# OPTIMAL TIMING FOR PLACING AND LIFTING COTTON FUTURES MARKET HEDGES

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## Abstract

A persisting question in using the cotton futures market to hedge price risk is that of determining the optimal time to place and lift hedges. The objective of this research was to determine the optimal time for cotton producers to hedge their price risk and lift that hedge using the cotton futures market. Results of this study indicated that placing cotton futures market hedges between June 11 and June 20 with a $0.015 stop order increased net returns by $0.0379 per pound over the study period.

## Introduction

Cotton producers are faced with a changing market environment, making risk management a key consideration to financial survival. One way in which producers can manage price risk is through the use of futures contracts. Hedging price risk using the futures market involves taking an equal and opposite position in the futures and cash markets. If futures and cash prices decrease while a hedge is in place, profits from the futures market offset lower cash prices. Conversely, if prices increase, losses in the futures market are offset by the improved cash price.

Once the concept of how the futures market can be used to hedge price risks is understood, the question turns to the optimal time to enter and exit the market. A timely placed hedge can add significantly to the price producers receive for their cotton, but a poorly timed hedge can result in financial losses until producers sell their cotton. Previous research on using the cotton futures market and optimal timing of placing hedges has found that producers can take advantage of price volatility to add to the selling price of their cotton. Specifically, Johnson and Bennett (2000) found that cotton producers can use moving averages to identify changing cotton futures market trends and select entry and exit points for hedges. This study found that cotton producers could add on average an additional $0.02 per pound to the final price they receive for cotton by making trades throughout the year based on moving averages. Likewise, Elam (2000) found that the cotton futures market tended to revert back to a long-run average price. This study suggested that cotton producers could base hedging decisions on whether or not the current futures price is above or below the long-run average.

However cotton producers are faced with constraints on their time for watching and analyzing the futures market. Furthermore, performing some types of analysis may require large amounts of data and equipment that may not be readily available to some producers. If this is the case, the prescriptions provided by Johnson and Bennett (2000) may not hold for producers only wishing to make one trade during the year. Therefore, an understandable set of guidelines determining the optimal time to place and lift one hedge during the year is required. The objective of this research was to determine the optimal time for cotton producers to hedge their price risk and lift that hedge using the cotton futures market.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:230-233 (2001)
National Cotton Council, Memphis TN

## Methods and Procedures

For the purposes of this research, it was assumed that producers would enter and exit the futures market only once during the life of each contract. Furthermore, it is recognized that the December cotton futures contract generally expires during the first ten days of December. However due to price irregularities associated with the last few days of trading a contract before it expires, it was assumed that producers would lift futures market hedges during the latter part of November.

### Study Data

Historical daily December cotton futures closing prices from 1980 through 1999 were analyzed for this study from the beginning of each contract through its expiration (about 18 months). Due to differences in trading dates (due to weekends and holidays) and in the total number of trading days for each individual contract, a standardized method was developed so comparisons could be made for like time periods across years. This standardized method involved the division of each of the 18 months for each contract into three time classifications (first through the tenth, eleventh through the twentieth, and the twenty-first through the end of the month). The daily cotton futures closing prices were then averaged for each time period, providing fifty-four time periods for each contract.

### Hedging

Each contract's average closing prices associated with each time period was analyzed in relation to the corresponding average price associated with the last ten days of November. This yielded all potential revenues that could have been generated through the placing and later lifting of a cotton futures market hedge for each time period and contract. The resulting potential revenues for each contract were then averaged, and the optimal time for producers to place and lift cotton futures market hedges was determined by evaluating the twenty year average and selecting that time period which provided the highest returns.

### Hedging with a Stop Order

When producers hedge their cotton through the use of a futures contract, they alleviate their downside price risk. However any upside price movement is also lost do to the nature of their position in the futures market. In other words, producers who place a hedge are protected against decreasing prices but are not allowed to participate in increasing price movements unless the placed hedge is lifted. The use of a stop order was evaluated to provide protection against a market that increased after a cotton hedge was placed. Given the optimal date to place a hedge as described above, the potential change in revenues generated from futures hedges were evaluated at various levels of stop orders. Specifically, this study considered the use of stop orders that ranged between $0.005/lb to $0.20/lb on $0.005/lb intervals. Resulting revenues generated through the use of the various stop orders were then evaluated to determine the optimal level of stop order. Revenue generated from the optimal level of stop order was then compared to placing cotton futures market hedges without a stop order.

### Effects on Net Price Received

Returns from both optimal trading strategies (with and without the use of a stop order) were added to the average price received by Texas producers for cotton (Texas Agricultural Statistics Service 1990, 1992, 1997, and 1999). The mean price received for cotton without hedging (average price received by Texas producers for cotton) was then compared to the mean net prices received for cotton using the optimal time to place cotton hedges with and without stop orders using a paired t-test. Since a larger variance could suggest a greater amount of risk associated with a given strategy, the variances of the two strategies were also compared with the variance of the average price received by Texas producers for cotton to determine if they were statistically different.

## Results

The results of this study are presented below in three different sections. The first section presents the results of the optimal time to place a cotton hedge (selling futures contracts) and lifting that hedge between November 21 and November 30 without the use of a stop order. The second section presents the results of placing and lifting a cotton hedge between the same two dates as the first section but including the use of a stop order. The final section presents the results associated with the effects of both hedging strategies on the net price received by Texas producers.

### Hedging without a Stop Order

Results of the study suggested that producers could increase their net price (cash price plus gain/loss from hedging) from the use of cotton futures market hedging. Specifically, results suggested that a cotton futures market hedge (sold cotton futures) placed between June 11 and June 20 corresponding with the year of contract expiration and lifted at harvest (between November 21 and November 30) increased the net price received by $0.0308 per pound on average (Table 1). It was also found that this strategy provided positive returns fifteen of the twenty years included in the study with the most made in a single year being $0.1730 per pound and the most lost in a single year being $0.1626 per pound.

The results can also be interpreted that on average the cotton futures market price decreased by $0.0308 between the study time periods of June 11 and June 20 through November 21 and November 30. The largest futures price decrease associated with these two study time periods for a single year was found to be $0.1730 per pound, and the largest price increase for a single year was $0.1626 per pound.

### Hedging with a Stop Order

As mentioned earlier, a stop order can be used to provide price protection while still allowing producers to participate in positive price movements. This study found that when a cotton futures hedge is placed between June 11 and June 20 corresponding to the year of contract expiration and lifted five months later at harvest, the optimal level of stop order to use was a $0.015 per pound. The average return from placing hedges during this time period with a $0.015 stop order was $0.0379 per pound. Hedges placed using this strategy provided positive returns thirteen of the twenty years included in the study with the most made in a single year being $0.1730 per pound and the most lost in a single year being $0.0517 per pound.

### Comparing the Two Strategies

When comparing the results of the use of a stop order with those found above from simply hedging, it was found that the use of a stop order provided higher average returns (Table 1). Specifically, hedges placed between June 11 and June 20 with a $0.015 per pound stop order had an average return of $0.0379 per pound versus the $0.0308 per pound average return from hedges placed without a stop order during the same time period. This represents a $0.0071 per pound or about a 23 percent increase. The highest single year's positive return with the use of a stop order was the same as hedging without a stop order, but the lowest single year's negative return with a stop order was $0.0517 per pound versus $0.1626 per pound from hedging without a stop order. Finally, it should be noted that hedging with a stop order provided thirteen years of positive returns while hedging without a stop order provided fifteen years of positive returns. This suggests that in two of the twenty years of the study the futures price increased by $0.015 per pound or more after the June 11 through June 20 time period when the hedge was placed with the stop order and then decreased below the futures price level where the hedge was placed.

Table 2 provides a comparison of the returns to hedging with and without the use of a stop order for each of the twenty years of the study. It should be noted that in the years where returns from hedging without a stop order were negative, returns from hedging with a stop order were less negative. This suggests that the use of a stop order allowed producers to participate in upward price movements. Only in 1989 and 1987 did hedging without a stop order provide higher returns than hedging with a stop order. In these two years the futures price increased by more than $0.015 per pound after the June 11 through June 20 time period when the hedge was placed but then decreased throughout the rest of the life of the contract. It is also important to note from Table 2 that, except for 1989 and 1987, hedging with the use of a stop order provided identical positive returns as those provided by hedging without the use of a stop order.

### Effects on Net Price Received

The effects of the two trading strategies on the average price received by Texas producers for cotton are presented in Table 3 along with the mean, variance, and standard deviations of the three price series. When the mean values of the three price series were evaluated using a paired t-test, results indicate that the means of both hedging with and without the use of a stop order are statistically different from the mean price received by Texas producers for cotton (Table 4). An F-test of the variances of the three price series suggest that the variances of the distributions of hedging with or without the use of a stop order are not statistically different from the variance of the average price received by producers for Texas cotton. This suggests that either hedging strategy can significantly increase the net price received for cotton, but does not increase or decrease the risk associated with hedging.

It is important to note that when the mean values and variances of the distributions of the two strategies (hedging with and without the use of a stop order) are evaluated, the means were found to be statistically different at the 0.15 level while the variances are not statistically different. This result suggests that producers could benefit on average from the use of a stop order when placing a hedge, however the risk has not been significantly decreased due to the use of a stop order.

## Summary and Conclusions

Cotton producers are faced with a changing market environment, making risk management a key consideration to financial survival. One way in which producers can manage price risk is through the use of futures and options contracts. However cotton producers are faced with constraints on their time for watching and analyzing the futures market, and performing some types of analysis requires large amounts of data and equipment that may not be readily available to some producers. Therefore, an understandable set of guidelines determining the optimal time to place and lift one hedge during the year is required. The objective of this research was to determine the optimal time for cotton producers to hedge their price risk and lift that hedge using the cotton futures market.

Results indicated that over the range of data, producers could benefit most from placing a cotton futures market hedge between June 11 and June 20 and lifting that hedge at harvest. This strategy was found to provide an additional $0.0308 per pound of cotton lint to net revenues. Furthermore, the use of a $0.015 per pound stop order used in conjunction with the hedge discussed above provided an additional $0.0379 per pound to net revenues.

When the gains/losses from the two hedging strategies were added to the average price received by Texas producers for cotton, it was found that the means of the two trading strategies were statistically different from the mean price received by producers. However, tests on the variances suggested that the variance of the two trading strategies did not differ statistically from the average price received by producers. These two findings suggest that, on average, net revenues were increased through the use of these two strategies while price risk was unaffected.

In conclusion , this study has developed two hedging strategies for cotton producers. It should be noted that the optimal time to place cotton hedges

varied when examined on a year by year basis. However over the range of data, it was found that placing a hedge between June 11 and June 20 and lifting that hedge between November 21 and November 30 provided the greatest returns on average. Furthermore, the use of a $0.015 per pound stop order further increased these average returns. Thus cotton producers may benefit from beginning to examine the potential hedging possibilities around the middle of June with about a $0.015 per pound stop order.

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Table 1. Results of hedging with and without a stop order.

| | Hedging without a Stop Order | Hedging with a $0.015/lb. Stop Order |
|---|---|---|
| Years of Positive Returns | 15 Years | 13 Years |
| Average 20 Year Return | $0.0308/lb | $0.0379/lb |
| Highest Positive Return | $0.1730/lb | $0.1730/lb |
| Lowest Negative Return | $0.1626/lb | $0.0517/lb |

Table 2. Returns from hedging with and without a stop order for each year of the study.

| | Return from Hedging ($/lb) | |
|---|---|---|
| Year | Hedging without a Stop Order | Hedging with a $0.015/lb. Stop Order |
| 1999 | 0.0645 | 0.0645 |
| 1998 | 0.1497 | 0.1497 |
| 1997 | 0.5100 | 0.5100 |
| 1996 | 0.2620 | 0.2620 |
| 1995 | - 0.0584 | - 0.0186 |
| 1994 | 0.0099 | 0.0099 |
| 1993 | - 0.0338 | - 0.0304 |
| 1992 | 0.0629 | 0.0629 |
| 1991 | 0.1730 | 0.1730 |
| 1990 | - 0.0287 | - 0.0159 |
| 1989 | 0.0079 | - 0.0176 |
| 1988 | 0.1063 | 0.1063 |
| 1987 | 0.0099 | - 0.0289 |
| 1986 | - 0.1626 | - 0.0517 |
| 1985 | 0.0047 | 0.0047 |
| 1984 | 0.0645 | 0.0645 |
| 1983 | 0.1497 | 0.1497 |
| 1982 | 0.0510 | 0.0510 |
| 1981 | 0.0262 | 0.0262 |
| 1980 | - 0.0584 | - 0.0186 |

Table 3. Average price received for Texas cotton and net price received from hedging with and without a stop order.

| Year | Average Price Received for Texas Cotton ($/lb) | Net Price Received from Hedging without a Stop Order ($/lb) | Net Price Received from Hedging with a $0.015/lb. Stop Order ($/lb) |
|---|---|---|---|
| 1999 | 0.414 | 0.479 | 0.479 |
| 1998 | 0.581 | 0.731 | 0.731 |
| 1997 | 0.601 | 0.652 | 0.652 |
| 1996 | 0.656 | 0.682 | 0.682 |
| 1995 | 0.746 | 0.688 | 0.727 |
| 1994 | 0.695 | 0.705 | 0.705 |
| 1993 | 0.535 | 0.501 | 0.505 |
| 1992 | 0.491 | 0.554 | 0.554 |
| 1991 | 0.536 | 0.709 | 0.709 |
| 1990 | 0.632 | 0.603 | 0.616 |
| 1989 | 0.590 | 0.598 | 0.572 |
| 1988 | 0.516 | 0.622 | 0.622 |
| 1987 | 0.596 | 0.606 | 0.567 |
| 1986 | 0.461 | 0.298 | 0.409 |
| 1985 | 0.516 | 0.521 | 0.521 |
| 1984 | 0.545 | 0.610 | 0.610 |
| 1983 | 0.596 | 0.746 | 0.746 |
| 1982 | 0.515 | 0.566 | 0.566 |
| 1981 | 0.481 | 0.507 | 0.507 |
| 1980 | 0.693 | 0.635 | 0.674 |
| Mean | 0.570 | 0.608 | 0.601 |
| Var. | 72.655 | 90.706 | 112.510 |
| St. Dev | 8.524 | 9.524 | 10.609 |

Table 4. Results of the paired t-tests and F-tests.

| | Hedging without a Stop Order & Average Price Received for Texas Cotton | Hedging with a $0.015/lb Stop Order & Average Price Received for Texas Cotton | Hedging without a Stop Order & Hedging with a $0.015/lb Stop Order |
|---|---|---|---|
| t-Statistic | - 1.7213 | - 2.5799 | 1.0713 |
| (P value) | (0.0507) | (0.0092) | (0.1487) |
| F-Statistic | 1.2484 | 1.5490 | 1.2407 |