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Corn Shortfalls: Historical Patterns and Expectations

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Continued strong growth in ethanol production should keep corn supplies tight for at least the next few years. With low carryover stocks, livestock producers and the ethanol industry are both vulnerable to the high prices that would result from a poor crop. It is too early to make predictions about what the 2007 crop will be, but insight into the likelihood of a short crop can be gained by looking at historical variations in production.

Figure 1 shows the percent deviation in actual corn production from expected levels since 1970. Expected corn production is estimated as the product of U.S. trend yield per harvested acre, U.S. planted acres, and the trend ratio of harvested to planted acres.

As shown, there have been four years since 1970 that saw production shortfalls of at least 20 percent. The shortfall in 1988, a year of hot, dry weather, was the largest, at about 28 percent, followed by the drought-year production of 1983. Next was 1993, a year of excess rain and no heat, and the fourth-largest short crop happened in 1974, which aided the dramatic surge in agricultural prices in that period. Interestingly, there are fewer years with a 10 to 20 percent production shortfall than a 20 to 30 percent shortfall. Figure 1 also illustrates that the potential on the upside for corn production is much lower than potential on the downside. Only in 1979 did crop size exceed expectations by more than 15 percent. Harvests that exceeded expectations by at least 10 percent occurred in 1972, 1982, 1985, 1994, and 2004.
It is interesting to note that production in 2006 exceeded expectations by a small amount. Yet we still had an unprecedented increase in corn prices, as ethanol production grew at a rapid pace.

It is an open question whether future supply shocks will follow the historical patterns. Many feel that current corn hybrids are better able to withstand hot and dry weather of the type seen in 1983 and 1988. This has yet to be demonstrated, though, as we have not had a severe drought since 1988. Dry weather in Illinois in 2005 and in the western Corn Belt in 2002 caused significant local yield losses, which suggests that corn crops remain vulnerable to drought. The odds of a repeat of the cold summer of 1993 are likely lower than suggested by a simple historical average because that event was linked to volcanic activity. Increasing corn acreage outside the Corn Belt will tend to increase variability in corn supplies.

If we use historical variations since 1957 as a guide, we can estimate the probability distribution of the size of the 2007 corn crop. Assuming that U.S. farmers plant 90.5 million acres of corn, we expect them to harvest 91 percent of planted acreage. With a 2007 trend yield of 149.4 bushels per harvested acre, expected U.S. corn production is 12.3 billion bushels. Figure 2 shows the probability distribution of the corn crop in one billion bushel increments. As shown, there is a 1 in 50 chance (a repeat of 1988) that the corn crop will fall below 9 billion bushels. There is a 12 percent chance that the corn crop will fall below 11 billion bushels. If the crop does fall short of 11 billion bushels then we should expect corn prices to rise to levels that may cause ethanol plants to shut down. On the other hand, there is a 70 percent chance that the corn crop will exceed 12 billion bushels, in which case prices will be moderate. Of course if planted acreage falls short of planting intentions, then the odds of high corn prices could grow substantially.

U.S. Biodiesel Production
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outpaced demand for the biofuel, and consumption has not picked up until recently. A partial explanation may be found in the relative prices of biodiesel versus diesel fuels and the reluctance of engine manufacturers to approve usage of the fuel until recently. However, quality standards for biodiesel are developing and quality certification systems have started to emerge, prompting engine manufacturers to extend their warranties. More manufacturers are approving the use of B20 in some or all of their engines. This may improve the acceptance of biodiesel. Additionally, mandates for the use of blends combined with the fuel’s use as an additive to improve the lubricity of ULSD may create additional demand for the product. However, the economics of today’s diesel prices and the prices of potential feedstock sources do not seem promising without continued government support and technological improvements. Projected increases in vegetable oil prices, especially soybean oil, will continue to squeeze margins for biodiesel producers.

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