STOCHASTIC ANALYSIS OF SELECTED HEDGING STRATEGIES FOR COTTON IN THE TEXAS SOUTHERN HIGH PLAINS

A Senior Honors Thesis

by

WILLIS A. RICHARDSON

Submitted to the Office of Honors Programs
& Academic Scholarships
Texas A&M University
in partial fulfillment of the requirements of the

UNIVERSITY UNDERGRADUATE
RESEARCH FELLOWS

APRIL 2002

Group: Economics and Agribusiness

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ABSTRACT

Stochastic Analysis of Selected Hedging Strategies

for Cotton in the Texas Southern High Plains. (April 2002)

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The most significant problem facing agriculture is price volatility. Farm prices are very unstable as evidenced by the wide swings in Texas cotton prices and by Congress approving *ad hoc* disaster payments in each of the past four years to help farmers.

Farmers have risk management tools in the futures and options markets that could help them with the problems they face regarding price volatility. Questions remain about how they should hedge their crops, when they should hedge, and in which market they should hedge their commodity. The purpose of this thesis was to analyze alternative marketing strategies in both the futures and options markets.

A simulation model was developed to simulate weekly cash and future prices and option premiums for cotton in West Texas. The model was simulated to analyze the economic consequences of alternative hedging strategies.

For the analysis, the hedging strategies were tested for both long and short crop years. In a long crop year all eight hedging strategies resulted in lower relative risk

(coefficient variation) then the cash sales strategy. In a short crop year the relative risk on receipts was reduced slightly for only three of the eight hedging strategies.

In conclusion, this study reveals that West Texas cotton farmers could better manage price risk by using a marketing strategy that involves the uses of the futures market for cotton. In short crop years risk averse decision makers would prefer to hedge their crop. In long crop years producers who are risk averse and moderately risk loving would prefer to use a marketing strategy that calls for purchasing puts on the options market.

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CHAPTER I

INTRODUCTION

Texas cotton farmers marketed about five million bales of cotton in the year 2000 at an average price of 54 cents per pound for a value of $1.3 billion. Cotton is the number one crop in Texas in terms of acres and gross receipts. Increasing the price per pound by just 3 cents would have increased returns to cotton farmers by $72 million. Over the past year monthly cotton prices in Texas have ranged from 56.75 cents per pound to 26 cents per pound.

The most significant problem facing agriculture is price volatility. Farm prices are very unstable as evidenced by the wide swings in Texas cotton prices and by Congress approving *ad hoc* disaster payments in each of the past four years to help farmers. Instability in price has increased since the 1996 Farm Bill was passed. The 1996 Farm Bill contributed to increased price instability by eliminating the target price program and CCC support prices. Ray, et al. (1998) and Adams (2000) have shown that the change in farm programs in 1996 increased the price risk to farmers by as much as 50 percent.

Another source of price instability is due to unstable exports, as evidenced by recent decreases in the amount of agricultural products being exported. The United States Department of Agriculture reports that U.S. cotton exports have fallen 20 percent since 1995 (USDA 2001). Export decline can be partly attributed to the slow recovery process in Russia's economy after the fall of the Soviet Union and economic problems in

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This thesis follows the style and format of the American Journal of Agricultural Economics.

Southeast Asia and Japan. A strong U.S. dollar also contributes to weaker export sales by making our products relatively more expensive. Farmers and agribusinesses in the U.S. do not control these factors, yet their incomes are directly tied to international trade and economies in the rest of the world.

The foreseeable future indicates that Texas cotton producers face decreased demand and more volatile prices. The Food and Agricultural Policy Research Institute (FAPRI) January 2001 Baseline projects continued weak demand for U.S. cotton exports and low prices through 2009. Increased price risk in an era of low prices has put even greater pressure on Texas cotton farmers to find better ways to manage price risk while marketing their produce.

Winston (1996) said, "That by selling (or shorting) futures we can reduce the risk involved in holding a commodity" (p. 176). Farmers have risk management tools in the futures and options markets that could help them with the problems they face regarding price volatility. Questions remain about how they should hedge their crops, when they should hedge, and in which market they should hedge their commodity (Chicago Board of Trade, 1998).

The purpose of this thesis was to analyze alternative marketing strategies in both the futures and options markets. Reduced price risk through better marketing would allow farmers to fix their price before harvest and thus reduce their overall risk, which allows them to produce more of their commodity in a more efficient manner. Additionally, improved marketing strategies that manage price risk will make Texas farmers more competitive in the global market for cotton.

CHAPTER II

TECHNICAL BACKGROUND & LITURATURE REVIEW

Technical Background

An understanding of some basic terms and concepts is needed to understand the use of the futures markets and the hedging strategies found in this Thesis. A futures contract is defined as an agreement between the seller and the buyer of the contract. On the day a contract is opened the seller agrees to deliver a commodity (in this case cotton) to some predetermined destination at a specified date in the future, for a certain price. One futures contract for cotton consists of 50,000 pounds of cotton lint or roughly 100 bales of cotton. To accomplish the buying and selling of futures contracts, organizations such as the New York Commodities Exchange exist to facilitate transactions. Cotton futures contracts are traded for eighteen months, for each of several specified delivery months. There are five different delivery months for cotton currently being traded on the New York Commodities Exchange: March, May, July, October, and December. The December cotton futures contract is used here because this contract month most closely corresponds to cotton harvest in Texas.

There are two basic types of buyers and sellers in the futures market, hedgers and speculators. A hedger is someone who takes offsetting positions in the cash and futures market to protect his profit from adverse price movements. Cotton farmers who want to protect against decreases in cash prices during the growing and/or harvesting seasons would establish a short hedge (sell futures contracts to cover part of their expected production costs). Hedging assumes that cash and futures prices move closely together and in the same direction. Speculators buy and sell futures contracts without taking an offsetting position in the cash market. This system works because the speculator assumes the price risk in hopes of gaining a profit by correctly predicting price movements in the futures market while never expecting to actually handle the commodity.

A short hedge is defined as a hedge placed (a futures contract sold) to protect against downward price movements in the cash market (Catlett and Libbin 1999, p. 65). By selling a futures contract hedgers hope to offset losses from a falling cash market with gains in the futures market.

Basis is defined as the difference between cash and futures price on any given day. The basis is important in hedging because the hedger is not subject to price risk but is affected by basis risk. If the closing basis could be predicted accurately, the hedger would know the pro-off price[1] for his commodity before the hedge was placed, and all price risk would be removed. The basis is important in making a decision on whether to deliver or close the hedge. If the closing basis is greater than the delivery cost, it would be profitable for a short hedger to deliver the cash commodity rather than buying back the futures contract to cancel the short hedge. Delivery does not take place the majority of the time.

Generally Texas cotton farmers in the Southern High Plains close out their position by offsetting (buying "back") the number of contracts sold earlier, before the

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[1] Pro-off price is calculated by adding the current futures price to the average or expected closing basis price.

contract month matures. The futures contract sold on the New York Commodity Exchange is grade 41 with a staple length of 1 & 1/16 inch strict low middling (SLM). Very little of the cotton grown in Texas will be of this grade or staple length. The farmer, therefore, places an imperfect hedge, for example, he does not plan to deliver his cotton but only assumes the price for his cotton will closely follow that of the futures market. The farmer may deliver his cotton but would be required to take a discount for the particular grade and staple of his product.

Another way to achieve protection from falling prices is to buy a put option (Catlett and Libbin 1999, p. 182). A put option provides a predetermined strike price that gives a sturdy price floor, but also allows the producer to take advantage of rising prices. The strike price can be above (in the money) or below (out of the money) the current future's price. The price paid for this market flexibility is the option premium, which is paid in full when the option premium is bought. In a falling market a farmer can offset (taking a second marketing position opposite the initial one) or exercise (both the buyer and seller are assigned a futures position) the option creating a short futures position. On the other hand, in a rising futures market, the farmer does not need protection, so he lets the option contract expire or offsets it to capture any remaining time value in the premium.

Literature Review

All decisions in today's world deal with uncertainty. One way people deal with the problem of uncertainty is to generate and analyze many alternative scenarios (Weida, Richardson, and Vazsonyi 2001, p. 247). The problem with this type of approach is that some scenarios have a greater probability of occurring than others and this makes it difficult for people to see the entire range of consequences that might occur from decisions they make or actions they take. Thus simulation is an important tool because it helps to quantify the uncertainty inherently found in the decision making process.

"Today we rely less on superstition and tradition than people did in the past, not because we are more rational, but because our understanding of risk enables us to make decisions in a rational mode" (Bernstein 1996, p. 4). Simulation is a tool that allows us to manage risk in our day-to-day activities. It is suggested that when probabilities are too complex to be considered manually, simulation is a useful way of analyzing situations (Weida, Richardson, and Vazsonyi 2001, p. 247).

Reutlinger analyzed different methods for evaluating the riskiness of investment projects. He used an approximation of probability distributions from actual projects to simulate an estimated sample. Jones (1972) demonstrated the applicability of simulation for analyzing alternative risk management strategies for business decisions. Hardaker, Dillon, and Anderson (1977) indicated that simulation is the preferred methodology for analyzing risky decisions in agriculture.

Simulation has been used to analyze alternative hedging strategies designed to manage the volatility of prices in the futures and options markets. For example Bailey and Richardson (1985) simulated alternative marketing strategies for Texas cotton farmers to determine the economic payoffs from using future prices to hedge price risk. Their analysis is dated as they considered only futures contracts where as this project uses options contracts and futures as the risk management tools.

Simulation analysis of risky marketing strategies is a way of estimating the probability distribution of returns for alternative hedging and cash strategies. Several methods have been suggested and used to rank alternative probability distribution for risky investments. Bailey (1985) used stochastic dominance with respect to a function to rank alternative hedging strategies. Hardaker, Dillon, and Anderson (1977) suggest the use of mean variance and stochastic dominance with respect to a function for ranking risky strategies. Richardson (2002) describes ten different methods for ranking risky strategies. His dynamic certainty equivalents method extends the ranking of risky alternatives beyond stochastic dominance by showing the risk aversion level where decision makers switch preferences, much like McCarl's (1988) risk root calculator.

CHAPTER III

METHODOLOGY

Marketing Strategies

For a point of comparison, this study used a base marketing strategy that sold the whole crop on the cash market the last week in November. Alternative hedging strategies were then compared to these results. Cash prices were obtained from Wednesday's closing prices for cotton 1 and 1/16 inch SLM in Lubbock Texas (NYCE).

Six alternative marketing strategies were analyzed. The final net price for all strategies was calculated by taking the difference between the sold futures contract price and the ending futures contract price in the fourth week of November and then adding the final cash price at the end of November.

Two different types of hedging strategies were tested. The first hedging strategy was to sell at the beginning of the contract in December, and the second type of hedge was to sell after planting in May. Within these two types of hedging strategies, three different rules for starting the hedge were analyzed. The first two strategies hedged the entire amount of the crop when the futures price was greater then the cost of production per pound. These two strategies are referred to as "Dec All" and "May All." The next two strategies hedged one third of the crop when the futures price exceeded the cost of production; it then hedged another third of the crop when the price went above the cost of production again; and hedged the final third of the crop when the futures price went above the cost of production for the third time. These two strategies are referred to as "Dec 1/3" and "May 1/3." In much the same way the fifth and sixth strategies hedged a quarter of the crop the first four times that the futures price rose above the cost of production. These two strategies are referred to as "Dec1/4" and "May 1/4."

Two hedging strategies that utilized options were analyzed. The final net price for the options strategies was calculated by adding the profit or loss from the option premium between purchase of the put and sale of the put in November to the final cash price received for cotton in November. The first option based hedge (November) was initiated when the in the money strike price was greater then the cost of production. The second option based hedge (November) was sold when the out of the money hedge was greater then the cost of production.

Data Analysis

Monte Carlo simulation was used to analyze the economic consequences of the nine alternative marketing strategies. Simulation was used because it is a methodology that has been used to analyze marketing strategies and it is a tool for analyzing strategies for risk management. To simulate alternative cotton marketing strategies, forecasts of the cash and futures prices were needed.

The first step in simulating alternative marketing strategies is to forecast cash and future prices. A time series technique -- vector autoregression (VAR) was used to forecast the cash and future prices. Time series models forecast future values through past observations. Ford (1986) describes vector autoregression as "a system of equations whose dependent variables are regressed on lagged observations of all the variables in the system" (p. 4). Weekly cash and futures prices from December 1990 to November 2001 were analyzed with the VAR model. The number of lags used in estimating the

VAR model was seven, which was based on analyzing the sample autocorrelation coefficients for cash and futures price series. Based on the Dickey-Fuller test, the first difference of cash and futures prices was deemed to be sufficient to make the data stationary.

The time series model's forecasts for the 2002 cotton crop were considered to be unrealistic. The model forecasted prices declining to 19 cents per pound while FAPRI, forecasted that cotton prices would be about 40 cents per pound in 2002. The VAR model generated such low prices because the forecast weighted recent developments in the market too heavily. In June of 2001, China released 2 million bales of excess cotton onto the world market and thus caused cotton prices to drop in the short run. The VAR model was unable to turn around the resulting down turn in prices.

To analyze marketing strategies with such a strong downward trend in prices is unrealistic, so an alternative method was implemented. A decomposition forecasting method was used to forecast and simulate cash and futures prices (Diabold 2000, p. 207-240). The procedure called for segregating the historical data into different types of marketing years, developing indices for each year, and applying the indices to FAPRI's forecast for cotton prices in 2002. The first step in the process was to separate the weekly historical prices for 1990 to 2001 into two different types of years, namely years where prices trended. Diabold (2000) calls this a regime switching technique (p. 75). The stock to use ratio, announced at the beginning of the year, was used to predict whether prices would trend up or down. This is referred to as separating the data into short and long crop years[2]. This resulted in six years being classified as short crop years (1990, 1991, 1994, 1995, 1996, 1998) and six being classified as long crop years (1992, 1993, 1997, 1999, 2000, 2001). Residuals from mean annual prices were calculated each year for each of the twelve years (j) and each of the 52 (i) weeks, resulting in series of $\hat{e}_i = O_{ij} - \bar{O}_j$, where $\bar{O}_j$ is the mean of observed prices in year j and O_{ij} are observed prices in year j for week i. These twelve sets of residuals constitute relative price risk for a marketing year and incorporate the historical inter-temporal correlation within actual years.

A bootstrap simulation technique was used to simulate (select) a set of annual cotton price residuals from either the short or long crop year residuals database. Care was taken to insure the stochastically drawn fractional residuals maintained their week-to-week relationship observed in history. Bootstrapping is a procedure for simulating Monte Carlo outcomes and is most often used to estimate variances for distribution parameters (Richardson 2002). It is used with small sample sizes when the cost of increasing the sample size is too high. The bootstrap method is able to increase the sample size by re-sampling the original data set with replacement, many times. This method thus offers an inexpensive way to expand sample size and reduce the variance on the population parameters.

[2] Short crop years have a stock to use ratio < 1.22 and long crop years have a stock to use ratio > 1.22, based on the past 12 years of cotton prices.

Simulation Model

The simulation model consisted of a six-step process. In the first step, bootstrap techniques were used to randomly select a sequence of random deviates from the historical database of deviations of cash price from the annual means. This yielded a 52-week forecast of random deviations from the mean price. In step two, the model multiplied the stochastically selected weekly random deviates by the average forecasted annual price from FAPRI, which resulted in random weekly cash prices for twelve months. The bootstrap technique allowed the inter-temporal correlation of prices to be maintained as they had been observed in the past. The resulting random weekly cash prices were used as the "realized" cash prices, and to analyze the different hedging strategies.

Step three of the model used a regression equation to calculate the stochastic futures price as a function of cash price thus yielding stochastic weekly future prices. The results of an ordinary least squares regression equation relating weekly futures prices to cash prices was:

	Intercept	**Slope**
Beta	6.842	0.986
t-statistic	8.535	67.383
R-Square= 0.936		**F-test**=4540.533
Standard Deviation Residuals= 2.470		

The simulated random weekly future prices for each of the 52 weeks was FP = (b_0) + (b_1) (cash price) + (standard deviation residuals * SND) where SND is a random independent standard normal deviate. In step four, the weekly stochastic future prices were used in the Black-Scholes model to calculate implied volatility and option premiums for each week. The option premiums were calculated using stochastic future prices thus yielding stochastic premiums. Next, step five calculated the pro-off price (futures price + average ending basis) for each week using the historical average basis for the fourth week of November and the stochastic weekly futures prices. The pro-off price was compared to triggers, in the different hedging strategies, which initiated short hedge contracts when the pro-off price was greater then the cost of production[3]. The final step calculated the net price by adding the gains or loses, from the marketing strategy, to the cash price for selling the crop in the fourth week in November.

In summary, the model simulated stochastic weekly cash prices, future prices, option premiums, and pro-off prices. Alternative marketing strategies were then evaluated by using these stochastic values. The model was simulated for 100 iterations (replications) using the pseudo-random number procedure in Simetar[4]. The stochastic prices generated by the model were tested to insure that they replicated the historical price risk for long and short year crops.

The cash sales strategy used the stochastic cash price for the fourth week in November to calculate cash receipts. Cash receipts were used as a base for comparing the other strategies. The 100 percent hedge before planting strategy was evaluated by

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[3] Cost of Production was estimated to be $.55 per pound.

[4] Simatar (Simulation for Excel To Analyze Risk) is an Excel Add-In used to simulate risk models programmed in Excel. It was developed at Texas A&M University, for risk analysis, by Richardson, Schumann, and Feldman (2002).

short hedging in the first week when the pro-off price exceeded the cost of production. The receipts earned under this strategy were simulated by adding (or subtracting) profits (or losses) from the hedge to the receipts from cash sales in the fourth week of November. Gains from hedging were observed when the futures price decreased over the year.

The option marketing strategies were simulated in a similar fashion. The returns to an option hedging strategy were calculated as the sum of cash receipts plus profits (or losses) gained from premiums. Because an option is the right to sell but not the obligation to sell: in years that prices increased above the option strike price, the original premium paid was lost because the hedger would let the contract expire to get a higher price for their cotton.

CHAPTER IV

RESULTS FOR SELECTED MARKETING STRATEGIES

Nine marketing strategies were simulated in a stochastic model using historical risk for the past twelve years. The strategies evaluated were:

Cash – sell all cotton at the fourth week of November cash price.

Dec All – short hedge all cotton the first week the pro-off price is greater then the cost of production.

Dec 1/3 – short hedge 1/3 of the cotton the first three weeks the pro-off price is greater then the cost of production.

Dec 1/4 – short hedge 1/4 of the cotton the first four weeks the pro-off price is greater then the cost of production.

May All – short hedge all cotton the first week, after May 1, that the pro-off price is greater then the cost of production.

May 1/3 – short hedge 1/3 of the cotton the first three weeks, after May 1, that the pro-off price is greater then the cost of production.

May 1/4 – short hedge 1/4 of the cotton the first four weeks, after May 1, that the pro-off price is greater then the cost of production.

In Money – sell a put option the first week that the in the money pro-off price is greater then the cost of production.

Out Money – sell a put option the first week that the out of the money pro-off price is greater then the cost of production.

Results of the nine marketing strategies are summarized in Table 1. The results indicate that average returns for hedging cotton would exceed cash sales in five of the eight strategies, regardless of whether it is a short or long crop year. The average gains to hedging for these strategies are substantial (2 to 3 cents per pound). In a long crop year, all eight strategies resulted in lower relative risk or coefficient of variation (CV) then the cash sales strategy. Five of these strategies cut the relative risk associated with cash sales of 21 percent to about 11 percent. In a short crop year the relative risk on receipts was reduced slightly for three of the eight marketing strategies.

The simulated returns for the nine marketing strategies were ranked using stochastic dominance with respect to a function (Table 2). Lower and upper risk aversion coefficients (RAC's) of –0.2 and 0.2, respectively, were used for the analysis. The results are inconclusive because the order of preference differs from the lower RAC to the upper RAC. For example, in the long crop year results, the cash sales strategy is ranked first for the lower RAC (-0.2) and cash sales is ranked last for the upper RAC (0.2). These results indicate a switching of preferences between the –0.2 to 0.2 RAC interval. In addition, the short crop years in the stochastic dominance rankings on Table 2 also are not consistent within the –0.2 to 0.2 RAC intervals. The risk averse decision (0.2 RAC) maker would rank the Dec All hedging strategy first, followed by the Dec 1/4 and Dec 1/3 strategies. Decision makers with this level of risk aversion would rank the two strategies that used options the lowest. The simulation results warranted further analysis because of the inconsistent rankings given the –0.2 to 0.2 RAC intervals.

Table 1. Statistical Summary of Simulated Hedging Strategies for Cotton

Long

	Cash	Dec All	Dec 1/3	Dec 1/4	May All	May 1/3	May 1/4	In Money	Out Money
Mean	59.91	61.64	61.64	61.58	58.48	58.49	58.57	63.01	63.12
StDev	12.97	7.23	6.79	6.84	11.75	11.47	11.36	6.99	7.10
CV	21.65	11.73	11.02	11.10	20.09	19.61	19.39	11.09	11.24
Min	37.80	48.14	49.17	49.02	37.80	37.80	37.80	52.00	51.81
Max	77.04	83.28	79.43	79.68	82.79	82.08	81.45	78.92	78.40

Short

	Cash	Dec All	Dec 1/3	Dec 1/4	May All	May 1/3	May 1/4	In Money	Out Money
Mean	59.93	59.95	59.93	59.94	59.94	59.96	59.98	59.28	59.25
StDev	7.93	7.73	7.60	7.56	8.48	8.40	8.37	8.23	8.20
CV	13.23	12.89	12.68	12.61	14.15	14.01	13.95	13.89	13.84
Min	48.01	45.95	44.51	44.13	41.00	43.89	44.29	44.97	45.40
Max	72.58	77.84	76.77	77.37	78.63	79.31	78.74	77.69	77.20

Table 2. Ranking of Marketing Strategies Based on Stochastic Dominance with Respect to a Function

Long Crop Year

Lower Risk Aversion Ranking		Upper Risk Aversion Ranking	
Series Name	**Level of Preference**	**Series Name**	**Level of Preference**
Cash	Most Preferred	In Money	Most Preferred
May All	2nd Most Preferred	Out Money	2nd Most Preferred
May 1/3	3rd Most Preferred	Dec 1/3	3rd Most Preferred
Dec All	4th Most Preferred	Dec ¼	4th Most Preferred
Out Money	5th Most Preferred	Dec All	5th Most Preferred
In Money	6th Most Preferred	May ¼	6th Most Preferred
May 1/4	7th Most Preferred	May 1/3	7th Most Preferred
Dec 1/4	8th Most Preferred	May All	8th Most Preferred
Dec 1/3	Least Preferred	Cash	Least Preferred

Short Crop Year

Lower Risk Aversion Ranking		Upper Risk Aversion Ranking	
Series Name	**Level of Preference**	**Series Name**	**Level of Preference**
May All	Most Preferred	Dec All	Most Preferred
May 1/4	2nd Most Preferred	Dec ¼	2nd Most Preferred
May 1/3	3rd Most Preferred	Dec 1/3	3rd Most Preferred
Dec All	4th Most Preferred	May ¼	4th Most Preferred
In Money	5th Most Preferred	May 1/3	5th Most Preferred
Dec 1/4	6th Most Preferred	Cash	6th Most Preferred
Out Money	7th Most Preferred	May All	7th Most Preferred
Cash	8th Most Preferred	In Money	8th Most Preferred
Dec 1/3	Least Preferred	Out Money	Least Preferred

Dynamic certainty equivalents (DCE) analyses were performed on the simulated data. Results of the DCE analysis were summarized in Figure 1 and 2. For a long crop year the DCE results indicate that persons who have RAC's less then –0.06 would prefer cash sales, but persons who have RAC's greater then –0.06 would prefer the hedging strategies that used the options market. In addition, if option hedging strategies were not available producers with RAC's greater then –0.03 would prefer to hedge all, 1/3, or 1/4 of their potential production in December. Hedging six months before harvest in a long year was preferred because prices are at their highest when the future contracts are first issued. Thus allowing the hedger a higher probability of locking into a futures price that was greater then their cost of production.

For a short crop year the DCE results indicated that persons who have RAC's less then –0.02 would prefer to hedge all of their cotton in May after planting, but persons who have RAC's greater then –0.02 would prefer to hedge all, 1/3, or 1/4 of their product in December (Figure 2). Also, the DCE results showed that the hedging strategies that used options were least preferred in short crop years. This is understandable because in short crop years cash prices rise and in order to sell their crops at a higher price the producer is forced to let his option contract expire and thus loses his premium payment.

Figure 1. Ranking of Alternative Marketing Strategies in a Long Crop Year Using Certainty Equivalents Assuming an Exponential Utility Function

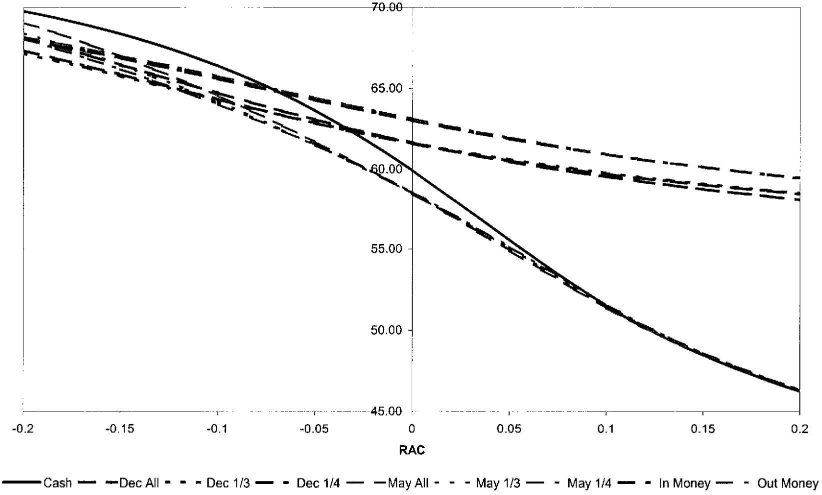
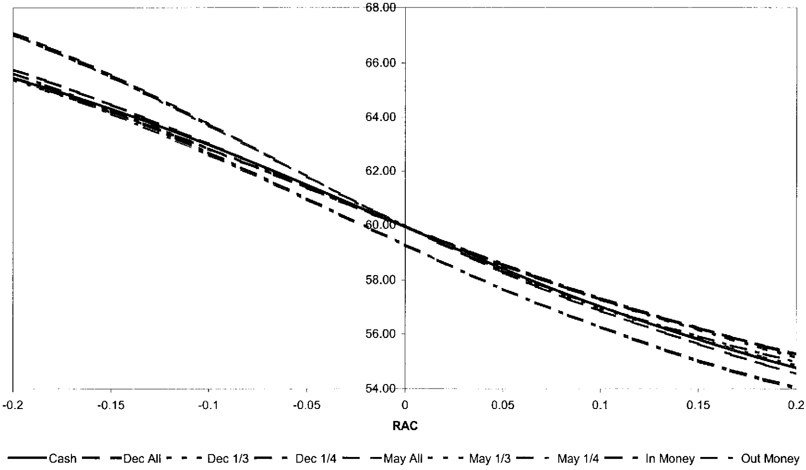


Figure 2. Ranking of Alternative Marketing Strategies in a Short Crop Year Using Certainty Equivalents, Assuming an Exponential Utility Function



CHAPTER V

SUMMARY AND CONCLUSION

The most significant problem facing agriculture is price volatility. Farm prices are unstable as evidenced by the wide swings in Texas cotton prices. The foreseeable future indicates that Texas cotton producers face decreased demand and more volatile prices. FAPRI's January 2001 Baseline projects continued weak demand for U.S. cotton exports and low prices through 2009. Increased price risk in an era of low prices has put even greater pressure on Texas cotton farmers to find better ways to manage price risk while marketing their produce.

Farmers have risk management tools in the futures and options markets that could help them with the problems they face regarding price volatility. Questions remain about how they should hedge their crops, when they should hedge, and in which market they should hedge their commodity. The purpose of this thesis was to analyze alternative marketing strategies in both the futures and options markets.

A simulation model was developed to simulate weekly cash and future prices and option premiums for cotton in West Texas. The model was simulated to analyze the economic consequences of alternative hedging strategies. The hedging strategies analyzed were:

Cash – sell all cotton at the fourth week of November cash price.

Dec All – short hedge all cotton the first week the pro-off price is greater then the cost of production.

Dec 1/3 – short hedge 1/3 of the cotton the first three weeks the pro-off price is greater then the cost of production.

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May All – short hedge all cotton the first week, after May 1, that the pro-off price is greater then the cost of production.

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In Money – sell a put option the first week that the in the money pro-off price is greater then the cost of production.

Out Money – sell a put option the first week that the out of the money pro-off price is greater then the cost of production.

For the analysis, the hedging strategies were tested for both long and short crop years. In a long crop year all eight hedging strategies resulted in lower relative price risk (coefficient variation) then the cash sales strategy. Five of the hedging strategies cut the relative price risk associated with cash sales from 21 percent to about 11 percent. In a short crop year the relative price risk was reduced slightly for only three of the eight hedging strategies.

Stochastic dominance was used to rank the alternative marketing strategies. The results are inconclusive because the order of preference differs from the lower RAC to the upper RAC. For example, in the long crop year results, the cash sales strategy is ranked first for the lower RAC and cash sales is ranked last for the upper RAC. In addition, the short crop years in the stochastic dominance rankings also are not consistent within the –0.2 to 0.2 RAC intervals tested. The risk averse decision maker would rank the Dec All hedging strategy first, followed by the Dec 1/4 and Dec 1/3 strategies. Decision makers with this level of risk aversion would rank the two strategies that used options the lowest.

A second risk ranking procedure, dynamic certainty equivalence (DCE) was used to indicate likely preferences among the marketing strategies. For a long crop year the DCE results indicate that persons who have RAC's less then –0.06 would prefer cash sales, but persons who have RAC's greater then –0.06 would prefer the hedging strategies that used the options market. Finely, for a short crop year the DCE results indicated that persons who have RAC's less then –0.02 would prefer to hedge all of their cotton in May after planting, but persons who have RAC's greater then –0.02 would prefer to hedge all, 1/3, or 1/4 of their product in December

In conclusion, this study reveals that West Texas cotton farmers could better manage price risk by using a marketing strategy that involves the uses of the futures market for cotton. In short crop years risk averse decision makers would prefer to hedge their crop in December. In long crop years producers who are risk averse and moderately risk loving would prefer to use a marketing strategy that calls for purchasing puts on the options market.

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