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## *Less Uncertainty About Future Corn Prices Highlights Liquidity*

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A high probability of lower corn prices in 2014 is leading to prospects of lower incomes for U.S. corn producers. Despite near-record farm income in 2013, markets appear more convinced that corn prices are unlikely to match the levels of the past few years. The variability of expected harvest prices mirrors that of a decade ago as diminishing ethanol growth has curbed demand potential.

Though crop producers often characterize price uncertainty as a nuisance to be managed through various risk management strategies, less uncertainty is not automatically better for producers. Expected future corn prices are significantly less volatile now than in recent years. However, the decreased uncertainty is accompanied by prospects of considerably lower prices.

Expectations of lower corn prices and reduced profitability for 2014 corn production underscore the importance of liquidity. Liquidity allows producers to combat potential short-term risks of significantly weaker, or even negative, profit margins. Overall, farmers have greatly improved their cash position in the last several years, suggesting that a crisis in 2014 is unlikely. However, some less-liquid operations may be more exposed to short-term risks than others and weaker profitability could intensify challenges beyond 2014.

### *Limited Potential for High Corn Prices*

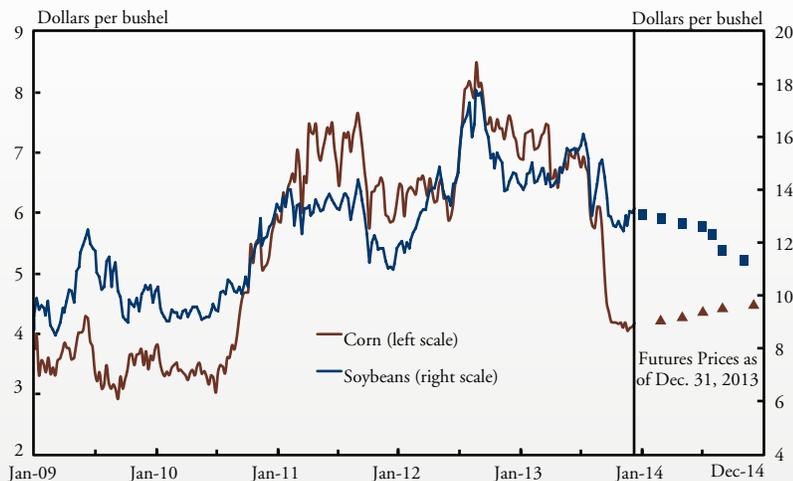
Income from crop production, particularly corn, appears likely to be lower in 2014. Moreover, futures and options markets point to considerably less uncertainty about the range of 2014 harvest prices than in recent years. These markets also suggest a relatively small probability that corn prices will top 2013 levels.

Whether U.S. corn producers' incomes will be lower in 2014 critically depends on the level of uncertainty about future corn prices. Following a rebound in production in 2013, corn prices have plummeted from \$7.50 per bushel in March 2013 to just over \$4.00 per bushel in December (Chart 1). The decline in soybean prices has been more modest, falling from nearly \$15.00 per bushel in March 2013 to about \$13.00 per bushel in December. Although future incomes will also depend on how much production costs adjust alongside lower crop prices, the USDA has projected that net returns per acre of corn production could fall by 38 percent from 2013 to 2014.

One measure of future uncertainty about corn prices is implied volatility, calculated from options markets. Broadly, implied volatility can be interpreted as the market's expectation of uncertainty at a specific time in the future.<sup>1</sup> For corn, December futures and options contracts

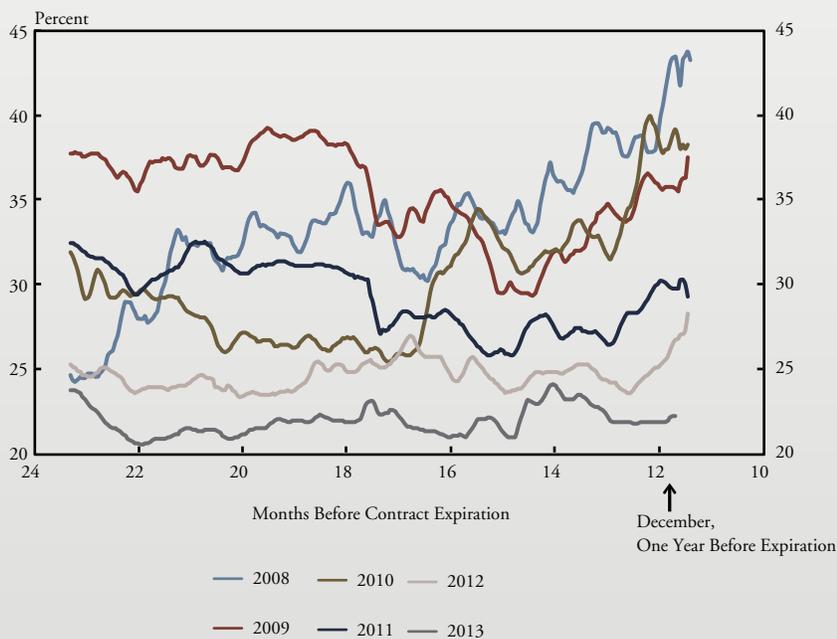


**Chart 1**  
**U.S. Corn and Soybean Prices**



Source: Commodity Research Bureau and Chicago Board of Trade.

**Chart 2**  
**Implied Volatility of U.S. Corn Options Contracts**  
**Five-Day Moving Average**



Source: barchart.com

are considered to best reflect information associated with the fall harvest. Implied volatility associated with the December 2014 contract, then, can be used as a forward-looking measure of uncertainty about harvest prices.

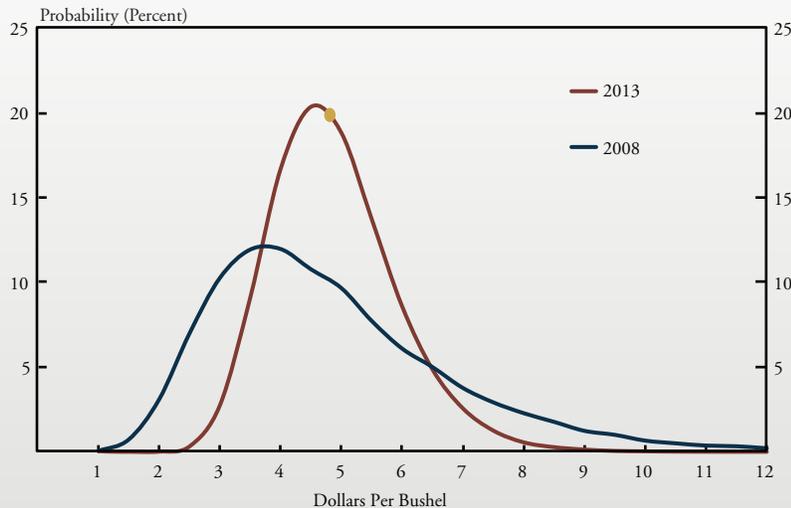
Uncertainty about 2014 corn harvest prices appears to be substantially less than in previous years. The implied volatility of the December 2014 options contract averaged 22 percent during the first three weeks of December 2013. This number suggests 2014 harvest prices are statistically likely to range only 22 percent above or below the underlying futures price. In contrast, implied volatility in December 2008 was 42.8 percent, nearly double this year's measure, but very similar to the average from 1997 to 2005.<sup>2</sup> Since 2008, implied volatility one year before harvest has steadily declined (Chart 2).

A relatively low measure of implied volatility suggests a much tighter range of probable 2014 harvest prices. Chart 3 illustrates probability distributions for December 2008 and December 2013, representative of market-based expectations for the subsequent year's harvest prices.<sup>3</sup> The distribution suggests a 19-percent probability that 2014 harvest prices will lie between \$4.50 and \$5.00 per bushel, represented by the gold marker, and a 68-percent probability that prices will be less than \$5.00 per bushel.

The key difference between 2008 and 2013 is that less uncertainty implies limited potential for large price swings in 2014. In 2008, there was a much wider range



### Chart 3 Simulated Probability Distribution for U.S. Corn Prices in One Year



Note: The gold marker illustrates a probability of 19 percent that 2014 harvest prices will be between \$4.00 and \$4.50 per bushel.

Sources: barchart.com and author's calculations.

of expected 2009 harvest prices, driven by higher implied volatility at the time. In fact, the 2008 distribution suggests a probability of 21 percent that 2009 harvest prices would be higher than \$6.00 per bushel. (Prices were close to \$3.00 per bushel at harvest in 2009.) Conversely, the 2013 distribution shows a probability of less than 10 percent that 2014 harvest prices will be higher than \$6.00 per bushel.

Yet, producers may be more concerned about the lack of upside price potential for 2014 than existing downside price risks because of crop insurance. Crop insurance guarantees most farmers some income support if prices fall substantially between February, when crop insurance

base prices for corn are determined, and harvest. For the vast majority of farmers, then, the possibility of very low prices reflected by the left-most portion of each distribution is somewhat irrelevant. In 2009, farmers purchasing crop insurance could have received some income support if the harvest price for corn fell below the base price of \$4.04 per bushel. In 2014, farmers may receive some support if harvest prices fall below the base price determined in February.

#### *Why Less Price Uncertainty?*

There are several potential explanations for why markets seem to be more certain about the range of future corn prices. Volatility in other markets

has fluctuated drastically in recent years, which may be thought to correspond to similar volatility patterns in commodity markets. Adverse weather is also known to generate uncertainty on the supply side. However, aspects related to demand are a more likely explanation for why markets recently seem to have narrowed their range of expected corn prices.

One possible argument for the recent downward trend in forward-looking volatility might be that volatility in equity markets has had spillover effects in commodity markets. Following the financial crisis in 2008, equity markets were extremely volatile. A common measure of equity market volatility is the Chicago Board Options Exchange Market Volatility Index (VIX). In December 2008, the VIX averaged a reading of 52. In the first three weeks of December 2013, the VIX averaged just 15. However, the VIX also averaged only 21 in December 2009, whereas implied volatility derived from corn options markets remained relatively high. These volatility differences in 2009 suggest volatility spillover effects from equity markets likely have not been a key driver of the trend of declining implied volatility in corn markets.

Uncertainty about expected supply can also generate significant price uncertainty. For example, in May 2012, the average implied volatility of the December 2012 contract was 28.5 percent. As the



2012 nationwide drought intensified in June and July, implied volatility surged to nearly 40 percent. In 2013, implied volatility of the December contract for that year jumped from 26 percent in April to more than 30 percent by the end of May due to delays in planting. However, supply uncertainty is often driven by weather-related uncertainty. This uncertainty is resolved at harvest and there appears to be little correlation between precipitation levels from one year to the next.<sup>4</sup>

Alternatively, the changing nature of demand might explain declines in implied volatility over the last several years. Specific instances of demand uncertainty may be difficult to identify, and are made more imprecise by extraneous short-term factors, such as weather or macroeconomic events. Unlike uncertainty in supply expectations, though, demand uncertainty is not necessarily resolved from one year to the next. Long-term trends in implied volatility, therefore, are more likely to be attributable to fundamental changes in demand.

Over the past decade, growth in demand for U.S. corn appears to have slowed. Trends in global consumption, an indicator of demand, have shifted in recent years. From 2004 to 2010, global consumption increased by an average of 4.2 percent, according to the USDA. During the same time, production increased by an annual average of about 3.7 percent. In 2013, U.S. farmers harvested a record 14

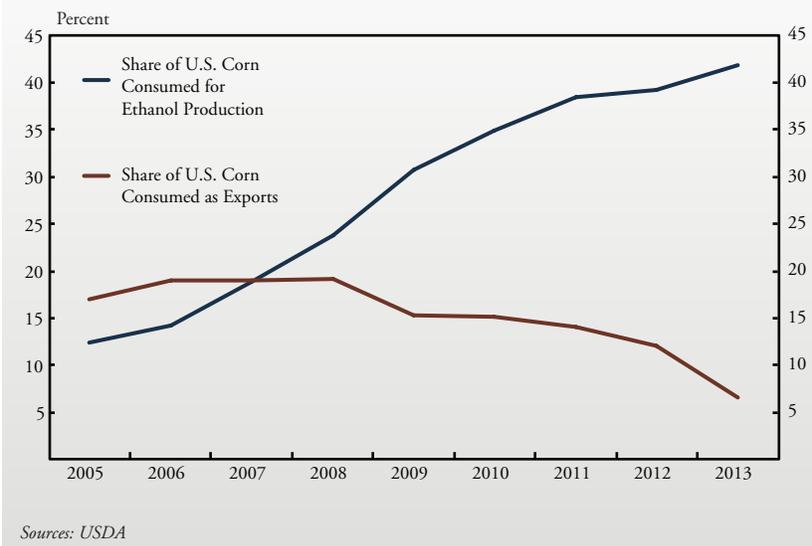
billion bushels of corn, 7 percent more than the previous record set in 2010. However, the USDA projects that consumption of this past year's record crop will be roughly the same as in 2010, potentially boosting inventories that had been dwindling.

Slower growth in ethanol production is a key factor in explaining slower demand growth. From 2005 to 2010, an additional 3.2 billion bushels of corn were consumed in the production of ethanol, an increase of 245 percent. At the same time, the share of U.S. corn used to produce ethanol surged from 12 percent in 2005 to 35 percent in 2010 (Chart 4). In 2013, though, ethanol blended for use in transportation fuel was essentially at, or very near, the maximum level attainable. The USDA projects that

corn used for ethanol production in 2014 will be only 8 percent higher than in 2010, accounting for 42 percent of U.S. corn consumption.<sup>5</sup>

Meanwhile, U.S. corn exports have declined sharply in recent years. Historically, export markets accounted for a large share of demand for U.S. corn. As recently as 1995, exports accounted for nearly 25 percent of total U.S. corn consumption. This share has dropped in recent years alongside sharp growth in U.S. ethanol production. In 2013, exports accounted for only 7 percent of total U.S. corn consumption. For consumption to maintain the 2004 to 2010 growth rate of 4.2 percent, exports would need to be 42 percent higher in 2014 than the average over the last decade and 90 percent higher than the average of

**Chart 4**  
**Sources of U.S. Corn Consumption**





the past three years. Export growth of this magnitude may be difficult to achieve in the face of increasing global competition for export markets.

### *Liquidity is Key*

A high probability that 2014 profit margins will be weaker underscores the importance of short-term liquidity. In general, though, crop producers appear to be well-positioned to withstand possible short-term setbacks. Strong income from corn production in recent years has strengthened farmers' balance sheets and improved their overall liquidity. However, farm businesses with limited equity and lower levels of working capital, may be more exposed to short-term difficulties.

Liquidity is a crucial first line of defense against short-term setbacks. High levels of liquidity allow producers to pay bills as they come due and signal creditworthiness to lending institutions. Maintaining sufficient liquidity should be a priority for any business, but particularly those facing a high probability of short-term downside risks to profitability.

One common measure of liquidity is net working capital, defined as current assets minus current liabilities. Current assets, sometimes referred to as gross working capital, includes cash and other assets that can be quickly converted to cash. Current liabilities are typically interpreted as short-term debt obligations, due in less than one year.

Another useful measure of liquidity is the current ratio. The current ratio, current assets divided by current liabilities, is particularly useful because it allows one to easily compare levels of liquidity across different types and sizes of operations. A ratio of 1:1 (or, equivalently, 1.0) suggests farmers have just enough cash or cash-equivalent assets to meet their short-term debt obligations. Thus, a higher current ratio implies a higher level of liquidity.

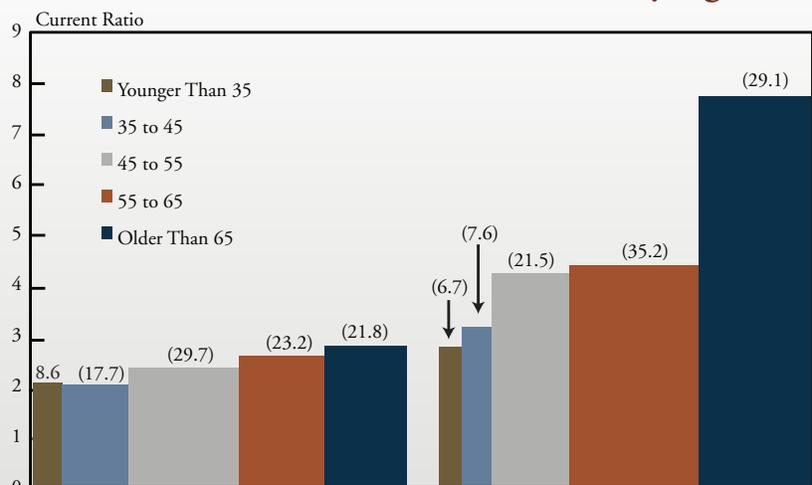
Overall, farmers specializing in corn production have improved their liquidity during the recent boom years. According to the USDA, the current ratio for this group of farmers has improved from an average of 2.4 between 1996 and 2006 to 4.5 in 2012, an increase of 188 percent.

Although data are not yet available for 2013, it seems likely this measure of liquidity remained high in 2013 alongside near-record farm income.

Older farmers appear to be best positioned against short-term risks when assessing farm business liquidity by age of the operator. Farmers above age 65, historically the most liquid, had a current ratio of 7.7 in 2012, compared with an average of 2.8 from 1996 to 2006 (Chart 5). Overall, farmers between the ages of 45 and 65 had a current ratio above 4.0 in 2012, compared with an average of less than 2.7 from 1996 to 2006.

In addition, older farmers account for most farm businesses specializing in crop production. Approximately 29 percent of farm

**Chart 5**  
**Current Ratios for U.S. Corn Producers by Age**



Source: USDA

Note: Numbers in parentheses and width of bars depict the percentage of farmers in each age category.



businesses have primary operators above age 65 (illustrated by the width of each column in Chart 5). Moreover, approximately 86 percent of farm businesses have primary operators above age 45, a cohort with significant liquidity in their operations.

Small farm operations have also improved their liquidity dramatically in recent years. Farm businesses with gross farm income (GFI) less than \$100,000 annually had a current ratio of nearly 10.0 in 2012, compared with an average of 3.5 from 1996 to 2006 (Chart 6). This group accounted for roughly 14 percent of farm businesses specializing in crop production in 2012. Although farm businesses with a higher GFI had lower levels of liquidity by comparison, there has

been significant improvement across all economic classes since the 1996 to 2006 average.

Despite strong overall liquidity, some farm operations could be more exposed to short-term risks. Young farmers, although relatively small in number, generally have the lowest levels of liquidity. Large farming operations, potentially those that have taken on additional debt in an effort to expand, are also less liquid. Farmers who have negotiated high cash rent leases may also face more pressure if rents do not quickly adjust to lower corn prices. Farmers who have negotiated multiyear cash rent leases may be particularly exposed to short-term risks.

Weather could also emerge as a short-term risk in 2014. Severe

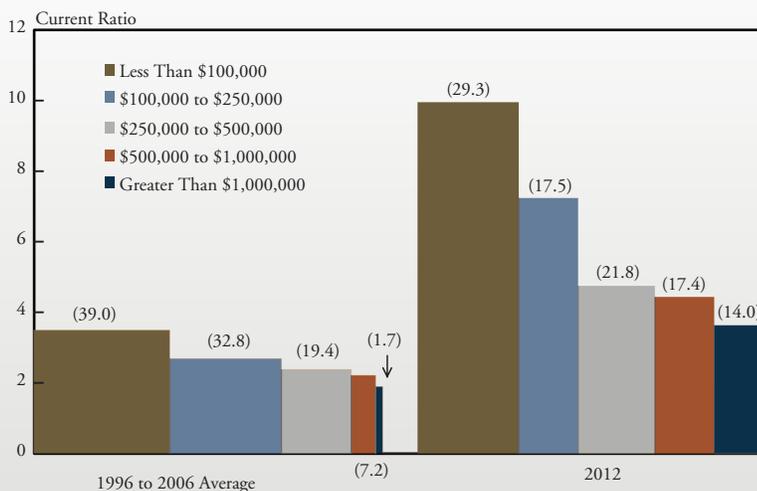
adverse weather confined to a small locale during the 2014 growing season could be especially damaging to farmers in that area if the adverse conditions are not widespread enough to push prices higher in compensation for lower yields. In this case, the support from crop insurance for the affected farmers will likely be limited.

### Conclusion

The U.S. crop sector has experienced record incomes the past few years, driven by soaring crop prices. Current market expectations, however, reflect more certainty that upside price potential for corn in 2014 is somewhat limited. Slowing demand from the ethanol industry, competition in foreign markets, and increased global production may continue to dampen commodity price swings and constrain income growth potential.

If farm incomes fall in the coming year, the liquidity of agricultural producers will play an important role in managing short-term financial risks. Past profitability should position crop farmers to adequately manage shrinking profit margins and repay debt obligations. Still, some producers will likely face more short-term risks in the coming year, particularly young farmers and large operations with higher debt levels. Farmers making decisions about production in 2014 and beyond should carefully consider their own levels of liquidity in the face of more certainty about lower prices in the future and reduced profitability.

**Chart 6**  
**Current Ratios for U.S. Corn Producers by Annual Gross Farm Income**



Source: USDA

Note: Numbers in parentheses and width of bars depict the percentage of farmers in each category of economic class.



## ENDNOTES

- <sup>1</sup>More technically, implied volatility is the volatility of an underlying instrument, a futures contract in the case of corn, which causes the theoretical option value to equal the current market price of the option. Theoretical option values are derived from an option pricing model, typically the Black-Scholes pricing model.
- <sup>2</sup>McPhail, L., and B. Babcock. "Ethanol, Mandates, and Drought: Insights from a Stochastic Equilibrium Model of the U.S. Corn Market." March 2008. Working Paper 08-WP 464. Center for Agricultural and Rural Development, Iowa State University.
- <sup>3</sup>The probability distributions were generated under the assumption that prices follow a log-normal distribution. Financial asset prices are often assumed to be log-normally distributed, which follows from the assumption that returns, continuously compounded, are normally distributed.
- <sup>4</sup>Irwin, S., and D. Good. "Do Recent Precipitation Deficits Tell Us Anything About Next Summer's Precipitation?" December 19, 2012. Farmdocdaily, University of Illinois Urbana-Champaign.
- <sup>5</sup>Dried distillers grains (DDGs) are a byproduct of ethanol production. This figure does not account for the use of DDGs as a substitute for corn consumption. Accounting for this substitution effect could cause ethanol's (net) share of corn consumption to be lower.

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