



# Newsletter

Center for Agricultural Policy and Trade Studies  
North Dakota State University

## Price Surges in U.S. Major Crops: Causal Mechanisms and Relative Importance

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Abrupt increases in crop and food prices have caught a lot of attention from the general public, as well as economists, recently. The general public is surprised at the sudden increase in retail food prices. The Consumer Price Index (CPI) for all food has increased 5.5 percent between 2007 and 2008. This is the highest annual surge since 1990 and is more than twice as high as the 2.3 percent gain in the overall CPI, excluding the food and energy sectors. Agricultural economists, on the other hand, are perplexed by the dramatic surge in the price of major field crops. The prices of



corn, soybean, and wheat have increased by 174%, 125%, and 190%, respectively, for the 2006 – 2008 period (Muhammad and Kebede, 2009).

Several previous studies have identified the factors causing the recent surge in crop prices. These factors are the recent increase in

oil price, the continued depreciation of the U.S. dollar, and the recent increase in corn based ethanol production. As the U.S. dollar began to depreciate in the beginning of 2002, the increased U.S. exports exerted upward pressure on U.S. prices for agricultural commodities through the enhanced foreign demand. The rising crude oil prices provided incentives to expand bio-fuels production, which eventually resulted in an increased demand for agricultural commodities, mainly corn. However, quantitative analysis has not been completed. In addition there isn't sufficient information to explain how those casual effects are transmitted across the

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## Long-run Average Prices of Wheat by Class

*Hyun S. Kim, Won W. Koo and Richard Taylor*

The assumption that agricultural commodities can be grouped together is widely used in academic research as well as in making farm policy. Wheat is one of these commodities where grouping or aggregation is commonly used.

The United States Department of Agriculture (USDA) develops the average prices for different wheat varieties that are used in many academic studies. While aggregation is used in empirical analysis for simplicity, the ag-

gregated price may not properly represent dynamic behavior of individual wheat price.

The U.S. produces five different classes of wheat: hard red winter (HRW), soft red winter (SRW),

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various major field crops.

This study attempts to answer two fundamental questions; How do such factors affect crop prices? How much does each causal factor contribute to crop price surges?

A time series econometric technique is used to answer these two questions. The variables used for this study are the prices of corn, wheat, and soybeans, oil price, the price of ethanol, and the value of the U.S. dollar. Weekly data for July 2006 to July 2008 is used to estimate the relationship.

Major findings can be summarized as follows. The relative contribution of each causal factor to the crops is quite different. The recent surge in the price of corn is influenced by the price of ethanol under the Energy Security and Independence Act (ESIA) of 2007 and the depreciation of the U.S. dollar. An increase in ethanol price contributes to the increase in corn price by 2.77-11.68%. Because of mandated uses of ethanol under ESIA, an increase in the price of ethanol tends to stimulate the production of corn-based ethanol, which increases the demand for corn. As a result, the prices of ethanol and corn are positively correlated with each other, indicating that an increase in the price of etha-

nol tends to increase the price of corn.

Corn price plays a leading role in the surge in soybean and wheat through the linkages among the crops in production. More specifically, the shock in corn price contributes to soybean and wheat price variation by 25.11-45.74% and 9.52-31.17%, respectively. In addition, the depreciation of the U.S. dollar exerts upward pressure on crop prices through enhanced foreign demand for U.S. agricultural commodities. Such changes in exchange rate contribute to price fluctuation of 2.31-5.47% for wheat and 0.89-3.20% for soybeans.

The structural shock in ethanol price is explained through the sudden hike in oil price which then boosted the demand for ethanol. The increase in oil price results in increased ethanol price by 5.55-26.21%. Ethanol price is also highly vulnerable to shocks in corn price by 6.61-52.43%. This implies that the future of the ethanol industry may depend on oil price movements. In addition, the technological possibility of substituting cellulosic materials for corn to produce ethanol is an important factor affecting the ethanol industry since the supply of corn for ethanol production is limited.

The prices of corn, soybeans,

and wheat are closely correlated with one another whenever there are any external shocks to any of these commodities. The recent surges in commodity prices are initiated by the increased price of corn through the significant increase in corn-based ethanol production. The depreciation of the U.S. dollar against major foreign currencies is another factor affecting the surge in commodity prices. As long as production of corn-based ethanol continues, the prices of agricultural commodities such as corn, soybeans and wheat are expected to remain higher than the long run average price of the commodities for the last decades. □

*"...an increase in the price of ethanol tends to stimulate the production of corn-based ethanol.."*



Long-run Average - Continued from page 1

hard red spring (HRS), durum, and white wheat (WW). Each class of wheat can be produced in specific regions under different growing conditions and has unique milling and baking properties. For example, HRW and HRS are used in making bread, SRW and WW are used in cookies, cake, and snack foods, and durum is used in pasta products. Also, some classes are processed for different end uses and, thus, do not belong to the same market in consumption.

In production, different regions produce different classes of wheat. HRW is mainly produced in Kansas, Nebraska, Oklahoma, and

Texas; SRW is grown in the Midwest and on the Atlantic coast; HRS is produced mainly in North Dakota and South Dakota, Montana, Minnesota, and Nebraska; durum is produced primarily in North Dakota and Montana; and WW is grown mainly in Michigan, New York, and the Pacific states.

In addition, the distribution of wheat prices (mean and variance) is different by class. Therefore, there could be a suggestion that wheat varieties should be treated as separate commodities and that individual wheat prices should be used for empirical analysis. Additionally, the price risk for each class of wheat would be different

since individual wheat classes have different sensitivity to production quality by weather condition. Thus, this study estimates the means and variances of the long-run prices of wheat by class, and test the null hypothesis that the price of each wheat class is different from one another.

The time series econometric technique is used to estimate the means and variances of long-run prices of individual wheat classes produced in the U.S. The data used for this estimation are the weekly data from 1988 through 2006. The most recent data for 2007 and 2008 are not included since commodity market, espe-

*...there could be a suggestion that wheat varieties should be treated as separate commodities...*



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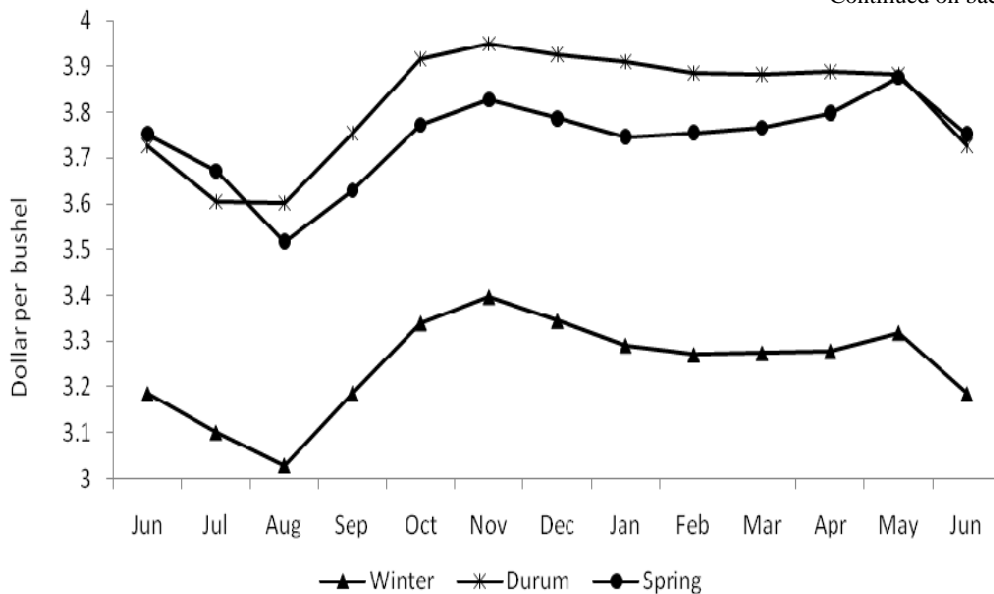


Figure 1. Estimated Long-run Prices of Wheat by Class



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cially wheat market, was abnormally distorted by external factors such as drought in Australia and a significant increase in corn-based ethanol production which indirectly led to increase in wheat price.

The major findings can be summarized as follows for the three wheat categories of spring, durum and winter wheat. First, although the changes in long-run mean prices for the three wheat classes in a crop year have similar patterns, there exist large gaps among their long-run average prices (figure 1).

The differences in average prices and their variances between HRW and DNS, and those between HRW and durum are tested under the null hypothesis that the

long-run average and variance of prices are statistically the same. The test rejects the null hypothesis, indicating that the means and variances of individual wheat prices are significantly different from one another. The test results imply that aggregated wheat price over different classes is not a good representation of

the prices of individual wheat classes. □

**Table 1. Mean and Variance of Long-run Prices (\$ per bushel) for Wheat by Class (1988-2006)**  
*Paired Differences t-Ratios of Mean and Variance of Long-run Prices*

Item	Class			Paired Difference test statistics	
	HRW	DNS	Durum	HRW-DNS	HRW-Durum
<b>Mean of Long-run Prices</b>	3.25	3.74	3.83	-95.09*	-67.92*
<b>Variance of Long-run Prices</b>	1.29	1.46	1.61	-1.38**	-1.63**

Note: \* and \*\* indicate significance at 1% and 10% level, respectively.