USING MOVING AVERAGES AS A COTTON PRICING TOOL

J. L. Johnson and B. K. Bennett
Texas Agricultural Extension Service, Texas A&M University
College Station, TX

Abstract

Moving averages are one of the oldest and most popular technical indicators for identifying price trends and momentum. The purpose of this analysis was to evaluate various decision criteria for the entry and exit of short hedges to protect against downside price risk. Eight combinations of short and long term price momentum indicators were evaluated in conjunction with a series of four symmetrical penetration levels to generate specific hedging strategies for evaluation. These strategies were back tested on data from the December cotton futures contract from 1990 through 1999 beginning on February 1st of the production year through contract expiration. Results accounted for trading costs and identified two viable hedging strategies that added an annual average of over 2.0 cents per pound to the selling price of cotton during the study period.

Introduction

Cotton futures markets provide an opportunity for producers to manage price risk by hedging prices above those prevailing at harvest (Wood, et al, 1989). There are many technical analysis tools available to assist in the timing of entry and exit points for these hedges. One of the most popular and easily understood is the simple moving average (MA). The MA provides up-to-date indications of market activity by reflecting only the most recent inputs into the market. The MA is an average of successive numbers over a specified period, updated each trading day by dropping the oldest number, adding the newest number, totaling, and recalculating.

The motive for this analysis originated from cotton producers who regularly participate in a series of marketing club educational programs sponsored by the Texas Agricultural Extension Service. After reviewing the basic premises of MAs, the discussion turned to the monetary benefits available from incorporating MAs into a marketing plan designed to reduce downside price risk, identifying the most appropriate set of MAs to utilize, and evaluating various penetration levels for identifying entry and exit points. This purpose of this paper was to examine selected price momentum indicators and penetration values to examine their success in protecting cotton price levels in varying market environments.

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Discussion

Moving Averages (MAs)

The purpose of the MA is to smooth out daily price fluctuations to get a clear view of the prevailing market trends and their reversals. Calculations for a MA are simple and straightforward. For example, to obtain the 9-day MA for the December cotton contract, take the last nine daily price closes, add them up, then divide by nine. Each successive day in the series, the oldest price is dropped from the total and replaced by the most recent price. The total of these most recent nine daily closing prices is then averaged.

The MA can be computed using any number of days, weeks or months (Murphy, 1986). It is important to note that the MA lags behind the underlying daily prices, the lag of which is proportional to the period of the MA. As daily MAs are plotted and connected, a fluctuating trend line that follows the price line develops. Consequently, MAs with different time spans each tell a different story and a trade-off ensues . The shorter the time span, the more sensitive the MA will be to daily price changes. The longer the time period the greater the lag and the less sensitive will be the resulting price trend.

Another aspect of MAs that needs to be specified is the actual price of cotton to be included in constructing the MA. The most common price to use is the daily close. However, any desired price can be used for the calculation, such as the high, low, close, the average of the high and the low or any other combination.

MAs have been shown to be effective in protecting downside price risk during the production period as well as upside price risk after harvest (Hassler et al., 1991). MAs are not intended as a panacea to outmaneuver the market, but as a reference point for appropriate trading signals. By reducing the effect of cycles, seasonal variations and irregular movements, MAs are believed to provide the trader a better idea of the underlying supply and demand strength in the market. When two MAs are used, the shorter MA provides the actual trading signal while the longer one defines the trend. In general, a sell signal is given when the short term MA penetrates the longer term MA from above. On the contrary, a buy signal is given when the short term MA penetrates the longer term MA from below. If price drops sharply below the MA line a rebound toward the MA line may occur resulting in a whipsaw action. As a result, a shorter MA may signal a producer or trader to enter or exit the market sooner, but you run a greater risk of false signals. The longer time span reduces the chance of false signals, but the signal may come after a large part of the trend already has occurred (Pring,

1991). Therefore, testing and back testing of different MAs is required.

Hedging Strategies

The focus of this analysis was based on the use of price momentum indicators and MAs to protect solely against downside price risk during the final 10 months of the cotton contract life (February 1st through expiration). Specifically, the purpose was to evaluate the success of various price momentum decision criteria in determining appropriate entry and exit points for short hedges. Data for this analysis included the daily closing prices for the 1990 through 1999 December cotton futures contracts obtained from the New York Cotton Exchange (New York Cotton Exchange, 1990-1999). Various price momentum indicators were then calculated from this information. Active hedging strategies based on signals generated by the price momentum indicators were restricted to the period beginning February 1st of the production year and continuing through contract expiration. This constraint allowed for an adequate volume of trading activity for the contract as well as the coordination of the intended level of production and the amount of cotton to be protected from downside price risk.

Producers suggested a combination of, admittedly aggressive, price momentum indicators for the December cotton futures contract including the daily closing price (C), 3-day moving average (3D); 6-day moving average (6D); 9-day moving average (9D); and 18-day moving average (18D). Specifically, the eight combinations evaluated included: C against 3D; C against 6D; C against 9D; C against 18D; 3D against 6D; 3D against 9D; 3D against 18D; and 9D against 18D.

Improving returns from MA trading models can be accomplished by fine-tuning criteria for entry and exit points using various penetration parameters. Penetration levels are intended to filter unprofitable trades in an untrending market (Edwards and Magee, 1997). In order to confirm that a change in the price trend had indeed occurred, four symmetrical penetration levels were evaluated: 0.5, 1.0, 1.5, and 2.0 cents per pound. This constraint implied (for the 1.0 cent scenario) that the hedge would be placed once the shorter term price indicator crossed the longer term price indicator from above by at least 1.0 cent. Likewise, the signal to lift the hedge occurred when the shorter term price indicator crossed the longer term price indicator from below by at least 1.0 cent. Each of the eight combinations of price momentum indicators were evaluated for these four symmetrical penetration levels.

Results

The combination of eight price momentum indicators and four symmetrical penetration levels resulted in 32 hedging strategies for evaluation across the 1990-1999 December cotton futures contracts. Collectively, a total of 1,194 short hedges were systematically identified and evaluated based on the signals triggering hedges by individual trading strategies. The total number of trades resulting from each hedging strategy is reported in table 1. Not surprisingly, hedging strategies based on shorter time periods resulted in a greater number of trades. Likewise, the lower symmetrical penetration levels also increased trading activity. As both the selected time frame for the price momentum indicator and the penetration level become more passive, the number of confirmed trading signals declined. Thus, the selection of time period and penetration level can be useful for producers attempting to balance their intent to protect prices with their desired level of trading activity.

The percentage of successful (or profitable) trades is shown in table 2. The success rates for these hedging strategies ranged from 26 percent to 50 percent. The only exception was the 3D-6D combination with a 2.0 cent penetration value. However, this strategy only signaled one trading opportunity through the 10 year study period and can be dismissed from consideration as a viable risk management option. It should be noted that success rates can be misleading because they do not account for the extent of the resulting profits and losses resulting from individual trades. The collective consequences of the profits generated from successful hedges or losses resulting from false signals provides the true measure of the value of alternative trading strategies.

The cumulative results of the hedging strategies without trading costs are reported in table 3. It should be noted that each price momentum indicator did have at least one corresponding penetration level which resulted in a positive outcome from trading. Likewise, each penetration level corresponded to at least one price momentum indicator to produce additional profits. This result supports the hypothesis that there is not any absolute right or wrong time period for constructing a MA. But, it does highlight the need to couple the selected time period with an appropriate penetration level.

Incorporation of trading costs, or commissions, provided the final component required to evaluate the alternative hedging strategies. The cumulative results of each strategy including a $70 commission charge per hedge are shown in table 4. This provided a clearer picture of the success of each hedging strategy after trading activity (and transaction costs) was balanced against the hedging strategy outcomes. The most profitable strategy identified among those considered was the combination of a 3D-18D MA paired with a 1.5 cent penetration level. Interpretation of the resulting benefits of this strategy shows an addition of 23.00 cents per pound to the cotton selling price over the 10 year period. This equates to an average annual increase of 2.3 cents per pound over

sales at harvest. For a producer with yields equal to 250 and 500 pounds per acre, this strategy would have added revenues of $5.75 and $11.50 per acre, respectively. Other notable combinations included: 9D-8D with a 0.5 cent penetration value (adding 21.33 cents per pound); C-3D with a 1.5 cent penetration value (adding 16.72 cents per pound); and C-9D with a 2.0 cent penetration value (and 16.21 cents per pound).

Summary

Certain points are worth remembering when working with moving averages. There are no set number of days for moving averages that are considered the most reliable; personal preference guides the selection. Generally, the longer the time frame of the moving average, the lower the level of crossover penetration required to signal a trading opportunity. The moving average will never be 100 percent correct, and will nearly always be out of phase with the market in choppy, sideways markets where there is a great deal of price fluctuation. For this reason, confirmations of trend changes should be sought from alternative technical sources.

In this study, there did not appear to be a monetary incentive for using overly aggressive trading signals based on short term price momentum indicators and low penetration levels. This combination resulted in a high level of trading activity and incidences of false signals which proved too costly to justify. However, by utilizing any of the time periods evaluated and coupling them with an appropriate penetration level, positive monetary rewards resulted. In general, profitable combinations of the more aggressive price momentum indicators (shorter time periods) required a more passive penetration level. Similarly, the more passive price momentum indicators (longer time periods) required a more aggressive penetration level. This observation affirms the trade-off between false signals generated by shorter term price momentum indicators and the longer lags in identifying price trends inherent with longer term price momentum indicators.

The most profitable hedging strategy identified across the 1990-1999 December cotton futures contracts was the combination of a 3-day and 18-day moving average coupled with a 1.5 cent symmetrical penetration level. This strategy was shown to add an average of 2.3 cents per pound above the selling price received at harvest. It is very probable that more profitable combinations exist, which could be based on alternative time periods or penetration levels. Further, this study examined downside-only price risk protection, and did not allow for trading activity intended to capture additional upside price movements. Producers reap their rewards from upside price trends through their physical cotton production. Finally, past performance is not a guarantee of future success. However, the moving average did appear to serve as an easy-to-use indicator of market trends that could be used to assist producers with the timing of hedging decisions.

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Table 1. Number of trades generated by price momentum hedging strategies, December 90-99 cotton contracts, February 1st - contract expiration.

	Symmetrical Penetration Level (cents/lb.)			
	0.5	1.0	1.5	2.0
Price Indicators	number of trades (total over 10 yrs.)			
C - 3D	118	42	14	6
C - 6D	112	60	28	19
C - 9D	97	56	35	19
C - 18D	67	48	32	23
3D - 6D	63	22	8	1
3D - 9D	69	33	18	11
3D - 18D	53	33	21	17
9D - 18D	33	18	12	6

Table 2. Percentage of profitable trades generated by price momentum hedging strategies, December 90-99 cotton contracts, February 1st - contract expiration.

	Symmetrical Penetration Level (cents/lb.)			
	0.5	1.0	1.5	2.0
Price Indicators	profitable trading rate (percent)			
C - 3D	39.8	26.2	50.0	33.3
C - 6D	33.0	33.3	42.9	31.6
C - 9D	32.0	35.7	34.3	31.6
C - 18D	35.8	37.5	34.4	34.8
3D - 6D	34.9	36.4	50.0	0.0
3D - 9D	34.8	36.4	33.3	27.3
3D - 18D	37.7	39.4	47.6	35.3
9D - 18D	42.4	38.9	33.3	33.3

Table 3. Cumulative results of price momentum hedging strategies, December 90-99 cotton contracts, February 1st - contract expiration.

	Symmetrical Penetration Level (cents/lb.)			
	0.5	1.0	1.5	2.0
Price Indicators	effect on selling price (cents/lb. over 10 yrs.)			
C - 3D	0.65	- 8.44	18.68	-13.52
C - 6D	-10.65	-12.11	8.55	- 1.42
C - 9D	- 8.09	- 3.23	- 5.74	18.87
C - 18D	- 2.26	2.95	6.02	10.11
3D - 6D	- 6.88	- 0.57	1.39	- 3.82
3D - 9D	- 0.84	12.48	- 0.05	-10.13
3D - 18D	1.44	17.92	25.94	5.67
9D - 18D	25.95	9.06	- 1.59	-11.32

Table 4. Cumulative results of price momentum hedging strategies with trading commissions of $70 per hedge included, December 90-99 cotton contracts, February 1st - contract expiration.

	Symmetrical Penetration Level (cents/lb.)			
	0.5	1.0	1.5	2.0
Price Indicators	effect on selling price (cents/lb. over 10 yrs.)			
C - 3D	-15.87	-14.32	16.72	-14.36
C - 6D	-26.33	-20.51	4.63	- 4.08
C - 9D	-21.67	-11.07	-10.64	16.21
C - 18D	-11.64	- 3.77	1.54	6.89
3D - 6D	-15.70	- 3.65	0.27	- 3.96
3D - 9D	-10.50	7.86	- 2.57	-11.67
3D - 18D	- 5.98	13.30	23.00	3.29
9D - 18D	21.33	6.54	-3.27	-12.16