HOW MUCH DOES THE MARKET FEAR STICKINESS? EVIDENCE FROM THE 1996 CROP YEAR

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Abstract

Several factors converged during the 1995 growing season, resulting in high, uncharacteristic levels of stickiness in the 1995 West Texas cotton crop. As a result, textile mills experienced losses in time and production as well as increased costs in the face of this situation. Some 1995 crop cotton was sold the next year in the 1996/97 market. It was observed that this cotton was selling at a discount to the 1996 crop. For cotton with the same HVI quality attributes, 1995 crop cotton was being discounted by an average of approximately 3 cents/lb. It was concluded that mills and buyers, aware of the sticky problems experienced with the 1995 crop, were wary of this cotton and were discounting it in the 1996/97 market based on the threat of potential stickiness and their fear of this threat.

Introduction

The designation “sticky” is given to cotton when it adheres to the surface of machinery during the processing phase. This condition arises from the presence of excess amounts of sugar on the cotton fibers, which come from two primary sources—physiological and insect sugars. Physiological sugars are manufactured by the cotton plant and are the result of natural plant development, such as plant growth and boll formation (Lalor; Carter, 1990). The second source of stickiness is caused by insect deposits on the cotton plant. These deposits, commonly referred to as honeydew, are the result of excess sugars excreted by insects feeding on the juices of the plant. Honeydew deposits are most commonly attributed to the aphid and the whitefly (Lalor; Carter, 1990, 1992; Brushwood).

While extreme cases of stickiness can cause problems during the ginning process, sticky cotton is usually first detected when it reaches the textile mills. In the mills, sticky cotton can cause problems at almost every stage of the manufacturing process. In the case of natural plant sugars, the impacts are usually not as dramatic as those caused by insect honeydew. Plant sugars are distributed uniformly on the fibers and have a different chemical makeup than insect sugars. While the levels of stickiness present in plant sugars usually will not produce immediately noticeable effects, the presence of these sugars can cause a chronic buildup of residue on textile processing equipment, eventually resulting in contamination, yarn unevenness, increased cleaning cycles, and machine down-time (Lalor; Carter, 1990, 1992; Perkins, 1991).

The effect of insect sugars is far more severe and can cause mills to shut down for cleaning. It is estimated that 75-80% of the problems associated with sticky cotton are caused by insect honeydew (Carter, 1990). These insects, particularly the aphid and whitefly, ingest plant juices and excrete sugar droplets on the ground, leaves, or lint. Unlike physiological sugars, however, these sugars are more concentrated and are deposited randomly on the plant (Brushwood). These sugars are much more difficult to detect than plant sugars because of this random distribution. The sticky point sources collect on textile machinery, requiring additional labor and cleaning and resulting in machine stoppages, serious production problems, and mill shutdowns (Carter, 1990).

Whether resulting from natural plant sugars or insect honeydew, sticky cotton can have serious consequences for textile mills. Stickiness can disrupt practically every step in the fiber processing and yarn manufacturing processes, which can result in poor yarn and fabric quality. Aside from the effects of stickiness on the end products, increased lint fly from sticky cotton accumulates on machinery, flooring, and ductwork, requiring additional labor and accelerated cleaning (Carter, 1990, 1992). Additionally, dust particles can adhere to the fiber, causing excessive wear and abrasion on textile machinery. These factors lead to losses in time and efficiency, as well as an increase in costs of production (Floeck and Ethridge).

Although testing methods are available, none currently exist that would provide a quick and efficient means of accurately detecting stickiness in large quantities of cotton, such as would be necessary to be introduced into a High Volume Instrument (HVI) line. While some current tests do provide fairly accurate results, none so far has been perfected (Perkins, 1993; Brushwood and Perkins). In addition, the randomness of honeydew deposits causes stickiness to vary among the cotton bolls, so that the sample taken may not necessarily be representative of the tested lot as a whole.

This lack of an efficient means of testing the stickiness of cotton combined with the serious consequences of processing sticky cotton has caused much trepidation among the textile industry. Mills (and merchants) will, therefore, attempt to avoid obtaining sticky cotton. This can result in discounts and even outright boycotts of cotton that is rumored to be sticky. However, there has been no measurement of the extent to which cotton prices are discounted in response to stickiness, or the risk of stickiness. The purpose of this study was to measure the market discounts associated with the perceived risk of cotton being sticky.

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1995 West Texas Cotton

A subject for analysis is provided by the 1995 crop grown in the West Texas cotton marketing region. A portion of the 1995 crop experienced sticky problems because of the convergence of several environmental factors. Heavy September rains and subsequent hot weather caused the late crop to regrow new leaves. This regrowth accounted for high levels of plant sugars in the cotton and attracted a late-season aphid infestation. In addition, the killing freeze occurred later than normal in the season (the second week in November), contributing to the regrowth and aphid problems. Because producers faced low yield potentials, crops were not defoliated and were allowed to continue their growth. Finally, there were no late-season rains to wash off the honeydew (ITC).

The combination of these factors led to the development of stickiness in an estimated 5 to 10% of the total crop produced in the West Texas region (Shaw). While the stickiness was either not detected or not reported in the ginning process, these sticky bales caused major disruptions in textile manufacturing and led to serious problems for some textile manufacturers. Consequently, the 1995 West Texas crop earned a reputation for being sticky (ITC).

Concerns about stickiness followed the cotton into the next marketing year as well. During the 1996 crop year, mills were more cautious in their buying, especially concerning old crop (1995) cotton. To illustrate, there were 1996 sales in which 1995 crop cotton, with quality attributes comparable to that of the average 1996 lot, sold (in extreme cases) at a discount in excess of 8 cents/lb. While not all cases were as readily apparent, it was observed that, on average, 1995 cotton was selling at a discount in the 1996 market.

Determining the Discount for Risk of Stickiness

The use of hedonic price analysis has made it possible to derive implicit values such as that for sticky cotton. The underlying principle of hedonic price analysis is that a commodity is a collection of several utility-bearing characteristics, each of which has its own implicit value to the consumer. The value of the commodity, therefore, results from the collection of the values of its underlying characteristics. The explicit price is observable in the market, but the values of these characteristics are not because one characteristic is not bought and sold independently of another (Rosen).

For example, the price of cotton is influenced by its quality characteristics, but the price of one characteristic alone is not observable. A buyer who values strength cannot price cotton based solely on that attribute because the price reflects the value of the cotton's combination of attributes (e.g. strength, staple, micronaire, etc.). The same holds true for stickiness, which can be viewed as one of the qualities embodied in the product. However, to the extent that these qualities are measurable and/or observable, the implicit prices for each of these qualities can be derived by disagregating the price of the commodity so as to account for each of the observable characteristics. By regressing the price of the commodity against its attributes and differentiating the resulting equation with respect to each of these attributes, an implicit price can be derived for each (Brown et. al.; Brown and Ethridge).

The problem presented in the case of sticky cotton is the lack of a standardized measurement for this characteristic. Because there is no industry-sanctioned method for testing for and measuring the degree of stickiness present, there is no indication or measurement provided for stickiness when the cotton is bought and sold. This makes it difficult to derive an implicit price. However, given the reputation of sticky cotton in the West Texas region and the discounts observed for 1995 cotton selling in the 1996 market, this provided a means of indirectly measuring the impact of consumers' concerns (fears) about potentially sticky cotton on the market. Through the use of hedonic price analysis, this information was used to derive an implicit price for the risk of stickiness by using the discounted prices for 1995 crop to represent the price paid for sticky cotton. There was, however, no evidence to conclude that the 1995 crop sold in 1996 was, in fact, sticky. But given the circumstances surrounding 1995 cotton, it is reasonable to assume that the cotton was being discounted because of the fear that it was potentially sticky. Therefore, given these assumptions, the objective of this analysis was not to determine the value of stickiness, *per se*, but to determine the discount for potential stickiness and examine how the market responded to this threat.

Description of Data and Model

The data used in this study were the spot market transactions as recorded by the Daily Price Estimation System (DPES) for the 1996/97 cotton marketing year for the West Texas region. The DPES is an automated, computerized, econometric system which receives data from electronic spot markets operating in the West Texas and East Texas/Oklahoma cotton marketing regions (Hoelscher and Hudson). These producer spot market transactions are stored by the system and used to estimate quality premiums and discounts for cotton sold in these regions on a daily basis (utilizing the concept of hedonic price analysis).

Of the transactions received for the 1996/97 marketing year, a total of 1,252,303 West Texas bales were recorded as being sold during the 1996 season over a period of 91 days (Hoelscher, Hudson, and Ethridge). Of these, 77 days (approximately 994,836 bales and 13,817 sales) were used in the computations, running from October 22, 1996 to March 10, 1997. This represented only days in which 1995 crop from West Texas was observed being sold on the 1996 spot market. A total of 25,731 bales (293 sales transactions), or about 2% of the total cotton sold in the 1996/97 cotton marketing year, was old crop (1995) cotton. These data represent producer spot market transactions only, not contracted cotton, commission sales to mills, or sales among merchants.

Table 1 provides a listing of the average price, lot size, and quality attributes for the 1995 and 1996 crop cotton sold in 1996 used in the 77 day sample. These averages are computed by taking a simple average (a sum of all data, divided by the number of observations) of the data compiled for this time period. The average quality of the 1995 cotton was comparable (several attributes were, in fact, better) to that of the 1996 cotton. However, the average price received for the 1995 cotton within this time period was almost 4 cents/lb. lower than that received for 1996 cotton.

The econometric model used to make the estimations for this analysis was based on that used by the DPES, which makes daily estimations for the spot market quotations. The model regresses spot market prices received by producers against the reported quality characteristics of the cotton. These quality characteristics are those used by the USDA in its grading of cotton (U.S. Dept. of Ag.). For these estimations, the final model specification for the 1996/97 marketing year was used to disagregate prices with respect to each quality (Hoelscher, Hudson, and Ethridge). In addition to the grading standards used in the DPES model, an additional variable was introduced. This binary variable (D95) was used to distinguish between new (1996) and old (1995) crop cotton sold in the 1996/97 marketing year. The model used to make these estimations was:

$$P = \beta_0 e^{\beta_1 LF + \beta_2 LF^2 + \beta_3 C1 + \beta_4 C1^2 + \beta_5 DUM1 + \beta_6 DUM2 + \beta_7 DUM3 + \beta_8 STA}$$

$$e^{\beta_9 STA^2 + \beta_{10} STR + \beta_{11} M + \beta_{12} M^2 + \beta_{13} LB + \beta_{14} HB + \beta_{15} LO + \beta_{16} HO + \beta_{17} D95}$$

where:

LF = leaf grade (1-7),
C1 = first digit of the color grade (1-7),
DUM1 = binary indicator for the second digit of the color grade (if the second digit=2, DUM1=1; DUM1=0 otherwise),
DUM2 = binary indicator for the second digit of the color grade (if the second digit=3, DUM2=1; DUM2=0 otherwise),
DUM3 = binary indicator for the second digit of the color grade (if the second digit=4, DUM3=1; DUM3=0 otherwise),
STA = staple length in 32nds of an inch,
STR = strength of the cotton in grams/tex,
M = micronaire reading,
LB = percentage of bales classed as level 1 bark,
HB = percentage of bales classed as level 2 bark,
LO = percentage of bales classed as level 1 other extraneous matter,
HO = percentage of bales classed as level 2 other extraneous matter, and
D95 = binary indicator for the crop year (D95=0 for 1996 crop; D95=1 for 1995 crop).

Once the data were compiled, estimations were made for each day used in the analysis. These daily parameter estimates were then weighted by the number of sales transactions per day. The resulting set of parameters represented a weighted average for the 77 day data set.

Results

The daily parameters from the model were used to calculate a base price (using base levels for each quality attribute) for 1996 West Texas cotton (i.e., D95=0). A base price was then calculated in similar fashion for 1995 cotton (i.e., D95=1). The difference between these two prices (the base price for 1996 crop and 1995 crop cotton sold in the 1996/97 market) was taken to give the discount for 1995 West Texas cotton. The same procedure was used with the weighted parameters to give the average discount for the year.

Figure 1 displays the movement of these “sticky risk discounts” throughout the season. The average discount was 285.56 points/lb. The daily price differences ranged from a discount of 864 to a premium of 164 points/lb. Approximately 95% of these fell between -683 and 112 points/lb. Although in some cases the difference between prices for 1995 crop and 1996 crop yielded a premium, this occurred only 4 times throughout the season. The discounts seemed to follow a fairly tight distribution throughout the first part of the season (until December 12), during which time there appeared to be a slight downward movement in discounts. Afterwards, the discounts began to fluctuate more widely, but remaining primarily between 200 and 400 points/lb.

The (weighted) average cost of blending sticky cotton at the textile mill was found to be 3.47 cents/lb. across a range of perceived stickiness levels (Floeck and Ethridge). This represents an additional cost incurred by mills as a consequence of processing sticky cotton. The similarity between this added cost and the average discount found above may be indicating an effort on the part of the mills to estimate additional processing costs caused by stickiness and discount the old crop cotton according to those estimates to compensate for these (possible) added costs.

Summary and Conclusions

Overall, the 1995 crop cotton differed little in measured quality from the 1996 crop cotton. Despite the similarities in quality and the fact that they were selling in the same time period, 1995 crop cotton sold at an average discount of almost 3 cents/lb. to 1996 crop cotton. This is evidenced both by the average prices observed and the average discounts calculated using the hedonic model. Allowing a small discount for the cotton being old crop, there is no other evidence available to warrant discounts of the degree seen here.

Because of the effects of sticky West Texas cotton on the textile industry, in the absence of other evidence it is reasonable to conclude that the discounts witnessed in the 1996/97 marketing year were a direct result of the notoriety of the 1995 crop. Because this stickiness would only be discovered after the fact if the cotton was purchased by a mill, buying the 1995 cotton was a speculative activity on the part of the mills. In order to compensate for the risks associated with purchasing the 1995 crop cotton, prices for 1995 crop cotton were discounted by varying degrees, possibly associated with different mills' degrees of risk aversion and the estimated costs of processing sticky cotton. Producers, in turn, faced with an already depressed market for 1996 crop cotton and the accumulation of carrying charges associated with holding the 1995 crop, were eventually forced to sell their 1995 stocks at these discounted prices.

This analysis helps demonstrate the extent to which sticky cotton influences the market. It is important to understand this relationship in order to aid in dealing with the problem of stickiness. The tangible threat of lower prices in response to stickiness or the threat of such may make producers more aware of the problem and encourage the development of methods to deal with stickiness before it reaches the market.

Thus far, this is the only measurement that has been made to determine the role that stickiness plays in price determination. It is important to note that this measure represents only the threat of potential stickiness and the mills' speculation of such. However, until an objective and reliable test for stickiness has been accepted by the cotton industry, it will be difficult to determine the value of actual stickiness itself and provide an accurate market valuation of cotton based on this characteristic.

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Table 1. Data on 1995 and 1996 Crop Cotton Sold in the 1996/97 Marketing Year; West Texas.[a]

	Average	
Variable	1995 Crop	1996 Crop
Price (cents/lb.)	60.27	64.21
Bales per Sale	88	72
Leaf Grade	2.75	3.08
First Digit of Color Grade	2.36	2.55
Second Digit of Color Grade	1.31	1.28
Staple	33.42	34.30
Strength	28.43	27.50
Micronaire	3.55	3.77
Level 1 Bark	19.67%	22.34%
Level 2 Bark	0.00%	0.04%
Level 1 Other	1.32%	0.72%
Level 2 Other	0.01%	0.11%

[a] Source: Daily Price Estimation System, Texas Tech University.

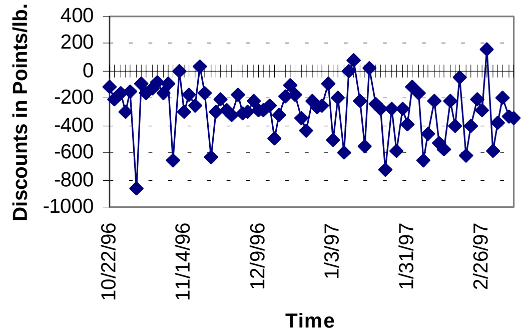

Figure 1. Movement of Discounts for 1995 West Texas Cotton Sold in 1996/97.