

ECONOMICS & MARKETING

Cotton Producers' Use of Selected Marketing Strategies

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INTERPRETIVE SUMMARY

The 1996 Federal Agriculture Improvement and Reform (FAIR) Act decreased much of the government's price support and exposed cotton producers to a potentially greater degree of price risk than previously experienced. Considering these changes, Congress has been discussing the need to help farmers and ranchers to become active risk managers. However, few producers manage their risk using futures and options. The purpose of this study is to examine the use of forward pricing behavior of cotton producers in the framework of their overall marketing behavior. The specific objectives are (i) to provide insight on cotton producer use of various marketing strategies, (ii) to determine motivating factors that affect allocation of crop to alternative marketing strategies, and (iii) to analyze share allocation of cotton crop to alternative marketing strategies. Marketing strategies considered in this analysis are cash sales, forward contracting, marketing through pools (cooperatives), and hedging.

This study is based on a survey of cotton producers, which elicited information on producer marketing practices. The survey revealed that in 1999 and 2000, marketing through pools (cooperatives) was the most popular method of marketing cotton with more than half of producers using this marketing mode. In popularity, marketing pools were followed by cash sales and forward contracting, each accounting for about 30% of cotton sales. Hedging with futures and options was much less common with about 20% of producers using this

strategy to price about 8% of their crop. The survey results indicate that the use of cash sales and forward contracts has decreased over the last 10 yr, while marketing through pools and hedging with futures and options have become more common.

The survey generated data on factors that are hypothesized to affect marketing behavior of cotton producers, such as education, marketing training, risk aversion, use of debt, scale of farm operation, government payments, off-farm income, and producer attitudes. These factors were included in empirical analysis, which concentrated on simultaneous analysis of allocation of different shares of crop to alternative marketing strategies in order to take into account interaction between these marketing strategies. The results of the model estimation revealed that hedging with futures and options is positively affected by size and leverage and negatively affected by marketing training, belief in the benefits of pools, and personal marketing preferences. Producers that believe that marketing pools can net them a higher price than they can get themselves are less likely to allocate significant portions of their crop to forward contracting. Allocation of cotton to cash sales is positively affected by government payments and off-farm income and negatively affected by size, belief in the benefits of pools, and perceptions of market efficiency. Share allocation to marketing through pools is positively affected by marketing training, risk aversion, belief in the benefits of pools, and personal marketing preferences, and is negatively affected by income from government payments.

The results of this analysis indicate that producer preferences are among the most important factors that affect producer marketing behavior, which implies that the use of forward pricing tools may potentially be expanded by addressing these non-economic factors. Implications for educators include characteristics of producers that make them more likely to use one of the selected marketing strategies. Educators may use this information to

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better tailor their training programs to the specific needs of the audiences they address. This study reveals a negative correlation of income from government payments and the use of forward pricing techniques, marketing pools in particular, which may be of interest to policymakers since efforts to support producers' income and to encourage them to use forward pricing appear contradictory on the basis of this evidence.

ABSTRACT

Few cotton (*Gossypium hirsutum* L.) producers use futures and options to price their crop despite significant efforts to educate farmers about risk management tools. The purpose of this study is (i) to provide insight on producer use of various marketing strategies, (ii) to determine motivating factors that affect allocation of crop to alternative marketing strategies, and (iii) to analyze share allocation of cotton crop to alternative marketing strategies. Marketing strategies considered in this analysis are cash sales, forward contracting, marketing through pools (cooperatives), and hedging. Data for the study were obtained from the survey of cotton producers conducted in the spring of 2000. Models for share allocations to different strategies are estimated using a seemingly unrelated regression approach. The results of the empirical analysis suggest that hedging with futures and options is positively affected by farm size and leverage and is negatively affected by marketing training, belief in the benefits of pools, and personal marketing preferences. Producers that believe that marketing pools can net them a higher price than they can get themselves are less likely to allocate significant portions of their crop to forward contracting. Allocation of cotton to cash sales is positively affected by government payments and off-farm income and negatively affected by size, belief in the benefits of pools, and perceptions of market efficiency. Share allocation to marketing through pools is positively affected by marketing training, risk aversion, belief in the benefits of pools, and personal marketing preferences, and negatively affected by income from government payments.

U.S. farm commodity programs shifted course with the passage of the 1996 Federal Agriculture Improvement and Reform (FAIR) Act. The FAIR Act decreased much of the government's price support and exposed cotton producers to a potentially greater degree of price risk than

previously experienced. Despite significant efforts to educate farmers about risk-management tools, few producers use these tools. Some surveys (Asplund et al., 1989; Goodwin and Schroeder, 1994) demonstrate that less than 10% of producers use hedging to manage their price risk (Table 1). Furthermore, producers that use hedging price only 20 to 50% of their crop using futures markets (Table 2). These empirical findings do not appear to agree with theoretical studies that predict high optimal hedge ratios (Table 3).

The majority of the previous studies investigated forward pricing behavior of grain producers from the Corn Belt region. Limited information exists on forward pricing behavior associated with other commodities, such as cotton. Furthermore, some of these studies are based on the surveys of workshop or conference participants (Shapiro and Brorsen, 1988; Patrick et al., 1998), which may not be representative of the population of farm operators. Finally, limited information exists about the use of forward pricing tools other than forward contracting and hedging. Levels of use and interactions between various forward pricing tools have not been investigated.

The purpose of this study is to examine the use of selected forward pricing strategies in the overall framework of producer marketing behavior. The specific objectives of this study are to 1) collect data on cotton producer use of various marketing strategies; 2) determine motivating factors that affect allocation of crop to alternative marketing strategies; 3) determine the motivating factors and analyze share allocation of cotton crop to alternative marketing strategies. Marketing strategies considered in this analysis are cash sales, forward contracting, marketing through pools (cooperatives), and hedging. Hedging includes all transactions in the futures and/or options markets.

THE STUDY

Description of Data

Data in this study were obtained from a mail survey of cotton producers, which was administered during the spring and early summer of 2000 throughout the cotton-growing states of the United States. A random sample of 3500 producers was

Table 1. Empirical futures use.

Authors	Location	Year	Commodity	Futures use
				%
Asplund et al., 1989	Ohio	1987	Crop	7.00
			Wheat (<i>Triticum aestivum</i> L.)	5.91
Goodwin and Schroeder, 1994	Kansas	1992	Corn (<i>Zea mays</i> L.)	10.73
			Sorghum [<i>Sorghum bicolor</i> (L.) Moench]	1.84
			Soybean [<i>Glycine max</i> (L.) Merr.]	5.22
Patrick et al., 1998	Indiana	1995	Soybean	8.10
			Corn	16.2

Table 2. Empirical hedge ratios.

Authors	Location	Year	Commodity	% Priced
Goodwin and Schroeder, 1994	Kansas	1992	Wheat	22.88
			Corn	33.84
			Sorghum	21.67
			Soybean	28.65
Patrick et al., 1998	Indiana	1995	Soybean	54.40
			Corn	27.30

Table 3. Theoretical hedge ratios.

Authors	Location	Year	Commodity	% Priced
Berck, 1981	California	1981	Cotton	11-136
			Corn	85-87
Myers and Thompson, 1989	Michigan	1977-1985	Soybean	102
			Wheat	94
Lence and Hayes, 1994	Iowa	1994	Soybean	40-80
Lapan and Moschini, 1994	Iowa	1994	Soybean	53-75
Hanson et al., 1999	Michigan	1996	Corn	44-64

drawn and surveys were mailed out in March of 2000. A Dillman three-wave method was used (Dillman, 1979). About 50 surveys were returned with a wrong address, which resulted in a sample size of about 3450 producers. After a three-wave mailing, 244 responses were received, which yielded a response rate of about 7%. Responses from 69 producers were eliminated from the sample because they reported that they did not plant cotton in 1999. Thus 175 responses were used for the analysis.

Because of the low levels of response, the survey data were tested for a possible presence of a non-response bias using the "wave" technique (Ratneshwar and Stewart, 1989). The wave technique, one of the commonly used procedures, is based on the logic that respondents of the second wave are similar to all non-respondents in the population because these respondents did not respond to the first wave. The results of the test indicated no statistical difference between the respondents to the initial mailing and the respondents to the second mailing among the selected variables. Thus the respondent group was assumed

representative of the population of cotton producers. Although no statistical evidence of the non-response bias in the sample was detected, the small sample size remains a source of concern. The small sample may simply indicate the lack of interest cotton farmers exhibit to the use of forward pricing, particularly hedging techniques.

The general characteristics of farmers and farm operations generated by the survey are similar to the national data from the 1997 Census of Agriculture (National Agricultural Statistics Service, 1997). Figure 1 compares the percentage distribution of ages of cotton producers obtained from the survey to the census data. This figure demonstrates that our sample is fairly consistent with population characteristics. However, our sample is slightly overdrawing producers from the 36 to 45 yr age category. Figure 2 compares the percentage distribution of cotton farms by size obtained from the survey to the census data. According to this figure, the survey sample is consistent with population across the smaller farm sizes, slightly overdrawing responses from the 106 to 404 ha categories and under-drawing respondents from the "405 and above" ha categories. On the basis of these observations, it appears that the survey sample is fairly representative of the population with a heavier concentration on the middle-aged, medium-size producers.

Cotton Producers' Marketing Activities

Levels of use of futures and options revealed by the survey are consistent with the results reported in the previous studies that used random samples of grain producers (Asplund et al., 1989; Goodwin and Schroeder, 1994). The percentages of surveyed producers using selected marketing methods for the time periods 1990-1995, 1996-1998, 1999, and 2000 are summarized in Table 4. Data for 2000 reflect

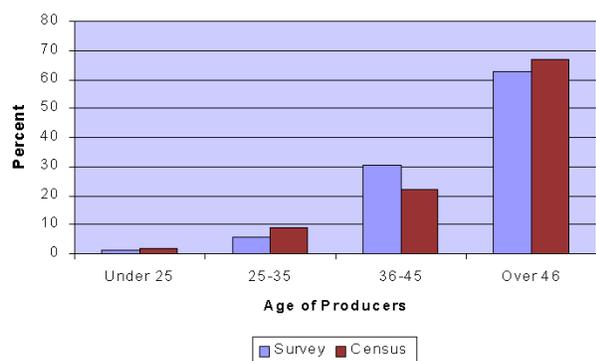


Fig. 1. Comparison of cotton producers' age distributions: Survey vs. 1997 Census of Agriculture.

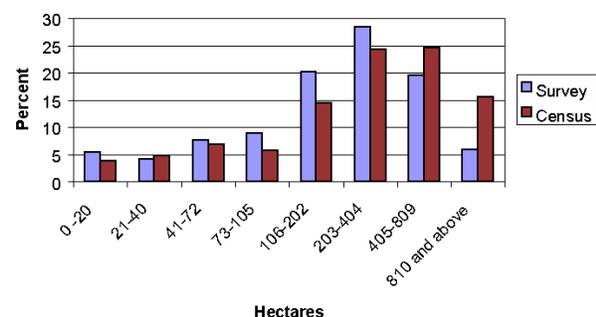


Fig. 2. Comparison of cotton farm size distributions: Survey vs. 1997 Census of Agriculture.

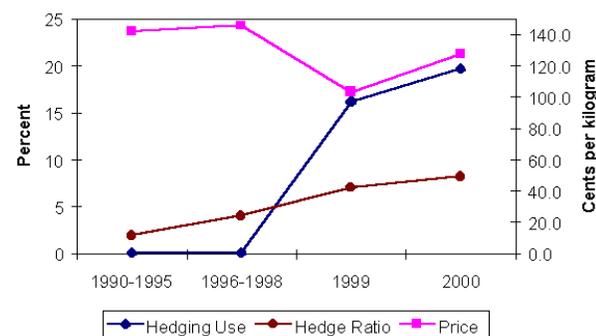


Fig. 3. Use of direct hedging relative to cash prices of cotton.

farmers' expectations for the 2000 season. These data demonstrate that the use of cash sales and forward contracts has decreased over time, while marketing through pools and direct hedging with futures and options have become more common. In 1999 and 2000, marketing through a pool became a more prevalent method of marketing cotton (52.1 and 58%, respectively). Pools are followed by cash sales (41.3 and 36.4% for 1999 and 2000, respectively) and forward contracting (32.3 and 27.8%, respectively). Direct hedging with futures and options has been much less common. However, the

Table 4. Marketing strategies used (do not include post-harvest strategies).

Strategy used	1990-1995	1996-1998	1999	2000
	------%-----			
Cash	57.4	49.37	41.3	36.4
Pool	34.2	48.73	52.1	58
Forward	39.4	37.34	32.3	27.8
Futures	0.04	0.06	7.2	8.6
Options	0.03	0.06	9	11.1
Total forward pricing use	73.63	86.19	100.6	105.5
No. of observations	155	158	167	162

Table 5. Average shares of cotton, priced using selected marketing strategies.

Strategy used	1990-1995	1996-1998	1999	2000
	------%-----			
Cash	43.02	33.12	32.1	24.79
Pool	31.40	43.49	47.77	52.55
Forward	22.68	21.30	23.82	18.40
Futures	1.52	2.31	2.47	2.33
Options	0.39	1.70	4.52	5.86
Total forward priced ratio	55.99	68.8	78.58	79.14
No. of observations	155	158	167	162

use of these methods increased substantially since 1990, from 0.04 to 8.6% for futures and from 0.03 to 11.1% for options. The overall use of forward pricing techniques increased from 74% in 1990-1995 to 106% in 2000. A value >100% of use indicates that some producers used combinations of several forward pricing strategies.

Similar trends are observed in average shares of cotton sold using selected marketing strategies. The average percentage of crop marketed by survey respondents using selected marketing strategies is shown in Table 5. Cash sales and forward contracts made up a smaller share of cotton priced over time, while marketing through pools and direct hedging gained larger shares. However, changes in the use of alternative marketing strategies were less pronounced for the share allocation of crop, which indicates that even though a larger percentage of people used alternative marketing techniques (not selling in the cash market), they tended to price a relatively smaller share of their crop using these techniques. High overall forward pricing ratios that ranged from 56% in 1990-1995 to 79% in 2000 appear consistent with optimal hedge ratios recommended by the previous theoretical studies (Table 3), although they include other forms of forward pricing in addition to hedging through futures and options. In 1999 and 2000, the allocation of the cotton crop to direct hedging techniques was positively correlated with the price of cotton (Fig. 3). The anticipated increase in

crop allocation to direct hedging techniques in 2000 would have taken place predominantly in the form of options contracts. This partial diversion from futures to options contracts may have been associated with margin calls on futures, since 45% of respondents indicated that margin calls presented a cash-flow problem. The lack of use of direct hedging before 1996 probably can be attributed to the form of government programs, but it also can be argued that the increased use of direct hedging that has recently occurred is partially a result of educational efforts. These issues will be more closely addressed later in the article.

Futures and options markets may also be used for speculation. The respondents of the survey indicated that in 1999 they priced 2.45% of their crop in futures and 4.5% of their crop in options markets at or after harvest. These figures may include farmers who practiced storage hedge, as well as those who were speculating (e.g., entered the contracts not covered by a physical commodity). About 11% of respondents indicated that at some time during the growing period in 1999 they had a net long position in the futures/options market, which is indicative of speculative behavior. Seven percent indicated that they constructed some hybrid positions, which could also have been used for speculation. About 10% of producers indicated that they had bought some put contracts (right to sell) in 1999, and about 13% said that they had bought call contracts (right to buy). Considering that put-call fences are rather sophisticated techniques, the majority of the 13% who purchased call options in 1999 were probably speculating, although these data are not direct evidence of speculative behavior. Cotton producers participating in the survey placed an average of 2.59 hedges and lifted an average of 2.73 hedges in 1999. However, about 16% of producers reported placing a hedge, while only 9% reported lifting a hedge in 1999, which suggests that some respondents did not fully understand this question.

Factors that Affect Producer Marketing Behavior

Previous literature outlined a number of factors that affect producer marketing behavior. These factors may be summarized in three categories: (i)

characteristics of the farm operator and the farm: operator's human capital, farm size, and financial condition; (ii) operator use of alternative risk-reduction techniques: diversification of farm enterprises, participation in government commodity programs, and use of crop insurance; (iii) non-economic factors.

The first set of determinants was advanced by proponents of technology adoption literature (Khaldi, 1975; Huffman, 1980; Wozniak, 1984). The adoption theory is relevant for producer marketing decisions because a producer is faced with a choice of whether to use the conventional method of selling the crop in the cash market or to adopt one of the alternative forward pricing techniques. According to this theory, human capital and innovative ability/willingness to adopt alternative marketing methods are directly related to the use of forward pricing strategies because higher levels of human capital are likely to facilitate successful use of these instruments. The results of the survey indicate that about 55% of producers received a college education and about 44% of farmers attended marketing education programs in the last 10 yr with an average of 14.2 h of marketing training. However, the majority (about 70%) of farmers who attended market education programs attended less than 5 h of such training.

Another aspect of human capital is producers' level of risk aversion. The impact of risk aversion on the use of a marketing strategy depends on the producer's perception about the risk-reducing qualities of this strategy. If forward pricing were expected to reduce risk, this variable would have a positive effect on the use of forward pricing techniques. Conversely, if cash marketing were expected to increase risk, this variable would have a negative impact on the use of cash sales. A self-assessed willingness to take risks relative to other farmers on a scale from 1 to 10 was used as a measure of risk aversion. Most producers indicated that they were moderately risk-averse with the average level of risk aversion at 4.73. Only 10% of producers rated themselves as much less or much more willing to take risks relative to other farmers.

Economies of size are often associated with forward pricing (Asplund et al., 1989; Tronstad, 1991; Goodwin and Schroeder, 1994). Previous research suggests that learning about alternative

marketing strategies has significant lumpy costs that may be associated with charges for the training programs, purchases of educational materials, publications, etc. Because larger farms can spread these lumpy costs over more production, they may enjoy a potentially larger net price enhancement per unit of production. Thus larger farms may be more likely to use these alternative marketing strategies. Similar arguments can be made regarding the use of futures and options contracts because such strategies may involve using particular equipment necessary to obtain market information, subscriptions to market information and market advisory services, and transactions costs associated with trading activities. The size of the cotton operation is used as a proxy of the farm's scale. Financial characteristics of a farm have also been shown to play a role in the use of forward pricing techniques. One of the most important components of the financial characteristics of a farm is leverage (Turvey and Baker, 1989; Brorsen, 1995; Collins, 1997). Optimal hedge models suggest a positive impact of leverage on the use of forward pricing because forward pricing may provide an additional source of liquidity. However, Asplund et al. (1989) argue that leverage and forward pricing may be negatively correlated if a farm operator's use of debt and leverage indicates his lack of risk aversion. This relationship may indicate a producer's lack of desire to reduce risk through forward pricing, thus the effect of leverage on forward pricing is ambiguous. Two measures of leverage are elicited in the survey: producers indicate that, on average, about 18% of the market value of their assets (long-term debt) and about 49% of their operating capital (short-term debt) was borrowed in 1999. Long-term debt is considered a more general measure of leverage because it excludes the short-term component that varies from year to year depending on the capital needs for operating expenses; therefore, it is used for empirical analysis.

A second set of factors that affect forward pricing reflect the interaction of marketing methods with other factors that affect income risk. Forward pricing is not the only method of risk reduction. Alternative methods considered in this analysis include obtaining income from off-farm sources, participating in government commodity programs, and purchasing crop insurance. If off-farm income is considered within the risk-balancing framework

(Gabriel and Baker, 1980; Turvey, 1989), it is expected to substitute for hedging. However, as Asplund et al. (1989) point out, off-farm work activities by farm family members may be complementary to hedging if they are used as a response to income/price variability. Thus, the use of forward pricing and off-farm income may be positively correlated if both are used as strategies to reduce risk. In 1999, the average income of the respondents' households from off-farm sources was \$50,411, with about 68% of respondents earning off-farm income of less than \$50,000. The average income from off-farm sources was about 12% of the average gross farm income (\$405,555). It is important to note, however, that about 14% of off-farm income was related to agricultural activities. This portion of off-farm income was probably tied to the same cyclical movements as on-farm income, thereby potentially dampening any diversification effect.

Participation in government commodity programs is another alternative way to reduce risk exposure. The majority of the previous literature (Turvey and Baker, 1990; Sakong et al., 1993; Hanson et al., 1999) suggests an inverse relationship between government programs and forward pricing because government programs, in essence, provide a free put option for a producer. Other studies (Gabriel and Baker, 1980; Collins, 1985; Featherstone et al., 1988) analyze the impact of government programs from the risk-balancing standpoint. These authors argue that risk-reducing and income-augmenting policies may induce choices that increase financial risk (i.e., higher leverage). If leverage is directly related to hedging (as suggested by Turvey and Baker, 1990; Brorsen, 1995; Collins, 1997), these findings suggest an indirect positive effect of government payments on forward pricing. Thus the total impact of government payments consists of a negative direct impact and a positive indirect impact. Because the magnitude of these effects is not known, the direction of the total impact is ambiguous.

The 1996 Farm Bill dramatically changed the provisions of the previous farm programs in an attempt to decouple price support from production decisions. However, only 19% of the respondents of the survey indicated that they have increased the share of their cotton production hedged since the 1996 Farm Bill. In 1999, 96% of producers received



Fig. 4. Hedge ratios relative to the difference between cash price and the loan rate.

government payments for an average payment of about 26% of their gross farm income. The most significant sources of government payments were loan deficiency payments and producer option payments that added an average of 12% to producers' gross farm income. Disaster payments and Agricultural Market Transition Act (AMTA) (transition) payments contributed an average of 7% each.

Another aspect of government programs discussed by Hanson et al. (1999) is that marketing loan payments effectively truncate cash price realization at the loan rate, while allowing market price to change freely. According to the results of the survey, cotton producers would be hedging higher proportions of their production at greater differences between the cash price and the loan rate (Fig. 4). However, producers indicated that they would hedge an average of 14% of their production if the loan rate were 7 cents above the cash price. At these price levels, the government would effectively provide a free put option for producers, thereby discouraging hedging. Producers may recognize the existence of the free put option, and still "double hedge" by purchasing a put option at the loan rate. In the case of double hedging, a producer would receive a loan deficiency payment and value of a put option if the price of cotton falls below the loan rate. However, if the cotton price stays above the loan rate, this producer will receive no loan deficiency payment and incur loss equal to the price paid for the put option.

Another alternative of managing risk is crop insurance. The effects of crop insurance on forward pricing decisions have not been studied extensively. Coble et al. (2000) observed that yield insurance products exhibit a complementary relationship with

hedging, while revenue insurance products act as substitutes to hedging at some levels of coverage. About 65% of the participants of the survey indicated that they have bought additional crop insurance above the minimal catastrophic coverage required to remain eligible for government program benefits.

Multiple peril crop insurance, which is a yield insurance product, was the most popular type of crop insurance among survey respondents with almost 83% of producers purchasing this type of insurance in 1999. This figure increased slightly in 2000 with 85% of producers expecting to buy multiple peril insurance. Those who bought this insurance insured about 95% of their cropland for an average of 65% level of coverage. The second most popular insurance product was crop revenue coverage, which is a revenue insurance product. About 12.6 and 14.7% of respondents purchased or expected to purchase additional levels of crop revenue insurance in 1999 and 2000, respectively. They insured about 80% of their cropland for an average of 67% level of coverage. Other products have been used very rarely, with only two instances of group risk plan purchases in 1999 and one expected case in 2000. Because yield insurance was a predominant product purchased by the survey participants, 52% of respondents disagreed with the statement that "having bought crop insurance made them less likely to hedge," which is consistent with relationships discussed by Coble et al. (2000).

The third set of factors included in this analysis is producer attitudes. The limited significance of some previous empirical studies of hedging has led some authors (Musser et al., 1996) to suggest that there may be a large random component associated with forward pricing or some alternative non-economic explanation. Shapiro and Brorsen (1988) found that the most important factor related to hedging in their study was farmers' perception of whether hedging can increase income stability. Furthermore, Pennings and Leuthold (2000) found that farmers' behavioral attitudes related to market orientation, risk exposure, market performance, and entrepreneurial behavior played an important role in their use of futures contracts.

A percentage distribution of producer responses to selected Likert-scale questions concerning their attitudes is presented in Table 6. These questions

Table 6. Percentage distribution and average ratings of selected statements concerning producer attitudes.

Attitude toward futures markets	Strongly agree 5	Agree 4	Neutral 3	Disagree 2	Strongly disagree 1	Average score
	-----%-----					
On average, alternative pricing mechanisms will result in a higher price than selling only in the cash market.	13	45	34	8	1	3.61
On average, using futures increases my revenues more than the cost of trading.	2	30	50	17	1	3.14
Using futures can reduce my price risk.	6	47	39	7	2	3.47
I believe that market timing strategies can increase revenues.	18	60	20	2	1	3.92
The market information I receive is too difficult for me to understand.	3	16	18	50	13	2.47
I would rather be in a position to capture upward movements in prices than have my price locked in during the growing season.	8	57	24	10	1	3.59
A marketing pool nets me a higher price than I can get myself.	25	28	31	14	2	3.6
Trading futures/options are too complicated.	7	32	25	28	7	3.04
I prefer to use other means of risk management than hedging.	13	53	21	11	1	3.65

were coded such that the strongest agreement received a highest value and the strongest disagreement received a lowest value. The responses indicate that about 78% of producers believe that market-timing strategies can increase revenues. However, producers are mostly uncertain whether using futures can increase their revenues more than the cost of trading (more respondents agreed with this statement than disagreed, but 50% were neutral). About 65% of respondents reported that they would rather be in a position to capture upward movements in prices than have their prices locked in during the growing season, and about 58% of producers believe that, on average, alternative pricing mechanisms will result in a higher price than selling only in the cash market. About 53% of respondents think that using futures can reduce their price risk.

About 63% of producers indicated that it is not difficult for them to understand the market information that they receive. However, the fact that producers appear to understand market information did not translate into the use of futures and options. Therefore, simply teaching producers about market information does not appear to be a sufficient means of inducing direct hedging. Extensive use of other forms of forward pricing, such as marketing pools and forward contracts, possibly substituted for direct hedging. About 66% of producers indicated that they prefer to use means of risk management other than hedging. This choice suggests that alternative methods of risk management are preferred to hedging and it is necessary to analyze hedging in conjunction

with these alternative methods. A majority of producers (53%) believe that marketing pools can net them a higher price than selling in the cash market, and high membership levels in marketing cooperatives are indicative of the popularity of this marketing tool.

Empirical Analysis

One of the goals of this study is to examine producer hedging behavior in the framework of their overall marketing behavior by providing a joint analysis of alternative marketing strategies. This goal is achieved via simultaneous analysis of allocation of different shares of crop to alternative marketing strategies:

$$\text{Shares} = f(\text{Education, Training, RiskAversion, Leverage, Size, GovPayments, OffIncome, CrInsurance, Attitude1, Attitude2, Attitude3})$$

where Shares represent the percentage of crop allocated to selected marketing strategies. These strategies are cash sales, marketing through pools, forward contracting, and hedging. Explanatory variables reflect factors that affect marketing behavior discussed in the previous section and are described in Table 7. Because the focus of this study is to examine marketing behavior including interactions between various marketing strategies, models for share allocations to different strategies are estimated using a seemingly unrelated regression

Table 7. Summary statistics for variables used in the empirical estimation.

Variable	Definition	Mean	Standard deviation
Education	1 = less than high school, 2 = high school diploma or GED, 3 = college, and 4 = graduate school	2.71	0.70
Training	Hours of training attended	4.73	9.73
RiskAversion	Self-assessment of the willingness to take risks relative to others on a scale from 1 to 10, with 10 being the most risky	5.72	1.96
Leverage	Percentage of the market value of the farm assets that was borrowed in 1999	17.68	19.96
Size	Cotton hectares (thousands)	0.30	0.27
GovPayments	Percent gross farm income from government payments†	27.33	14.56
OffIncome	Off-farm income/gross farm income	0.20	0.25
CrInsurance	1 if producer bought additional levels of crop insurance above CAT coverage, 0 otherwise	0.64	0.48
Attitude1	A marketing pool nets me a higher price than I can get myself‡	3.48	1.08
Attitude2	I prefer to use other means of risk management than hedging‡	3.59	0.91
Attitude3	I believe that market-timing strategies can increase revenues‡	3.91	0.69

† Includes disaster payments, loan deficiency payments, producer option payments, and AMTA (transition) payments.

‡ Likert-scale questions from 1 to 5, with 5 indicating the highest level of agreement.

Table 8. Seemingly unrelated regression estimates of models for share allocation of cotton to various marketing techniques.†

	Cash sales	Pools	Forward contracts		Direct hedging
Intercept	159.703*** (32.683)	-111.009*** (34.269)	27.570	(34.599)	42.822*** (22.465)
Education	-6.538 (4.951)	3.835 (5.191)	3.719	(5.241)	4.066 (3.403)
Training	-0.319 (0.377)	0.959*** (0.395)	-0.536	(0.399)	-0.506*** (0.259)
RiskAversion	-2.478 (1.815)	2.918* (1.903)	1.355	(1.922)	0.827 (1.248)
Leverage	-0.047 (0.185)	0.018 (0.193)	-0.011	(0.195)	0.203* (0.127)
Size	-15.743*** (5.433)	2.973 (5.697)	6.533	(5.752)	9.665*** (3.735)
GovPayments	0.876*** (0.247)	-0.812*** (0.259)	-0.015	(0.262)	-0.138 (0.170)
OffIncome	21.930* (14.782)	-14.349 (15.499)	-19.490	(15.649)	5.295 (10.160)
CrInsurance	-4.247 (7.437)	4.517 (7.797)	6.132	(7.873)	2.349 (5.112)
Attitude1	-14.724*** (3.472)	23.329*** (3.641)	-7.300*** (3.676)		-3.936** (2.387)
Attitude2	-0.700 (4.176)	12.068*** (4.378)	-5.773 (4.421)		-14.048*** (2.870)
Attitude3	-13.964*** (5.090)	6.123 (5.337)	5.857 (5.388)		1.851 (3.499)
R ²	0.412	0.488	0.167		0.363
Adjusted R ²	0.345	0.430	0.072		0.290

† Numbers in parentheses are asymptotical standard errors.

*, **, and *** indicate coefficients asymptotically significant at 15, 10, and 5% levels, respectively.

approach proposed by Zellner (1962). This method involves generalized least-squares estimation and achieves an improvement in efficiency by taking into account the fact that cross-equation error correlations may not be zero.

The results of model estimation are presented in Table 8. Estimated share models explain 49% of variation in marketing through pools, 41% of variation in cotton allocation to cash sales, 36% of variation in direct hedging, and 17% of variation in forward contracting. The relative lack of explanatory power in the forward contracting model may be explained by the fact that forward contracting is typically based on established contacts between the producer and the buyer of the producer's cotton (e.g., merchant or a textile mill), rather than on economic factors proposed in this model.

According to the results of the model estimation presented in Table 8, allocation of cotton to cash sales is positively affected by government payments and off-farm income and negatively affected by size, belief in the benefits of pools (Attitude1), and perception of market efficiency (Attitude2). Income from government payments has its strongest impact on share allocation of cotton crop to cash sales, which confirms the risk-reducing properties of government payments described in previous studies and suggests that the direct impact of government programs on hedging offsets the negative indirect impact. The results also suggest that smaller farms are more likely to sell their crop in the cash market, which is consistent with previous studies, and suggests that there are added costs (and complexities) associated with most forward pricing

strategies that are more significant for smaller farms because of the limited amount of production. A positive impact of off-farm income on crop allocation to cash sales indicates that off-farm income may be used as a risk-minimization tool. An inverse relationship between perception of market efficiency and crop allocation to cash sales indicates that producers who believe that market-timing strategies can increase revenues are less likely to sell large shares of their crop in the cash market. Individuals who believe that marketing pools can net them a higher price than they can get themselves (Attitude1) are also less likely to allocate their crop to cash sales.

Share allocation to marketing through pools is positively affected by marketing training, risk aversion, belief in the benefits of pools (Attitude1), and personal marketing preferences (Attitude2) and is negatively affected by income from government payments. These results indicate that producers that attend more marketing training probably receive some information that makes marketing through pools more attractive for them. Popularity of pools is also suggested by the impact of personal preference toward this alternative on marketing allocation decisions. One of the reasons for this popularity is suggested by the impact of Attitude1, which indicates that producers that believe that marketing pools can net them a higher price than they can get themselves allocate larger shares of their crop to this marketing alternative. The direct relationship between marketing through pools and risk aversion indicates that cotton producers perceive this marketing alternative as relatively "safe." This result is consistent with frequently asserted risk-minimization properties of forward pricing. An inverse relationship between marketing through pools and income from government payments supports the hypothesis that government programs provide a substitute for forward pricing proposed in the previous theoretical studies (Turvey and Baker, 1990; Sakong et al., 1993) and is consistent with the findings of some previous empirical studies (Goodwin and Schroeder, 1994).

Direct hedging allocation decisions are positively affected by size and leverage and negatively affected by marketing training, belief in the benefits of pools (Attitude1), and personal marketing preferences (Attitude2). Surprisingly, the results indicate that

marketing training tends to divert producers from pricing their crop using futures and options. This result contradicts the evidence that marketing specific education enhances forward and futures pricing use reported by Goodwin and Schroeder (1994). A possible reason for this finding may be the fact that producers who acquire more marketing education tend to better understand the complexities associated with trading futures and/or options, including transactions costs, margin calls (for futures), time and money involved in collecting market information, and at the same time, these producers may have more information about other forward pricing alternatives available to them. The positive relationship between hedging allocation decisions and farm size supports the economies of size hypothesis and is consistent with previous findings by Shapiro and Brorsen (1988), Asplund et al. (1989), and Goodwin and Schroeder (1994). A positive impact of leverage on direct hedging allocation decisions is consistent with optimal hedging models and empirical findings of Shapiro and Brorsen (1988) and Goodwin and Schroeder (1994). A negative relationship between direct hedging allocation decisions and producer personal marketing preferences (Attitude3) and belief in the benefits of pools (Attitude1) is also consistent with expectations. Notably, producer marketing preferences and farm size had the strongest impact on share allocation of cotton crop to direct hedging alternative.

Forward contracting allocation decisions are negatively affected by Attitude1, which indicates that producers who believe that marketing pools can net them a higher price than they can get themselves are less likely to allocate significant amounts of their crop to forward contracts. Among other variables included in this analysis, only hours of marketing training and producer marketing preferences are marginally significant at a 20% confidence level and have a positive effect on allocation of cotton crop to forward contracting.

This analysis found no evidence that education significantly affects marketing allocation decisions. This result contradicts previous studies by Shapiro and Brorsen (1988), Asplund et al. (1989), and Goodwin and Schroeder (1994). This result may be caused by the measurement limitations of the variable used in this study. The lack of significance

of the crop insurance variable may be caused by the mixed effects of various types of crop insurance purchased by producers (since yield insurance products are possible complements and revenue insurance products are possible substitutes for forward pricing, according to Coble et al., 2000).

Summary and Discussion

This study examined cotton producer marketing behavior and factors that affect allocation of the crop to selected marketing strategies. The survey of cotton producers revealed that farm operators forward price, on average, about 79% of their crop. The most widely used form of forward pricing among cotton producers is marketing through pools with 52% of the crop priced through this channel. Such a high share of marketing through pools is not typical for other commodities and may be associated with high management requirements of cotton production. The second most commonly used form of forward pricing is forward contracting followed by options and futures hedging. Cash marketing remains a strong alternative, accounting for about 30% of cotton sales. The survey results indicate that the use of cash sales and forward contracts has decreased over the last 10 yr, while marketing through pools and direct hedging with futures and options have become more common.

The survey generated data on factors that affect producer marketing behavior that are used in the empirical analysis. The empirical model examined producer marketing decisions in the framework of their overall marketing behavior. This study extends the dichotomy of forward pricing versus cash sales assumed in the previous models of hedging behavior by including several forms of forward pricing. This approach allows examination of the specific impacts of the motivating factors on various forward pricing alternatives. In general, the results of this study support the relevance of motivating factors outlined by the previous studies and indicate that producer preferences are among the most important factors that affect marketing behavior. This finding implies that the use of forward pricing may potentially be expanded by addressing these non-economic factors.

This study also outlines certain characteristics of cotton producers that may make them more likely to use one of selected marketing strategies. These

results may be used by educators to better tailor their training programs to the specific needs of the audiences they address. A negative correlation of marketing training with hedging allocation decisions demonstrated in the empirical analysis suggests that these training programs did little to encourage producers to use direct hedging. Potential audiences are very heterogeneous, with a diverse set of reasons to use or not to use direct hedging. Targeting learning about various forms of marketing including pools and forward contracts, in addition to futures/options, appears warranted given the conditions and preferences expressed by producers.

Another set of results discussed in this study may be of interest to policymakers. This study reveals a negative impact of income from government programs on the use of forward pricing techniques, marketing pools in particular. This finding suggests that as long as government payments remain in place, producer use of forward pricing will probably remain low. Since the passage of the 1996 FAIR Act, Congress has been discussing the need to help farmers and ranchers to become active risk managers. Numerous grants have been allocated to support educational programs focusing on various risk-management tools including crop insurance as well as futures and options. However, efforts to support producers' income and to encourage them to use futures and options appear contradictory on the basis of the evidence presented in this study.

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