Forecasting Cotton prices in Warangal District – an empirical analysis

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Introduction

Forecasting prices of agricultural commodities is important from the farmer's point of view for making agriculture profitable. Domestic forecast of cotton prices in USA is expecting a slash of six per cent due to price support policies of the developing world especially India, according to a report from Texas Tech University's, Cotton Economics Research Institute (CERI) (Darren Hudson, 2009). A periodic review of the dynamics of various local, national and international factors and their inclusion into the models for forecasting prices of various crops would help farmers in choosing crop plans and consequently in realizing remunerative prices for their produce. Isengildina-Massa et al (2009) developed a model which forecasted changes in the U.S. upland cotton farm price based on changes in U.S. cotton supply, changes in U.S. stocks-to-use ratio (S/U), changes in China's net imports as a share of world consumption, selected farm policy parameters, and changes in the foreign supply of cotton. Cotton is one of the important commercial crops in India. India's importance could be realized by its influence on world cotton prices as discussed above.

Warangal district in Andhra Pradesh is an important district for cotton cultivation, having an area of 1.54 lakh hectares with production of 3.59 lakh tonnes in the year 2005-06 (www.apdes.gov.in). Cotton is occupying the second place among principal agricultural crops and the first place in commercial crops grown in the district. Cotton is occupying 24.7 per cent area of the total cropped area of the district. The crop has profound influence on farmers in economic terms. The farmers of the district had witnessed the cultivation of the conventional, later hybrid and the most recent, the advanced transgenic Bt hybrids over the years. The district like all other parts of the state had received erratic rains both in terms of quantity and distribution. Improper implementation of package of practices, erratic rains and cultivation in low fertile soils might hinder the desirable yields in the district. However, higher income could be realized through proper marketing strategies such as selling the produce at a time when there are higher prices in the market. For this purpose, analysis for finding out the prices

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of the produce in the future and consequently the most congenial time for marketing the produce are necessary. Hence a study has been under taken in the district to forecast cotton prices with the following objectives:

1. To study the price behavior of Cotton in Warangal district.
2. To forecast the price of Cotton for realization of remunerative price for the farming community.
3. To determine the accuracy of the prediction through validation of the forecasted data with the actual data.

Methodology

Day wise data pertaining to the Cotton prices were collected from the Agricultural Market Committee of Warangal which is one of the important markets for Cotton in Andhra Pradesh. Basic statistical tools, such as mean and standard deviation were used to arrive at the congenial time where stable and remunerative prices would exist for the crop in the district and other related issues. The week end averages were worked out for the period from 1988 to 2008. The analysis was carried out with the following assumptions.

1. The price variations would encompass the local, regional, national and international factors that affect the cotton prices.
2. The price variations over years were only due to the seasonal trends in the study area.
3. Cotton market would exhibit weekly trends in price variations.

The year wise, month wise and week wise data on prices was arranged in a frequency distribution table after necessary coding of the years. Centered moving averages were worked out and arranged week wise to eliminate the extreme values over the years so as to arrive at the modified mean for the particular week of a month over years. The de-seasonalised data thus obtained was forecasted using linear trend analysis and then the seasonal trends were taken into consideration (Levin and Rubin, 1998) to predict the week wise prices for the year 2009. The same was validated with the actual data to check for the accuracy of the methodology used for the forecast of Cotton prices in Warangal district of Andhra Pradesh.

Results and Discussion

Data on cotton prices for the last 21 years that was collected from the Enamamula market yard which is an important market yard for Warangal district, were analyzed and the results are discussed here under.

1. Marketing Decisions

From the farmer's point of view, price forecasting would be important in two aspects i.e what is the right time and what would be the rate at that time to sell the produce such that the farmers could realize remunerative price for their produce. For that purpose Standard deviation (Stability of the price) and Mean (to know the remunerativeness) of the week end averages were calculated for Cotton prices in Warangal district. The results are shown in Figure I wherein it can be concluded that August I and III weeks followed by July III and August IV week were the remunerative period for marketing cotton produce in the district. Cotton prices were more in the off season than the harvesting season i.e October to March. These results emphasize the importance of storage of the produce at farmer's level for realization of remunerative price for Cotton.

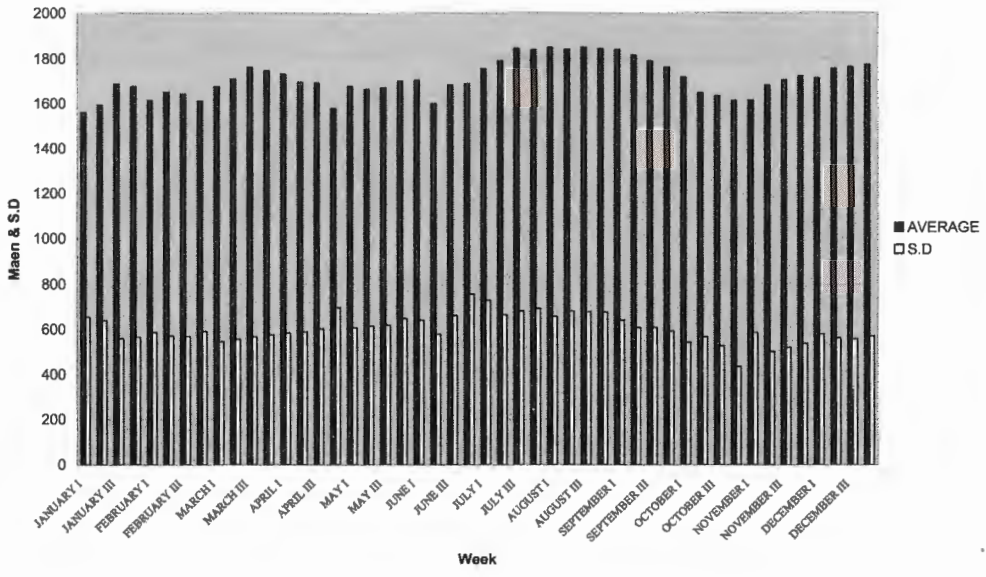


Figure 1. Week wise, monthwise Mean, Standard deviation of Cotton prices in Warangal district

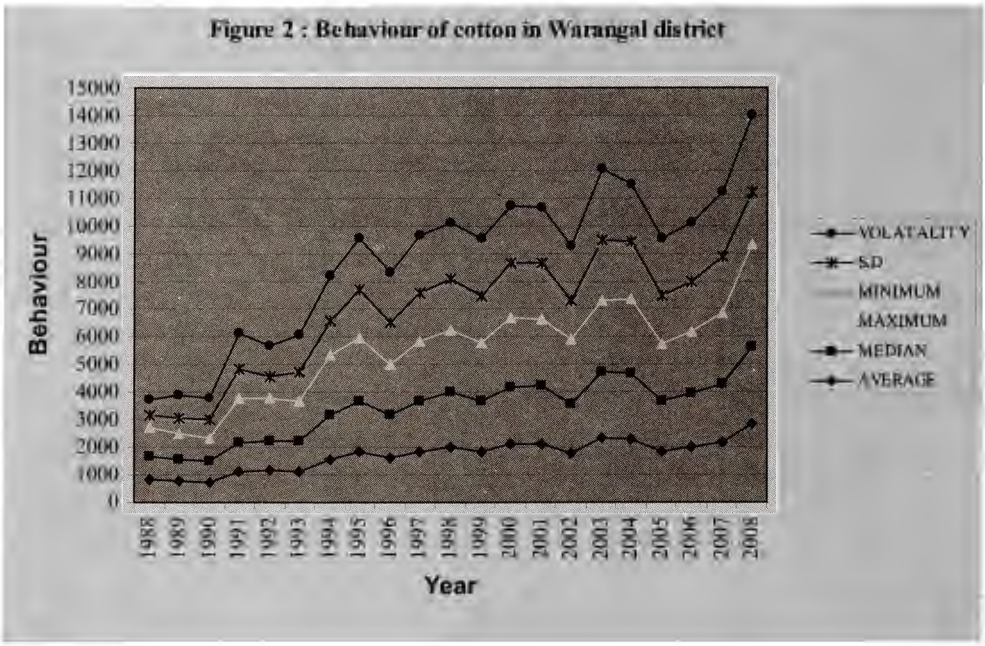
2. Price Behaviour

Averages, median, minimum, maximum, standard deviation, skewness, kurtosis and volatility were calculated to assess the behaviour of Cotton prices in Warangal district for the last twenty one years. The results are presented in table 1. A perusal of the table reveals that the average prices received by the farmers in Warangal district increased from Rs.813.40 in 1988 to Rs. 2848.38 in 2008. Minimum price received by farmers

Table 1. Characteristics of Cotton Prices in Warangal District

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Average	813.40	782.32	745.77	1124.65	1150.81	1123.54	1583.24	1865.28	1596.23	1838.21	1989.45
Median	832.75	791.00	745.00	1045.00	1106.25	1097.50	1606.25	1825.00	1570.00	1837.50	2005.50
Maximum	1100.00	908.50	862.50	1640.00	1512.50	1467.50	2170.00	2282.50	1875.00	2170.00	2230.00
Minimum	287.50	515.00	595.00	782.50	650.00	887.50	975.00	1575.00	1365.00	1650.00	1727.50
C.V%	18.44	10.04	8.90	21.85	15.38	14.53	16.60	8.78	9.00	6.16	6.95
Skewness	-0.84	-0.92	-0.10	0.30	-0.21	0.54	-0.58	0.99	0.18	0.64	0.02
Kurtosis	2.19	1.68	-0.85	-1.27	0.62	-0.78	0.79	0.75	-1.03	0.78	-1.18
Volatality	559.58	823.15	797.63	1304.46	1094.81	1321.95	1614.30	1821.74	1784.30	2046.74	2002.20
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	
Average	1839.53	2096.21	2120.07	1777.85	2356.99	2290.58	1833.76	1983.64	2156.61	2848.38	
Median	1845.00	2081.00	2125.00	1806.25	2362.50	2400.00	1825.00	1981.25	2150.00	2775.00	
Maximum	2090.00	2525.00	2415.00	2300.00	2562.50	2650.00	2100.00	2200.00	2537.50	3670.00	
Minimum	1537.50	1770.00	1750.00	1070.00	2090.00	1837.50	1637.50	1725.00	1850.00	1494.00	
C.V%	7.54	8.37	9.72	18.52	5.41	10.98	4.67	5.13	8.61	15.26	
Skewness	0.11	0.83	-0.19	-0.53	-0.15	-0.81	0.69	0.20	0.32	-0.05	
Kurtosis	-0.80	0.75	-1.11	-0.57	-1.11	-0.90	2.40	0.15	-0.89	0.98	
Volatality	2066.76	2072.18	2046.67	1976.76	2521.63	2047.14	2064.08	2096.70	2346.67	2796.55	

increased from 287.50 in 1988 to 2090.00 in 2003. Maximum price received by farmers increased from Rs. 862.50 in 1988 to Rs.3670.00 in 2003. Barring a few years across the study period, the prices of Cotton were exhibiting co-efficient of variation percentage (C.V %) of more than five per cent reflecting the price instability in Cotton prices of the district. This indicated the necessity of intensification of price stabilization measures by the agencies involved for ensuring remunerative prices by the Cotton farmers in Warangal district (Reddy et al, 2004). The C.V % ranged from 5.13 in 2006 to 18.44 in 1988.



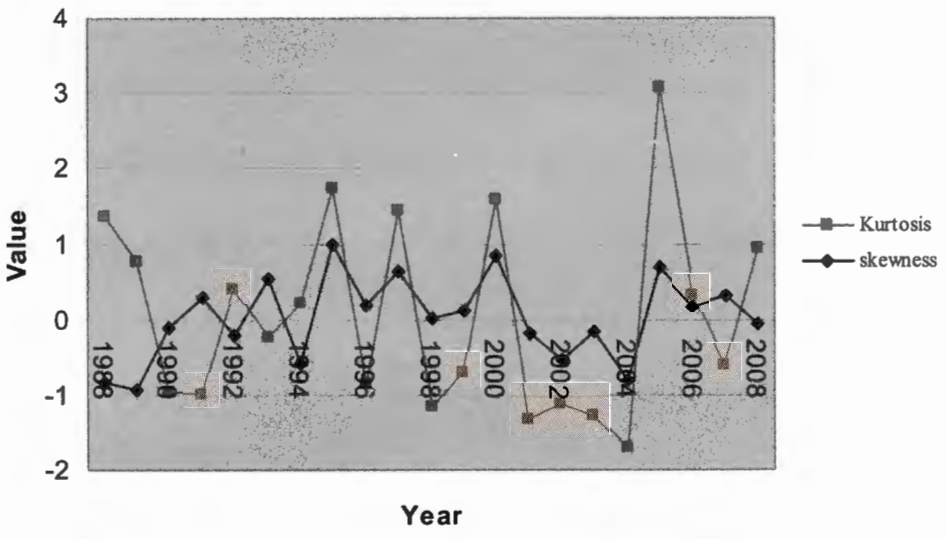
Note: S.D and Minimum prices are roving together in the figure

Year wise volatility in Cotton prices were worked out through the standard deviation of logarithmic values of mean monthly prices during the study period. The volatility values ranged from the 559.58 in 1988 to 2796.55 in 2008 as shown in Figure 2. The increasing trends of volatility of Cotton prices reemphasize the importance of intensification of price support mechanism in the study area so as to ensure reasonable income to the Cotton farmers in the district.

3. Symmetry and Cyclical Fluctuations

Year wise skewness and kurtosis values were calculated to know about the symmetry and cyclic fluctuations for the cotton prices over 21 years in Warangal district. The skewness values ranged from -0.92 to 0.99 indicating that the Cotton prices were almost symmetric over the study period. A perusal of Figure 3 reveals that the cyclical fluctuations in cotton prices are frequent and occurring almost annually.

Figure 3 : Symmetry and Cyclic fluctuations of Cotton prices in Warangal



4. Forecasting and Validation

The data on year wise and month wise week end average prices of Cotton for the past twenty one years in the study area were analyzed and the resultant de-seasonalised prices, weekly index and forecasted prices are presented in Table 2. De-seasonalised prices were showing increasing trend due to the positive regression co-efficient obtained in the trend analysis. The forecasted prices were maximum during June III week and minimum during July III week due to the inclusion of weekly indices in predicting them. Predicted de-seasonalised prices ranged from 2533.251 to 2611.845 where as

Table 2. Validation and Forecasting of Cotton Prices in Warangal District

Year	Month	Week	De-seasonalised prices	Weekly index	Forecasted prices	Actual prices	Variation (%)
2009	JANUARY	I	2528.15	1.01	2565.86	2940.00	-14.58
2009	JANUARY	II	2530.09	1.01	2546.26	2940.00	-15.46
2009	JANUARY	III	2532.20	1.00	2538.21	2940.00	-15.83
2009	JANUARY	IV	2534.37	1.00	2536.97	2940.00	-15.89
2009	FEBRUARY	I	2536.59	1.00	2534.17	2970.00	-17.20
2009	FEBRUARY	II	2538.87	1.00	2538.19	2940.00	-15.83
2009	FEBRUARY	III	2540.93	1.00	2552.62	2935.00	-14.98
2009	FEBRUARY	IV	2543.02	1.01	2572.78	2860.00	-11.16
2009	MARCH	I	2544.85	1.01	2577.38	2860.00	-10.97
2009	MARCH	II	2546.52	0.99	2523.38	2860.00	-13.34
2009	MARCH	III	2548.30	0.99	2522.74	2860.00	-13.37
2009	MARCH	IV	2549.98	0.99	2524.60	2860.00	-13.29
2009	APRIL	I	2551.63	1.01	2583.69	2725.00	-5.47
2009	APRIL	II	2553.24	1.01	2583.44	2725.00	-5.48
2009	APRIL	III	2554.77	1.00	2561.39	2464.00	3.80
2009	APRIL	IV	2556.11	1.00	2548.91	2716.00	-6.56
2009	MAY	I	2557.54	0.99	2540.97	2762.00	-8.70
2009	MAY	II	2559.08	0.99	2542.71	2875.00	-13.07
2009	MAY	III	2560.58	0.99	2542.02	2985.00	-17.43
2009	MAY	IV	2562.07	0.99	2541.18	2869.00	-12.90
2009	JUNE	I	2563.64	0.99	2539.26	2846.00	-12.08
2009	JUNE	II	2565.35	1.00	2563.96	2927.00	-14.16
2009	JUNE	III	2567.05	1.04	2668.12	2813.00	-5.43
2009	JUNE	IV	2568.48	1.01	2594.26	2823.00	-8.82
2009	JULY	I	2570.24	1.01	2593.37	2582.00	0.44
2009	JULY	II	2572.04	0.99	2553.07	2866.00	-12.26
2009	JULY	III	2573.81	0.98	2520.10	2638.00	-4.68
2009	JULY	IV	2575.68	0.98	2523.07	2830.00	-12.16
2009	AUGUST	I	2577.57	0.98	2530.94	2833.00	-11.93
2009	AUGUST	II	2579.29	0.98	2533.52	2655.00	-4.79
2009	AUGUST	III	2580.94	0.98	2533.48	2911.00	-14.90
2009	AUGUST	IV	2582.42	0.98	2533.38	2833.00	-11.83
2009	SEPTEMBER	I	2583.53	0.98	2537.80	2781.00	-9.58

2009	SEPTEMBER	II	2584.93	0.98	2545.46	2634.00	-3.48
2009	SEPTEMBER	III	2586.20	0.99	2555.84	2619.00	-2.47
2009	SEPTEMBER	IV	2587.33	0.99	2566.73	2650.00	-3.24
2009	OCTOBER	I	2588.42	1.00	2577.27	2738.00	-6.24
2009	OCTOBER	II	2589.59	1.00	2584.00	2731.00	-5.69
2009	OCTOBER	III	2590.10	1.00	2584.25		
2009	OCTOBER	IV	2591.64	1.00	2595.68		
2009	NOVEMBER	I	2593.31	1.01	2612.42		
2009	NOVEMBER	II	2594.94	1.01	2617.71		
2009	NOVEMBER	III	2596.65	1.01	2618.27		
2009	NOVEMBER	IV	2598.32	1.00	2606.82		
2009	DECEMBER	I	2599.95	1.00	2588.55		
2009	DECEMBER	II	2601.61	0.99	2588.00		
2009	DECEMBER	III	2603.23	1.00	2595.28		
2009	DECEMBER	IV	2604.78	1.00	2597.03		

predicted forecast prices ranged from 2526.10 to 2674.32. There was 7-14% variation between the forecasted and actual prices that were considered for validation of the methodology adopted. The forecasted prices were less than the actual prices that were prevailing in 2009 up to October II week.

Conclusion

- August I and III weeks followed by July III and August IV week are the remunerative periods for marketing cotton produce in the district.
- The instability in Cotton prices of the district during the study period indicated the necessity of intensification of price stabilization measures by the agencies involved for ensuring remunerative prices by the Cotton farmers in Warangal district.
- The increasing trends of volatility of Cotton prices re emphasize the importance of intensification of price support mechanism in the study area so as to ensure reasonable income to the Cotton farmers in the district.
- Although the Cotton prices tended to be symmetric over the period, they are exhibiting frequent fluctuations.
- The predicted forecast prices ranged from Rs.2526.10 to Rs.2674.32 for the year 2009.

Implications

There are various methodologies available for forecasting prices of various agricultural commodities based on the past price data. Validation of this type of forecast for its accuracy is needed before recommending the results to various stake holders. As far as the results are accurate, the same methodologies based on past price data could be continued. However, as the divergence between the forecast and the actual prices increases, analysis through forecasting models involving local, regional, international and other factors affecting the prices specific to the commodity (Cotton in this case) and their validation might be necessary.

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