HAS PRICE BEHAVIOR OF MAJOR FARM PROGRAM CROPS CHANGED SINCE FAIR?

Carl R. Zulauf, Matthew C. Roberts, and Abigail G. Boor*

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Department of Agricultural, Environmental, and Development Economics
College of Food, Agricultural, and Environmental Sciences
The Ohio State University
2120 Fyffe Road
Columbus, OH 43210

* McCormick Professor of Agricultural Marketing and Policy, Ohio State University; Assistant Professor, Ohio State University, and Masters Student, University of Arizona.

Abstract

Background discussion has begun on the next farm bill. A key issue is the behavior of prices. In general average annual prices of the eight major farm program crops are lower during the period since the Federal Agriculture Improvement and Reform Act of 1996 (FAIR) was enacted than during the pre-FAIR period containing the 1974/75 - 1995/96 crop years. In contrast, price variability does not differ statistically between the two periods. However, caution is in order as the variability of yield has been smaller for seven of the eight crops in the post-FAIR period. The decline in yield variability exceeds 50% for corn, cotton, and oats.
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Introduction

Background discussion has begun on the next farm bill. A key component of the information set that will frame this discussion is the expected behavior of price. Price behavior is of particular interest because of the major farm policy changes authorized by The Federal Agriculture Improvement and Reform Act of 1996 (FAIR) and confirmed by the Farm Security and Rural Investment Act of 2002. FAIR eliminated annual acreage set aside programs and most government storage programs, key features of U.S. farm policy since its inception during the Great Economic Depression of the 1930s. The annual set aside program limited the number of acres that could be planted to a crop. Public stock programs accumulated stocks when price was low, and sold public stocks when price was high. FAIR also gave farmers more decision making freedom by allowing them to not plant their farm program acres or to plant program acres to any crop except fruits and vegetables. All three FAIR policy changes potentially affect the supply and thus price of a crop, especially farm program crops.

This article examines whether the average and variability of annual prices for the major farm program crops of barley, corn, cotton, oats, rice, sorghum, soybeans, and wheat have changed since FAIR was enacted. Many factors can change between two periods, including changes in policy, changes in demand, and different weather patterns. Therefore, this study does not ascribe causation to any factor, including FAIR. Instead, it provides an overview which in turn provides a foundation for future research and policy discussions.

The next section contains a brief discussion of the literature surrounding this topic and the analytical procedures used in this study. Findings of the analysis are then presented. The final section contains a summary.
Literature and Procedures

The impact of FAIR’s policy changes on the variability of price was a topic of concern during the debate over FAIR (e.g., Collins and Glauber, 1998). Studies conducted since FAIR was enacted have uniformly concluded that the variability of cash prices have not increased (Lence and Hayes, 2002; Natcher and Weaver, 2000; Weaver and Natcher, 2000; and Zulauf and Blue, 2003). Only Lence and Hayes examined average price; finding that the price of corn and soybeans differed little between FAIR and pre-FAIR policy.

This study uses an event study approach (MacKinlay, 1997), where the event is the enactment of FAIR. Multiple studies of similar events are needed to determine if the event causes a similar type of change. However, there is only one FAIR event. Thus, this study cannot determine FAIR’s impact on price, but it can address a related and important question: “Has the behavior of price changed since FAIR was enacted?”

The study begins with the 1974/75 crop year. This year is commonly used as the beginning of a new regime of prices that emerged after the price upheavals of the early 1970s (e.g., Kenyon, Jones, and McGuirk, 1993). The years are divided into a period pre-dating the FAIR event, the 1974/75 - 1995/96 crop years, and a period after the FAIR event, the 1997/98 – 2004/05 crop years. Tests confirm that the 1974/75 - 1995/96 crop years can be considered as one period for this study even though farm policy changed over this period. The 1996/97 crop year is excluded because it was a transition year. FAIR was signed into law during April 1996 (U.S. Department of Agriculture (USDA), 1996), several months after the 1996 winter wheat crop was planted. The data used in this study are from USDA. The most recent data are from the December 2004 World Agriculture Supply and Demand Estimates.

Because of the small number of available observations, bootstrap methods are used. Bootstrap methods are a common procedure for improving the power of statistical tests when a small number of observations exist.
Considerable debate exists over whether price variability should be measured in absolute or relative terms (Hirschey, 1996, pp. 600-602). A common measure of absolute price variability is the standard deviation of the level of annual price. A common measure of relative price variability is the standard deviation of the percent change in annual price between adjacent years. Both measures were computed. While some differences exist, both measures present a similar picture of price variability. Therefore, only the relative price variability measure is discussed. The relative measure of variability also is used for the other variables examined in this paper.

**Findings**

The average and variability of annual prices for the pre-FAIR and post-FAIR periods are presented in Figures 1 and 2, respectively. Except for barley, average price is lower during the post-FAIR period. Magnitude of the decline is 15% for corn, 14% for cotton, 5% for oats, 17% for rice, 13% for sorghum, 13% for soybeans, and 9% for wheat. Except for oats, these declines are significant at the 95% level of statistical confidence.

Price variability is lower during the post-FAIR period for most of the program crops. The exceptions are soybeans and cotton. The near doubling in the variability of cotton prices is the only statistically significant change.

In assessing the changes observed in average price and price variability, it is important to remember that many factors besides farm policy changed between the pre-FAIR and post-FAIR periods. They include (1) the devaluation of the Brazilian real and other currency realignments, (2) market and policy developments in China, (3) continuing evolution toward market economies in the former Soviet Union countries, (4) recent rapid expansion in U.S. demand for ethanol, (5) continuing expansion of soybean acres in South America, and (6) bilateral and multilateral international trade agreements, including those involving the U.S. In addition, the Asian currency crisis of the late 1990s contributed to the low prices that occurred
from 1998 through 2001. Periods of low prices occurred in the pre-FAIR period, but low price periods may account for a greater share of the shorter post-FAIR period. We illustrate the important concern about the impact of other factors by briefly examining two factors: changes in U.S. acres planted to the farm program crops and the variability of U.S. yields for these crops.

Comparing the post-FAIR to pre-FAIR period, acres planted to most of the crops changed substantively, ranging from -65% for oats to +19% for soybeans (see Figure 3). Acres planted to corn, cotton, rice and soybeans increased. Acres planted to the other four crops decreased. Except for corn, the changes in planted acres are statistically significant.

Not surprisingly, the changes in planted acres are inversely related to the changes in prices. Average price declined for the four crops with more planted acres (corn, cotton, rice, and soybeans). More acres translate into more supply and thus a lower price, all other factors remaining the same. In contrast, acres declined for both crops with insignificant changes in prices (barley and oats).

In assessing the relationship between changes in planted acres and average prices, it is important to note that acres planted to soybeans have been increasing since the 1920s, acres planted to oats have been declining since the mid 1950s, acres planted to sorghum have been declining since the mid 1970s, and acres planted to barley have been declining since the mid 1980s. Thus, many of the changes in acres observed after FAIR was enacted are a continuation of longer term trends. Therefore, while FAIR’s policy changes may have allowed planted acres to change more than they would have changed otherwise, the direction of change in planted acres likely would have occurred even without FAIR.

FAIR gave producers greater planting flexibility. An important question in understanding the future behavior of prices, especially their variability, is how this increased planting flexibility will impact farmers’ willingness to adjust their planted acres to changes in crop prices. Figure 4 does not address this question, but it does provide an initial overview of the variability of acres planted to the eight farm program crops in the post-FAIR and pre-FAIR periods.
Excluding barley, the variability of annual planted acres has been less during the post-
FAIR period. The decline is significant at the 95% level of statistical confidence for corn, cotton, oats, rice, soybeans, and wheat. In trying to understand this finding the impact of the 1983 crop year needs to be considered. In 1983, a large amount of acreage was removed from production in an attempt to reduce the large public stocks accumulated over the previous three years. Removing the impact of this crop year from the pre-FAIR period reduces the variability of planted acres for corn, cotton, oats, rice, and sorghum to 6%, 15%, 11%, 13%, and 13%, respectively. Little change occurs for the other three crops. Thus, even after removing the impact of the 1983 crop year, the variability in planted acres remains lower in the post-FAIR period for all crops except barley. Furthermore, the difference remains statistically significant for cotton, soybeans, and wheat. These findings suggest that the variability of planted acres and the responsiveness of planted acres to changes in price in the post-FAIR environment are topics with interesting research potential.

Yields are a major source of supply uncertainty. Yield variability has been lower during the post-FAIR period for all of the major farm program crops except wheat (see Figure 5). The decline is statistically significant for corn, cotton, and oats. For each of these crops the decline exceeds 50%, with corn having the largest decline at 70%.

Lower yield variability translates into lower price variability if all other factors remain the same. While FAIR may have impacted yield variability, the widespread decline among crops whose production systems and core production areas vary widely suggests that more benign weather for crop production probably is at least part of the explanation.

Summary

Before discussing the conclusions and implications of this analysis, two limitations need to be restated. First, the small number of observations limit the power of statistical tests to determine significant differences. Thus, the findings of this study may change as more years
are added to the data set. Second, many factors may have changed between the pre-FAIR and post-FAIR periods, including changes in policy, demand, and weather patterns. Despite these two limitations, managers and policy makers need information about on-going changes in order to make more informed decisions and to formulate key questions that need monitoring. Given the limitations, our conclusions and implications focus on the common themes that emerge from examining the eight major farm program crops as a group.

Except for barley, average prices are lower since the Federal Agriculture Improvement and Reform Act of 1996 (FAIR) was passed. The lower prices for corn, cotton, rice, sorghum, soybeans, and wheat during the post-FAIR period (1997/98–2004/05 crop years) are statistically significant. Beneficiaries of these lower prices include livestock producers, ethanol producers, importers, and domestic consumers.

Variability of the average annual price of the farm program crops, when considered as a group, does not differ between the pre-FAIR and post-FAIR periods. This conclusion is consistent with previous studies, but caution is warranted. Variability of yield is smaller during the post-FAIR period for the program crops except for wheat. It is statistically significantly lower for corn, cotton, and oats. More favorable weather seems likely to be at least part of the explanation for the lower yield variability observed during the post-FAIR period. This possibility suggests that considerable uncertainty likely surrounds the true level of price variability since FAIR was enacted.
References


Figure 1. Average Annual Price, U.S., 1974 – 2004 Crops

Notes: ** and * indicate that a crop’s average prices for the 1974-1995 and 1997-2004 periods differ significantly at the 99% and 95% levels of statistical confidence, respectively. Prices for barley, corn, oats, sorghum, soybeans, and wheat are in dollars per bushel. Prices for cotton are in dollars per pound. Prices for rice are in dollars per hundredweight.
Figure 2. Variability of Annual Average Price, U.S., 1974 - 2004 Crops

Note: ** indicates that the variability of a crop’s prices during the 1974-1995 and 1997-2004 periods differ significantly at the 99% level of statistical confidence. Variability is measured as the standard deviation of the percent change in annual price.
Figure 3. Average Annual Planted Acres, U.S., 1974 - 2004 Crops

Note: ** indicates that the average acres planted to a crop during the 1974-1995 and 1997-2004 periods differ significantly at the 99% level of statistical confidence.
Figure 4. Variability of Annual Planted Acres, U.S., 1974 - 2004 Crops

Note: ** and * indicate that the variability of the acres planted to a crop during the 1974-1995 and 1997-2004 periods differ significantly at the 99% and 95% levels of statistical confidence, respectively. Variability is measured as the standard deviation of the percent change in annual planted acres.
Figure 5. Variability of Yield, U.S., 1974 – 2004 Crops

Note: ** and * indicate that the variability of a crop’s yield during the 1974-1995 and 1997-2004 periods differ significantly at the 99% and 95% levels of statistical confidence, respectively. Variability is measured as the standard deviation of the percent change in yield.