Daily Hedonic Price Analysis in Cotton: An Alternative Approach for Providing Market Information

by

Darren Hudson, Don Etheridge, and Jeff Brown

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Abstract

Information on prices of commodities that are differentiated by quality is important for understanding how the markets where these goods are traded operate. Hedonic price analysis provides a means to address this issue. Through econometric estimation, the overall price of a good can be disaggregated into its components. That is, the value or "price" of a quality attribute can be estimated through econometric analysis. This allows one to disaggregate the observed (aggregated) price of the product into its component parts based on the different levels of quality of the commodity. The hedonic approach has been well-established for some time, but it has not previously been applied to the *daily* analysis and reporting of prices.

The hedonic approach was adapted to analyze the daily price of cotton in the Texas-Oklahoma market regions. Using actual sales observations from two electronic spot cotton marketing firms, a hedonic model was formulated to explain the daily price of cotton as a function of the specific quality attributes of cotton bales traded. This model is used to estimate parameters, which are used to compute prices, premiums, and discounts for the various qualities of cotton. These prices, premiums, and discounts are reported on a daily basis.

The application of the hedonic approach is applicable to other commodities. The speed at which estimates are produced, and the fact that the estimates are reproducible and statistically valid adds credibility to the price reports produced. Thus, this research has important implications for other commodities in addition to cotton.

Introduction

Many goods or commodities are comprised of characteristics, commonly referred to as quality attributes, that are qualitatively important. This is the case for cotton, which contains a large number of specifically identified quality attributes. The means of identifying the value of qualitative attributes embodied in goods is usually

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identified as hedonic price analysis, which has been applied in many situations (e.g., Blomquist and Worley; Fisher, Griliches, and Kaysen; King; Lancaster; Rosen).

The key ingredient in hedonic analysis is the ability to identify a set of specific, measurable or identifiable qualities. Although the first application of hedonic analysis (although it was not explicitly defined as hedonic analysis) may have been in agricultural commodities (Waugh), the concentration of work has been in other sectors. There has been limited use of the approach in agricultural commodities (e.g., Brorsen, Grant, and Rister; Danielson; Espinosa and Goodwin; and Lin and Mori). The objectives of the following discussion are to discuss the development of hedonic analysis in cotton, provide a sample of the empirical results, and show the usefulness of hedonic analysis in commodity price analysis.

Hedonics in Cotton

Cotton is a commodity composed of many quality attributes. Variations in quality require accurate and precise information on quality and price differentials. Cotton grading and price reporting facilitate transmission of this information to market participants. Official grading in cotton in the U.S. is administered by the Cotton Division, Agricultural Marketing Service (AMS), U.S. Department of Agriculture (USDA). In an attempt to motivate cotton producers to monitor cotton quality, the government began offering classing services in 1937. This service proliferated throughout the country until almost all of the cotton produced in the U.S. is now classed using a standardized grading system (Starbird et al.) The original grading system has evolved from a few subjective measurements of fiber attributes to a larger number of more objective measurements. Evolution of measurement technology in cotton has led to objective measurement of fiber attributes previously evaluated by subjective visual assessment (e.g., fiber length and color), plus objective measurements of several other important fiber attributes not previously provided. This system, called High Volume Instrument (HVI) grading, was adopted nationwide in 1991. Grading changes implemented in 1993 separated the composite grade code, a mixture of color, leaf content, and other foreign matter content, into separate trash (leaf) and color designations, as well as designations for bark and other extraneous matter found in the cotton lint (U.S. Dept. of Ag., 1993).

These changes facilitate more rapid and objective measurements of fiber properties, which is an important component of market information. However, these changes also affect another important component of market information--price reporting. Price reporting in the U.S. is also administered by the Cotton Division of AMS in the form of the Daily Spot Cotton Quotations (DSCQ). AMS must provide price quotations for all qualities of cotton in the seven designated marketing regions of the U.S. (U.S. Dept. of Ag., Daily Issues; U.S. Dept. of Ag., 1962; U.S. Dept. of Ag., 1964). The new grading system requires that the DSCQ provide market quotations of prices, premiums, and discounts for a leaf grade, color grade, fiber length, micronaire (fineness and maturity), fiber strength, bark content, and other extraneous matter content (U.S. Dept. of Ag., Daily Issues). The discrete quality categories for cotton represent 25,000 possible quality combinations for which prices, premiums, and discounts must be derived (Hudson, Ethridge, and Brown).

A problem with the current price reporting system is that its results are not reproducible (Hudson, Ethridge, and Brown). The procedures used to formulate the DSCQ are not fully documented (Cole, 1993) although the process has been described (Kuehlers). Market reporters begin the price quotation process by gathering a small sample of transactions information through sales recaps, which are provided by traders in the market. This serves as the basis from which the quotations are made. The reporter then conducts interviews with market participants, primarily merchants, to form a "mental picture" of the market activity. Based on these interviews, the market reporter makes changes to his/her preliminary quotations and prepares them for publication. Although a simplified description, it serves to demonstrate the point that subjectivity enters the formulation process. The subjective nature of the estimates, and the fact that sample characteristics used in the formulation process are unknown, make direct statistical tests of reliability impossible. Thus, one cannot ascertain directly the reliability of the prices given by the DSCQ. Taken together, the increased complexity of the grading system, subjectivity of the DSCQ, and budget reductions in the USDA, which further limit the ability of AMS to have the manpower to do market evaluations (Cole, 1995), raise questions about the accuracy of DSCQ market price information.

A search began in the late 1970s, in conjunction with the testing of the HVI grading system, for more objective and statistically reliable approaches to estimating market prices, premiums, and discounts. Models were formulated to explain prices as a function of fiber quality attributes (Ethridge, Shaw, and Ross; Ethridge and Shaw, 1977, 1978). Upon learning that the models formulated were, in fact, hedonic models, an exploration of the literature in hedonic analysis and applications began. This line of research eventually led to the work by Ethridge and Davis. Continued research into hedonics in cotton led to several empirical applications and subsequently began the exploration into some of the more complex theoretical issues (Ethridge and Mathews; Hembree, Ethridge, and Neeper; Ethridge and Neeper; Bowman and Ethridge; Chiou, Chen, and Capps; Chen, Chiou, and Anderson).

Over this same period (beginning around 1981), HVI grading was being widely adopted within Texas. By 1985 or 1986, it was becoming more apparent that HVI was moving toward widespread use, which posed difficulties for price reporting as discussed earlier. Research results on pricing and the rate of adoption of HVI indicated that (1) more pricing information based on quality was needed and (2) the existing procedures for estimating price differentials based on quality (the DSCQ) were not sufficient or reliable (Ethridge, Neeper, and Hembree; Ethridge).

The previous work on hedonics in cotton provided a base for a more comprehensive analysis of quality premiums and discounts. However, several questions arose as to how well the hedonic approach would work in estimating cotton prices, premiums, and discounts: Could it work on a daily basis? Were there enough data? Where would data come from? Which is an effective price model structure? The technology for moving information electronically was developing rapidly in the late 1980s, which offered possibilities for handling the problem of the logistics of daily price information. The existence of the computerized electronic spot market, TELCOT, provided an obvious means for addressing the data collection problem.

To address the problem of model specification, prior research on hedonic cotton models gave some preliminary indications as to the appropriate functional forms. Most past works dealt with both aggregated data and individual lot sales (less aggregated) data. A linear functional form has generally performed well in cases where aggregated data were used (Hembree, Ethridge, and Neeper; Chen, Chiou, and Anderson; Bowman and Ethridge). As data become less aggregated--e.g., more toward individual sales and less toward regional or national averages--the non-linear functional forms have performed better (Ethridge and Mathews; Ethridge and Neeper; Ethridge, Engels, and Brown). Conceptually, there are reasons to expect the hedonic relationship for the quality attributes of cotton fiber to be non-linear.

After extensive testing, two models were selected for more careful consideration and extended testing. These were a "linear difference" model (Bowman and Ethridge) and a multiplicative or "double-log" model (Ethridge, Engels, and Brown). The linear difference model was determined to be inferior on the basis of conceptual and empirical criteria. Ethridge, Engels, and Brown also considered different weighting and aggregation schemes, but all were found to be inferior to the single day, unweighted data. Finally, Brown conducted an extensive statistical analysis for the most appropriate functional form using the single day, unweighted sales information. This line of research led to the model that is currently in use, which is discussed in the next section.

The Daily Price Estimation System

The research discussed in the previous section led to the development of the Daily Price Estimation System (DPES). At the heart of the system is a hedonic model that accounts for all variables that are currently priced in the cotton market. The specific functional form for these relationships is:

$$P_i=\beta\ e^{\beta_1 CTR_i^2+\beta_2 C1_i^2+\beta_3 C2_i^2+\beta_4 STA_i+\beta_5 STA_i^2+\beta_6 STR_i}\ e^{\beta_7 M_i+\beta_8 M_i^2+\beta_9 R_i+\beta_{10} LB_i+\beta_{11} HB_i+\beta_{12} LO_i+\beta_{13} HO_i}\epsilon_i\ , \tag{1}$$

where P_i is the price of a mixed lot i in ¢/lb., $C1_i$ is the average of the first digit of the color grade code in mixed lot i, $C2_i$ is the average of the second digit of the color grade code for mixed lot i, STA_i is the average staple (fiber length) of mixed lot i in 32nds of an inch, STR_i is the average fiber strength of mixed lot i in grams/tex, M_i is the average micronaire (fineness and maturity) index of mixed lot i, R_i is a binary dummy variable for the marketing region (R=0 is West Texas, R=1 is East Texas/Oklahoma), LB_i is the percentage of bales with level 1 bark in mixed lot i, HB_i is the percentage of bales with level 2 bark in mixed lot i, LO_i is the percentage of bales with level 1 other extraneous matter in mixed lot i, HO_i is the percentage of bales with level 2 other extraneous matter, β_i are parameters, and $\ln\epsilon_i$ is the mean zero, normally distributed error term. The conceptual appeal of this model is that the price-quality relationships develop premium and discount patterns that are curvi-linear rather than linear, and the coefficient magnitudes suggest decreasing marginal contribution of the desirable attributes (Brown et al.). Further, this specific non-linear relationship is known to provide estimates that result in no systematic pattern in the error term (Brown). By taking the partial derivative of Equation 1 with respect to each variable, one can show the marginal contribution of that variable to the total price. This structure is also appealing in the sense that the model is easily estimated using the ordinary least squares (OLS) regression technique.

Data. Data for the estimation process are obtained from two electronic marketing firms operating in the Texas-Oklahoma markets--TELCOT and The Network. The sample of sales on which data are obtained constitute an estimated 2/3 of all producer spot market sales throughout both West Texas and East Texas/Oklahoma, which does not include contracted cotton or marketing pool sales. For example, a total of 34,285 sales constituting approximately 1.8 million bales of cotton were used by the DPES in the estimation of daily prices, premiums, and discounts over a 5 month period during the 1993/94 marketing year (Hudson, Brown, and Ethridge).

The *daily* data sets are composed of all individual lot sales that occur in a trading day. Each lot sale record gives information on the location of the cotton, size of the mixed lot in bales, date sold, and the lot average values for each of the quality attributes identified in Equation 1. This allows analysis of the characteristics on a sale by sale basis, which allows for more precise measurement of the prices, premiums, and discounts. Additionally, the consistent format and timely transmission of sales information allows computer automation of the estimation process.

Computer Automation. To address the problem of timely transmission and estimation of prices, premiums, and discounts, the estimation process was automated. In its most basic description, the DPES is a communications-package driven set of software components that performs a standard set of sequential operations on market transactions data, with the core analytical component being the hedonic model for cotton in Texas-Oklahoma cotton markets shown in Equation 1.

Basically, the process of automation and estimation is as follows. At the end of each trading day, the DPES computer either accesses or receives the data sets described above from each data cooperator (a diagram of the physical process is shown is Figure 1). When all data are compiled, dates are checked to make sure the correct data set has been received. If not, an error message is printed and the estimation process is aborted. If dates are correct and if 40 or more sales observations exist for that day, the data are sent to the mainframe computer, where SAS is used to perform the statistical analysis. If 40 observations are not present, the system discontinues estimation and notifies users that the system does not have enough observations to generate reliable estimates. The minimum of 40 sales is based on statistical principles and empirical experience with the system (see Ethridge, Engles, and Brown or Brown et al. for a more detailed description of this process).

SAS is used to obtain OLS regression estimates of model parameters, expected signs of the coefficients are evaluated (Brown et al.), and both data and statistical results are stored. Parameter estimates and statistical results are transferred back to the DPES computer, where a spreadsheet is employed to insure that all data points are within relevant ranges (e.g., first digit of the color grade between 1 and 7). If any of the data fall outside the specified ranges, the estimation process is aborted and error messages are printed. If no errors exist, the parameter estimates are permanently stored and tabular results are printed. Other statistical analysis performed in the spreadsheet include a regression of predicted versus actual prices to check for systematic error in price estimates. Results are then automatically transferred to outside users via fax or computer text file. Current recipients include AMS Market News in Memphis, TN, the National Cotton Council's COTNET bulletin board, and each of the data cooperators, among others. The entire process usually takes approximately two hours, and is performed overnight. Therefore, the estimation of one day's information is usually in the hands of market participants the next day. By comparison, the current method used by AMS has at least one day lag in the transmission of the DSCQ.

Empirical Results of the DPES

A random sample of five days results are shown in Table 1. As can be seen, the parameters are estimated daily, resulting in a new price equation for each trading day. The functional form of the equation remains the same (Equation 1), but the parameters are re-estimated daily. Table 1 illustrates that most coefficients are highly significant in most cases. The R^{2}'s indicate that over 70% of the variation in cotton price is explained by variation in cotton quality. Since 1989, the R^{2}'s have typically ranged between 0.75 and 0.95, which is high considering the cross-sectional nature of the data. In regressions of predicted prices from the model versus the actual lot sales, the R^2's have typically ranged between 0.85 and 0.95. The magnitude of the R^2 does vary with such things as volume of sales and movements in prices. That is, in periods when prices are moving up or down quickly or in periods of light or heavy volume, the R^2 tends to decrease. For example, the average R^2 for the 1994-95 marketing year was 0.79, the lowest average since daily estimation began in February, 1989. This may be because prices were rising rapidly and buyers may have paid less attention to quality differences than ordinarily.

A second set of results are given by crop year averages. The daily parameter estimates can be aggregated into one yearly equation by computing the weighted average (weighted by number of sales per day) of all daily price equations. This provides one equation for the entire crop year, which is useful in examining the average quality premiums and discounts for a given crop. The weighted average parameter estimates for both the 1993/94 and 1994/95 crop years are presented in Table 2. Yearly averages for the individual quality attributes are also presented in Table 2.

Uses of the Estimates. The on-going (daily) application of the DPES is the daily reporting of prices, premiums, and discounts. An example of a daily output is shown in Table 3. The broadest direct dissemination to market participants is through COTNET. However, faxes and data file transmissions disseminate this information to several other sources. Although the major component of the DPES work, daily dissemination is not the only use for the price estimates.

An analysis by Brown et al. compared the DPES and DSCQ for a random sample of sales transactions. Using the Theil's inequality coefficient, the authors found that the DPES estimated prices were closer to the actual than the DSCQ. Using regression analysis of predicted prices versus the actual and a modified F-test (Harrison), the authors also found that the DSCQ showed a significant systematic error with respect to actual prices, while the DPES did not. Taken together, the authors concluded that the DPES performed better at estimating producer market prices than the DSCQ.

Since the statistical reliability of the DPES is known, it has been used to examine several facets of the DSCQ prices. Using the DPES as a measure of the producer market (first pricing point in the marketing channel), it has been shown that the DSCQ tend to overstate producer quality discounts and understate producer quality premiums in the two Texas-Oklahoma markets (Hudson et al., 1994a, 1994b; Hudson, Ethridge, and Brown; Brown et al.; Hudson and Ethridge). The DSCQ appear to err both in measuring the *level* of premiums and discounts and in tracking the *movement* of prices through time.

The DPES results are also being used to examine a range of pricing issues. They have provided the only objective market information on discounts for bark in cotton (Ethridge et al.; Hudson, Brown, and Ethridge), on values of fiber attributes in the textile mill cleaning process (Hudson et al., 1995), and are being used to re-evaluate the relationships between cash and futures markets in cotton (Brown, Hudson, and Ethridge). These results are also contributing to other research efforts, including evaluation of ginning practices (Ethridge, Barker, and Bergan) and variety selection (Wiley et al.) that effect both lint yield and quality. The results from the DPES are also being used to account for changes in values of cotton with changes in quality in an analyses of typical farms' responses to proposed commodity program changes and of cotton irrigation practices, both at the Policy Analysis Center at Texas A&M University.

The potential applications of the DPES are numerous. Having pricing structures in both equation and tabular form that are verifiable and reproducible can add precision to research that must make assumptions about prices based on historical data. Having equations of price relationships gives a means to allow for variations in quality when using prices in research, rather than using a fixed price and assuming quality is homogeneous.

Implications

The application of hedonic theory to cotton price estimation can add two primary things to price reporting--*objectivity* and *reliability* of statistical analysis of prices. It allows a more comprehensive and rigorous analysis of price-quality relationships, while enhancing the speed at which prices can be analyzed and reported. Although this approach may have significant implications for cotton price reporting, the importance of the approach is not limited to cotton. The potential exists for the implementation of daily hedonic price estimation in many commodities.

Any commodity that has definable, differentiable quality characteristics is a potential candidate for this approach to price reporting. Those commodities which are traded on a daily basis may also be a candidate for *daily* hedonic price analysis. The primary limiting factors are data and logistics. The hedonic approach requires a larger volume of sales transactions than do current price reporting approaches used by USDA. Once sufficient data exist, the problem becomes logistics--that is, how does one collect, compile, and analyze the data in a timely manner. The current state of technology allows one to readily address this problem. Telecommunications allow for easy transfer of data in electronic and non-electronic form. Computer memory and CPU speed are adequate to handle large data sets and data processing requirements. Finally, the econometric tools are present to formulate reliable and sophisticated models.

Financing is a secondary problem in the implementation of a hedonic price estimation system. Computer equipment (i.e., a CPU, modem, and software) are a fixed cost, but probably not a limiting constraint. The larger cost item is probably data acquisition, particularly the investment in working out logistics. Additionally, this type of analysis requires specialized econometric and analytical expertise, as well as substantive knowledge of the market being analyzed. This likely means that more human capital is needed for the more sophisticated system.

It should be noted that this is not a price discovery model. That is, there is no account made for quantity in the functional form. This is because the model is not predicitive in nature. It only analyzes prices *ex post*, which is the function of price reporting. If the intended use of the model were predicitive, quantity would have to be accounted for by the model.

Future Plans

The first priority is to maintain the daily operation of the DPES, including the daily monitoring of accuracy and the maintenance of a historical record of prices. Beyond that, wider dissemination of the information through the Data Transmission Network (DTN) is a possibility. The system could be made more efficient if it were more self-contained (i.e., using PC-SAS instead of the mainframe version). This would allow even more rapid processing and transmission of information. Finally, expansion of the hedonic approach to other market regions (e.g., the Mid-South and Southeast) is planned. The inclusion of more data cooperators is being initiated. This would include information from merchant firms operating in these regions, giving a broader base of data from which estimates will be made.

Additional research on other pricing issues is also planned. First, an analysis of the distortions to the CCC loan schedule from the inaccuracies in the DSCQ is being considered. Additional research is also needed into the direct impacts of the DSCQ on market price formation. Finally, a similar approach to the DPES is being used to estimate prices, premiums, and discounts at the textile manufacturing end of the market channel. When that is complete, an analysis of differences in pricing structures at different ends of the marketing channel would be useful in examining the pricing differences and may lead to an indication of the overall pricing efficiency in the cotton industry.

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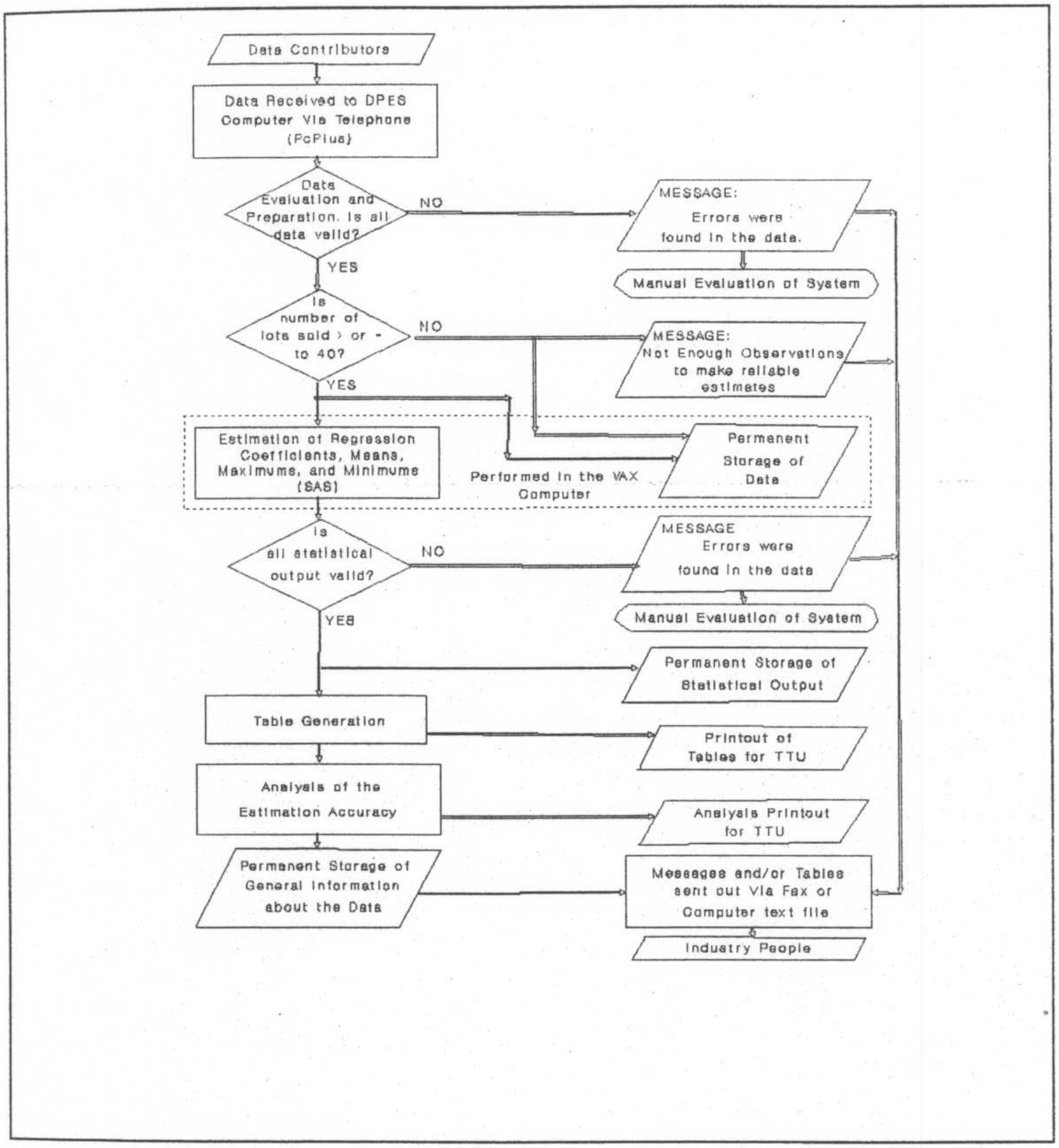

Figure 1. Schematic Diagram of the Daily Price Estimation Systems.

Table 1. Estimated Parameters of Equation 1 from a Random Sample of 5 Days; 1993 Crop.

Independent Vars.	Dates				
	18OCT93	03NOV93	19NOV93	07DEC93	29DEC93
Int (ln β_o)	-2.5654	0.7324	1.2140	1.0795	3.0625
	(-3.36)[a]	(1.42)	(4.39)	(6.00)	(9.67)
CTR^2	-0.0008	-0.0017	-0.0025	-0.0013	-0.0006
	(-1.18)	(-4.90)	(-19.51)	(-16.70)	(-4.33)
$C1^2$	-0.0002	-0.0004	-0.0002	-0.0021	-0.0017
	(-0.13)	(-0.47)	(-0.58)	(-10.89)	(-5.48)
$C2^2$	-0.0095	-0.0055	-0.0065	-0.0065	-0.0057
	(-4.42)	(-3.99)	(-11.79)	(-22.17)	(-14.07)
STA	0.2973	0.1230	0.1033	0.1176	0.0269
	(6.45)	(4.03)	(6.16)	(10.86)	(1.40)
STA^2	-0.0043	-0.0016	-0.0014	-0.0016	-0.0003
	(-6.15)	(-3.58)	(-5.35)	(-9.76)	(-1.10)
STR	0.0000	0.0019	0.0021	0.0016	0.0010
	(0.00)	(2.11)	(5.25)	(6.92)	(3.00)
M	0.6815	0.4203	0.3738	0.3683	0.2179
	(10.53)	(8.46)	(17.94)	(25.70)	(14.76)
M^2	-0.0835	-0.0516	-0.0451	-0.0446	-0.0264
	(-10.13)	(-8.48)	(-17.91)	(-25.86)	(-14.57)
R	0.0119	0.0006	-0.0030	0.0023	0.0097
	(1.62)	(0.14)	(-1.69)	(2.23)	(4.74)
LB	-0.0234	-0.0366	-0.0186	-0.0206	-0.0089
	(-2.93)	(-6.73)	(-7.36)	(-14.43)	(-4.68)
HB	-0.8873	0.0000	0.0000	0.0000	0.0000
	(-0.54)	(0.00)	(0.00)	(0.00)	(0.00)
LO	-0.0620	-0.0160	-0.0788	-0.0911	-0.0483
	(-1.61)	(-0.94)	(-7.36)	(-12.22)	(-2.62)
HO	0.0000	0.0000	-0.1238	-0.0781	-0.0399
	(0.00)	(0.00)	(-6.73)	(-7.41)	(-3.73)
R^2	0.8790	0.8341	0.7837	0.8543	0.7624
F-Value	55.45	74.02	285.31	663.87	138.27
d.f.[b]	84	162	945	1359	517
N.O.[b]	98	176	959	1373	531

[a] Numbers in parentheses are t-values.

[b] d.f. means degrees of freedom and N.O. is number of observations.

Table 2. 1993-94 and 1994/95 Weighted Average Parameters and Qualities.

Parameter for Equation 1	Variables and Yearly Average Coefficients 1993/94	1994/95
Intercept ($\ln \beta_o$)	1.7565	2.7354
CTR^2	-0.0014	-0.0010
$C1^2$	-0.0020	-0.0010
$C2^2$	-0.0052	-0.0047
STA	0.0800	0.0060
STA^2	-0.0011	-0.0010
STR	0.0018	0.0013
M	0.3428	0.2142
M^2	-0.0414	-0.0258
LB	-0.0176	-0.0122
HB	-0.2130	-0.0786
LO	-0.0441	-0.0232
HO	-0.1498	-0.0614

Quality Attribute	Qualities and Yearly Average Values 1993/94	1994/95
Leaf Grade (CTR)	3.3	3.39
Color 1[a] (C1)	2.47	2.93
Color 2[b] (C2)	1.55	1.66
Staple (STA)	33.3	32.91
Strength (STR)	28.02	27.79
Micronaire (M)	4.2	4.12
Level 1 Bark (%) (LB)	33.10	12.25
Level 2 Bark (%) (HB)	0.03	0.10
Level 1 Other (%) (LO)	1.15	2.15
Level 2 Other (%) (HO)	0.14	0.27

[a] First digit of the color grade.
[b] Second digit of the color grade.

Table 3. Example of the Daily Output of the DPES.

Daily Spot Cotton Price Estimates
Estimates by the Department of Agricultural Economics, Texas Tech Univ.
Date: 07DEC93; Region: West Texas # of Bales: 51,360
Color Grade and Staple Prem. and Disc. in Points/lb. # of Sales: 916

11	21	31	41	51	Staple	61	71	12	22	32	42
-418	-449	-500	-571	-660	28	-767	-891	-512	-542	-593	-662
-284	-316	-369	-441	-533	29	-643	-770	-381	-412	-464	-535
-163	-196	-250	-324	-419	30	-531	-661	-263	-295	-347	-421
-57	-90	-145	-221	-317	31	-432	-565	-158	-191	-244	-319
35	2	-54	-132	-230	32	-347	-482	-68	-101	-156	-232
112	77	21	-58	-157	33	-276	-413	7	-27	-82	-159
171	137	79	53.22	-100	34	-220	-359	66	32	-25	-102
214	179	121	53	-60	35	-181	-320	108	73	17	-62
240	205	146	66	-35	36	-157	-297	133	98	41	-38
247	212	154	74	-28	37	-150	-290	140	106	49	-30
247	212	154	74	-28	38	-150	250	140	106	49	-30

52	62	23	33	43	Staple	53	63	34	44	54
-750	-855	-695	-743	-811	28	-896	-1000	-946	-1011	-1092
-625	-733	-569	-619	-688	29	-775	-880	-827	-893	-977
-513	-623	-455	-506	-577	30	-666	-773	-719	-787	-873
-413	-526	-354	-406	-478	31	-570	-679	-624	-693	-780
-328	-442	-267	-320	-394	32	-487	-598	-542	-612	-701
-257	-373	-195	-249	-324	33	-418	-531	-474	-545	-635
-201	-318	-139	-193	-269	34	-364	-478	-421	-493	-584
-161	-279	-99	-153	-229	35	-325	-440	-383	-455	-547
-137	-256	-75	-130	-206	36	-302	-418	-360	-433	-525
-130	-249	-67	-122	-199	37	-295	-411	-353	-426	-518
-130	-249	-67	-122	-199	38	-295	-411	-353	-426	-518

Mike Differences Points/lb.

Mike Range	Discount
26 & below	-524
27-29	-400
30-32	-243
33-34	-140
35-49	-0
50-52	-220
53 & above	-317

Trash Differences-Points/lb.

Trash Code	White	Light Spot	Spot	Tinged
1	104	102	99	95
2	83	82	79	76
3	48	47	46	44
4	-0	0	-0	-0
5	-62	-60	-58	-56
6	-136	-133	-129	-123
7	-222	-218	-211	-202

Bark Differences Points/lb.

Bark Code	Disc.
Level 1	-108
Level 2	--

Other Differences Points/lb.

Other Code	Disc.
Level 1	-463
Level 2	--

Strength Differences Points/lb.

Level	Prem/ Disc
<18	-54
19	-45
20	-37
21	-29
22	-21
23	-12
24&25	-0
26	12
27	21
28	29
29	37
30	46
31+	54

Results are not for general distribution.