Integrating Cotton Yield and Price Risk Into Cotton Price Outlook and Marketing Plan Development for Texas Growers

Final Report to Cotton Incorporated

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Project Summary

This project involved the use of computer tools to integrate price and yield risk into farm-level analysis. These computer tools and the visual aid graphics that they generate add value to Extension programs that address the within-year marketing, insurance and policy decisions farmers routinely face. In the past, most of the focus of these tools has been on multi-year impacts from investment or farm policy changes, e.g., A&M's Agriculture and Food Policy Center analyses of the impact of baseline/alternative policies on representative farms. There has been little or no focus on short-term price risk, e.g., within a cotton production/marketing year.

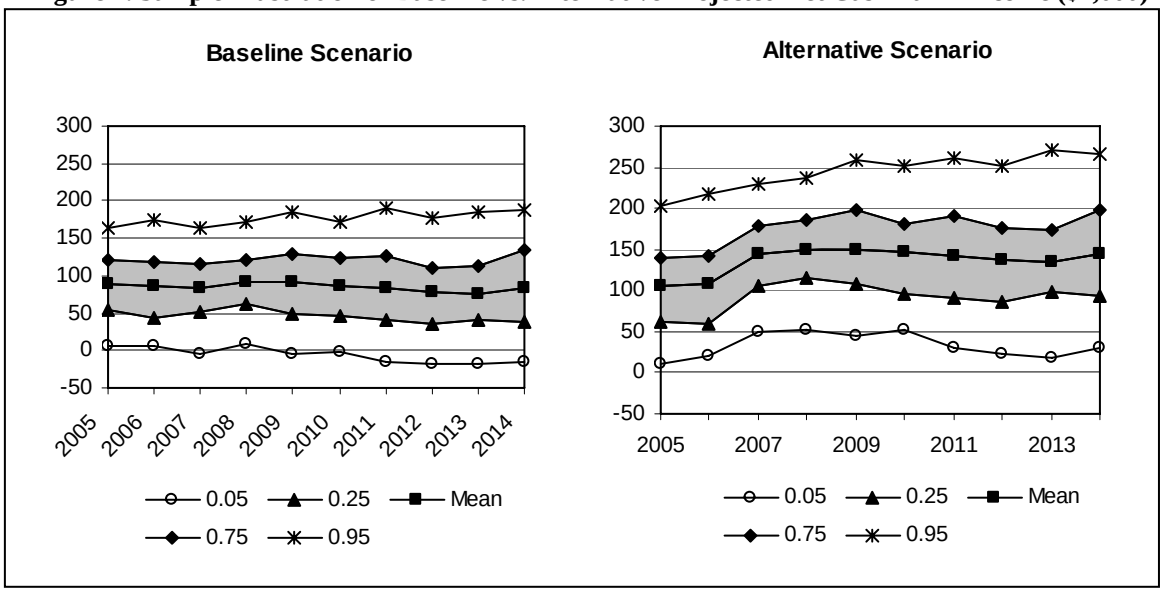
This project developed and refined methodologies for analyzing the actual risk of short-term (i.e., within a season) cotton price variability using historical prices. Yield variability can be incorporated using historical producer yield data series in major producing areas of Texas. Combining price and yield risk creates a more realistic approach to providing cotton market outlook information and to weighing the implications of management decisions on bottom-line risk. In this project we developed and have begun to deliver educational materials across Texas on cotton market outlook and cotton market plan development using visual aids and graphical results from integrated risk analyses. The results from this project should enhance educational programs on cotton risk management using helpful visual aid graphics to illustrate the impact of alternative marketing, insurance and policy decisions.

Introduction

Agricultural economists, like other university faculty, have an unfortunate tendency to segregate the world into their own little area of specialty. Even Extension economics programs are defined in terms of "Marketing", "Production Economics", "Policy", etc. Sometimes the term "Risk Management" is used, but that often simply is default discussion of crop insurance. Cotton producers are often left having to integrate all of these elements into their business plans by themselves.

Ongoing development of analytical tools by Texas A&M agricultural economists have created considerable potential for integrating price and yield risk into farm-level analysis. Most of the focus of these tools to date has been on multi-year impacts from investment or farm policy changes. An example of thfsis is the farm-level analysis produced by the FARM Assistance program for its grower clients[1]. This type of analysis generates both numerical and graphical projections that more readily communicate the long-term risk of grower decisions (typically long-term management strategies). An example of this type of visual aid is presented in Figure 1. This type of graph shows not only the projected average net cash farm income for two alternative strategies, but also the range of possibilities with an associated probability level. With this graphical presentation, a producer can quickly assess the 90% and 50% confidence intervals on the projected profit measure. More specifically, when the baseline projection is presented with an alternative projection, the differences in both average performance and risk are readily apparent.

Figure 1. Sample Illustration of Baseline vs. Alternative Projected Net Cash Farm Income ($1,000)



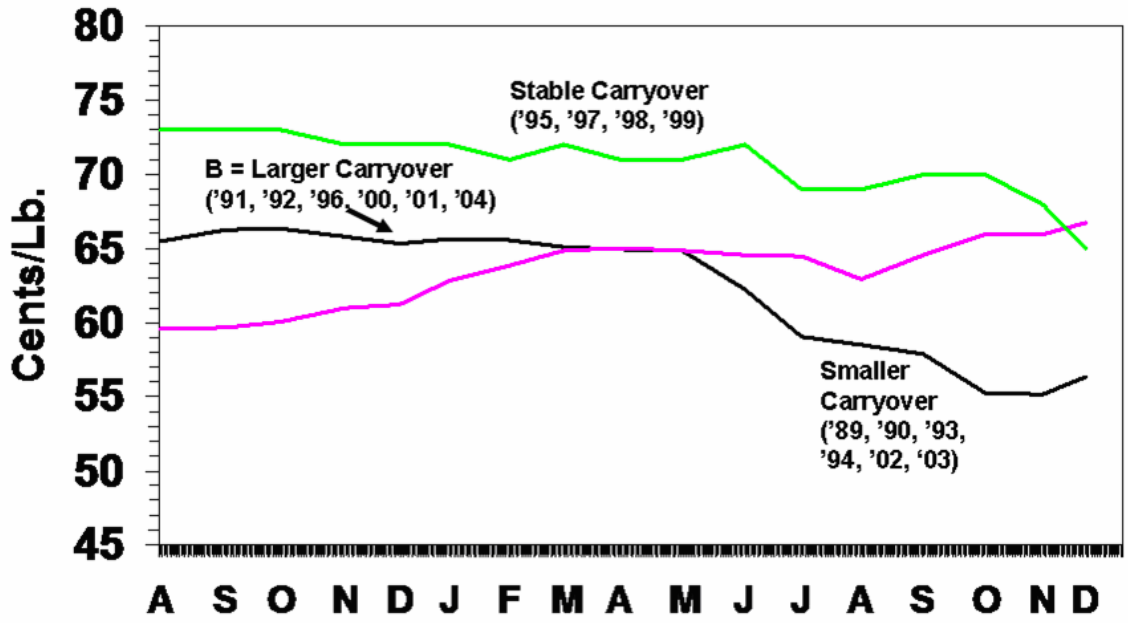
The type of presentation above is entirely appropriate, if not necessary, for discussions about marketing and insurance questions since these decisions are also

[1] See Klose, S. L and Outlaw, J. L. 2005. Financial And Risk Management (FARM) Assistance: Decision Support for Agriculture. *J. of Agricultural and Applied Economics.* Vol. 37 (forthcoming).

inherently associated with risky outcomes. This type of visual comparison can greatly aid growers to assessing both the profit and risk implications of alternative combinations of hedging, crop insurance, revenue insurance, and/or farm programs.

Another example where intra-seasonal risk information would be useful is in market outlook presentations. Extension economists and others regularly give presentations on price outlook. While there is some information on seasonality that is published by private sources, there has been little or no public analysis of cotton price seasonality. Further, even the private seasonality information does not include any assessment of risk, i.e., what is the likelihood that prices in a given season will fall within a certain range? Lastly, does the average seasonal price pattern (and the associated variability) change when different types of price patterns are averaged versus treating all prices in an annual series as equally likely? The latter situation is illustrated in Figure 2, which indicates different average seasonal price patterns depending on whether the marketing year was classified as stocks increasing, stable carryover, or stocks decreasing.

Figure 2. Average Seasonal Price Patterns for December Futures Contracts, By Carryover Type.

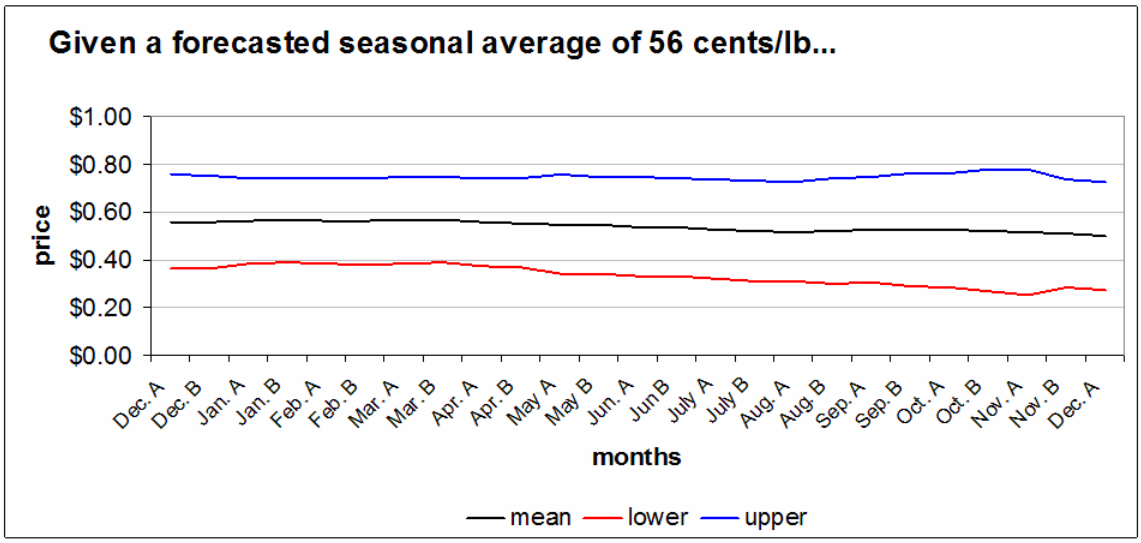


The purpose of this project was to develop a risk based seasonal price index of cotton prices to address the issues described above. In the process, we tested and refined the seasonal risk components of the FARM Assistance model, which will allow for comprehensive (i.e., yield and price) risk analysis of Texas cotton farming operations.

Methods and Results

In order to develop a seasonal index of cotton prices, we used fifteen years of daily closing values of the final twelve months of trading of NYBOT December cotton contract. These daily price data were divided up into 24 semi-monthly periods, and average prices were calculated for each semi-monthly period. This resulted in fifteen observations for each semi-monthly period. The variability within a given period formed the basis for simulating a risk-based seasonal index, which we did using the Excel add-on risk software Simetar©. Using a forecasted average seasonal price of 56 cents/lb, the resulting seasonal index (Figure 1) reflects the average seasonal trends, peaks, and lows assuming each annual pattern over the fifteen years was equally likely (Figure 3).

Figure 3. A Seasonal Index of December Cotton Futures, Averaged Over 15 Years.



The seasonal index shown in Figure 3 has some immediate applications for market outlook presentations and analysis. First, it highlights the risk underlying private analyst writings about "predictable" seasonal patterns as a basis of hedging or speculation. The risk-based seasonal index shows that for an average seasonal price forecast at any point in time, there is 95% chance, based on historical variability, that the price could be fifteen cents higher or fifteen cents lower. This is based on the outer 95% confidence bands (Figure 3).

In addition to adding risk to a seasonal futures pattern, our project expanded this effort by re-estimating the seasonal index based on select years, i.e., according to whether the marketing year was one with increasing carryover stocks or decreasing

carryover stocks. The former is generally associated with lower average prices, while the latter is associated with higher average prices. We were interested to see how using selected years influenced 1) the overall seasonal pattern, and b) whether we can get tighter 95% confidence intervals around our seasonal price path. The results from these two simulations are displayed in Figures 4 and 5.

Figure 4. A Seasonal Index of December Cotton Futures Using Only Historical Years of Increasing Ending Stocks.

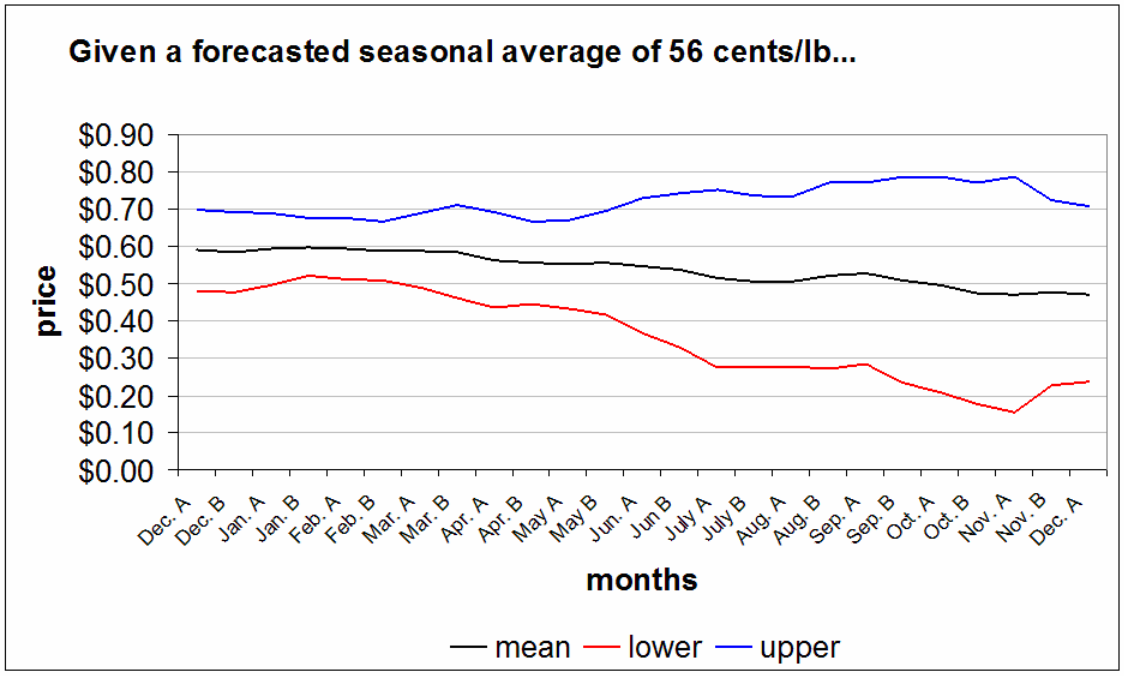
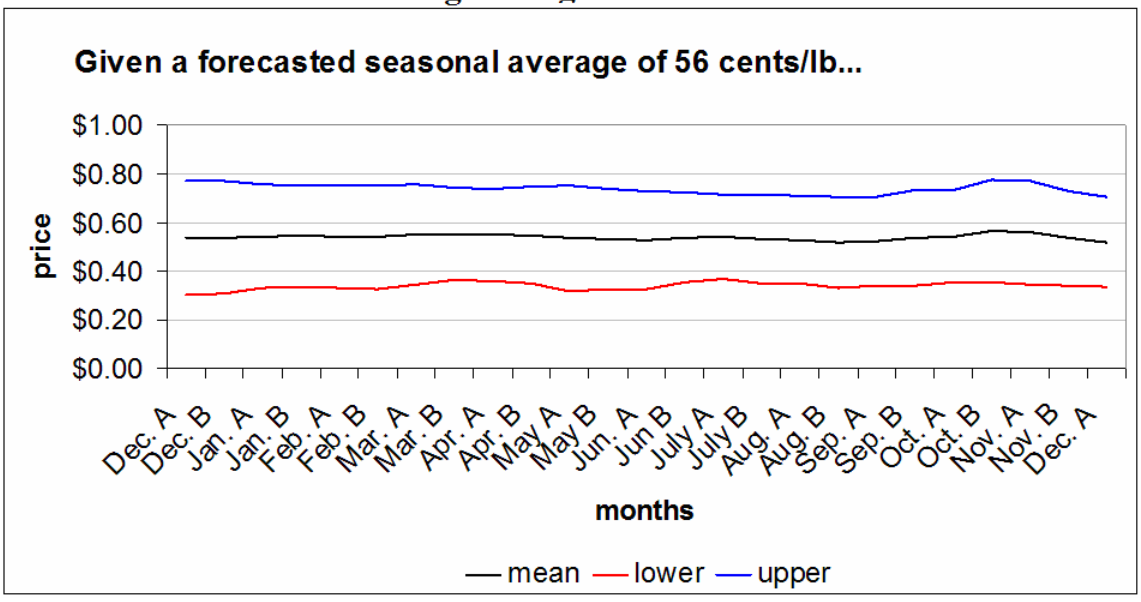


Figure 5. A Seasonal Index of December Cotton Futures Using Only Historical Years of Decreasing Ending Stocks.



Seasonality Discussion. Comparing Figures 4 and 5 to Figure 3 shows that simulating risk-based seasonal price indices gives a small change in the average seasonal price pattern, and a larger change in the level of confidence around that price pattern. For example, the seasonal index of December futures based on increasing carryover observations in Figure 4 shows a tighter confidence interval during the spring planting season and a much wider confidence interval during the fall harvest season, relative to Figure 3. This implies that short crop years show a uniformly stable/rising historical spring price pattern and a wide variety of fall prices. The seasonal index of years with decreasing carryover looks similar to the index based on the full fifteen years of observations. Extension price outlook discussions can incorporate these types of seasonal results depending on what type of carryover is forecasted.

Delivery. Dr. John Robinson has already included information like the above in outlook presentations during 2006/07. This includes Extension outlook presentations, a four hour Master Marketer session (January 18, 2007 in Lubbock), and several planned day long Advanced Topic Series workshops planned in February, 2007. These types of graphs will continue to be presented on Dr. Robinson's educational website (http://agecon2.tamu.edu/people/faculty/robinson-john/index.html) and in future Extension outlook meetings.

FARM Assistance. The refinements in intraseasonal price risk modeling have also been incorporated into the FARM Assistance program. The latter is a whole farm and ranch computerized decision support system for long-term strategic planning decisions. It was developed and is delivered by Extension specialists through Texas Cooperative Extension. In the past, price forecasting within the FARM Assistance program suffered from the very same problems that motivated this study: the price forecasting did not account for seasonality nor the likelihood and influence of short supply years versus surplus years. Whereas the methodology and results discussed above was developed as a stand-alone tool, a similar procedure for seasonal price risk, in combination with existing yield risk modeling, was developed within the FARM Assistance whole farm model framework. First, a seasonal price index was constructed as before using historical daily price series. However, since the FARM Assistance program simulates prices and yields over a ten year time horizon, some adaptions to the methodology were required. For example, if the upcoming year projected price was a relatively high price, the FARM Assistance simulation model only draws its random selection of possible prices from historical high years. Also, for forecasted years following high years, the model only draws possible prices from those types of years. This approach thus incorporates both seasonality and different year classifications in simulating risky price outcomes. Then, within the FARM Assistance whole farm model, this price simulation is combined with a grower's own yield history to simulate cash flow, net returns, etc. for baseline and alternative scenario's.

Lastly, the refinements in analytical methods will be available to the FARM Assistance analysts to handle any requests from clients for analyzing alternative marketing and insurance strategies. The timing of FARM Assistance activity is more

general throughout the year. During calendar year 2005, the FARM Assistance program analyzed 77 farming operations that had at least 15% of their acres in cotton production.

Significance

Existing Program Enhancement. This project should enhance the existing educational programs of Texas Cooperative Extension in the area of marketing and risk management for Texas cotton growers. There is a well established demand for cotton market outlook in Texas, and Extension agricultural economists have developed educational programs to address marketing issues in depth. This proposed effort would fit seamlessly into the existing educational program, and should enhance the communication and understanding of the risk implications of alternative strategies.