## When Will the Bubble Burst?

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High prices are their own worst enemy. Increased profit margins entice entrepreneurial investment, which results in increased production. Lower market prices inevitably follow. The magic hand of Adam Smith ensures that winners' gains and losers' losses will be temporary, as entrepreneurs correct market imbalances.

The temporary nature of high prices is well known to corn, soybean, and wheat farmers. Over the last 50 years there have been only two corn price increases that have been sustained for more than two years. The first was from 1973 to 1975 when a combination of short crops around the world and increased export demand dramatically increased prices. The second was from 1979 to 1984 when high corn prices were sustained by supply controls, government-defended floor prices, and drought. Farmers in the United States and around the world have always been able to out-produce the market and government policy.

Farmers have a strong incentive to continually adopt cost-reducing and yield-enhancing technologies. Thus, even when prices are low, agricultural supply tends to increase, as farmers seek out the seemingly never-ending advances in seed technology, improved pest management, and more productive machinery. When prices are high, farmers have the added incentive to bring more land into production and to plant the
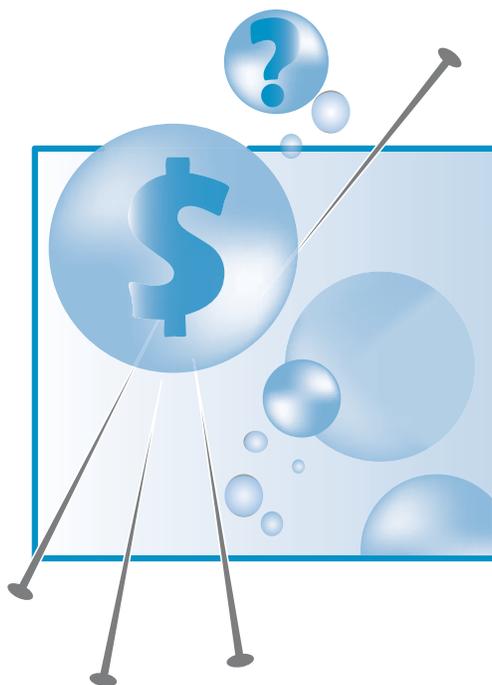
crops that bring the greatest economic return.

Because farmers have traditionally produced ingredients that are turned into food, the demand for farm products reflects characteristics of that demand. World food demand depends primarily on population and income, both of which expand predictably and slowly. When production of food ingredients outstrips the growth in food demand for more than a year or two, prices inevitably decline. The resulting price declines can be large because food demand is quite insensitive to price. There really is only so much food any person can eat.

Nonstop increases in supply combined with slow and predictable demand growth have resulted in a seemingly inexorable long-run trend of falling inflation-adjusted agricultural prices intermixed with one or two years of high prices caused by unexpected supply disruptions. In

agriculture, as with most other commodities, it has not been a question of if price bubbles will burst but only a matter of when.

A New Era for Agriculture?

The last period of high prices was in 1995 when the season-average price of corn rose to $3.24 per bushel. At the height of concern that 1996 production would not be sufficient to meet demand, 1996 new-crop futures rose as high as $3.83 in July before beginning a five-year decline. It is noteworthy that Chicago Board of Trade corn prices did not indicate that such high prices were permanently with us. Futures prices for the 1997 crop never rose above $3.08 and futures prices for the 1998 crop never rose above $3.00 per bushel. It is clear that traders believed that the high prices in 1995 and 1996 were unsustainable in that a return to normal crop conditions would result in lower prices. A drop in demand caused by the late-1990s Asian financial crises caused prices to drop even further than traders thought likely.

The futures market is telling us a very different story today. Although we are coming off a record corn harvest, the 2008 new-crop corn harvest is more than $5.00 per bushel. The new-crop soybean futures price is more than $12.50 per bushel. In contrast to the 1995/96 high price period, the markets today are not indicating that these record prices are temporary. Farmers can sell their 2009 and 2010 crops for about the same price.

The impacts on agriculture would be staggering if these price levels were permanent. For example, current prices imply that land rents

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in Iowa and the rest of the Corn Belt should increase by a factor of about 2.8, even after accounting for the loss of government payments, the higher production costs associated with increased demand for inputs, and increased returns to management and machinery. As land rents go, so too do land prices. Iowa State University's annual land price survey showed that in 2005 the average acre of farmland in Iowa was valued at $2,914. That year is a useful benchmark for land values because crop prices had not yet increased. Multiplying the 2005 land value by 2.8 suggests that $5.00 corn and $12.00 soybeans could support average land values in excess of $8,000 per acre.

Crop prices at these levels dramatically increase the cost of raising hogs, finishing cattle, and producing milk and eggs. These costs will have to be passed on to consumers through higher retail prices for meat, eggs, and dairy products to keep livestock producers in business. Competition for land between specialty crops, oilseeds, and food and feed grains will also increase the prices of other products such as hops, malting barley, beans, and vegetables. Consequently, we should expect to see increased food prices over the next year or two as these cost increases are passed on to consumers.

But how much faith should we put in the Chicago Board of Trade as a long-run indicator of price levels, particularly when all the world's farmers face an unprecedented incentive to increase production? How can we reconcile what the markets are telling us with the iron rule of market economics that the cure for high prices is high prices?

Impact of the New Energy Bill

On December 6, 2007, the U.S. House of Representatives passed its version of the new energy bill that was later combined with a Senate version of the bill and signed by President Bush on December 19. Early December is an important time for commodity prices because the House indicated for the first time that it would include an expanded renewable fuels standard for corn ethanol and a new mandate for biodiesel. On December 1, the price of December 2009 corn was $4.15 per bushel. By January 14, this price had increased to over $5.00 per bushel. The price of November 2009 soybeans increased from $9.51 to $12.40 per bushel over the same period. An examination of the short- and long-run impacts of the new corn ethanol mandate can help reconcile the laws of economics with what is happening on the Chicago Board of Trade.

Corn ethanol use is mandated to grow from 9 billion gallons this year to 13.2 billion gallons in 2012 and to 15 billion gallons in 2015. Accounting for the distillers grain that replaces the corn that is used to produce ethanol, and the expected growth in average yields, this level of production will require 16.2, 23.2, and 25.5 million acres of corn, respectively, to be devoted solely to ethanol production. The required level of corn production will occur, but only if farmers are compensated through high prices.

How Quickly and How Far Can Prices Drop?

Congress adopted new corn ethanol and biodiesel mandates during a time when world supplies of corn, wheat, and oilseeds are tight. Thus, the markets quickly responded by signaling the world's farmers to increase production. How quickly production can ramp up internationally will determine when commodity prices start retreating. The key countries and regions to watch are the United States, Brazil, Argentina, the European Union, Ukraine, and Russia.

The 2008 supply picture in South America indicates at most a small increase in production. U.S.

production capacity can be quickly increased only by good growing conditions or a significant drop in acreage enrolled in the Conservation Reserve Program. The ability of Ukraine and Russia to expand production quickly is questionable given how far their agricultural sectors have fallen. And any expansion of E.U. acreage will likely be devoted to meeting their own biofuels mandates. An anticipated slow ramp-up in production combined with the need to meet new demand from biofuels mandates is why Board of Trade prices are so high for the next three crop years.

Over time, however, yield increases, infrastructure investments, and expansion of crop acreage will all work to increase world supplies; the profit signals are just too high for these price levels to be sustainable over the long term. Even so, the demand expansion from U.S. and other countries' biofuels mandates is so large that it is likely that meeting food and fuel demand will require higher-cost production practices and cultivation of lower-yielding acreage. In economic terms, this expansion of demand will push world agriculture up its long-run supply curve, which means that future price levels will be permanently higher.

A simple supply and demand analysis of three possible future scenarios provides insight into how low we can expect corn prices to fall. In the figure, demand for corn to produce 15 billion gallons of ethanol is insensitive to the price of corn because of the mandate. For quantities in excess of 15 billion gallons, the analysis assumes that ethanol production does not affect the price of gasoline.

Three Scenarios for Price Projections
1. Elimination of the $0.51-per-gallon subsidy given to wholesale buyers of ethanol, wholesale price of gasoline at $2.50, and ethanol valued at its energy value

2. Continuation of the $0.51 subsidy, $2.50 gasoline, and ethanol valued at its energy value
3. No ethanol subsidy, $2.50 gasoline, and ethanol valued on a par with gasoline value

The critical difference between these scenarios is the price of ethanol at production levels in excess of 15 billion gallons. In the first scenario, the additional ethanol will have to compete with gasoline without subsidy, which implies an ethanol price of $1.67 per gallon. This translates into an ability to pay for corn at about $3.12 per bushel. The second scenario adds a $0.51-per-gallon subsidy, which makes the ethanol price equal to $2.18 per gallon, and an ability to pay for corn equal to $4.52. The third scenario assumes that automobile manufacturers and blenders optimize fuel pumps and car engines so that fuel mileage does not decrease with ethanol, which implies an ethanol price of

$2.50 per gallon and an ability to pay for corn equal to $5.33.

When ethanol producers' ability to pay for corn (indicated by the demand curves in the chart) in excess of the mandate is less than the price of corn needed by U.S. corn farmers to supply the required corn to meet the mandate (indicated by where the supply curve in the chart intersects 15 billion gallons), then the mandate will bind and the supply price of corn will be $4.00 per bushel. This is what occurs in scenario 1. If some combination of market demand or additional subsidy to ethanol drives ethanol producers' ability to pay for corn to above $4.00 at 15 billion gallons, then the mandate will not bind, the long-run price of corn will be greater than $4.00 per bushel, and corn ethanol production will exceed 15 billion gallons. This occurs in scenarios 2 and 3 when corn supply meets corn demand at 21.5
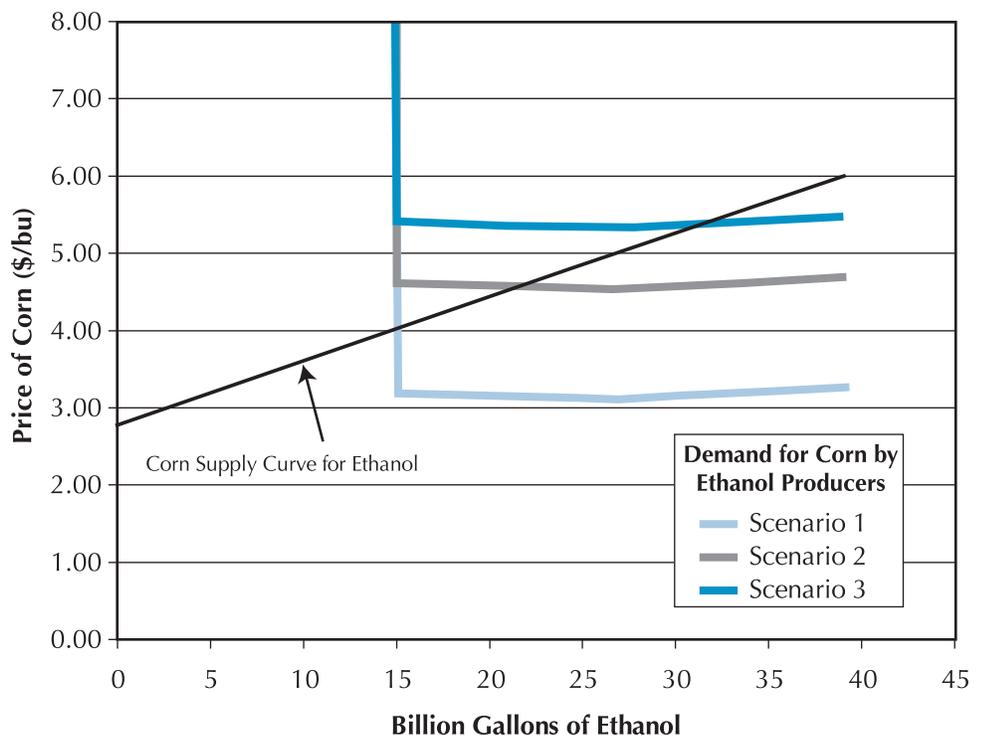
What Will the Price of Corn Be After the New Mandate Is Met?

price of Midwest diesel was approximately $2.80 per gallon, indicating a 35¢-per-gallon difference in the market demand price for biodiesel and diesel. However, to generate a market demand price of $4.50 per gallon for biodiesel with this level of market price premium would require crude oil prices of $140 per barrel. Exported quantities would not be counted toward the renewable fuels standard.

Third, the price of biodiesel could be increased to $4.50 per gallon if the purchase of biodiesel by blenders were subsidized. The subsidy would have to vary inversely with the price of diesel to ensure a $4.50 biodiesel price. If blenders are willing to pay 35¢ more per gallon for biodiesel than for diesel, then the required variable tax credit would equal $4.15 minus the wholesale price of diesel. The cost of meeting the biodiesel mandate using tax credits would be borne fully by taxpayers.

Fourth, and lastly, biodiesel prices could be increased enough to cover feedstock costs if the government simply mandated that diesel blenders use levels of biodiesel required by the EISA. Blenders would have to pay biodiesel producers a price high enough to allow the producers to stay in business to produce the required volumes. Blenders would then have to sell the blender product at whatever price they could induce diesel consumers to pay. The cost of the biodiesel mandate would be shared by consumers and blenders.

Economic Impacts of the Energy Independence and Security Act

Passage of the EISA with a one-billion-gallon biodiesel mandate was meant to help a biodiesel industry that has been squeezed by low margins caused by spiraling feedstock costs that have outpaced biodiesel prices. The mandate will indeed increase the price of biodiesel, either through higher subsidies to diesel blenders or because blenders are forced to pay biodiesel prices high enough to allow biodiesel producers to cover their feedstock costs. However, higher biodiesel prices do not automatically imply a profitable biodiesel industry. The capacity of the biodiesel industry will still be far in excess of that needed to meet the mandate. This excess capacity means that biodiesel prices will need to be increased only enough to induce biodiesel producers to run

their plants to produce the required amounts of biodiesel. That is, we should expect biodiesel prices to increase only enough to cover operation costs. If this is the case, then owners of biodiesel plants should not expect to obtain much, if any, return on their invested capital.

This dismal outlook for the U.S. biodiesel industry hinges on feedstock prices always being bid to the industry's break-even point. Prices cannot fall below this point as long as excess capacity exists. Prices cannot be bid above this point because demand for feedstock will drop as biodiesel plants stop operating. This new competitive environment is reinforced by increased biodiesel capacity in Europe, Brazil, and Argentina that has resulted from their mandates. Consequently, the ultimate beneficiary of expanded biodiesel mandates is not the biodiesel industry. Rather, farmers and landowners should expect to see the lion's share of benefits from these new mandates because feedstock prices will be maintained at levels that just keep the biodiesel industry afloat. ◆

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and 31.5 billion gallons, respectively. The long-run corn price is determined solely by ethanol producers' ability to pay for corn in these two scenarios.

Cautionary Notes

Economists loathe making predictions about where future prices are headed because they are so often wrong. The long-run predictions of corn prices given here are predicated on a number of key assumptions.

The first is that current government biofuel mandates will be maintained despite opposition from an array of groups. The biodiesel mandates will increase the price of oilseeds, thus increasing competition for corn land, which results in the $4.00 price of corn at 15 billion gallons of ethanol. If the biodiesel mandates are relaxed (but the ethanol mandate is maintained), the long-run corn price will be lower. The second key assumption is that corn yields will continue to grow as they have in the past. If seed companies increase the rate of yield growth, then the

corn supply curve will shift to the right in the graph. This shift will lower the long-run corn price if the ethanol mandate binds. However, if the mandate does not bind, then the shift simply means that the corn ethanol sector will grow even larger, leaving the long-run price of corn unchanged. Third, if the futures markets are completely wrong and crude oil prices drop significantly, then $2.50 gasoline will just be a bad memory. However, because of the corn ethanol mandate, the price of corn will be determined by the mandate, as in scenario 1. ◆