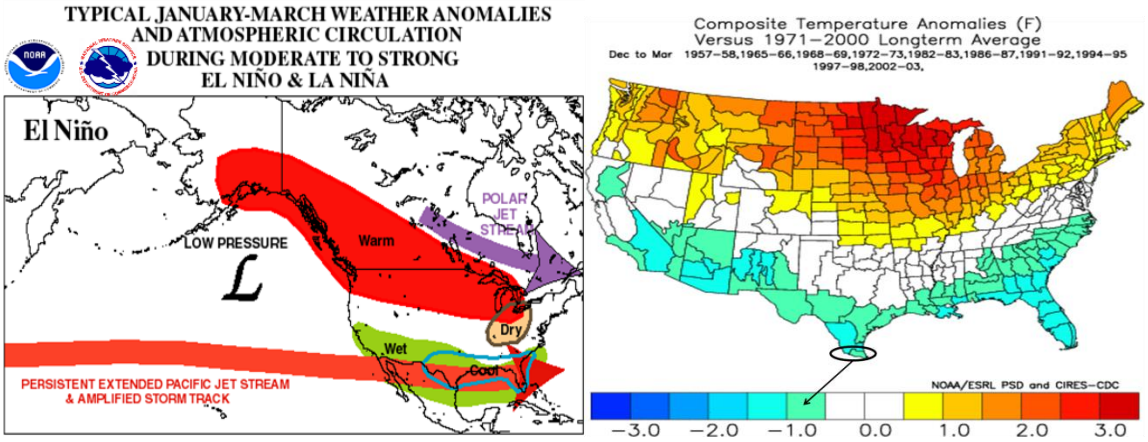

Figure 5: North American Winter Weather Patterns during El Nino Periods

Thoughts on Aggregate Risk and Portfolio Construction Implications

We must remember that the atmospheric anomalies resulting from El Nino are part of chaotic global weather system that is anomalous in and of itself. While many of the disturbances to atmospheric conditions result in changes to normal weather patterns, this does not happen all of the time. Therefore, one must account for the changes in probabilistic terms by altering price distributions and shifts in correlations that may occur while knowing that even the probabilities themselves are subject to change.

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