

Crop Price Conditions April 28, 2017

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Beginnings of the fourth consecutive year of unfavorable commodity prices bring the question of conditions necessary for improved prices and the outlook for these conditions. Although accurate forecasting of commodity prices is an impossible challenge, field crop prices establish characteristics that provide insights for expectations that potentially impact market conditions. The foremost characteristic is that crop prices follow a long-term equilibrium with supply and demand such that surplus supply results in less than average prices and short supply results in greater than average prices. Thus, price analysis is related to factors that change quantity supplied and quantity demanded.

A complicating factor for producers is that crop prices often trend together so that a low price for a crop is accompanied by low prices for other crops, and there are no attractive alternatives for profitable planting decisions. Table 1 presents linear correlation coefficients for corn, soybeans, wheat, upland cotton, and long-grain rice. While all correlations between crop prices are statistically significant, some crops have greater pair-wise correlations than others. Corn and soybean prices with a 0.95 correlation have the greatest tendency to move together. Wheat prices have a 0.93 correlation with both corn and soybean prices. Long-grain rice prices have a 0.86 correlation with soybean prices indicating low price conditions for rice often do not have soybean prices as an attractive alternative. Upland cotton prices have lower correlations with other crop prices which corresponds with current observed conditions of cotton prices relatively more favorable than in recent years.

Table 1. Linear Correlation Matrix¹, U.S. Prices, Major Field Crops, 1980-2016

	Corn	Soybean	Wheat	Cotton, Upland	Rice, Long- Grain
Corn	1	0.95	0.93	0.61	0.81
Soybean		1	0.93	0.61	0.86
Wheat			1	0.48	0.86
Cotton, Upland				1	0.59
Rice, Long-Grain					1

¹All correlations are statistically significant at the 95% confidence level.

Low crop prices stimulate increased quantities demanded that are factors in reducing surplus supplies. Corn and soybean meal quantities demanded increase as animal units on feed increase, but trending yield increases lead to increased production that limits the impacts of increased consumption. Historically, returning to equilibrium supply and demand with favorable prices involves climatic conditions that entail a yield decrease. Figure 1 presents annual corn yield as a percentage of the moving five-year average yield. Annual corn yield averages 5% greater than

the moving average yield. The four most recent annual corn yields have surpassed 105% of the moving average which is contributing to surplus supply. Three consecutive years prior, yields were less than the moving average with 2012 yield only 80% of the five-year moving average. Figure 2 presents similar circumstances for soybeans. Recent years of low prices are attributable to recurring favorable yields, and the preceding three years of high prices are attributable to diminished annual yields. Statistical lags are often involved in not observing exact relationships between annual crop yields and price, but cointegration analysis for 1986-2016 indicates a generalized inverse relationship between corn and soybean prices with annual yield.

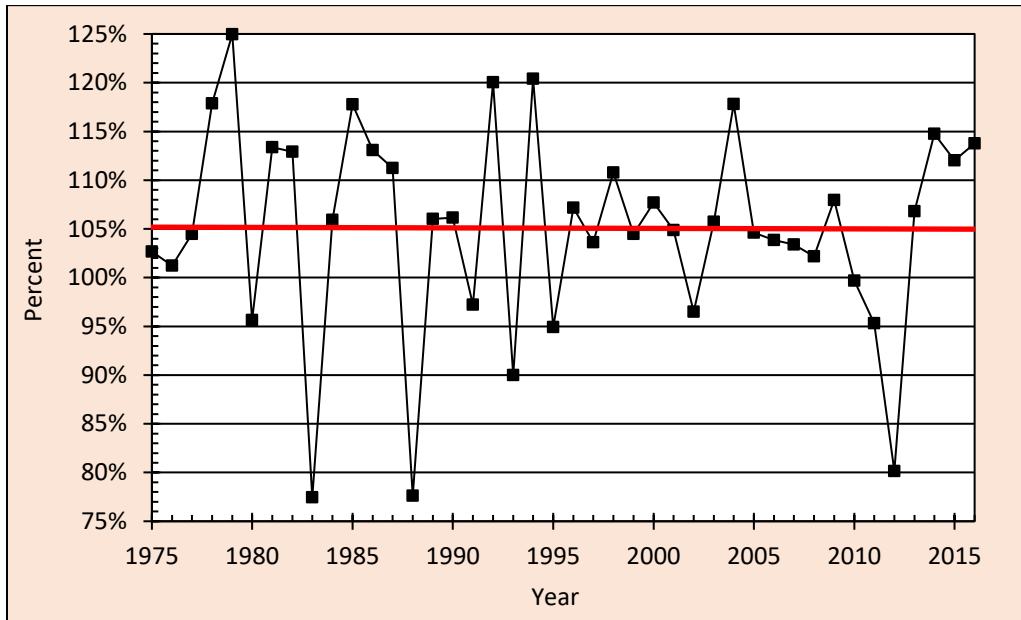


Figure 1. Corn, U.S. Yield, Percent of Five-Year Moving Average, 1975-2016

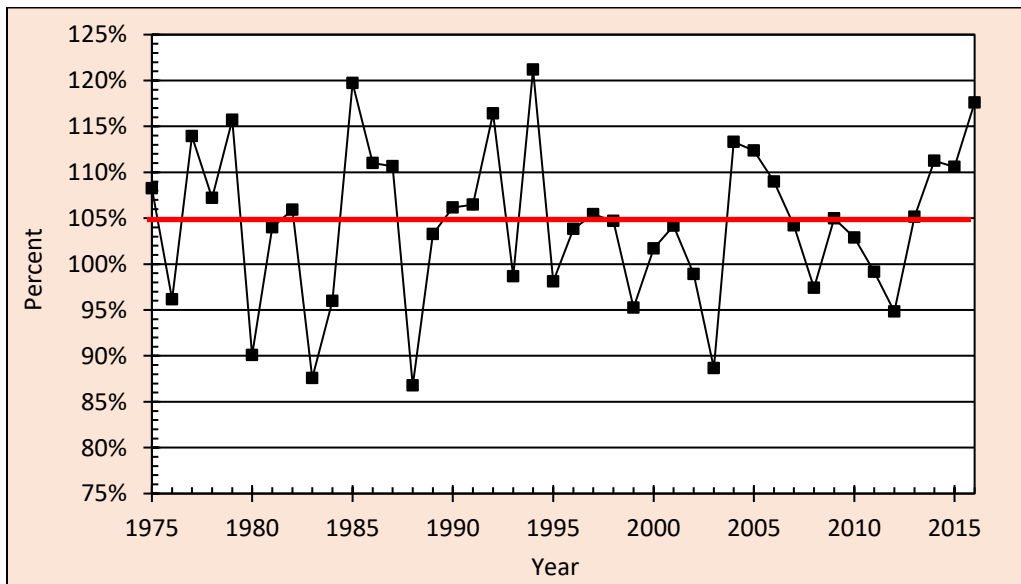


Figure 2. Soybean, U.S. Yield, Percent of Five-Year Moving Average, 1975-2016

In contrast, long-grain rice prices are not cointegrated with annual yields. Long-grain rice annual yields are typically 104% of the moving average. Recent years presented in Figure 3 indicate annual yields in 2015 and 2016 less than 104% of the moving average, but prices were not favorable compared to historical levels. Annual yields in 2012 and 2013 were greater than average expectations, and prices were at levels regarded as favorable by producers. The dominant cointegrating relationship for long-grain rice is acreage and price. An inverse cointegrating relationship between acreage and price indicates that low rice prices require acreage reductions for returning to an equilibrium relationship with favorable prices. Approximately 50% of U.S. rice is exported, but U.S. rice composes less than 2% of global production. Production shortfalls in the U.S. are readily compensated for by production from other nations. This compares to corn and soybean production in which the U.S. is a dominant global producer, and U.S. production shortfalls impact global markets so that U.S. prices are responsive.

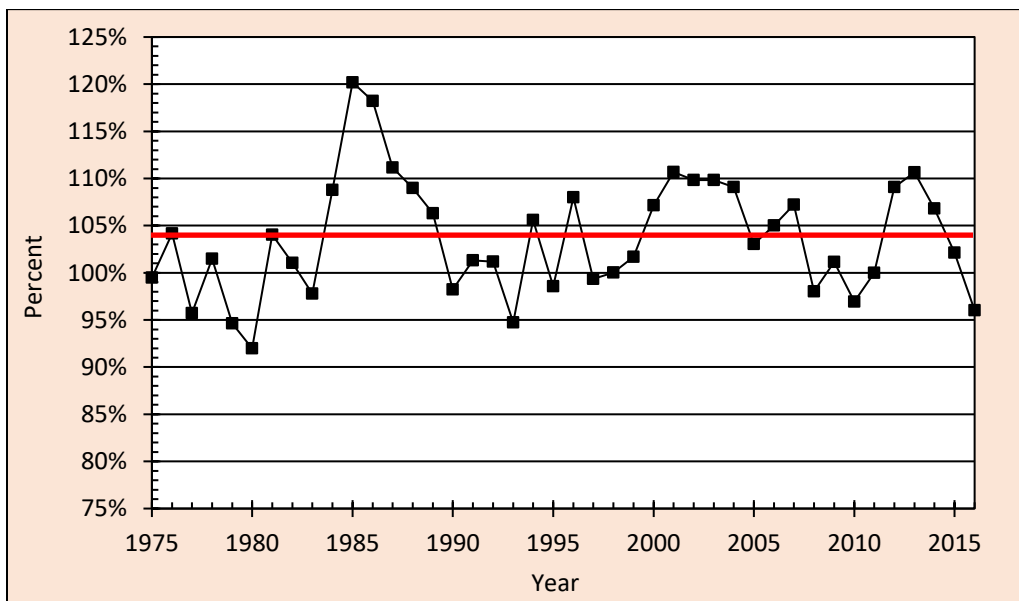


Figure 3. Long-Grain Rice, U.S. Yield, Percent of Five-Year Moving Average, 1975-2016

Conditions leading to current low corn and soybean prices and expectations for returning to long-term average prices correspond to U.S. agricultural policy for commodity price support programs. Increased yields lead to increased annual production without acreage increases. This productivity contributes to increased supplies that are not needed in the current production year. The effect is downward pressure on crop prices that eventually decrease to levels that trigger program payments. These payments partially compensate for revenue that is not forthcoming from market conditions and allow producers to sustain production. Sudden decreases in annual yields are inevitable, and quantities once regarded as surplus supply become buffer quantities that serve as available supply and prevent market prices from reaching excessive levels.