Producer Perceptions of Corn, Soybean and Cotton Price Risk

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Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Atlanta, Georgia, January 31-February 3, 2009

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Abstract:

Risk is an inevitable part of agricultural production and all producers face various forms of risk. This study used the subjective price expectations and price distributions of survey participants to determine how producer's expectations compare with that of the market. Data used for this study were gathered through survey responses from Mississippi State University Extension meeting and workshop participants.

Individual respondent's discreet stated price and price distribution information was fitted to a continuous distribution and an implied mean and standard deviation was determined. This was compared to market price and price risk data. Participants largely over-estimated price. Individual volatilities resulting from each fitted distribution were lower than that implied by the market.

Key Words: price risk, price perception, subjective probability elicitation

Introduction

Risk in production agriculture is inevitable. The risks can stem from weather, genetics, pests and disease which impact yields or from volatile prices due to supply and demand factors, whether it is local in nature or a global phenomenon. Whichever the case agricultural producers constantly must deal with risk. In regard to price risk there are various tools that can be utilized. These include futures and options contracts, forward contracts and insurance products.

Many of the tools available to minimize price risk have been in existence for a number of years. The most recognizable are futures contracts which date back to 1848 while options on futures surfaced in 1982. Other risk mitigating instruments available to producers are forward contracts and insurance products. Even though these tools have been available for some time, few agricultural producers use them to manage risk (Shapiro and Brorsen 1988; Asplund, Forester and Stout 1989; Makus et al. 1990; Goodwin and Schroeder 1994; Schroeder at al. 1998; Hall et al. 2003). Some of the common reasons cited for limited utilization of price risk management tools are the lack of knowledge of the products, the high cost associated with using these products and producer perceptions that many risk management tools do not effectively reduce overall risk or stabilize income.

Numerous studies have quantified the risks prevalent in crop production, yet many producers do not attempt to offset price risk using the many tools available. A number of hypotheses about what factors contribute to producer use of price risk management tools have been tested including producer knowledge, experience, age, risk aversion level, operation leverage, diversification, and others. This study focuses on a hypothesis that producer expectations of the price risk they face is biased downward making them overoptimistic about market price stability.

Gaining insight into producers' price and price variability expectations is crucial in understanding their management decisions. Two dimensions of producer expectations are evaluated. The first being producer's perception of the future price of two futures contracts on corn, cotton and soybeans. The first is a nearby and the second contract allows for a more distant forecast. The second information elicited is the expectations of price variability. The expected price is used to gauge producers' ability to forecast prices and the latter is used to gauge producers' outlook on price variability. This latter measure is compared to the variability present in the market via a common measure of market risk, implied volatility derived from the Black commodity option pricing model.

Knowledge of producer's risk expectations is beneficial for management consultation. For example, if producers convey expectations that are consistent with the market's expectation, then minimal use of tools for price risk protection is likely associated with something other than price risk expectations as producers foresee this risk and simply choose not to hedge against it. On the other hand, if producer perceptions of price risk are lower than the market anticipates, this would suggest that producers underestimate price risk inherent in the market. In this case, more education regarding the magnitude of the market risk present is needed to help producers be more aware of their price risk exposure.

This study uses the subjective price expectations of survey participants to determine how producer's expectations compare with that of the market. Utilizing the elicited probabilities, this research parameterizes the stated distribution and tests if group and individual distributions are different from the distribution established by the futures and options market. Results from this analysis are useful for assessing reasons for the apparent lack of use of risk management tools. Results from this study also provide insight to educators when designing information producers use for management decisions. Furthermore, with better information on producer perceptions of market risk expectations either the current design of risk management tools can be adjusted so that they better target the desired user, or new products can be implemented that better serve producers.

Previous Literature

Several studies have tested the causes of lack of producer adoption of forward contracts, futures contracts and/or options on futures. These are detailed here and summarized in table 1. Shapiro and Brorsen (1988) found that 63 percent of crop producers in Indiana hedge some portion of their crop. Of the total crop acreage hedged they found that 11.4 percent was hedged using futures contracts and 20.5 percent was forward contracted despite stating that three-fourths of the 41 farmers surveyed were risk averse. The authors note that producers tended to disagree with the belief that using futures in turn reduced income variability and therefore they chose not utilize them. Another study by Asplund, Forster and Stout (1989) found, by way of survey, that 42 percent of Ohio crop farmers forward contract and only 7 percent used futures markets to hedge their price risk.

Makus et al. (1990) surveyed 595 producers across 22 states and found that 32.3 percent had used futures contracts to hedge from 1986 to 1987 and 57.1 percent had used forward contracting. They found that age, whether the producer was engaged full-time, part-time or a land owner and whether the producer utilized government programs did not significantly affect futures use. The factors that did impact the use of futures were education, farm size, previous use of forward contracting and membership in marketing clubs.

Goodwin and Schroeder (1994) reported that only 10.4 percent of all Kansas agricultural producers surveyed used futures markets and only fewer than 11 percent of corn producers and 6 percent of soybean growers used futures contracts to hedge. They found that 42.8 percent of producers used forward contracts with 34 percent and 31 percent of corn and soybean producers using this method, respectively. They found farm size, education, crop and input intensity (the level of inputs such as fertilizer chemical used per acre) and debt-to-asset ratio increased the adoption of forward and futures use; however, experience decreased the level of price risk management use.

Musser, Patrick and Eckman (1996) found that 53.4 percent of Indiana crop producers hedge using futures contracts and 34.5 percent used options. The level of participation in forward pricing was the highest in this study with 74.1 percent of producers using this method of risk management. They found that larger farmers and corn producers were more likely to use forward and futures contracting as compared to previous studies.

Schroeder et al. (1998) conducted surveys at two different conferences, an Extension Agricultural Land Value conference in August of 1996 where the primary audience was crop producers and a Cattle Profit conference in August of 1997 where the participants were largely cattle producers. Results from the Agricultural Land Value conference showed that 64 percent of producers use forward contracting, 45 percent use futures and 56 percent use options. The Cattle Profit conference showed much different results however as 18 percent of cattle producers use forward contracting, 21 percent use futures and 18 percent use options.

Mishra and Perry (1999) state that roughly 40 percent of farmers had used a marketing strategy that included futures or forward contracts. Sartwelle et al. (2000) surveyed producers in Iowa, Kansas and Texas and found that 16 percent used futures or options and 25 percent used forward contracting. Experience was a significant factor in futures use but the number of crop acres, farm size and level of specialization did not have an effect. The amount of acres planted and the level of diversification did have a significant impact on the level of use of forward contracting; however, experience did not impact this use. Hall et al. (2003) surveyed Nebraska and Texas producers and found that 5 percent had used forward contracts and 7 percent had used futures and options.

Table 1. Summary of Multiple Studies Reporting Risk Management Usage by Producers

Study	Year	Location	Forward	Futures	Options	Forward and Futures	No. of Respondents	Type of Respondents
			(percent that use each method)					
Shapiro and Brorsen	1988	IN		63			41	Crop
			21	11				
Asplund, Forester and Stout	1989	OH	42	7			353	Crop
Makus et al.	1990	US	57	32			595	Crop and Livestock
Goodwin and Schroeder	1994	KS	45	11	19		537	Crop and Livestock
			12	8	10			
Musser, Patrick and Eckman	1996	IN	74	53	35		62	Crop
Schroeder et al.	1998	KS	64	45	56		55	Crop
			18	21	18		36	Livestock
Mishra and Perry	1999	US				40	7,225	Crop and Livestock
Sartwelle et al.	2000	KS, IA, TX	25	16			351	Crop and Livestock
Hall et al.	2003	NE, TX	5	7			1,313	Livestock

Insurance products are offered by the Risk Management Agency (RMA). First offered in 1989 these products serve to reduce the risk faced by producers. Since then crop insurance policies have gained prominence. Data from RMA shows about 81 percent of all corn and soybean acres and 93 percent of all cotton acres planted in 2008 were protected. Of all policies written in 2008 corn and soybeans accounted for about 24 percent each and cotton accounted just over 4 percent. The total liabilities covered by insurance products offered through RMA totaled just under 90 billion dollars. Of this total corn represented about 42 percent, soybeans 25 percent and cotton just under 3 percent.

Probability Elicitation

Nelson (1980) investigated procedures for eliciting probabilities. He defined four methods of probing survey respondents for information on probabilities: 1) direct estimation, 2) assigning weights, 3) cumulative distribution approach and 4) triangular distribution approach. The direct estimation method requires the respondent to state the probabilities they feel would be associated with the occurrence of particular events. He claimed of these the direct estimation and weighting provide the most comprehensive information from individuals since the latter two glean only three to four points to estimate a distribution.

Price and Yield Expectations

A number of studies have examined crop producer's expectations of both yield and price. Eales et al. (1990) conducted a survey of Illinois grain producers and merchandisers eliciting their expectations of corn and soybean price distributions. The weighting method was utilized in their study and price ranges were split into 18 intervals. The survey was conducted seven times from June to December 1987. The authors aggregated the data for each group of survey participants and then compared the subjective results with the implied volatilities derived from the Black (1976) model. They found that eight corn and twelve soybean price volatility expectations out of fourteen were significantly below the implied volatilities found via the Black model (at the 5 percent level). The level of error, the difference of producer expected risk from Black's implied volatility, was typically larger for soybean expectations as compared to corn.

Kenyon (2001) surveyed Virginia corn and soybean producers during January and February from 1991 thru 1998. He asked participants to give cash price expectations of the two crops at their specific location. He also had producers give the "price with a one in ten chance of prices falling below at harvest" and a "price with a one in ten chance of prices rising above at harvest". The price expectations were compared to the final harvest price at their respective location. Producers' expectation error (producer expectation minus the actual harvest price) varied from year to year, but when averaged across the eight-year period producers' expectations were within $0.03 for corn and $0.10 for soybeans. Distributions were formed from the price information gathered by Kenyon (2001) by formulating a histogram of the prices taking into account the high and low prices elicited. He found that producers typically were optimistic when forecasting prices.

Other studies have examined producer expectations in regard to crop yield. Pease et al. (1993) elicited subjective probabilities of crop yield and compared these to historical de-trended yields for individual farms from 1977 to 1986 using data from the Kentucky Farm Business Analysis Association. The authors calculated the percentage difference of the probability stated by each farm from the mean yield for that specific farm. They found that the simple mean of the ten years of data did not correspond well to the yield predicted by the farms. When the historical data were trimmed (removing a 20 percent of the lowest and highest values in the data), expected yields better matched expected yields given by the producers and a simple linear trend using all ten years was roughly equal to farmer's expected yield.

Eagelkraut et al. (2006) estimated crop producer's expectations of corn yield and compared these values to aggregate county data supplied by the National Agricultural Statistics Service (NASS). Their survey elicited probability distributions of crop yield via the direct estimation approach. They provided 10 yield intervals for respondents to assign probabilities. They also asked producers to state their average corn yield as well as information that compared their farm's yield with a typical farm in the same county. They fit individual discreet stated probabilities to a continuous Weibull distribution and found implied corn yield distributions for each survey respondent. They found that implied distributions provided by the producers and de-trended county yield distributions were relatively equal and the average implied standard deviation and average county standard deviation were not significantly different from each other.

Data

Data used for this study were gathered through survey responses from various meetings and workshops. An example of the survey is provided in the Appendix. Table 2 lists the type of meeting or workshop where each survey was administered as well as the number of survey participants, the date the survey was conducted and the period that participants were asked to forecast. Given that the data are elicited at group specific meetings and workshops, the survey data are not a random sample. However, given that the focus of this research is centered on crop production industry and the expectations of those involved in this industry, the specific target audience was of most direct relevance and interest.

Table 2. Summary of Survey Locations, Dates, and Responses

	Surveys Given	Number of Usable Surveys	Date of Elicitation	Crop	Contract	Forecast Length (days)
MSU Agronomic Crop Update	13	8	Nov. 7, 2008	Corn	Mar-09	105
					Sep-09	287
				Cotton	Mar-09	105
					Oct-09	315
				Soybean	Mar-09	105
					Nov-09	350
MS Central Delta Crop Producer Meeting	22	15	Nov. 13, 200	Corn	Mar-09	99
					Sep-09	281
				Cotton	Mar-09	99
					Oct-09	309
				Soybean	Mar-09	99
					Nov-09	344
MSU Cotton Shortcourse	41	18	Dec. 1, 2008	Cotton	Mar-09	81
					Oct-09	291
Mississippi-Louisiana Dairy Management Conference	32	4	Jan. 8, 2009	Corn	Mar-09	43
					Sep-09	225
				Soybean	Mar-09	43
					Nov-09	288
Northeast MS Multi-County Corn and Soybean Meeting	53	5	Jan. 15, 2009	Corn	Mar-09	36
					Sep-09	218
				Soybean	Mar-09	36
					Nov-09	281

The survey asked participants to give a most likely expected price (mean price) for two futures contract months for corn, cotton and/or soybeans. The two contracts represented a nearby and a more distant contract (approximately harvest time) traded on the Chicago Board of Trade. The groups of respondents were asked give their forecast for the final trading day of the option contract for each futures contract. All respondents were asked to provide a probability that the actual price on the stated date will be within a defined window which varied by commodity. After this, they were asked to provide probabilities that the actual contract price on the stated date would fall into six price ranges, three above and three below. Again these ranges varied by commodity. For example, in regard to the corn contract participants were asked to give the price they expect within a $0.50/bu range ($0.25/bu above and below) and then give the expected probability of the price falling into that range. Next, participants define the probability that the price of the nearby and distant corn contract will be between $0.25/bu and $0.75/bu above (below) their expected price, between $0.75/bu and $1.25/bu above (below) and finally $1.25/bu or more above (below) their expected price. This method of expected price elicitation allows for flexibility by respondents in that they are able to center their stated distribution on their own expected price rather than a predetermined set of prices defined by the survey.

The meetings where surveys were conducted were typically one day events where producers attended a central location for educational training. Some of the meetings had speakers that gave price forecasts; however, if this was the case, the survey was given prior to such information dissemination.

Unusable surveys were those that were not completed or where price and probability information could not be extracted in any way. Some survey respondents did not have price distribution probabilities that summed to one. These surveys were utilized by simply adding all reported probabilities and weighting each individual probability based on the summed value. For example, if the sum of all probabilities was 110 percent and the probability assigned to the $2-$6 higher expected price range was 20 percent, the adjusted probability for this range was 18.18 percent (or 20 divided by 110).

In addition to price and price distribution expectations, demographic information for each respondent was gathered for all groups. Respondents were first asked to state their age, gender and education level. Next, survey participants were asked to describe their primary occupation. The individuals were also asked to define the level of their specific operation. Lastly, respondents were asked how often they used futures. Table 3 reports the results of respondents' demographic information.

Table 3. Summary Statistics of Demographic Data of Survey Respondents

Descriptor	Mean	Standard Deviation	Minimum	Maximum
Age	43.7	12.65	24	57
Gender (% male)	100%			
Education[1]	3.89	0.33	3	4
Occupation				
Crop Producer	58.9%			
Livestock Producer	17.7%			
Agbussines	5.1%			
Banker/Lender	2.9%			
Real Estate	1.8%			
Academia/Extension	13.6%			
Operation Size				
Corn (acres planted/year)	2,640.0	2,076.78	150	6,000
Soybean (acres planted/year)	2,155.0	2,621.29	485	8,000
Cotton (acres planted/year)	2,445.6	1,674.28	328	5,000
Cows (head/year)	110.0	127.28	20	200
Stockers (head/year)	37.5	36.06	12	63
Futures Use				
Never	45.0%			
Sometimes	22.0%			
Often	33.0%			

[1] 1=Some High School, 2=High School Graduate, 3=Some College and 4=College Graduate or higher

Methods

Volatility in stocks and futures markets are commonly estimated in two ways, from historical data and from options prices. Historical volatility estimates are backward looking and use price series from past data to calculate variance or standard deviation values as proxies for a commodity's level of risk. A number of studies have found this type of volatility measurement does not accurately predict actual, or revealed, volatility as compared to models that estimate volatility from option prices. Poon and Granger (2003) summarize the results of numerous studies that compare historical and implied volatilities.

Black and Scholes (1973) laid the foundation for option pricing models. Their model stems from the financial sector and calculates the market's value for a European call option on stocks. Black (1976) further explored the pricing of options on futures contracts. Acceptance of implied volatility derived from Black's model is mixed. Some studies have found Black's model to be a poor estimate of actual volatility. Theoretically, error is present if arbitrage is not possible or costly to perform. Stock options that trade on multiple platforms and do not close at the same time make arbitrage opportunities difficult and costly and thus are a likely culprit of biased results for the Black-Scholes pricing model. However, since futures trade on the same exchange as the options they underlie, if options are mis-priced traders would have the ability to take advantage of the arbitrage opportunity fairly easily.

Still, some studies have found Black's model to be a poor predictor of actual volatility. Hauser and Neff (1985), Myers and Hanson (1993) and Hilliard and Reis (1999) all found the Black model to be inferior to historical variance, GARCH models and a model that follows a jump diffusion process, respectively. Jorion (1995), on the other hand, found implied volatility on foreign currency futures to perform better than a GARCH model of historical volatility.

Szamany et al (2002) compared the results of 35 commodities' volatility that were estimated using historical volatility and Black's model. They found that the Black model outperformed historical variance estimates for 32 of the 35 commodities including live cattle.

Empirical evidence is somewhat mixed regarding the ability of Black's model to accurately forecast market volatility relative to other estimates of price variance. However, most of the more recent and more comprehensive studies, in terms of scope of markets covered, conclude that implied volatility from Black's model is at least as accurate of a forecast of volatility as other methods. Furthermore, assuming that options markets are efficient and that Black's model is as accurate a depiction of option premiums as any alternative, its use as a proxy for the market's collective expectation of forward looking price variability is justifiable. Black's model is:

$$OP(F,t) = e^{r(t-T)}[FN(d_1) - SN(d_2)]\,, \tag{1}$$

with the conditions:

$$d_1 = \frac{\left[\ln\frac{F}{S} + \frac{\sigma^2}{2}(T-t)\right]}{\sigma\sqrt{(T-t)}}\text{, and} \tag{2}$$

$$d_2 = \frac{\left[\ln\frac{F}{S} - \frac{\sigma^2}{2}(T-t)\right]}{\sigma\sqrt{(T-t)}} \tag{3}$$

where, *OP* is the option premium, *F* is the underlying futures price, *S* is the strike price of the option, *T* is the date the option is exercised, *t* is the date the option is bought, *r* is the current risk free interest rate and σ^2 and σ are the variance and standard deviation of the underlying futures contract. The function $N(d_i)$ is the cumulative standard normal probability function and it gives the probability that a value with a standard normal distribution, $N\sim(0,1)$, will be less than d_i

This method allows for estimation of the volatility of the underlying futures price (called the implied volatility). As can be noticed from equations (1) – (3) if the option premium is known and the only unknown is the underlying futures contract price volatility this value can be found through the Black model. Computing the implied volatility is useful in recovering the market's expectation of the future price of the underlying commodity as well as the expected price distribution of the expected futures price.

The Black model measures the volatility of European options which are different from American options, the options available for each of the futures contract examined here. European options can only be exercised at the underlying contract's expiration whereas American options can be exercised at any point during the life of the option up to a set time shortly prior to the underlying commodity's expiration. Since respondents are asked to give their expected price at each contract's expiration the European and American options are equal.

This study asks respondents to give expectations of future price and the associated distribution of that price which involves eliciting probability information from the survey participants. To elicit price and price distribution information from respondents each individual stated an expected price as well as the probability of the price being higher or lower than their expected price. The survey gives ranges for producers to place a probability that the price would fall into each range. Thus, the survey responses of the probabilities elicited from respondents is discrete. In order to analyze the difference of each individual producer's expectation of volatility from the market implied expectations, methods to extract the distribution of each survey respondent's directly elicited price distribution must be established. To do this the discrete distribution must be fitted to a continuous distribution. This framework was established by Egelkraut et al. (2006). They use a linear programming routine that minimizes the sum of the squared difference between the elicited probability given by each survey respondent and a fitted probability. The objective function under this framework is:

$$\min_{\theta_i} \sum_{i=1}^{n} \left\{ \left[p_{i,1} - D\left(U_1 \middle| \theta_i\right) \right]^2 + \sum_{j=2}^{m-1} \left[p_{i,j} - \left(D\left(U_j \middle| \theta_i\right) - D\left(U_{j-1} \middle| \theta_i\right) \right) \right]^2 + \left[p_{i,m} - D\left(U_{m-1} \middle| \theta_i\right) \right]^2 \right\}, \quad (4)$$

where, $p_{i,j}$ is the probability given by each respondent i, $D()$ is the fitted cumulative distribution and U_j is the upper bound on each interval m. Equation (4) when solved will give the parameters of the fitted distribution. The fitted distribution used is a function of the assumptions of the distribution on the underlying elicited prices. Since prices are assumed to be log-normally distributed, this distribution will be used in the objective function in equation (4). Therefore the fitted cumulative distribution of the log-normal is:

$$D(x) = \frac{1}{2}\left[1 + erf\left(\frac{\ln(x) - \mu}{\sigma\sqrt{2}} \right) \right], \quad (5)$$

where x is the median price from each price range defined in the survey, μ and σ are the mean and standard deviation of x, respectively, and erf is the error function from integration of the normal distribution:

$$erf(z) = \frac{2}{\sqrt{\pi}} \int_0^z e^{-t^2} dt \quad , \quad (6)$$

where z is defined in equation (5).

The method used by Egelkraut et al. (2006) returns an implied mean and an implied variance for each individual. This method will allow for precise estimation of each individual survey respondents' price and price variability expectations which are compared to the market's expectations. The implied mean returned from the minimization procedure outlined in equation (4) is the natural log of the individual's expected price and the standard deviation for the length of the each forecast. The standard deviation returned from equation (4) is then annualized for comparison with the Black model.

Results

Each individual's price and price probability expectation were complied and aggregated across groups. Under the assumption of log-normal prices, the log-normal distribution properties were used to find the mean price and variance for each group. The group's expectation of price was then compared to the futures market settlement price and each group's implied price standard deviation calculated using equation (4) was compared to Black's implied volatility. The results of this analysis are reported in table 4.

Producers were overly optimistic in regard to price expectations. All nearby corn price expectations were higher than the settlement price on each respective day. Two of the 36 corn respondents had an implied price expectation lower than the settlement price for the distant contract. All 41 cotton price expectations, both nearby and distant, were above the futures settlement price. Three of the 36 individuals' implied soybean price expectation was lower than the settlement price for the nearby contract and six were less than the distant contract's settlement price.

Producers showed a tendency to underestimate price volatility and in most instances by a wide margin. For example, participants at the MSU Cotton Shortcourse inferred that on average the standard deviation for the price of cotton on the March contract was $0.17/lb whereas Black implied standard deviation estimates the volatility to be about $0.65/lb, a difference of $0.48/lb.

Table 4. Results of Each Group's Expectation of Future Price and Price Volatility

	Crop	Contract	Contract Settlement Price	Black's Annualized Implied Standard Deviation	Group Mean Expected Price	Group Mean Annualized Implied Standard Deviation
MSU Agronomic Crop Update	Corn	Mar-09	$3.94	$0.72	$4.47	$0.10
		Sep-09	$4.28	$0.36	$4.86	$0.08
	Cotton	Mar-09	$0.46	$0.68	$0.54	$0.20
		Oct-09	$0.51	$0.29	$0.63	$0.11
	Soybean	Mar-09	$9.30	$0.59	$9.74	$0.10
		Nov-09	$9.47	$0.30	$9.63	$0.08
MS Central Delta Crop Producer Meeting	Corn	Mar-09	$3.94	$0.63	$4.97	$0.08
		Sep-09	$4.27	$0.34	$5.47	$0.05
	Cotton	Mar-09	$0.42	$0.65	$0.60	$0.16
		Oct-09	$0.47	$0.28	$0.69	$0.08
	Soybean	Mar-09	$9.03	$0.57	$10.43	$0.08
		Nov-09	$9.18	$0.29	$10.38	$0.05
MSU Cotton Shortcourse	Corn	Mar-09	$0.47	$0.65	$0.64	$0.17
		Oct-09	$0.50	$0.34	$0.73	$0.08
Mississippi-Louisiana Dairy Management Conference	Corn	Mar-09	$4.07	$1.06	$4.92	$0.10
		Sep-09	$4.38	$0.43	$5.17	$0.06
	Soybean	Mar-09	$9.90	$0.83	$10.68	$0.07
		Nov-09	$10.01	$0.31	$10.24	$0.02
Northeast MS Multi-County Corn and Soybean Meeting	Corn	Mar-09	$3.65	$1.03	$5.06	$0.18
		Sep-09	$3.97	$0.40	$4.98	$0.07
	Soybean	Mar-09	$9.94	$1.02	$10.54	$0.15
		Nov-09	$9.61	$0.34	$10.69	$0.04

Conclusions

This research has assessed the ability of producers to gauge crop market price and price risk. By way of a survey producers stated their price and price risk expectations. Respondents were typically over optimistic in their expectations of corn, cotton and soybean price for both contracts, a nearby and more distant one. Overall producers underestimated the risk as compared to a common measure of market volatility, Black's implied volatility. Due to this outcome these findings are intuitive in two regards. First, given that price expectations were higher than the market implied producers are less likely to use futures as a risk reducing instrument because they feel they will obtain a higher price in the future. Secondly, since producers underestimate the level of risk it might be that these individuals consider risk management tools to be too expensive. For example, if the market considers the level of risk to higher than a producer thinks it is, the price associated with hedging is high given that the risk level is low in the producer's mind.

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USDA's Risk Management Agency. URL: http://www.rma.usda.gov/

Appendix: Survey Example

Price Expectation Survey
Please take a few moments to complete this survey. Your cooperation is greatly appreciated.

1. Age ______________ **2. Gender:** M F 3**. State Operation is Located in:** ______________

4. Education: (check one)

- ☐ Some High School
- ☐ High School Graduate
- ☐ Some College
- ☐ College Graduate or higher

5. Which best describes your primary occupation: (check one)

- ☐ Corn Producer
- ☐ Consultant
- ☐ Real Estate
- ☐ Academia/Extension
- ☐ Soybean Producer
- ☐ Agribusiness/Co-op
- ☐ Banker/Lender
- ☐ Student
- ☐ Cotton Producer
- ☐ Crop Marketing
- ☐ Livestock Producer
- ☐ Other

6. Please describe your operation: (if applicable)

Corn ______________ acres/yr Soybeans ______________ acres/yr

Cotton ______________acres/yr Livestock Raised ______________ head/yr

7. Do you use futures markets: ☐ Never ☐ Sometimes ☐ Often

Please give your best guess of the price you expect on the stated dates for each of the contracts listed below and then list the chances that the price will be within the given ranges. Your probabilities should add to 100%.

Example:
Weather forecasters often use probabilities. For example, tomorrow's expected high might be 40 degrees. But there is a chance the temperature will actually be higher or lower. Maybe there is 40% chance the high will be between 35 and 45, a 15% chance it will be between 45 and 55 and a 5% chance it will be between 25 and 35. Probabilities exist for all temperatures and together these should sum to 100%.

Expected Price for the MAR and SEP **CORN** FUTURES CONTRACT on Feb 20 and Aug 21, 2009:

	Mar Contract	Sep Contract
	Price I MOST expect: $ __________ /bu	Price I MOST expect: $ __________ /bu
higher than expected	$1.25/bu or more higher than I expect _____%	$1.25/bu or more higher than I expect _____%
higher than expected	$0.75 to $1.25/bu higher than I expect _____%	$0.75 to $1.25/bu higher than I expect _____%
higher than expected	$0.25 to $0.75/bu higher than I expect _____%	$0.25 to $0.75/bu higher than I expect _____%
	Within $0.25/bu of the price I expect _____%	**Within $0.25/bu of the price I expect** _____%
lower than expected	$0.25 to $0.75/bu lower than I expect _____%	$0.25 to $0.75/bu lower than I expect _____%
lower than expected	$0.75 to $1.25/bu lower than I expect _____%	$0.75 to $1.25/bu lower than I expect _____%
lower than expected	$1.25/bu or more lower than I expect _____%	$1.25/bu or more lower than I expect _____%
	TOTAL = 100%	TOTAL = 100%

Expected Price for the MAR and NOV **SOYBEAN** FUTURES CONTRACT on Feb 20 and Oct 23, 2009:

	Mar Contract			Nov Contract	
	Price I MOST expect: $ ____ /bu			Price I MOST expect: $ ____ /bu	
higher than expected	$2.50/bu or more higher than I expect	____%	higher than expected	$2.50/bu or more higher than I expect	____%
	$1.50 to $2.50/bu higher than I expect	____%		$1.50 to $2.50/bu higher than I expect	____%
	$0.50 to $1.50/bu higher than I expect	____%		$0.50 to $1.50/bu higher than I expect	____%
	Within $0.50/bu of the price I expect	____%		**Within $0.50/bu of the price I expect**	____%
lower than expected	$0.50 to $1.50/bu lower than I expect	____%	lower than expected	$0.50 to $1.50/bu lower than I expect	____%
	$1.50 to $2.50/bu lower than I expect	____%		$1.50 to $2.50/bu lower than I expect	____%
	$2.50/bu or more lower than I expect	____%		$2.50/bu or more lower than I expect	____%
	TOTAL =	100%		TOTAL =	100%

Expected Price for the MAR and OCT **COTTON** FUTURES CONTRACT on Feb 20 and Sep 18, 2009:

	Mar Contract			Oct Contract	
	Price I MOST expect: $ ____ /lb			Price I MOST expect: $ ____ /lb	
higher than expected	$0.25/lb or more higher than I expect	____%	higher than expected	$0.25/lb or more higher than I expect	____%
	$0.15 to $0.25/lb higher than I expect	____%		$0.15 to $0.25/lb higher than I expect	____%
	$0.075 to $0.15/lb higher than I expect	____%		$0.075 to $0.15/lb higher than I expect	____%
	$0.05 to $0.075/lb higher than I expect	____%		$0.05 to $0.075/lb higher than I expect	____%
	Within $0.05/lb of the price I expect	____%		**Within $0.05/lb of the price I expect**	____%
lower than expected	$0.05 to $0.075/lb lower than I expect	____%	lower than expected	$0.05 to $0.075/lb lower than I expect	____%
	$0.075 to $0.15/lb lower than I expect	____%		$0.075 to $0.15/lb lower than I expect	____%
	$0.15 to $0.25/lb lower than I expect	____%		$0.15 to $0.25/lb lower than I expect	____%
	$0.25/lb or more lower than I expect	____%		$0.25/lb or more lower than I expect	____%
	TOTAL =	100%		TOTAL =	100%