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Have Farmers Lost Confidence in Futures Markets?

Since 2007, the environment for trading futures contracts has changed significantly. In late 2012 graduates of the Texas A&M AgriLife Extension Master Marketer program were surveyed to assess the degree to which the changing climate of futures and options trading is impacting their confidence in futures markets and their perception of their ability to implement price risk management strategies.

Keywords: hedging, marketing, risk management education

Introduction

Futures markets are used to determine the value of many agricultural commodities, from spot markets and forward contracts (adjusted for time, place, and quality) to price guarantees on crop insurance products. Producers and users of agricultural commodities have relied on futures markets to manage price risk, confident that cash and futures prices move together over time and believing that cash and futures prices converge as the contract approaches expiration. In addition, funds held in margin accounts as a performance bond were assumed to be secure, safely held in segregated accounts at the brokerage firm.

Increased Price Volatility

Since 2007, the environment for trading futures and options contracts has changed. Commodity prices across the board have experienced dramatic increases in volatility (Carter, Rausser, and Smith, 2011; and Karali, and Power, 2013). For example, the difference between the contract high and contract low for the July Kansas City wheat contract from 1980 to 2006 averaged $1.17 per bushel (see Figure 1). That average range increased to $5.57 per bushel during the 2007 to 2012 time period. During five of the years between 1980 and 2006, the high-low range in prices was less than the current daily trading limit of $0.60 per bushel (1983, $0.45; 1985, $0.59; 1986, $0.54; 1991, $0.59; 1994, $0.58). Volatile markets increase the cost of maintaining margin accounts and may exceed the credit limits of many hedgers and traders.

Cash/Futures Convergence Problems

In the last several years, some commodity markets have experienced a lack of convergence, in that the futures price at expiration was well beyond any historical norms of comparison to local cash markets (Irwin, Garcia, Good, and Kunda, 2008). The lack of convergence leaves hedgers exposed to additional price risk. Forward pricing using futures contracts is based on the premise that, over time, the local cash price and futures prices move together. Therefore, adjusting for local conditions, pricing in the futures market is a close approximation to pricing in the cash market. The amount that the local cash price of a commodity is above or below the futures price for a particular month is called the basis (basis = local cash price minus futures). While most of the differential between the local cash price and the futures price can be explained by storage and transportation costs between a user's, or producer's, local cash market and the exchange specified futures market delivery point, local supply and demand conditions can also affect the amount of the basis.

Again using a wheat example, the region of Texas that accounts for the highest concentration of wheat production is identified in market reports as "Area North of the Canadian River" (USDA Market News, 2013). The Canadian River bisects the Texas Panhandle from west to east just north of Amarillo. The harvest basis in this region for the last thirty 30 years has varied by roughly forty cents per bushel, from twenty cents under to sixty cents under the July KC futures (Basis Project, 2013). The basis in 2010 plunged to $1.25 under July KC futures. With futures prices around $4.85 at harvest, cash wheat prices in the Texas panhandle fell to around $3.60 per bushel. Some areas in central Texas reported basis levels in excess of $2.00 under July futures-- putting cash wheat prices below $3.00 per bushel in the summer of 2010.

Security of Segregated Funds

In a nine month span from late 2011 to mid-2012 two futures commission merchants--MF Global and Peregrine Financial Group--were found to have misappropriated customer funds.

> While companies often make bad decisions and fail, no one expected the violation of one of the foundational principles of the futures markets: the protection of customer money. On Monday, October 31, at 2:30 in the morning, MF Global revealed that an estimated $900 million in customer money had gone missing - unaccounted for. MF Global filed for bankruptcy a few hours later.   --Stabenow, 2011

Then in July 2012, the Chief Executive Officer of Peregrine Financial Group was arrested for fraud in a twenty-year long scheme in which more than $200 million in customer funds went missing.   John Roe, Co-founder of the Commodity Customer Coalition, in testimony before the Senate Agriculture Committee examining the futures markets in response to the failures of MF Global and Peregrine Financial Group, described the problem this way: "An industry which just a year ago prided itself that no customer had ever lost a penny as the result of a clearing member default now hopes customer losses due to broker insolvencies will be limited to hundreds of millions of dollars, instead of billions of dollars" (2012).   The Commissioner of the Commodity Futures Trading Commission, Jill Sommers added, "…customers correctly understood the risks associated with trading futures and options, but never anticipated that their segregated accounts were at risk of suffering losses not associated with trading (2012).

The factors described above have created a climate in which confidence and trust in the use of futures contracts as an effective tool for price risk management may have been lost. Anecdotal evidence from some Texas producers reflected a possible change in their views of hedging due to these factors. In order to assess the degree to which these factors have impacted the risk management strategies of agricultural producers, this study surveys past participants in the Texas A&M AgriLife Extension Master Marketer program. While the group is not representative of all producers in Texas, it represents a sample of farmers and ranchers, merchandisers, and lenders with training and experience in the use of futures and options for hedging. Some of the important questions addressed by information gained in this survey include:

1. Have recent developments in the futures markets caused farmers and ranchers to stop using price risk management strategies based on futures markets?
2. Are farmers and ranchers increasing the use of other price risk management tools because of issues raised in the futures markets?

3. What educational implications do these findings have for future price risk management educational programs.

Methods

In December 2012, a survey was conducted of past participants of the Texas A&M AgriLife Extension Master Marketer program in order to assess the degree to which changes in futures trading have impacted the risk management strategies of this specific set of agricultural producers. A key component of the Master Marketer program is a 2½ year post-program survey of knowledge gains, practices implemented, and economic impact of participation in the program. Master Marketer graduates report a consistent increase in their understanding and willingness to use marketing concepts ranging from budget analysis, developing a marketing plan, general risk management, and crop and livestock marketing strategies including futures and options (McCorkle, Waller, Amosson, Bevers, and Smith 2009).

The Master Marketer Program

In the 1990's, Texas A&M AgriLife Extension Service economists developed an in-depth risk management education program that became known as Master Marketer. The intensive 64-hour risk management course focuses on marketing plan development and implementation, developing enterprise budgets and breakeven costs, and basic and advanced marketing tools including futures and options, basis, financial risks, fundamental and technical analysis, production risk alternatives (crop insurance, diversification and integration), agricultural policy, international trade, value added processes, niche markets, and marketing clubs. As of 2013, twenty-five Master Marketer programs have been conducted in Texas with 1,051 graduates.

With an average age of 45, Master Marketers are younger than the average Texas farmer whose average age is 59 years (USDA-NASS, 2009). Master Marketers manage an average of 2,422 crop acres, placing them in the 95th percentile of all farms in Texas. Master Marketers have a median gross income of $437,500. According to the Census of Agriculture only 4.2% of farms in Texas report gross incomes of $250,000 or more. A more detailed discussion of the characteristics of Master Marketer participants can be found in Qin et al. (2011).

Literature Review

The tendency for Master Marketer graduates--producers who are younger, have larger scale operations, and have received marketing training--to use futures and options is consistent with other studies that found these characteristics to be important in the use of futures and options for price risk management. Musser, Patrick, and Eckman (1996) found that 53% of large-scale corn and soybean farmers in a small, non-random sample used hedging and 34% options. This level of use of futures and options was well above that found in broader studies of all farmers.

Goodwin and Schroeder (1994) surveyed Kansas producers to evaluate adoption of forward pricing and futures markets. This study found that adoption increased with farm size, crop intensity, input intensity, leverage, and education. Another important result was that participation in marketing/risk management educational programs significantly increased farmers' adoption of forward-pricing techniques.

Makus, Lin, and Krebill-Prather (1990) studied hedging activities by 595 producers in a Futures and Options pilot program. Findings show hedging activity affected by marketing club membership, education, gross sales, and the producer's region. A study of 353 Ohio crop farms by Asplund, Forster, and Stout (1989) showed that forward contracting is significantly related to age, attendance at farm organization meetings, use of computers or consultants, gross receipts, and leverage. Hedging activity, however, was affected only by computer or consultant use and by gross receipts.

Survey

Surveys were sent to 911 Master Marketer program graduates still involved with agriculture and for whom we had valid contact information. Non-respondents received a postcard reminder after ten days, and another survey after another ten days. This process resulted in 127 usable surveys returned for a response rate of 14%. Comparisons of respondents and the population show distinct similarities on measures of age, farm size, farm revenue, and education between these two groups.

Respondents by age were older than Master Marketers in general, to be expected since the first Master Marketer program was held over fifteen years ago (see Figure 3). In the acres farmed category, respondents and the sample population varied by only 3% in the smallest and largest classifications (see Figure 4). In the category of farm revenue, survey respondents had incomes slightly higher than Master Marketers as a whole—45% of Master Marketers reported annual gross farm revenue above $500,000 while 57% of survey respondents were in this category (see Figure 5). Again, this may reflect the passage of time and general increase in U.S. farm incomes in recent years. Levels of education were very similar for the survey respondents and sample group: 67% of those responding to the survey had attained a college degree or higher, 64% of all Master Marketers have done the same (see Figure 6).

Comparisons of archival information on characteristics important to this research provide some basis for generalizability of the findings (Rogelberg, et al, 2003). Other tests of generalizability will be conducted on the survey results in order to address the issue of sample bias and enhance external validity (Radhakrishna and Doamekpor, 2008).

Recipients of the survey were asked to report the percent of production/utilization of any of the following commodities that were hedged during a given year using futures and options contracts. Findings show that in spite of increased volatility, convergence issues, and margin fund security, Master Marketer graduates trained in the use of futures and options are, generally, hedging more rather than less. In reporting the percent of total production that was hedged with either futures or options, there was an increase of 11% from 2003 to 2012 for cotton, grain, and cattle, from an average of 19% of total production/utilization to 30%. As might be expected the percent hedged varied by commodity (2003 compared to 2012): cotton from 14% to 21%, feed grains (corn and sorghum) from 22% to 36%, wheat from 11% to 25%, live cattle from 25% to 27%, and feeder cattle from 22% to 43% (see Table 1 and Figure 7). The 20% increase in the 'other' category represents primarily rice production.

Questions were also asked regarding the use other marketing tools for risk management in addition to or instead of futures and options. Responses included mostly cash contracts,

marketing pools, crop insurance, and grain storage. When asked if they used a marketing advisory service, 53% responded yes.

The most intriguing question of the survey, "Have you stopped or will you stop hedging altogether?" was answered "no" by 84% of the respondents. When asked if they had replaced or intended to replace futures/options hedging with some other risk management practices, the leading responses were to increase the use of cash contracting, pool marketing, and crop insurance.

Survey participants were asked to provide a scaled response to survey questions regarding disagreement or agreement (1 to 7, 1 = disagree, 7 = agree) with statements related to volatility, convergence and basis volatility, and margin fund security (Figure 8). When asked if increased futures price volatility and associated margins and options premiums are a serious impediment to the use of futures or options markets for risk management, the average of responses was 5.0 reflecting general agreement with that statement. Of the 122 who responded to that question, 63% responded with a scaled response of 5 or higher; 25% answered at level 7.

For the statement, "More variable basis and less reliable convergence between futures prices and cash prices are a serious impediment to my use of futures and options markets for risk management", the average response was 4.8, slightly lower than the level of agreement on the volatility statement but still may be seen as expressing general agreement. Of the 122 who responded to this statement, 57% rated their level of agreement 5 or higher, 18% rated their level of agreement a 7.

Regarding fund security, for the statement, "Margin account security with a brokerage house is a serious impediment to my use of futures and options markets for risk management" the average level of agreement was 4.1, a more neutral response. Agreement was rated 5 or higher by 35% of 123 respondents, 11% agreed at level 7.

Model

The goal of this study is to evaluate how managerial stimuli (independent random variables) such as market volatility, futures/cash market convergence, security of margin funds, etc., influence the decision to use hedging via commodity futures/options as a risk management tool. The dependent variable of this model then is the choice of whether or not to hedge. This implies two possible values of the choice, hedge = 0 or stop hedging = 1. Obviously this can be set up as a linear problem and modeled with a linear regression model. However, linear regression is normally used when the dependent variable is continuous, but in this case the dependent variable is binary and discrete. A linear probability model then is rejected in favor of either a logit or probit model.

Modeling this function will map the observed values of Y=0 or 1 to an S-shaped, sigmoidal curve which is a much better description of the dependent variable for our use. Either a logit or probit model, both of which use a monotonic transformation to guarantee that the resulting predictions will lie within the (0, 1) unit interval (Capps and Kramer, 1985) meets these criteria. While either model would work for our purpose, the logistic regression better suits our needs. Further, a maximum likelihood estimator will be used for the model as suggested (DeMaris, 1995).

The empirical model that will be used is specified in (1) below:

(1) $\quad \ln(P/_{1-P}) = x\beta,$

where the expression on the left-hand side of the equation is the log odds that the producer will select the choice to stop hedging (Y = 1) due to some managerial stimuli represented on the right-hand side of the model.

Specifically, the empirical model is given in (2):

(2) $\quad \ln(P/_{1-P}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \varepsilon,$

where

P is the probability the producer will stop hedging, Y = 1,

1-P is the probability the producer will hedge, Y = 0,

β_0 is the intercept of the model,

β_1 is volatility impeding the use of futures/options,

β_2 is lack of convergence an impediment to the use of futures/options,

β_3 are questions of security of the margin account an impediment to the use of futures/options,

β_4 is farm/ranch revenue a factor in the use/disuse of futures/options,

β_5 is age of the producer a factor in the use/disuse of futures/options,

β_6 is level of education a factor in the use/disuse of futures/options, and

ε is the usual disturbance term.

The independent variables in the model are scale variables. Included in these variables are a respondent's Likert scale rating of level of agreement that volatility, convergence, and fund security are impediments to hedging with futures and options. Gross revenue was included in the model in five groups: 0-$50,000, $50,000-$100,000, $100,000-$500,000, $500,000-$1,000,000, and greater than $1,000,000 scaled as base, 1, 2, 3, and 4. The base group for age is under 35 with a rating of 1 assigned to respondents from 35 to 44, 2 for ages 45 to 54, 3 for ages 55 to 64, and 4 for respondents 65 and older.

The model was then fit with the SAS system version 9.3 Proc Logistic using maximum likelihood with Fisher's scoring algorithm optimization technique. There were a total 110 observations used in the fit. The dependent variable consisted of 14 observations of discontinued hedging or Y = 1, the P(Y = 1) = 0.13, and 96 observations of continued hedging or Y = 0 or 1 - P = 0.87. The statistics of the fit were: AIC = 65.094 and $R^2 = 0.244$.

Testing the global null hypothesis:

H_0: all β's $= 0$

versus the alternate hypothesis

H_a: at least 1 $\beta \neq 0$,

the likelihood ratio test statistic (distributed χ^2) with 5 degrees of freedom $= 30.76$ with a p-value $= 0.0001$, therefore we reject the null hypothesis and assume at least one $\beta \neq 0$ that this was a significant regression.

In addition, a Hosmer and Lemeshow "Goodness of Fit" test was conducted under the null hypothesis

H_0: the fit of the model is adequate

versus the alternative hypothesis

H_a: the fit of the model is inadequate,

the test statistic $= 10.36$ (distributed χ^2) with 8 degrees of freedom which resulted in a p-value of 0.241, therefore we fail to reject the null hypothesis and assume this model is adequate to describe the system.

Results

Gross farm receipts, age and the intercept were statistically significant at the 10% level (see Table 2). The negative coefficient on the intercept indicates that those who have received Master Marketer training are not likely to have stopped hedging with futures and options in spite of volatility, convergence issues, and fund security. Farmers trained in the use of futures and options continue to use them as viable tools to manage price risk.

The negative coefficient on gross farm receipts suggests that as farm income increases, a farmer is less likely to have stopped using futures and options for hedging. Larger farms have the resources to fund margin accounts and/or pay higher option premiums relative to smaller farms. Increasingly larger farms may be more professional in their approach to risk management, utilizing a broader range of tools, and are better able to absorb the risk inherent in the current commodity price environment. Large farms may also be in the position of needing to manage price risk more so than a small farm.

Conversely, the positive coefficient on age indicates an increased likelihood of discontinuing the use of futures and options as a farmer gets older. Older farmers may be less willing to see the risk inherent with futures and options as acceptable given either their degree of wealth or goals associated with their business (retirement security versus growth). Older farmers may have a bias towards risk and prices set years ago by previous experience, in that option prices and margin requirements today are "just too high". These findings are consistent with other studies that have found decreases in risk aversion as wealth increases and increases in risk aversion with advancing age (Martin and Eisenhauer, 2001; Riley and Chow, 1992). Older farmers may be in a financial position enabling them to 'self-insure' against price risk.

Conclusion

Many stakeholders in the futures industry—producers, commercial interests, legislators, regulators, the exchanges themselves—have expressed concern that traditional hedgers will abandon the futures market due to the concerns described above. While recent developments in the futures markets may have caused some farmers and ranchers to stop hedging with futures and options, the results of this analysis suggest that for a specific population of producers who have received intensive risk management training, the overall trends in utilization of these marketing tools is increasing. In addition, farmers and ranchers who have stopped using futures and options markets report an increased use of other price risk management tools such as cash contracting, crop insurance, and marketing pools. Further analysis of the data indicate that the probability of continued use of futures and options for price risk management increases as gross farm receipts increase with 4 to 1 odds, while the probability of continued use of futures and options decreases as farmers get older with 2.25 to 1 odds. A focus on understanding and using futures and options markets continues to be a viable component of risk management education.

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Table 1: Percent of production/utilization of any of the following commodities that were hedged during a given year using futures and options contracts.

Year	cotton	feed grains	wheat	live cattle	feeder cattle	natural gas	other[†]
2003	14.00%	22.07%	11.46%	25.22%	21.82%	0%	18.75%
2004	13.75%	18.62%	8.21%	23.64%	23.64%	0%	18.75%
2005	15.90%	23.48%	11.86%	23.64%	28.14%	0%	17.50%
2006	14.27%	26.70%	12.14%	25.22%	30.71%	0%	25.00%
2007	16.22%	29.04%	16.48%	25.65%	37.06%	0%	28.33%
2008	17.02%	33.96%	14.64%	26.52%	33.11%	0%	18.75%
2009	17.11%	29.69%	13.66%	27.39%	42.63%	0%	27.20%
2010	21.82%	33.57%	17.22%	31.25%	38.95%	5.77%	27.20%
2011	27.34%	34.81%	19.20%	32.50%	43.05%	17.33%	31.20%
2012	20.78%	35.58%	25.30%	27.39%	42.69%	7.33%	49.38%

Table 2. Maximum likelihood estimates, odds ratio estimates, and confidence intervals estimating continued use of futures and options

Parameter	Estimate	Standard Error	p-value	Odds Ratio Estimate	95% Confidence Interval	
					Lower	Upper
Intercept[**]	-3.869	1.871	0.039	0.021	n/a	n/a
Volatility	0.435	0.346	0.209	1.545	0.784	3.044
Convergence	0.345	0.332	0.299	1.412	0.736	2.709
Security	-0.350	0.2433	0.151	0.705	0.438	1.136
Revenue[**]	-1.327	0.395	0.001	0.265	0.122	0.576
Age[*]	0.816	0.433	0.059	2.260	0.968	5.276

[**] denotes significance at the 0.05 level

[*] denotes significance at the 0.10 level

[†] Primarily rice but also includes diesel and canola.

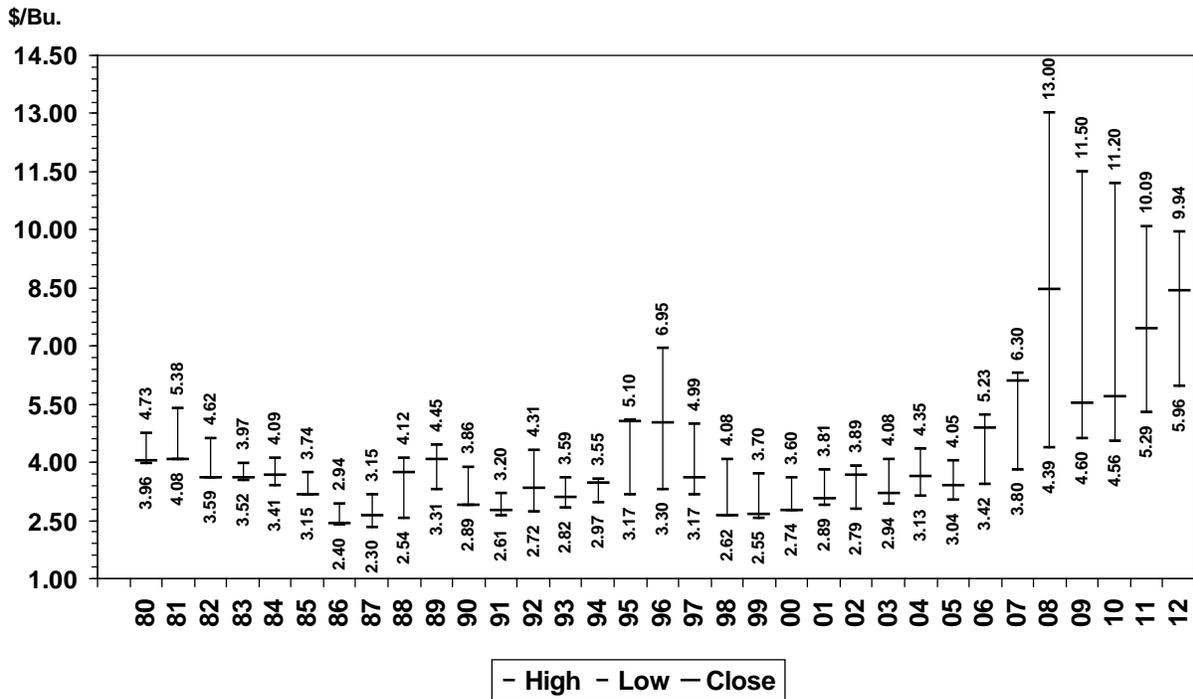Figure 1. July KCBT wheat prices, high, low close

Figure 2. Wheat Basis, Texas North of the Canadian River, last week of June cash price and July KC futures
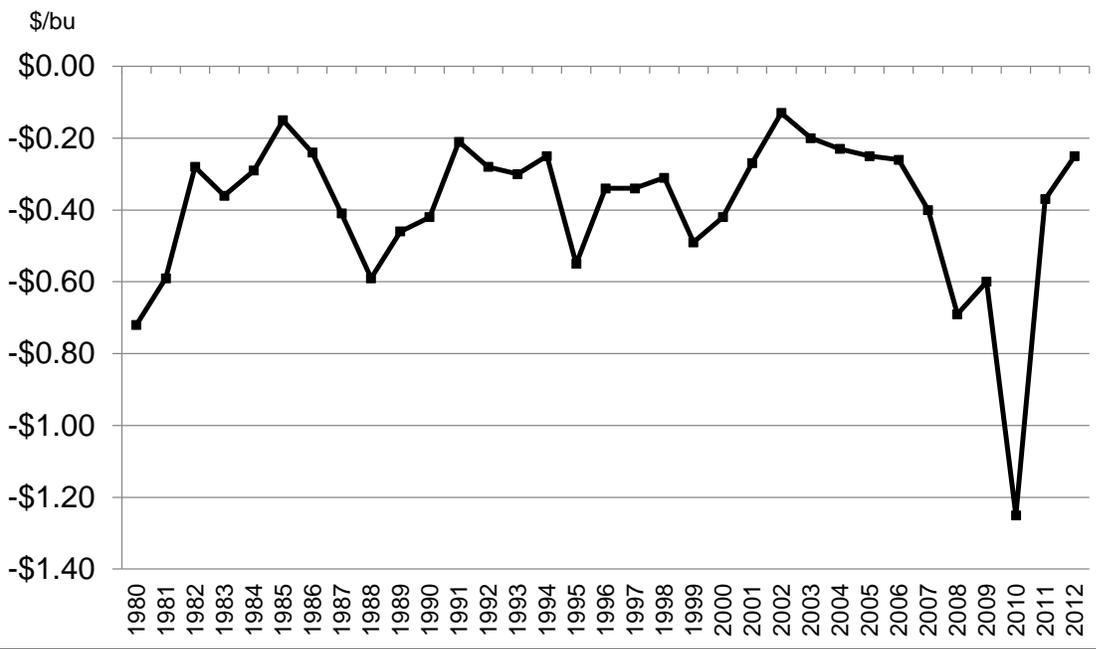
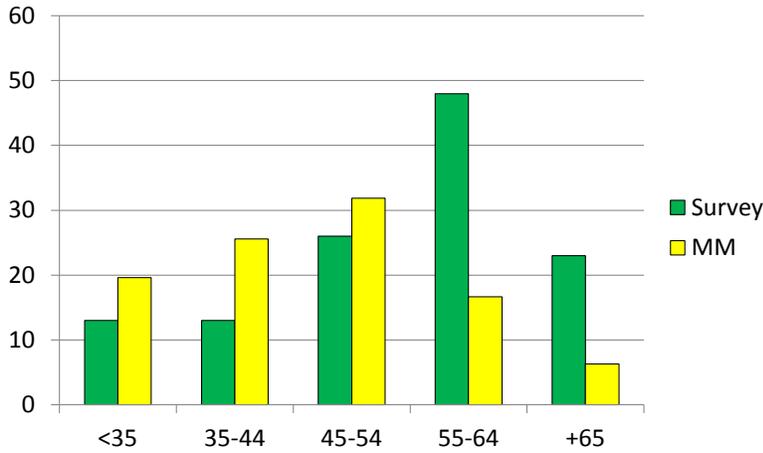Figure 3. Survey respondents and all Master Marketers by age

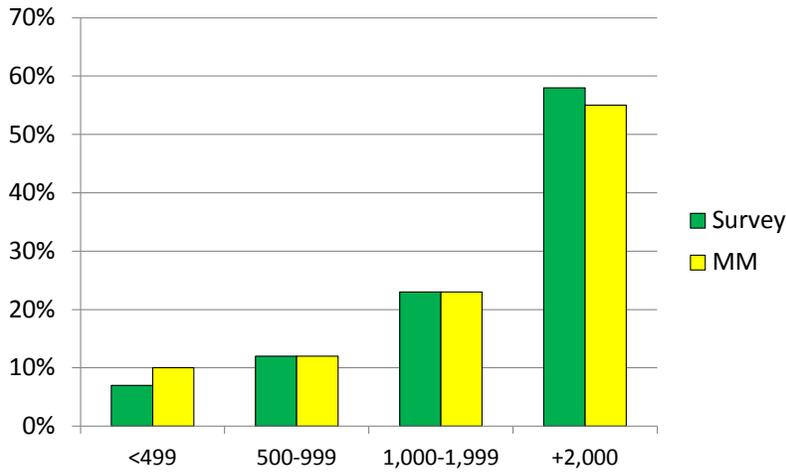Figure 4. Survey respondents and all Master Marketers by acres farmed

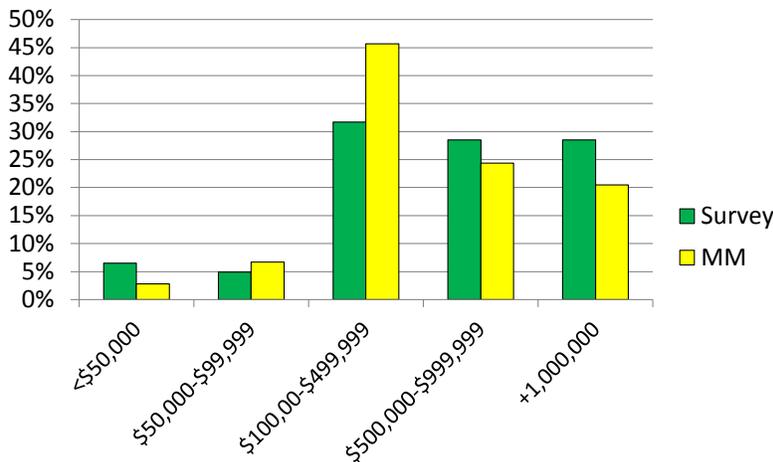Figure 5. Survey respondents and all Master Marketers by net farm revenue

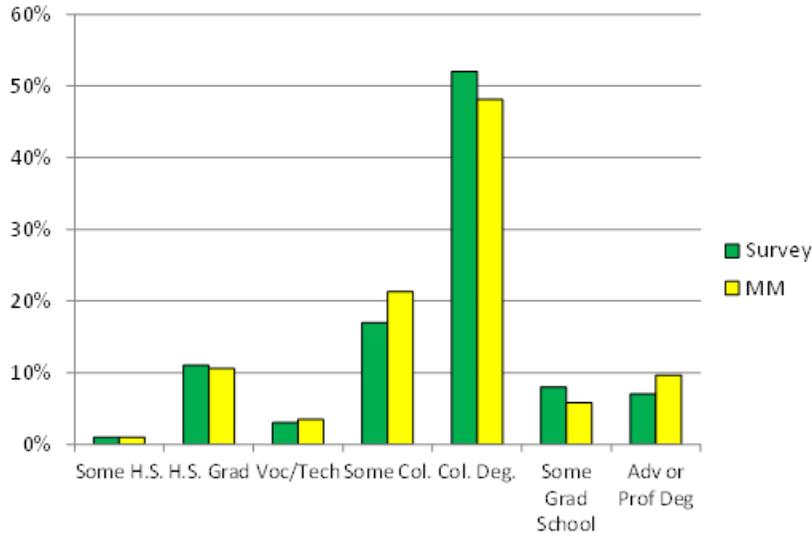Figure 6. Survey respondents and all Master Marketers by education level

Figure 7: Percent of production/utilization of any of the following commodities that were hedged during a given year using futures and options contracts.
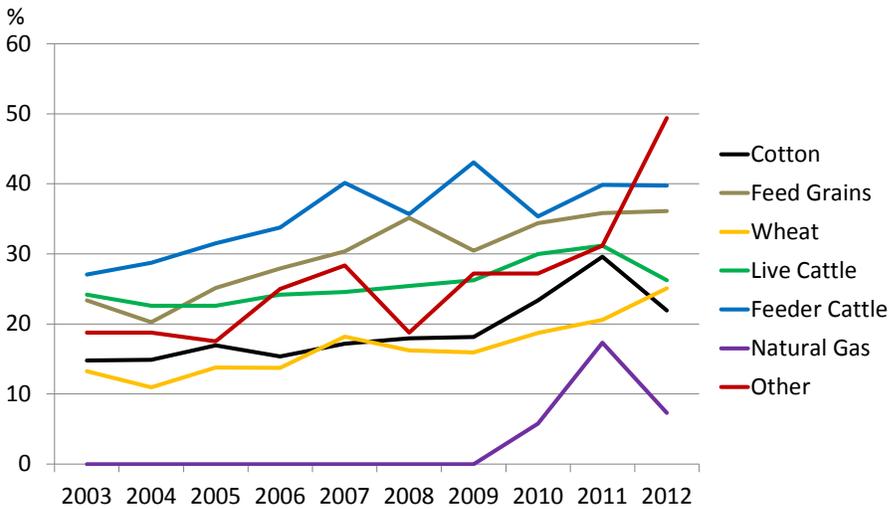
Figure 8. Serious Impediments to the use of futures and options, average scaled response