

The Outlook for Corn Prices in the 2008 Marketing Year

Bruce A. Babcock
babcock@iastate.edu
515-294-6785

Lihong Lu McPhail
lihonglu@iastate.edu
515-294-4611

Market prognosticators and fund managers who invest in corn and soybean futures in the winter and spring would have us believe that they have inside information about where markets are headed. But nobody can know what the price of corn will be for the 2008 crop because so many of the factors that will determine corn prices cannot be known at this time. We know that the 2008 corn yield will have a direct effect on corn prices, but 2008 growing conditions cannot be predicted. Other unpredictable factors that will affect the price of corn include the demand for corn from the ethanol industry, the value of the dollar, the supply of crops in other countries, and the overall level of world economic activity.

Predictors of corn prices and corn price variability can be obtained from futures and option prices on the Chicago Board of Trade. For example, if the December 2008 futures price is \$6.00 per bushel, then we know that traders think there is about a 50 percent chance that prices will below \$6.00 and a 50 percent chance that price will be above \$6.00. But futures prices give us no information about how far prices could fall or how much they could increase. For that information, we look at options prices. If the price of an “at the money” put or call option is \$0.70 per bushel, then we know from Black’s theory of option prices that the volatility of the futures price is about 30 percent. What this means is that the market suggests there is a 15 percent chance that the December futures

price will fall below \$4.20 and a 15 percent chance that the price will be higher than \$7.80. Thus, we know from observing trades in Chicago that the market suggests there is a 70 percent chance that the future price will be between \$4.20 and \$7.80 per bushel.

But what will happen to corn prices if a major drought hits this year or if Congress decides to relax ethanol mandates? Estimating the impacts of such events requires development of a computer model of the corn market. Such a model needs to include basic supply and demand relationships, such as the demand for feed and the level of planted acreage, but it also needs to account for the unknowable: the national corn yield, the level of export demand, and future gasoline prices.

To answer these types of “what if” questions, we developed a detailed model of the corn market for the 2008 crop. The model reflects the March 31 USDA acreage report that pegged prospective corn acreage at 86 million acres. The model also includes how further increases in ethanol production capacity will affect prices as well as the impact on the percentage of this capacity that will actually be used for production given corn prices, ethanol prices, and the price of distillers grains. Demand equations for corn used as feed, food, and exports are all accounted for also. Details about the model are given in our paper “Ethanol, Mandates, and Drought: Insights from a Stochastic Equilibrium Model of the U.S. Corn Market” (available at <http://www.card.iastate.edu/publications/>). This model is in the process of being expanded to include soybeans and wheat and to include three years of projections. But for now, it only includes corn and price projections for the 2008 crop year.

Projecting 2008 Corn Prices

The model is a “Groundhog Day” (the movie) model because we repeat the 2008 marketing year many times. One difference with the movie is that we allow the important factors that will affect the price of corn to vary according to what market traders believe will happen in the future or what history suggests will happen. The factors that we treat as being unknowable at this time (early April) are planted acreage, acres not harvested for grain, corn yield, the price of gasoline (which determines the price of ethanol), export demand, and the capacity of the ethanol industry. We treat as known the level of feed demand (given a price of corn), the level of the demand for corn by the food industry, and how stock levels will vary for different corn prices. To the extent possible, we calibrate the model to USDA data put together in the World Agricultural Supply and Demand Estimates (WASDE).

For each repeat of the 2008 crop and marketing year, a random draw (as in a card draw) of each of the unknowable factors is obtained by the computer. For each combination of the random draws, we have the computer solve for the price of corn so that demand equals supply. We simulate the corn market for 1,000 years, recording the market-clearing corn price each time. We take the average of the 1,000 prices as the “expected” corn price and we measure the variability of corn prices by taking the standard deviation of the 1,000 prices. This procedure is aptly named a Monte Carlo simulation model. In technical terms, it is called a partial equilibrium stochastic model of the corn market.

Model Results

We ran the model under a number of different scenarios, including a “base” scenario in which we as-

sumed that current ethanol mandates, tax credits, and import tariffs are maintained and that we have no information about 2008 growing conditions other than what we have observed in the past. Gasoline price levels and price variability were taken from the New York Mercantile Exchange gasoline futures and options markets. Our baseline corn price distribution has a mean (the expected price) of \$5.60 per bushel. This price represents the average price to be received by corn farmers for their 2008 crop (not the harvest price or any particular month's futures price). Taking into account the variability in the "unknowables," our estimate of the price volatility is 19 percent, which means that we have a 70 percent chance that the actual price will fall between \$4.53 and \$6.66. These results suggest that there is quite a small probability that corn prices will fall to levels that would satisfy the livestock industry. Our baseline results indicate that there is a 20 percent chance that the \$0.51-per-gallon tax credit is insufficient to make ethanol plants willing to produce mandated ethanol levels. This means that there is a reasonably high chance that ethanol prices will have to be bid above levels that would otherwise clear the ethanol market.

High corn prices have increased speculation that scheduled ethanol mandates will be relaxed. A relaxation of mandates would have little impact on the ethanol industry's capacity unless some plants currently under construction are mothballed. The 2008 crop-year impacts of eliminating the mandate are modest. We estimate that such a policy change would decrease the expected corn price by only \$0.26 per bushel to \$5.34 per bushel. The corn price volatility decreases to 17 percent because corn prices are

The modeling results suggest that there would be little relief from high corn prices in the short run even if U.S. ethanol mandates and subsidies were relaxed.

not bid up as strongly without a mandate in short-crop years.

Removal of both the mandate and the \$0.51 tax credit would be expected to have a much larger impact on corn prices because the ethanol industry's ability to pay for corn would decrease substantially. However, the extent to which ethanol prices would fall depends on gasoline prices and on the willingness of blenders to pay for reduced volumes of ethanol. Under this scenario, we estimate that ethanol production would decrease by about 30 percent from baseline levels, the expected ethanol price would decrease from \$2.39 per gallon to \$1.96 per gallon, and the expected corn price would drop from \$5.60 to \$4.83. The impacts of eliminating the mandate and the tax credit are not as great as one might expect because the ethanol industry would continue to operate until processing margins turn negative. The corn price impacts would be greater if the tariff on imported Brazilian ethanol were also eliminated.

The final situation we examined is what would happen to corn prices if we had a return of a 1988-style drought when corn yields were almost 25 percent below trend levels. Keeping the mandate in place would have a large impact on corn and ethanol prices. The expected price of corn would increase to \$8.62 per

bushel—54 percent above baseline levels—while the expected price of ethanol would have to be bid up to \$3.30 per gallon to induce ethanol producers to meet mandated consumption levels. This price of ethanol means that total ethanol subsidies under these drought conditions would average \$1.50 per gallon, for a one-year total subsidy of \$15 billion. Relaxing the mandate, the expected price of corn in this type of drought condition would still increase to \$7.28 per bushel. The ethanol industry would be working at less than half of its capacity, with a total ethanol supply of about 5.2 billion gallons, which is adequate to meet oxygenate requirements and clean air mandates.

Future Modeling Efforts

The scenario results discussed here show the policy value of constructing this type of model. The modeling results suggest that there would be little relief from high corn prices in the short run even if U.S. ethanol mandates and subsidies were relaxed. The existence of ethanol plants should keep corn prices high for the next year or two even under lower ethanol subsidies. As other countries respond to high crop prices with expanded production, we should expect to see a greater decline in corn prices over time with a change in ethanol policy.

Over the next six months to a year, CARD researchers will be developing a more realistic Monte Carlo model of the U.S. crop sector to capture more precisely the impacts on soybeans and wheat as well as corn from a change in U.S. ethanol policy. Expect to see economics lingo such as "dynamic, multi-market, rational expectations equilibrium" in the near future as we develop models to capture the interplay of energy and crop markets and the consequences of biofuels policies on commodity prices. ♦