ANALYSIS OF SELECTED FUTURES MARKETS COTTON TRADING AND PRICING STRATEGIES

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Abstract

Four cotton price risk management strategies were evaluated to ascertain how these marketing alternatives might be used by producers and other parties. Three of the selected strategies are futures and options of futures trading scenarios or alternatives that were evaluated for the 1987 to 1996 time period. Each of these three strategies yielded an average annual return over the 10-year analysis period of 2.99, 3.08, and 2.51 cents/lb for Strategy 1, 2, and 3; respectively. The fourth strategy is described as both a trading and pricing alternative that was evaluated over the 1980 to 1996 period and evaluated the effect of changes in government cotton programs mandated by the 1985 Farm Bill. A regression model was developed to improve the economic efficiency of Strategy 4. This constructed regression model was successful in improving the effectiveness of Strategy 4 by employing information about three variables: December futures contract prices, world supply-to-use ratio, and Chinese supply-to-use ratio

Introduction

There are many marketing tools farmers can use to secure themselves against unfavorable variability in price. While there is no formula to guarantee the best marketing decision, many strategies are available to help growers manage and reduce price risks. Several of these strategies for marketing cotton are evaluated in this paper. Researchers are constantly looking for knowledge about what moves cotton prices and are continuously reviewing historical tendencies (Cleveland, 1994). The scope of this study was to incorporate observed historical market tendencies into specific strategies. Three trading and one pricing strategies were selected and evaluated in this paper.

The purpose of this research is to provide the description of the strategies and the assumptions under which each can be used by producers or other parties. The first three strategies are based solely on historical tendencies. A ten year period, from 1987 to 1996, was used to build a gain/loss distribution from using these strategies. Since historical tendencies rely on annual similarities of the supply/demand factors and the way these factors affect the price, the beginning of the time period was deliberately selected after the Farm Bill of 1985. The premise is that the 1985 Farm Bill opened the U.S. cotton market for the global arena, thus bringing in a new set of variables affecting the U.S. market. Prior to this Farm Bill, the U.S. cotton market was shielded from the international competition, and thus, was influenced and controlled by a much different set of market forces.

The fourth strategy can be viewed as both a trading and pricing alternative and was successful for all six years from 1980 to 1985, but only five times out of ten years from 1987 to 1996. The statistical analysis was run to reveal the effect of the 1985 Farm Bill on this strategy, and analyze if the strategy can have its significance under a new set of assumptions that ensued the Farm Bill.

Pricing and Trading Strategies

Strategy 1. *Sell December futures the third week of June. Buy contracts back the first week of October*.

Strategy 1 reduces the risk of loss from selling in the downtrending market. Average return from trading futures using this procedure was 2.99 cents/lb for the last 10 years. Figure 1 is a representation of Strategy 1 for an arbitrarily selected year of 1991. The left part of the graph displays the futures price for each day during the third week of June when the sell decision is made, the right part demonstrates the daily prices during the first week of October when the contract is offset. The difference between the average prices of these weeks is a resulting gain or loss. Table 1 displays the distribution of gains and losses obtained from Strategy 1 from 1987 to 1996 and also lists futures prices, timing of the buy/sell decisions, and underlying gains/losses for strategy 1 for the period of study, 1987-1996.

Strategy 2. *Buy at-the-money Put options on October futures the third week of June. Liquidate them the first week of September*.

Strategy 2 resulted in a profit of 3.08 cents/lb for the ten-year analysis period. Because the only risk is the premium cost, this strategy may be preferable to futures sales, even though the net price is slightly lower. Purchasing in-the-money Put options, which requires the selection of strike price above the underlying futures contract, would result in higher net prices than purchasing at-the-money options. At-the-money option carries the lowest premium since the strike price is equal, or approximately equal, to the current price of the underlying futures price.

Figure 2 provides a snapshot of Strategy 2 for 1994. The left part of the chart depicts daily option premiums for the third week of June when the sell decision is made, while the right part illustrates put options premiums for each day during the first week of October when the contract is offset. The discrepancy of the average option premiums for these weeks is a resulting gain or loss. Table 2 shows the distribution of gains and losses for Strategy 1 from 1987 to 1996 and lists put options premiums, timing of the buy/sell

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decisions, and underlying gains/losses for Strategy 2 for the period of study, 1987-1996. Put at-the-money options were not always offered for trade during 1987-1991 the time period. Those days when put options were not available are designated by blank spaces in Table 2.

Strategy 3. *Buy May futures the first week of February. Sell the third week of March*.

Strategy 3 showed an average annual gain of 2.51 cents/lb from 1987 to 1996. Using call options during this time period does not work as well as using futures because the cost of the premium offsets much of the price improvement. Figure 3 pictures Strategy 3 for 1990. The left part of the graph represents daily futures prices for the first week of February when the buy decision is made, while the right part is the third week of March when the contract is offset. The difference between the average price for these weeks is an ensuing profit or loss. Table 3 exhibits the distribution of gains and losses for Strategy 3 from 1987 to 1996 and provides a source of required May futures prices, timing of the buy/sell decisions, and underlying gains/losses for Strategy 3 for the period of study, 1987-1996.

Strategy 4. *If the price of December futures has increased from July 1 to July 15, then delay any pricing decision; the price will go up. Conversely, if the price of December futures has decreased over that two-week time period, then forward price a portion of your crop.*

Figure 4 demonstrates a price increase from July 1 to July 15 during 1980. Strategy 4 suggests delaying the pricing decision expecting an upward price trend till December 1. Figure 5 shows that when futures price decreases from July 1 to July 15, as it did during 1984, this strategy recommends locking in a futures price right away or forward price a portion of the crop since the price trend is expected to decline till December.

Table 4 illustrates the success of Strategy 4 from 1980 to 1996. As seen in Table 4, Strategy 4 was successful in each of the years prior to the 1985 Farm Bill, from 1980 to 1985, but alternated the success and failure outcomes in the years following the 1985 Farm Bill. Strategy 4 produced success in only five of ten years after the 1985 Farm Bill, from 1987 to 1996. Whether the changes in seasonal tendencies that underlie Strategy 4 could be attributed to the 1985 Farm Bill provisions or not was to be determined by the regression model.

Strategy 4 Regression Analysis

The objective of the regression analysis for Strategy 4 was to, first, test the effect of the 1985 Farm Bill. If there was an effect, the second objective was to take advantage of the effects of the 1985 Farm Bill to possibly improve the efficiency of Strategy 4. This analysis was broken down into two time periods, before and after the 1985 Farm Bill. The comparisons for these time periods are provided in the following discussion.

The dependent variable tested was a linear slope of December futures prices between July 15 and December 1. The slope was calculated as a slope for simple linear regression model that included all the futures prices between July 15 and December 1.

The independent variables included the cotton supply/demand data of the world main producers that include USA, China, Uzbekistan, USSR, and Pakistan. Production, consumption, exports, imports, and ending stocks data were the variables of interest. However, with only six observations in the first time period (1980-1985), ten in the second period (1987-1996), and so many independent variables would create a problem with insufficient number of degrees of freedom. That's why the variables by countries were pooled in two, the U.S., and Rest-of-the-World (ROW). ROW was a subtraction of the U.S. from the World data. The variables by supply/demand data were also pooled in two, production and Supply-to-Use Ratio (S/U), where S/U includes ending stocks, consumption, and export, where S/U in defined below in Equation 1.

$$S/U = \frac{Ending\ Stock}{Consumption + Export} \quad (1)$$

Note, that this strategy makes prediction based on the December futures price change from July 1 to July 15. Thus, the difference between these two dates was also selected to be a variable in the model. Therefore, the independent variables of interest were consolidated to five variables.

$$Y = f(X1, X2, X3, X4, X5)$$

where,
Y = Slope of December futures prices between July 15 and December 1;
X1 = U.S. production, metric tons,
X2 = ROW production, metric tons,
X3 = U.S. S/U ratio,
X4 = ROW S/U ratio,
X5 = price change in December futures between July 1 - July 15.

Model 1. A preliminary regression model was run to further sort out the variables by their share in predicting *Y*. This model was run using regular SAS linear regression with the special model selection. The command for the model followed:

model Y = X1 X2 X3 X4 X5/selection = rsquare adjrsq cp mse ;

This command runs all the combinations of the regression models that can be constructed from these five variables and produces major parameters for model comparison. The model was run for the three time periods, (a) from 1980 to 1985 (before the Bill), (b) from 1987 to 1996 (after the 1986 Farm Bill), and (c) from 1980 to 1996 (excluding the Farm Bill year of 1986). The result of SAS procedure

showed the following variables that had a major influence on the response variable:

1. From 1980 to 1985 (period 1): X5 was the only variable to have a significant influence on *Y*. Neither USA nor ROW data helped to predict the response variable.
2. From 1987 to 1996 (period 2): the model composed of X3, X4, and X5 appeared to be the most appropriate equation for explaining *Y*.
3. From 1980 to 1996: None of the models seemed capable of explaining variation in *Y* .

Model 2. Model 1 suggested the following three variables to be helpful in predicting the response variable: USA S/U ratio, ROW S/U ratio, and "July 15 - July 1." The model consisting of these three variables was rerun using Excel 7.0 regression. Regression models were run for both the 1980-1985 and the 1987-1996 time periods. The estimated regression models and interpretations of the model parameters follow the description of the hypothesized model.

$$Y = f(X1, X2, X3)$$

where,
Y = Slope of December futures prices btw July 15 and December 1;
X1 = U.S. Supply-to-Use ratio,
X2 = Rest-of-the-World Supply-to-Use ratio,
X3 = price change in December futures between July 1 - July 15.

Summary of Regression Output for Model 2, Period 1 (1980-1985)

Regression Statistics	
Multiple R	0.9066
R Square	0.8219
Adjusted R Square	**0.5547**
Standard Error	0.0523
Observations	6

ANOVA Table for Model 2, Period 1

	df	SS	MS	F	Significance F
Regression	3	0.0253	0.0084	3.0761	**0.255**
Residual	2	0.0055	0.0027		
Total	5	0.0307			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0.2844	0.1145	-2.4844	0.1309
Variable X1	0.9983	0.4297	2.3234	**0.1458**
Variable X2	1.2571	0.5195	2.4199	**0.1366**
Variable X3	0.0113	0.0071	1.6011	**0.2505**

Summary of Regression Output for Model 2, Period 2 (1987-1996)

Regression Statistics	
Multiple R	0.8349
R Square	0.6971
Adjusted R Square	**0.5456**
Standard Error	0.0570
Observations	10

ANOVA Table for Model 2, Period 2

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.0449	0.0150	4.6024	**0.05**
Residual	6	0.0195	0.0033		
Total	9	0.0645			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.4702	0.1822	2.5806	0.0417
Variable X1	-1.5967	0.5776	-2.7642	**0.0327**
Variable X2	-1.3300	0.5746	-2.3146	**0.0599**
Variable X3	-0.0242	0.0080	-3.0197	**0.0234**

Regression analyses for both periods provide almost identical *Adjusted R-squares of 0.55*, even though *R-squares* are different. *R-square* of 0.8219 for period 1 means that over 82 percent of the variation in *Y* can be explained by X1, X2, and X3 in a linear relationship that exists between X's and *Y*. *Adjusted R-square* adjusts *R-square* parameter for the number of variables in a model, therefore, is a better statistic for comparison of various models. Confidence interval, α, for Model 2 was selected equal to 0.05. The selection of confidence interval α=0.05 means that *Significance F, or Observed Significance Level*, must be equal to 0.05 or lower to say that the predictor variables X1, X2, and X3 together help to predict *Y*. The closer the *Significance F* is to zero, the greater the relationship between the predictor variables and *Y*.

Since the *Significance F* of 0.255 from period 1 is greater than 0.05, X1, X2, and X3 taken together do not help to explain the variation in the dependent variable. However, the *Significance F* of the second period of 0.05 suggests that there is a statistical relationship between the variables and the December futures market. These two points make sense from the economic point of view. The 1985 Farm Bill opened the U.S. market to global competition. Cotton prices on the U.S. market became dependent not only on the domestic supply/demand factors, as it was before the 1985 Farm Bill, but on global factors as well.

Final Model. The last part of the objective of this study is to possibly improve the efficiency of strategy 4 which was so successful before the 1985 Farm Bill. Since the study already concluded that this Farm Bill brought in a new set of variables, the final model is constructed of the time period after the 1985 Farm Bill. The previous statistics showed that the dependent variable in the after-the-1985 Farm Bill period was most affected by the USA S/U, ROW S/U, and "July 1 - July 15." The ROW S/U was split by the countries again. Various regressions were run for the second time to examine the variables in all the combinations. The best fit in predicting *Y* was produced by the model containing the China S/U, World S/U, and "July 1 - July 15" futures price independent variables. These three variables are the ones that composed the final model. The final model with and its results follow below.

$$Y = f(X1, X2, X3)$$

where,
Y = Slope of December futures prices between July 15 and December 1,

X1 = China S/U ratio,
X2 = World S/U ratio,
X3 = price change in December futures between July 1 - July 15.

Summary of Regression Output for the Final Model

Regression Statistics	
Multiple R	0.9105
R Square	0.8291
Adjusted R Square	**0.7436**
Standard Error	0.0428
Observations	10

ANOVA Table for the Final Model

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.0534	0.0178	9.7022	**0.0102**
Residual	6	0.0110	0.0018		
Total	9	0.0645			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.6514	0.1521	4.2821	0.0052
Variable X1	0.2944	0.0946	3.1127	**0.0208**
Variable X2	-2.5744	0.5616	-4.5841	**0.0038**
Variable X3	-0.0189	0.0061	-3.1050	**0.0210**

Since the *Significance F* of 0.01 is less than the selected confidence level of 0.05, the predictor variables X1, X2, and X3 together help to explain variation in *Y*. *R-square* equal to 0.829 states that almost 83 percent of the variation in *Y* can be explained by X's in a linear relationship that exists between X's and *Y*. Moreover, all is needed to know is not the numerical slope, but whether it is going to be positive or negative to be able to say, if the price trend between July 15 and December 1 will be inclining or declining. The function for the tested model is:

$$\alpha + \beta X1 + \gamma X2 + \psi X3$$

From the regression output:

$$\hat{Y} = 0.6514 + 0.2944\ X1 - 2.5745\ X2 - 0.0189\ X3 \qquad (2)$$

where,
$\hat{Y}$ = Predicted *Y;*
X1 = China S/U ratio,
X2 = World S/U ratio,
X3 = prices of July 15 minus July 1 for December futures.

Function (2) permits a modification of strategy 4 for predicting the price trend between July 15 and December 1. The predicted number produced by $\hat{Y}$ should be treated as either a negative or positive slope since all is needed is to know whether the price trend will move up or down. The table below demonstrates the success rate for the newly constructed strategy. Note, that Strategy 4 is considered a success if it recognizes whether the slope will be negative or positive.

Strategy 4, Modified

To be able to use this strategy one needs to know the cotton December futures price quotes on July 1 and July 15, world supply-to-use ratio, and China supply-to-use ratio for a given year. This data is available from the International Cotton Advisory Committee reports and other publications. Plug in this data in the following function:

$$\hat{Y} = 0.6514 + 0.2944\ X1 - 2.5745\ X2 - 0.0189\ X3 \qquad (2)$$

where,
$\hat{Y}$ = expected slope of prie trend for December futures from July 15 till December;
X1 = China S/U ratio,
X2 = World S/U ratio,
X3 = price of July 15 minus July 1 for December futures contracts.

The recommended cotton pricing pricing from this analysis is as follows: If $\hat{Y}$ turns out to be positive, then delay any pricing decision; the price will go up. Conversely, if $\hat{Y}$ turns out to be negative, then forward price a portion of your crop because cotton prices are expected to decline between July 15 and December.

Summary and Conclusions

Cotton producers are price takers and face the risk of unfavorable price movements. Futures market theories offer strategies to manage and reduce price risk and reduce the variability of income. Four selected price risk management strategies are described and evaluated in this paper. Three of the selected strategies are futures and options of futures trading scenarios or alternatives that were evaluated for the 1987 to 1996 time period. Each of these three strategies yielded an average annual return over the 10-year analysis period of 2.99, 3.08, and 2.51 cents/lb for Strategy 1, 2, and 3; respectively.

The results of the regression models from Strategy 4 showed the factors that influenced December futures contract prices for cotton in the U.S. domestic market. Before the 1985 Farm Bill, the U.S. cotton December futures market was affected only by the domestic supply and demand factors, with the international variables having no significant influence. However, after the 1985 Farm Bill, the world supply and demand variables had major impact over the U.S. cotton market.

The statistical models run in the study demonstrated how to modify Strategy 4. The modified Strategy 4 showed success in all ten years studied, from 1987 to 1996. To be able to use this strategy one needs to know the cotton December futures quotations on July 1 and July 15, world supply-to-use ratio, USA supply-to-use ratio, and China supply-to-use ratio for a given year. Supply-to-use data are available from the International Cotton Advisory Committee reports and other publications.

References

Cleveland, O.A. "Cotton Market Information from Du Pont," Farm Journal Custom Publishing. Vol. 4, No. 4. June 1994.

Cleveland, O.A., and Earl Stennis. Cotton Marketing and the Cotton Grower. Research Report #122, Mississippi Agricultural and Forestry Experiment Station, Mississippi State University, July 1981.

Couvillion, C. Warren and Dewitt Caillavet. "Economics and Marketing: Mississippi Rice." Dept. of Agricultural Economics, Mississippi State University, January 1996.

Berck, P. "Portfolio Theory and the Demand for Futures: The Case of California Cotton," American Journal of Agricultural Economics. 63, 1981: 466-474.

Hauser, Robert and James S. Eales. "Option Hedging Strategies," North Central Journal of Agricultural Economics. Vol. 53, No. 1, 1971: 53-62.

Herndon, C.W. "Vertical Integration by Regional Milk Cooperatives in the Southwest: Potentials and Problems," Dept. of Agricultural Economics, Oklahoma State University, July 1984.

International Cotton Advisory Committee, Cotton Supply and Use Data by Countries, http://www.icac.org/icac/cottoninfo/supplyuse/supplyuse.html.

Querin, S. F., and W. G. Tomek. "Hedging Strategies Utilizing Technical Analysis: An Application to Corn in Western New York," Dept. of Agricultural Economics, Cornell University, February 1983.

Wood, Wendell. "Frequency and Duration of Profitable Hedging Margins for Texas Cotton Producers," Journal of Futures Markets, December 1989: 519-528.

Table 1. Gain/Loss Estimates for Strategy 1. New York Cotton Exchange Cotton FuturesPrices, 1987 - 1996.

		cents/lb										
	3rd Week of June:	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
S	Mon.	72.93	64.04	69.32	73.75	75.44	64.48	58.17	76.85	80.94	76.87	
E	Tues.	70.99	64.61	68.99	73.23	74.00	63.35	58.05	76.22	81.40	75.91	
L	Wed.	69.60	66.57	70.92	73.67	74.04	63.93	57.45	76.73	82.40	75.87	
L	Thurs.	71.27	64.95	70.78	73.84	75.64	64.20	57.37	76.90	81.99	76.25	
	Fri.	71.13	65.92	69.80	73.59	74.42	64.15	57.32	76.57	81.68	75.88	
	Week's Avg.	71.18	65.22	69.96	73.62	74.71	64.02	57.67	76.65	81.68	76.16	
	1st Week of October:											
	Mon.	71.04	52.81	75.13	71.58	65.52	52.20	58.24	66.94	89.68	76.16	
B	Tues.	70.66	53.13	74.97	72.35	65.01	53.20	58.54	66.47	90.56	77.75	
U	Wed.	70.98	51.93	74.70	72.03	66.71	53.53	58.80	67.08	91.72	76.79	
Y	Thurs.	70.85	52.47	74.62	71.94	65.64	53.26	58.68	67.38	88.72	76.73	
	Fri.	69.91	52.76	75.15	72.80		51.95	59.85	67.45	85.90		
	Week's Avg.	70.69	52.62	74.91	72.14	65.72	52.83	58.82	67.06	89.32	76.86	
	Profit/ Loss, cents/lb	0.50	12.60	-4.95	1.48	8.99	11.19	-1.15	9.59	-7.63	-0.70	2.99

Table 2. Gain/Loss Estimates for Strategy 2, New York Cotton Exchange Cotton Futures Prices, 1987 - 1996.

		cents/lb										
	3rd Week of June:	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
B	Monday			2.29		3.40	3.10		3.24	5.16	3.74	
U	Tuesday			1.80		3.50	3.20	2.55	3.41	5.40	3.68	
Y	Wednesday	3.55		2.04	3.10	3.65	2.85	2.20	3.09	5.14	3.14	
	Thursday		2.75	2.00	3.15	3.35	3.20	2.13	3.01	5.00	3.55	
	Friday	3.60		2.15	3.05	3.80	3.20	2.13	3.06	5.45	3.30	
	Week's Average	3.58	2.75	2.06	3.10	3.54	3.11	2.25	3.16	5.23	3.48	
	1st Week of September:											
S	Monday	0.01	12.95	0.01	4.41	14.00	8.55	3.88	8.05	4.40	2.56	
E	Tuesday	0.01	12.06	0.01	4.04	15.00	8.10	2.31	7.35	7.40	2.70	
L	Wednesday	0.01		0.01	4.53		7.52	2.70	5.37	9.65	3.58	
L	Thursday	0.01					7.60	2.30	5.73	8.34	4.07	
	Friday						8.62		6.03	9.07	4.27	
	Week's Average	0.01	12.51	0.01	4.33	14.50	8.08	2.80	6.51	7.77	3.44	
	Profit/Loss, cents/lb	-3.57	9.76	-2.05	1.23	10.96	4.97	0.55	3.34	2.54	-0.05	3.08

Table 3. Gain/Loss Estimates for Strategy 3, New York Cotton Exchange Cotton Futures Prices, 1987-1996

		cents/lb										
	1st Week of February:	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Avg.
B	Mon.	56.88	62.85	60.65	68.88	79.75	55.10	60.03	76.92	89.68	86.38	
U	Tues.	56.41	62.72	59.67	67.90	81.55	56.55	60.44	75.38	91.68	84.78	
Y	Wed	56.35	62.18	59.38	68.22	81.80	56.29	60.68	76.65	89.89	85.26	
	Thurs.	55.25	63.10		68.50	80.95	55.99	62.40	77.55		86.21	
	Fri.	53.90	63.30		68.15	82.38	56.43	62.12			86.10	
	Week's Average	55.76	62.83	59.90	68.33	81.29	56.07	61.13	76.63	90.42	85.75	
	1st Week of March:											
S	Mon.	56.93	63.47	61.29	71.61	84.12	55.35	64.65	75.97	109.51	84.64	
E	Tues.	56.59	63.36	61.17	70.61	82.17	54.94	63.55	76.77	109.36	83.90	
L	Wed.	56.20	63.95	61.28	70.02	82.36	55.85	61.60	76.93	109.09	85.65	
L	Thurs.	56.50	63.47	61.54	69.96	83.43	56.64	61.38	76.17	109.00	84.25	
	Fri.	57.57	63.03	61.97	70.69	81.43	56.63	62.10	75.76	107.00	84.69	
	Week's Average	56.76	63.46	61.45	70.58	82.70	55.88	62.66	76.32	108.79	84.63	
	Profit/Loss, cents/lb	1.00	0.63	1.55	2.25	1.42	-0.19	1.52	-0.31	18.38	-1.12	2.51

Table 4. Success/Fail for Strategy 4, Before Modification, 1980-1996.

Year	Success	Year	Success
		1987	No
		1988	Yes
		1989	No
1980	Yes	1990	Yes
1981	Yes	1991	Yes
1982	Yes	1992	No
1983	Yes	1993	Yes
1984	Yes	1994	Yes
1985	Yes	1995	No
1986	Farm Bill	1996	No

Table 5. Variables for model 2 (consists of two periods).

Year	X1	X2	X3	Y
1980	0.226	0.030	6.8	0.07
1981	0.561	-0.309	-0.2	-0.15
1982	0.740	-0.444	0.34	-0.1
1983	0.218	0.078	-1.28	-0.02
1984	0.349	-0.088	-3.04	-0.03
1985	1.118	0.661	0.31	0.01
1986		Farm Bill		
1987	0.406	-0.082	3.00	-0.13
1988	0.509	-0.207	-4.11	0.02
1989	0.182	0.079	2.85	-0.05
1990	0.142	0.146	-0.35	0.03
1991	0.228	0.149	-1.78	-0.13
1992	0.302	0.056	0.335	-0.07
1993	0.204	0.084	3.13	-0.01
1994	0.129	0.177	-0.74	0.04
1995	0.166	0.153	-3.09	0.15
1996	0.207	0.136	-0.01	-0.01

Source: http://www.icac.org/icac/cottoninfo/supplyuse/supplyuse.html

Table 6. Variables Used in Estimating the Final Model.

Years	X1	X2	X3	Y
1987	0.287	0.324	3.00	-0.13
1988	0.239	0.303	-4.11	0.02
1989	0.228	0.261	2.85	-0.05
1990	0.350	0.288	-0.35	0.03
1991	0.731	0.377	-1.78	-0.13
1992	0.626	0.357	0.30	-0.07
1993	0.447	0.289	3.13	-0.01
1994	0.678	0.305	-0.74	0.04
1995	0.725	0.319	-3.09	0.15
1996	0.690	0.342	-0.01	-0.01

Source: http://www.icac.org/icac/cottoninfo/supplyuse/supplyuse.html

Table 7. Success/Fail Distribution for Strategy 4, 1987-1996.

Years	Actual Slope	Predicted Slope	Success
1987	- 0.13	- 0.15	Yes
1988	0.02	0.02	Yes
1989	- 0.05	- 0.01	Yes
1990	0.03	0.02	Yes
1991	- 0.13	- 0.07	Yes
1992	- 0.07	- 0.09	Yes
1993	- 0.01	- 0.02	Yes
1994	0.04	0.08	Yes
1995	0.15	0.10	Yes
1996	- 0.01	- 0.03	Yes

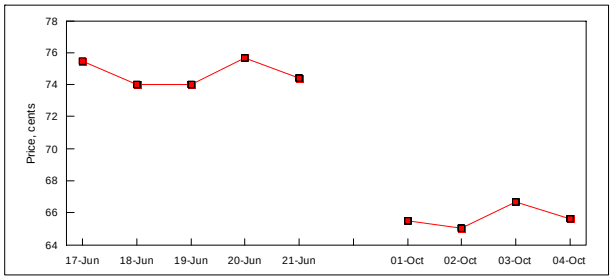

Figure 1. December Cotton Futures Prices; Third Week of June and Third Week of October, 1991.

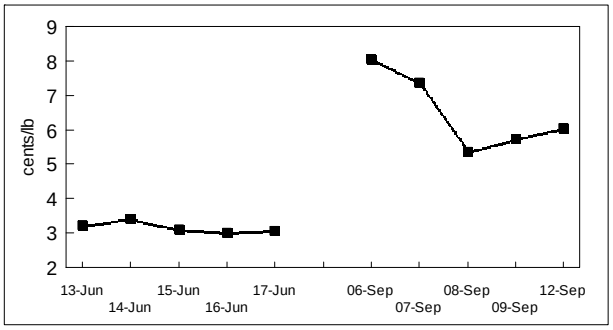

Figure 2. At-the-money Put Options Premiums on October Cotton Futures Contract; Third Week of June and First Week of September, 1994.

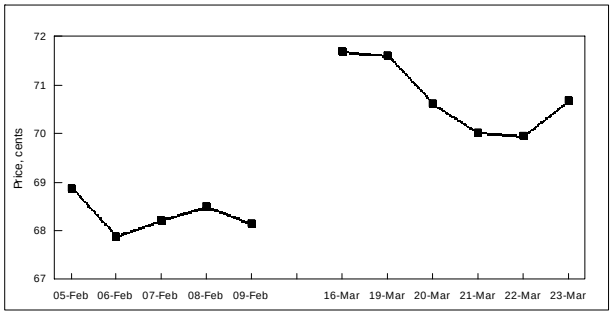

Figure 3. May Cotton Futures Contract Prices, First Week of February and Third Week of March, 1990

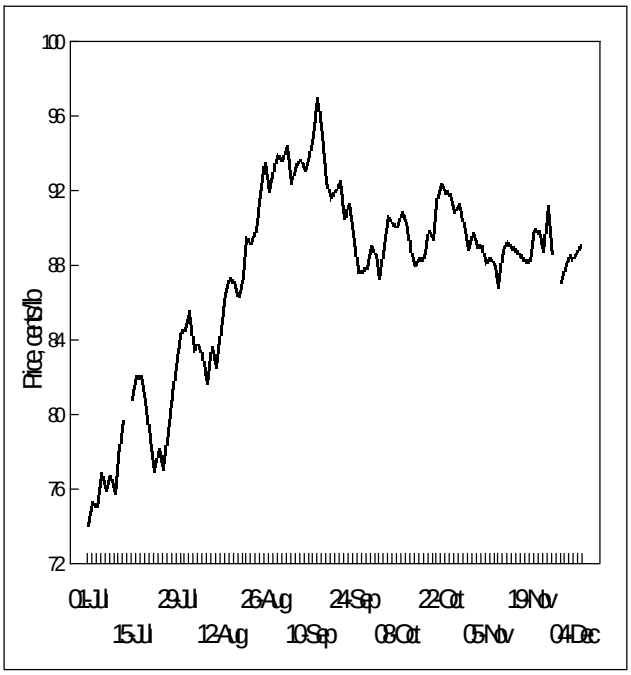

Figure 4. December Cotton Futures Prices, July - December, 1990.

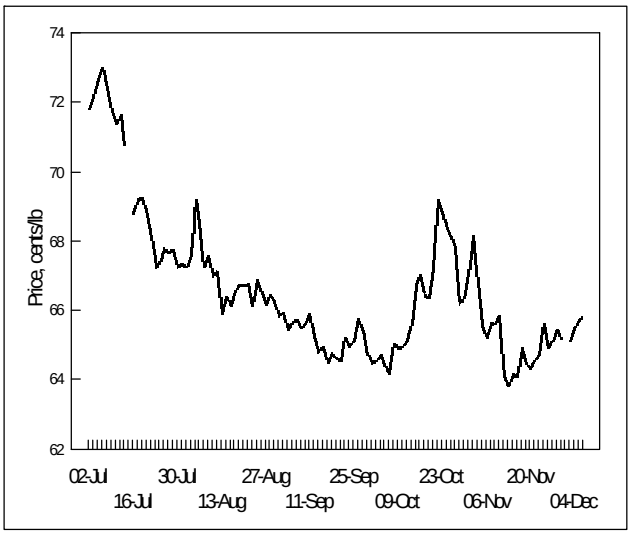

Figure 5. December Cotton Futures Prices, July - December, 1984.