ACCURACY OF COTTON PRICE REPORTING

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Abstract

The Daily Price Estimation System, whose accuracy in measuring market prices and quality premiums and discounts in the Texas-Oklahoma markets is known and documented, was used as the benchmark against which to determine if USDA's cotton price reporting accuracy has increased over time. The analysis found that during the study period (2000-2005) and the two market reporting regions studied, the Spot Quotations were accurate within an acceptable margin of error for 7 of the 28 cases analyzed (14 quality attributes in each of the two regions), not accurate but improving for 6 cases, inaccurate or deteriorating for 14 cases, and indeterminate for one case. Thus, Spot Quotations were "good or getting better" 46% of the time and "inadequate or deteriorating" 50% of the time.

Introduction

Competitive markets require market price information for them to function efficiently. In U.S. agricultural commodity markets, the U.S. Department of Agriculture's Agricultural Marketing Service fills the role of providing that market price information, with the expressed intent to increase the efficiency of operation of those markets. In fact, two of the primary reasons for establishing the Agricultural Marketing Service were to establish and oversee grading standards and report prices for agricultural commodities, including cotton (U.S. Dept. of Agriculture, 2007).

One of the often forgotten conditions, however, is that the price information reported must be accurate for it to result in more efficient operation of markets. Inaccurate market price information can promote inefficiency in market functioning; this has been documented in Ethridge and Hudson (1998), Ethridge et al. (1998), Hudson et al. (1998), and Aelvoet and Ethridge (2007, pp. 9-13). Inaccurate price information, to the extent that market participants accept it, causes misallocation (too much or too little) of resources, over/under production and/or consumption of goods, and confusion among market participants.

Accuracy in price reporting is more difficult for cotton than for many other agricultural commodities because of the complexity of the quality dimensions of cotton. With the many quality attributes of cotton in the grading of the commodity, determining the market premiums and discounts associated with each makes the task more complex, and the complexity is further increased by the integrated nature of attribute values. This is driven by the relevance of, and interdependence of, all of the attributes and their levels in the manufacturing processes where the fiber is used. Consequently, the question of the accuracy of the reported information about cotton prices, given its importance, merits constant attention and periodic re-visitation. Thus, the objective of the research reported here was to determine the extent to which USDA's reporting of cotton prices has become more accurate over time.

Methods and Procedures

The official price reporting mechanism in the cash (spot) market for cotton in the U.S. is the Daily Spot Cotton Quotations (DSCQ), administered by the Agricultural Marketing Service (AMS) of the U.S. Dept. of Agriculture (USDA) (Brown et al., 1995). AMS reports a price for each region for the base combination of quality attributes (color grade 41, leaf grade 4, staple 34, micronaire 3.5-4.9, strength 27 and 28, and uniformity 80) and the premiums and discounts for variations from that base quality (USDA, 2006). The DSCQ is formulated by market reporters gathering market information through interviews with market participants and sales information from cooperating providers (Hudson et al., 1996). Estimates of prices and quality premiums and discounts are provided for each of the seven designated markets in the U.S. for each trading day (Brown et al., 1995)

The only alternative source of cotton price information for cotton that includes premiums and discounts for quality attributes is the Daily Price Estimation System (DPES), which was created for the two Texas and Oklahoma markets (West Texas and East Texas/Oklahoma). DPES has been in development since 1988 to complement the more accurate and objective High Volume Instrument (HVI) grading system to provide an objective and accurate tool to

analyze and report cotton prices, premiums, and discounts (Brown et al., 1995). It is a computer-automated system for receiving and statistically analyzing sales data, estimating prices and quality premiums and discounts using an econometric model developed from hedonic price research, and transmitting the results to market participants (Brown et al., 1995). Unlike the DSCQ, the reliability of the DPES procedures and results have been tested and verified; all results are reproducible and its results are without systematic error, meaning there is no consistent over- or under-estimation of the values of any of the fiber quality attributes (Hudson et al., 1996) Because the actual spot market trading data are available only for the two Texas/Oklahoma market regions, the DPES is limited to those two market reporting areas.

Because of the known and documented accuracy of the DPES estimates, it was used as the benchmark against which to compare the DSCQ. In this analysis, the DPES indicators of cotton premiums and discounts were assumed to be accurate and the DSCQ premiums and discounts were compared to them over time to determine (1) if the premiums/discounts are significantly different in the two Texas/Oklahoma markets and (2) if they are different, if they are converging, diverging, or remaining constant over time. The study period for this analysis was crop years 2000 through 2005. Years prior to 2000 were excluded because the official price reporting system was changed in 2000 due to (1) a change in base strength from 24/25 grams per tex to 27/28 and (2) length uniformity premiums/discounts were added to the price reports in 2000. Prior analysis (Hudson et al., 1996) had evaluated earlier accuracy of the DSCQ.

Data consisted of annual average price premiums/discounts from the DPES (Nelson et al., 2001; Ward et al., 2002; Sanders et al, 2003, 2004; Fadiga et al., 2005, 2006) and DSCQ (USDA, "Cotton Price Statistics," 2002-2006) in the West Texas and East Texas/Oklahoma markets. Because the number of attributes and levels of each is so large (many thousands), attribute levels above and below base quality for each of 7 attributes (color grade, leaf grade, staple, micronaire, strength, length uniformity, and bark content) were selected to simplify the analysis. The attribute levels were color grades 21, 61, and 43, leaf grades 2 and 6, staples 32 and 36, micronaires 3.3 and 5.0, strengths 25 and 30, uniformities 78 and 83, and bark level 1, so with two market regions, there were 28 comparisons.

The analysis consisted of two main components: (1) tests of the average accuracy over the study period and (2) analysis of the patterns of premium/discount discrepancies over the study period. The first was conducted using a paired t-test of differences for each attribute level. The second component encompassed a trend analysis of both the DPES and DSCQ estimates of the premiums/discounts on each attribute and testing for deviations in trend slopes. The deviations of the DSCQ were then evaluated and summarized.

Findings

Average deviations from the market for each of the attributes analyzed are summarized in Tables 1 and 2. To illustrate, consider color 21 in Table 1. The average market premium for color 21 over color 41 (the base color) in the market (as measured by the DPES) over the 6 years was 22 points per pound of lint (.22 cents/lb). The average premium reported by AMS/USDA over that same period was 155 points/lb. The numerical average difference was 133 points and there was a significant difference ($P = 0.0007$) on the average between the DSCQ estimate of the premium and the market premium. Consider strength 25, or "low" strength. The DSCQ significantly ($P = .006$) over-discounted low strength compared to the market by 47 points/lb over the 6-year period.

Using statistical significance levels of $P < .10$ to denote significant differences, $.11 < P < .15$ as marginally different, and $P > .15$ as no difference in conjunction with Tables 1 and 2 yields the following results. "Good" color (color 21) premiums were on the average over-stated and "poor" colors (color 61 and color 43) were on the average under-discounted between 2000 and 2005. High leaf content (leaf 6) and low strength (strength 25) were over-discounted and high strength (strength 30) was over-premiumed during the study period. The average deviations from the market were not statistically significant for low leaf (leaf 2), high and low staple (32 and 36), low and high micronaire (3.3 and 5.0), low uniformity (uniformity 78), or bark content. High uniformity was marginally under-premiumed on the average.

Overall, for quality attributes below the base there were no significant differences on the average between the market and DSCQ discounts for 5 of those 9 attributes over the study period (short staple, high and low micronaire, low uniformity, and bark content); the DSCQ under-discounted on the average two attributes (high yellowness and

grayness) and over-discounted two attributes (high leaf and low strength). For quality attributes above base quality, there was no difference between the market and DSCQ premiums with 2 of the 5 attributes (low leaf and long staple), and the DSCQ over-premiumed on two (low yellowness and high strength) and under-premiumed on one (high length uniformity).

Table 1. Means of DPES and DSCQ and Differences, West Texas Cotton Market

Quality Attributes	Mean		Difference	Probability Level
	DPES	DSCQ	(DPES-DSCQ)	
Color 21	22	155	133	0.0007
Color 61	-444	-265	179	0.019
Color 43	-419	-309	110	0.077
Leaf 2	98	120	22	0.31
Leaf 6	-208	-301	93	0.02
Staple 32	-278	-246	32	0.43
Staple 36	147	190	43	0.58
Micronaire 3.3	-172	-163	9	0.57
Micronaire 5.0	-245	-255	10	0.56
Strength 25	-57	-104	47	0.006
Strength 30	13	38	25	0.027
Uniformity 78	-27	-42	15	0.39
Uniformity 83	18	7	11	0.11
Bark 1	-220	-177	43	0.23

Table 2. Means of DPES and DSCQ and Differences, East Texas/Oklahoma Cotton Market.

Quality Attributes	Mean		Difference	Probability Level
	DPES	DSCQ	(DPES-DSCQ)	
Color 21	22	200	178	0.002
Color 61	-442	-273	169	0.028
Color 43	-418	-324	94	0.11
Leaf 2	97	134	37	0.15
Leaf 6	-208	-302	94	0.026
Staple 32	-277	-237	40	0.32
Staple 36	147	217	70	0.36
Micronaire 3.3	-146	-163	17	0.62
Micronaire 5.0	-266	-261	5	0.83
Strength 25	-56	-104	48	0.005
Strength 30	13	36	23	0.02
Uniformity 78	-27	-43	16	0.37
Uniformity 83	18	7	11	0.11
Bark 1	-220	-186	34	0.32

The time patterns for the DSCQ deviations from the market in West Texas are shown in Figures 1 through 14; these serve to illustrate both magnitudes of differences and direction of movement in the premiums/discounts for the 14 attribute levels analyzed. The patterns in the East Texas/Oklahoma market were the same and the magnitudes were similar except for two attributes (color 21 and staple 32), which are shown separately in Figures 15 and 16. To illustrate what the figures show, consider Figure 1, which compares the DPES and DSCQ over the 6-year period of the study based on their annual premiums on color grade 21. Both the annual premiums (solid lines) and trends (dashed lines) are shown for the market (DPES) and the USDA reported premiums (DSCQ). Figure 1 shows that the market and DSCQ premiums trended in the same direction, and the trend lines are parallel (slopes are not significantly different). The DSCQ premiums were capturing the *increasing* value of good (low) color over time, but the premiums were consistently above the measured market premiums (note Table 1) and was neither diverging nor converging with the market over time.

In lieu of reviewing/discussing the time patterns for each of the attributes, a summarization of both the analysis of average differences over the study period and the time patterns is provided in Table 3. The 14 attributes in each of two regions makes a total of 28 cases evaluated. Further summarizing from Table 3 reveals that of the 28 situations, there were

- 1 not different and constant over time
- 6 not different and converging
- 6 not different but diverging
- 1 marginally different and constant over time
- 2 marginally different and converging
- 1 marginally different and diverging
- 4 different and constant over time
- 4 different and converging
- 3 different and diverging

Further examination of these results suggests that in 13 of the 28 cases (46%) the Spot Quotations were either not significantly different from the market or improving in accuracy, in 14 cases (50%) the Spot Quotations were either significantly different or deteriorating in accuracy, and in one case (4%) the verdict was indeterminate.

Table 3. Summary of Results on DSCQ Premium/Discount Accuracy; 2000-2005.*

Quality Attribute	Different from market on average?	Converging?	Diverging?
Color 21	Yes	No	No (Yes)
Color 61	Yes	No	Yes
Color 43	Yes (marginal)	No	No
Leaf 2	No (marginal)	No	Yes
Leaf 6	Yes	Yes	No
Staple 32	No	No	No (Yes)
Staple 36	No	No	Yes
Micronaire 3.3	No	Yes	No
Micronaire 5.0	No	Yes	No
Strength 25	Yes	No	No
Strength 30	Yes	Yes	No
Uniformity 78	No	No	Yes
Uniformity 83	Marginal	Yes	No
Bark 1	No	Yes	No

*Summaries apply for both West Texas and East Texas/Oklahoma except when there is an added parenthetical answer, in which case the answer in parentheses are for East Texas/Oklahoma.

Conclusions

Overall conclusions regarding implications for market pricing efficiency from the AMS market reporting for cotton are mixed. The "good or getting better" for 46% of the cases clearly improves the efficiency of the cotton marketing system for those attributes in those regions, and "poor or getting worse" for 50% of the cases clearly diminishes the efficiency of the cotton marketing system. Are the economic efficiency gains from the 46% less than the economic efficiency losses from the 50%? That is unknown because there are no reliable estimates of the magnitudes of the relative gains and losses, and estimation of that is beyond the scope of this study. It is a question that is recommended for future research. That said, it is important to underscore that for the goal of market efficiency, whether premiums or discounts are reported too high or too low is not as important as how close its reported level is to the true market level because the market imbalances occur irrespective of the direction of error.

These findings hold for the study period and for Texas/Oklahoma markets. While the study does not provide evidence that the same is the case in other U.S. regional markets, the implication is that similar outcomes are likely to be the case in the other regional markets. If the procedures used by AMS cannot accurately track the quality premiums and discounts in the two markets examined, can they accurately track them in the other markets?

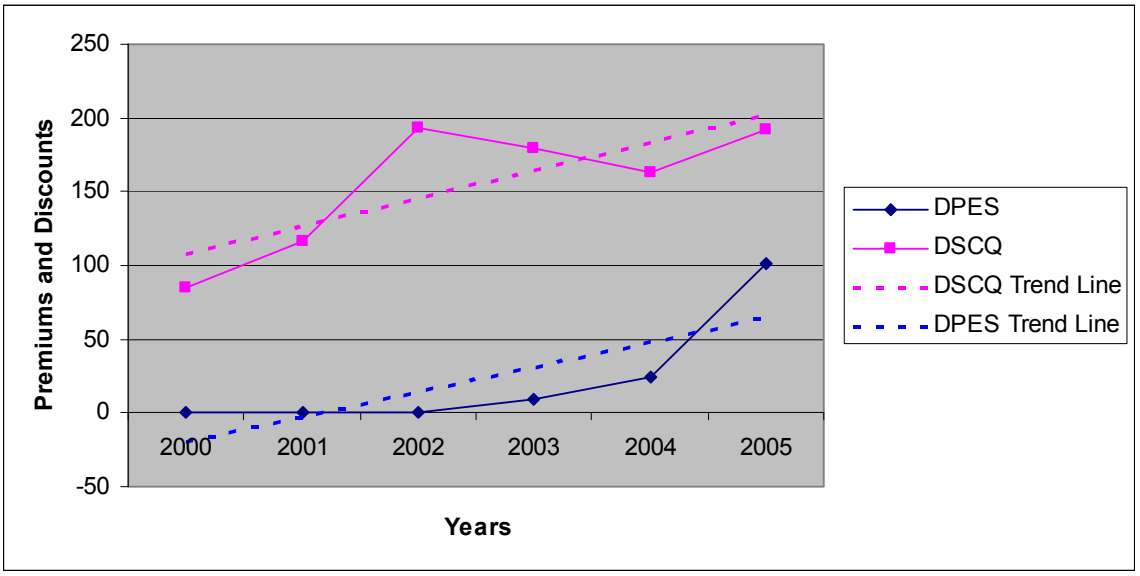

Figure 1. Average Annual West Texas Premiums for Color Grade 21 from DPES and DSCQ, with Trends.

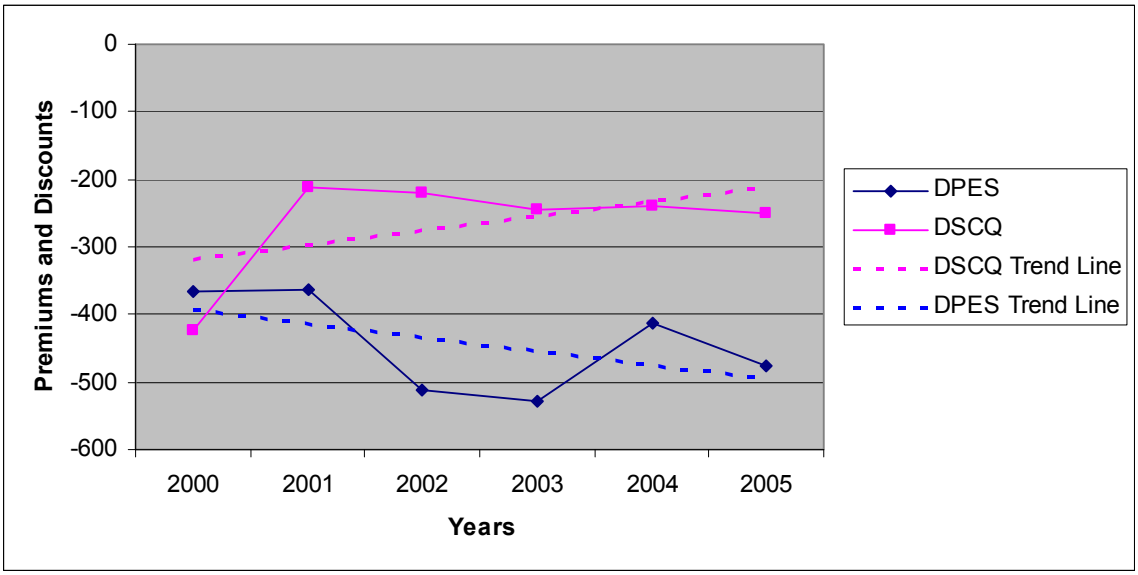

Figure 2. Average Annual West Texas Discounts for Color Grade 61 from DPES and DSCQ, with Trends.

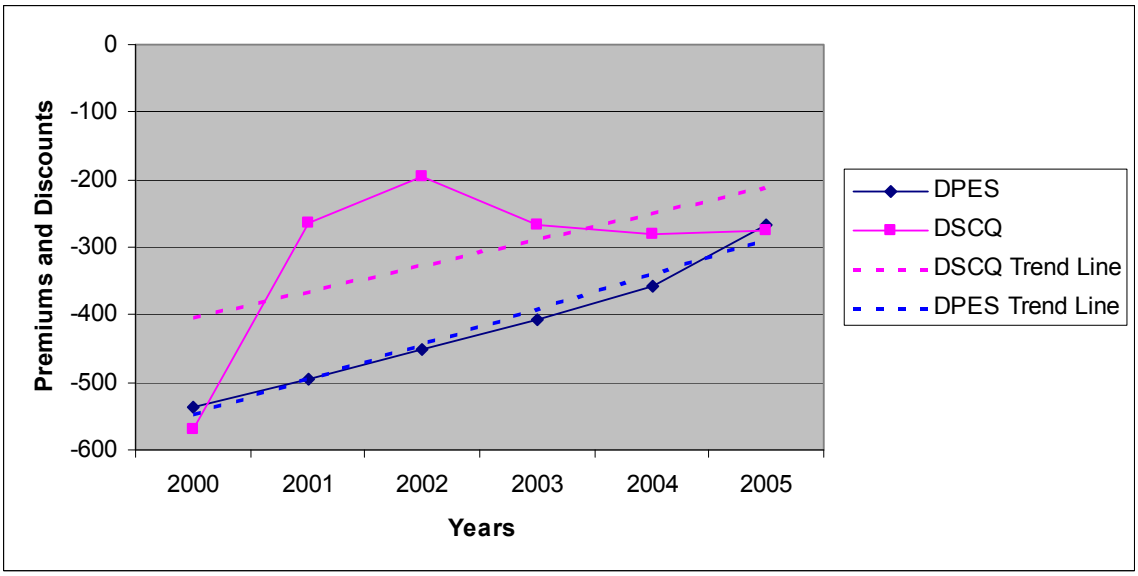

Figure 3. Average Annual West Texas Discounts for Color Grade 43 from DPES and DSCQ, with Trends.

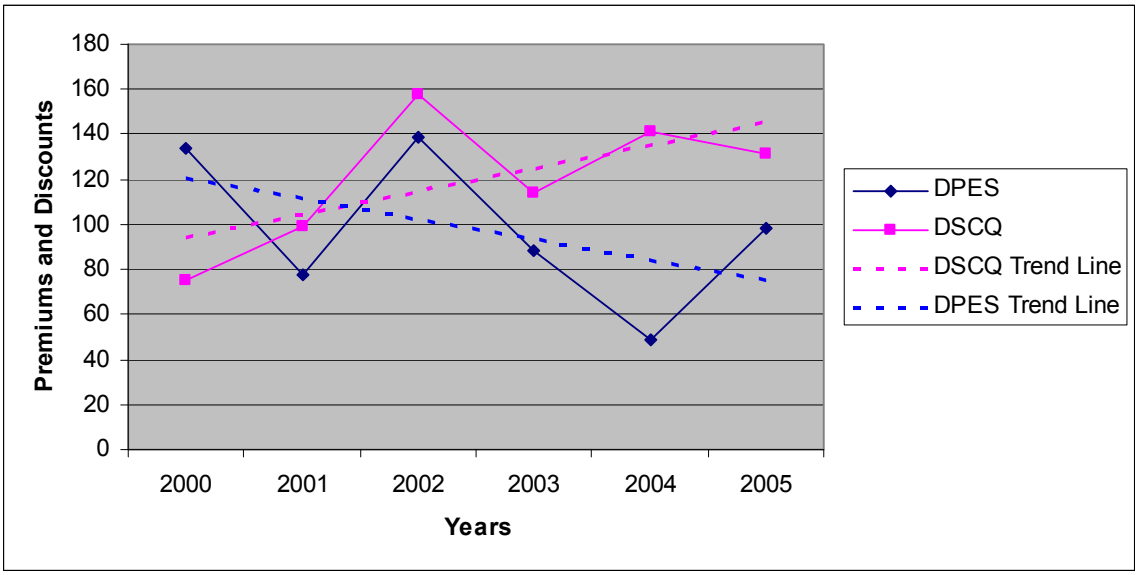

Figure 4. Average Annual West Texas Premiums for Leaf Grade 2 from DPES and DSCQ, with Trends.

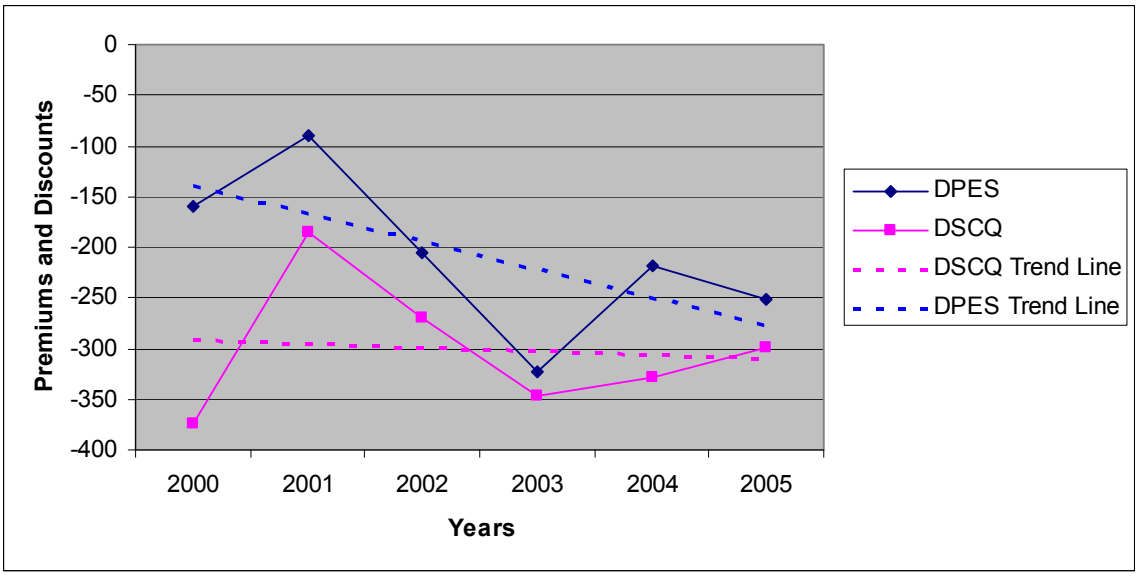

Figure 5. Average Annual West Texas Discounts for Leaf Grade 6 from DPES and DSCQ, with Trends.

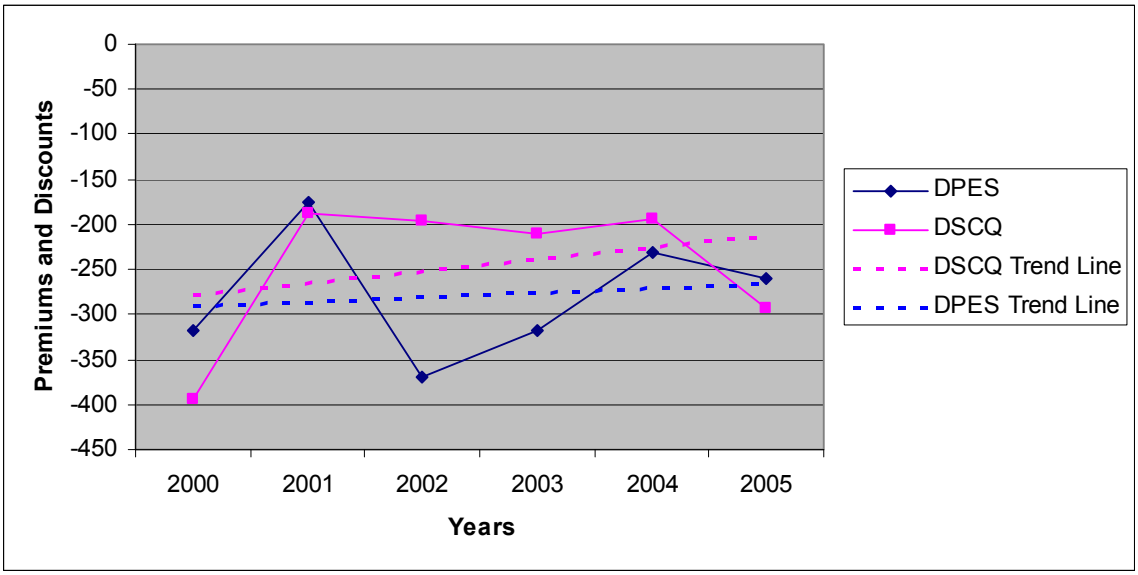

Figure 6. Average Annual West Texas Discounts for Staple 32 from DPES and DSCQ, with Trends.

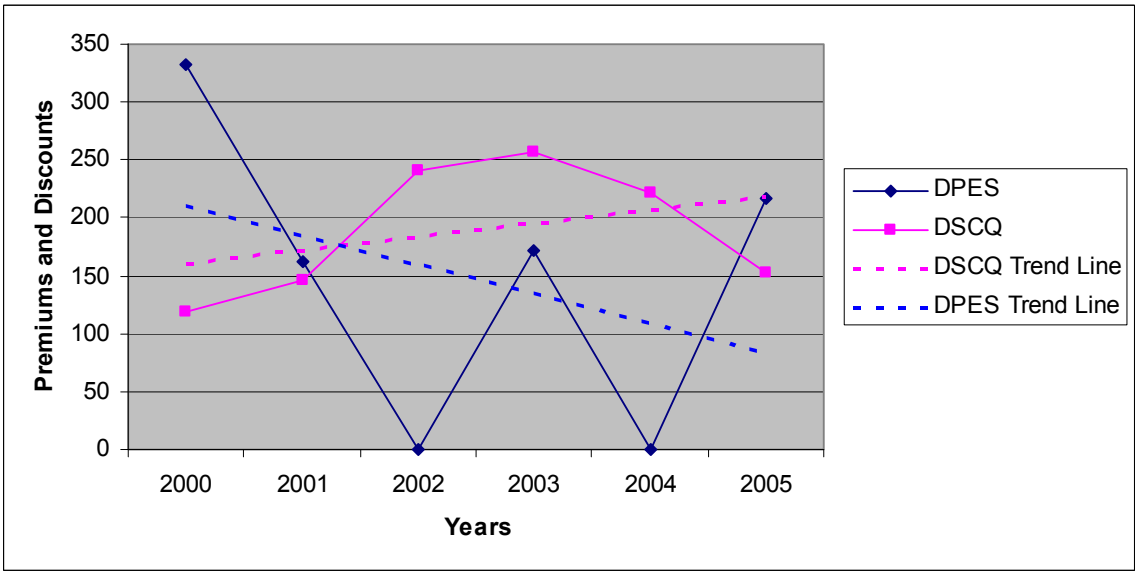

Figure 7. Average Annual West Texas Premiums for Staple 36 from DPES and DSCQ, with Trends.

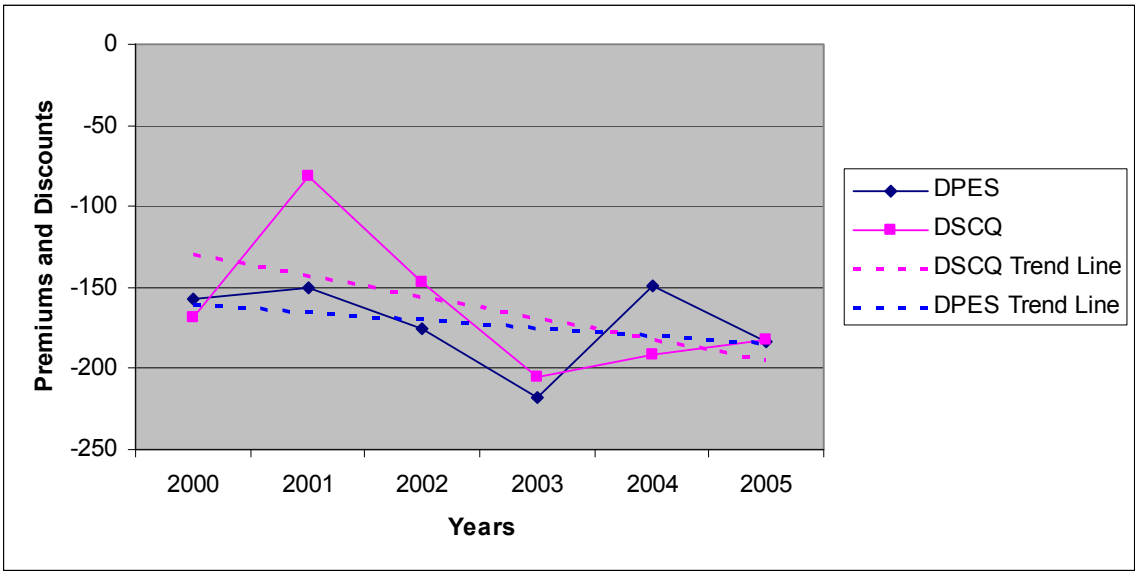

Figure 8. Average Annual West Texas Discounts for Micronaire 3.3 from DPES and DSCQ, with Trends.

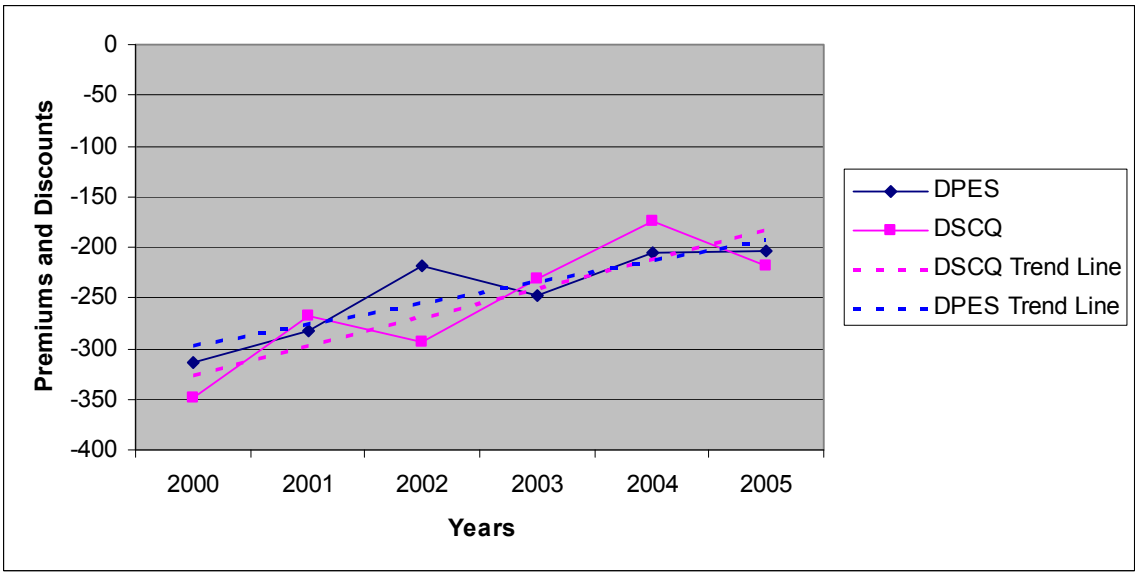

Figure 9. Average Annual West Texas Discounts for Micronaire 5.0 from DPES and DSCQ, with Trends.

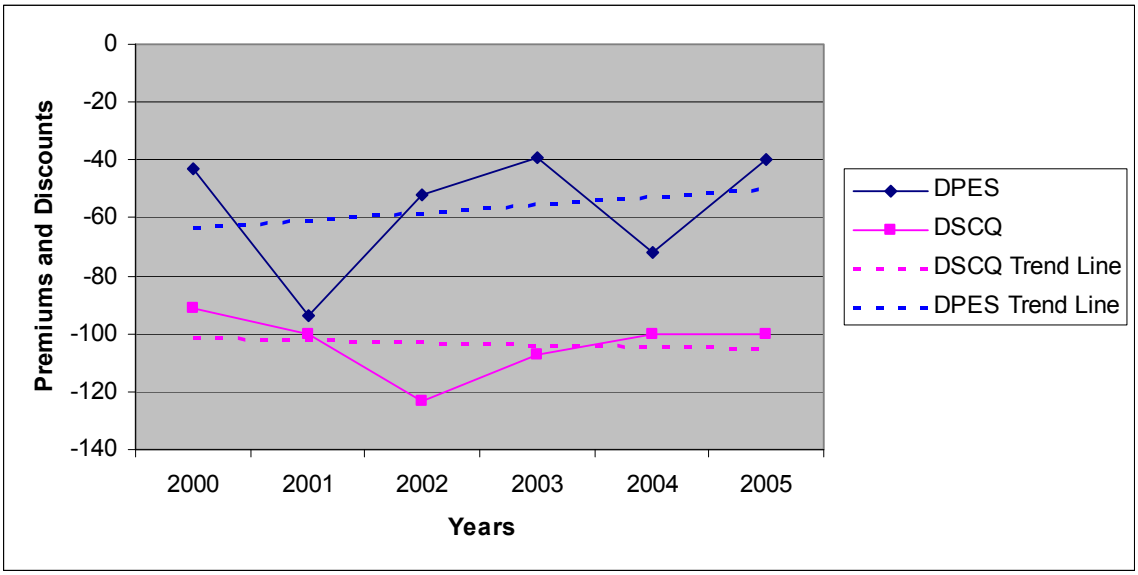

Figure 10. Average Annual West Texas Discounts for Strength 25 from DPES and DSCQ, with Trends.

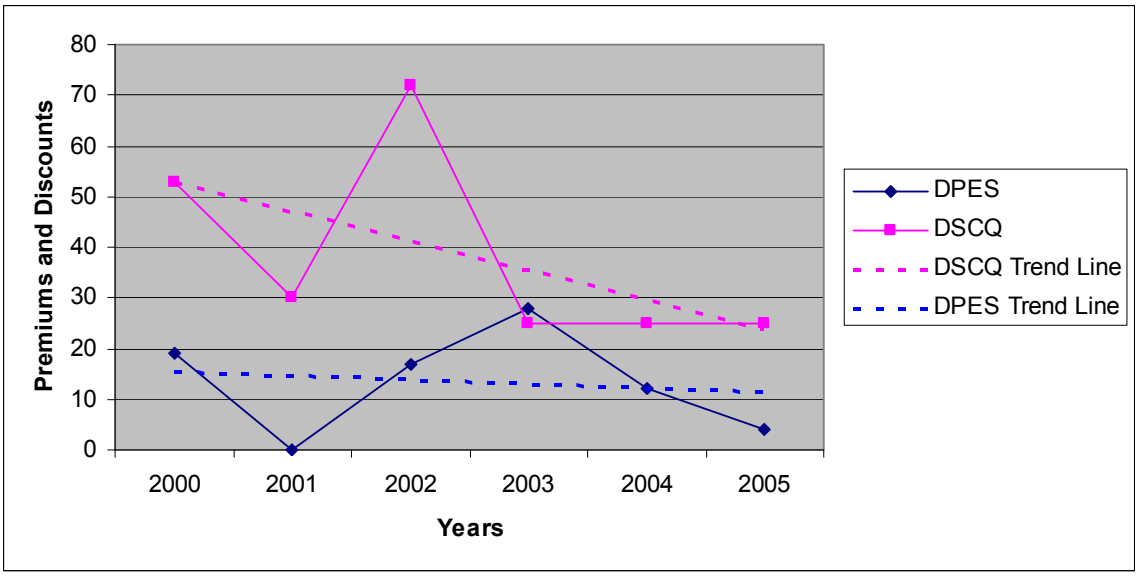

Figure 11. Average Annual West Texas Premiums for Strength 30 from DPES and DSCQ, with Trends.

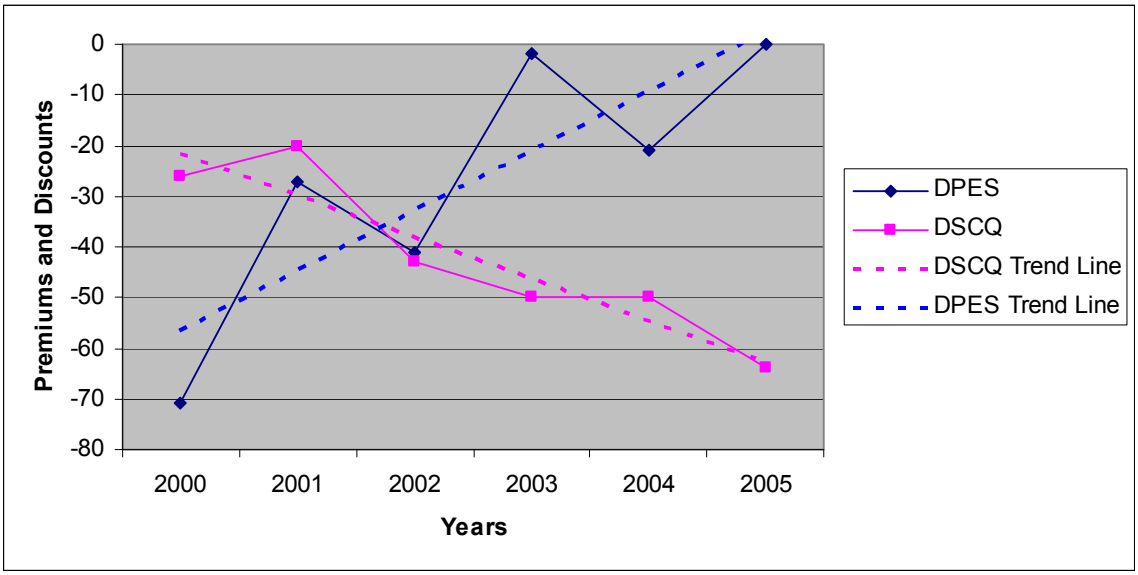

Figure 12. Average Annual West Texas Discounts for Uniformity 78 from DPES and DSCQ, with Trends.

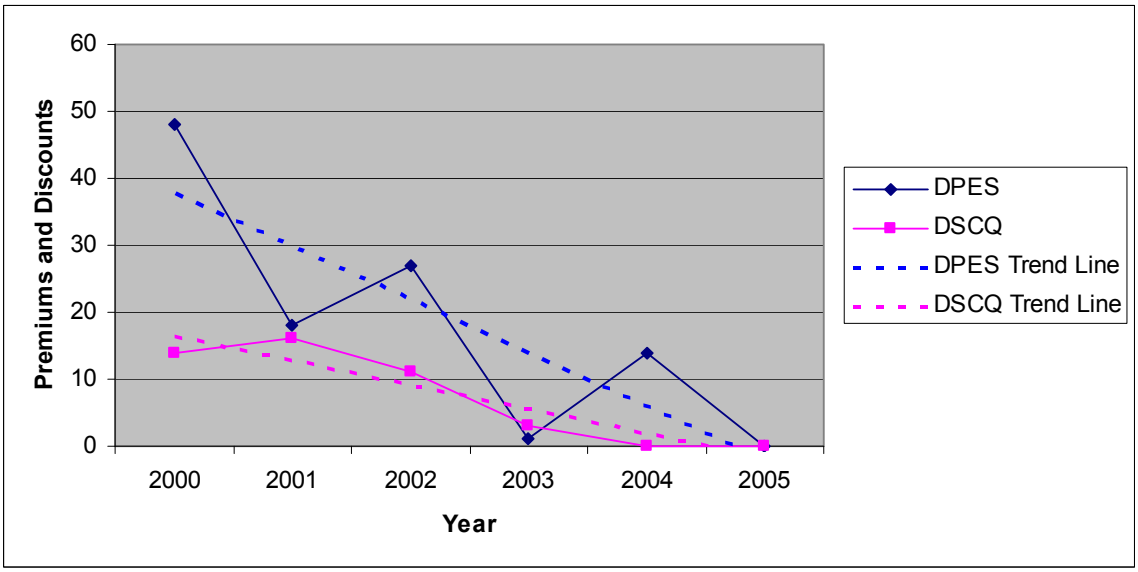

Figure 13. Average Annual West Texas Premiums for Uniformity 83 from DPES and DSCQ, with Trends.

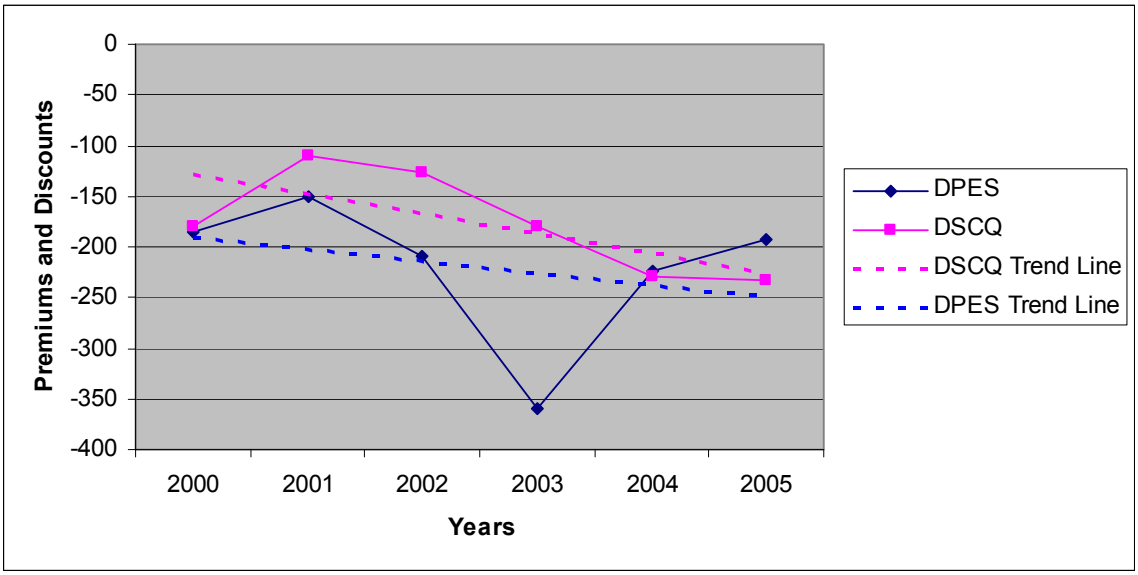

Figure 14. Average Annual West Texas Discounts for Bark Level 1 from DPES and DSCQ, with Trends.

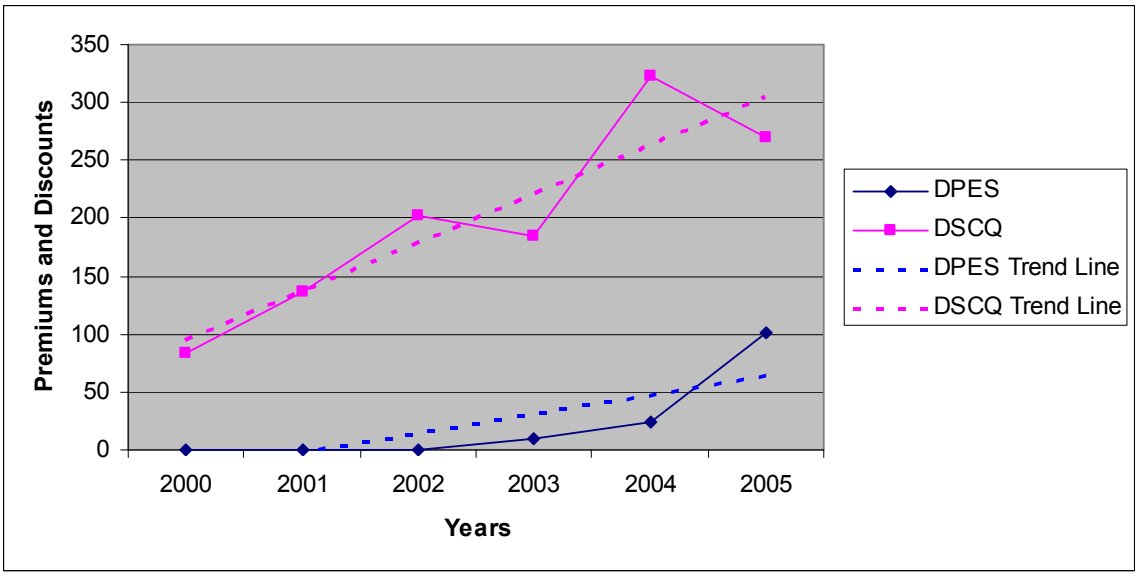

Figure 15. Average Annual East Texas/Oklahoma Discounts for Color Grade 21 from DPES and DSCQ, with Trends.

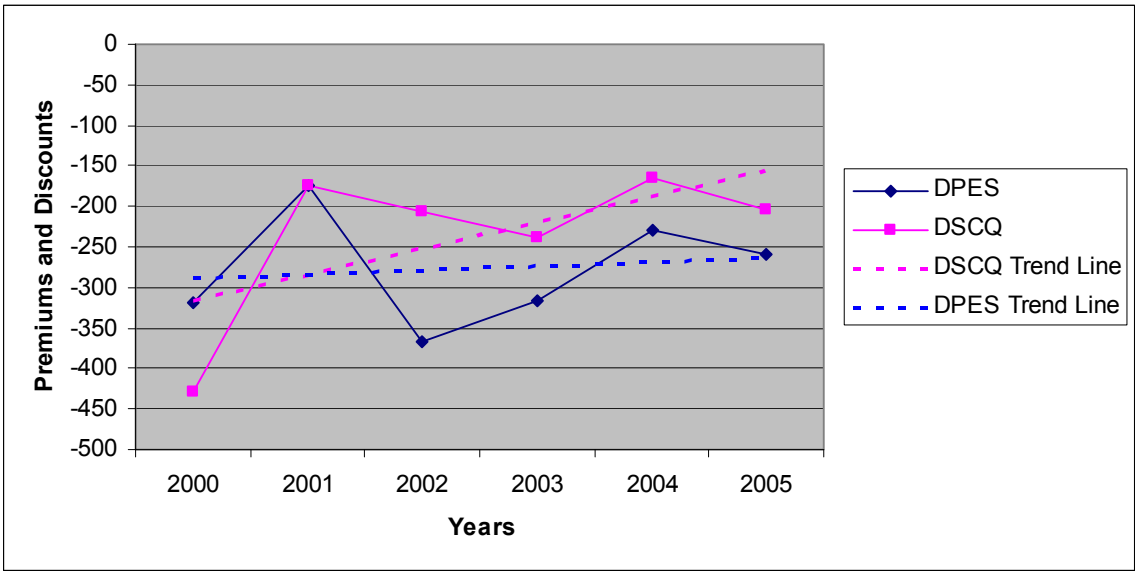

Figure 16. Average Annual East Texas/Oklahoma Discounts for Staple 32 from DPES and DSCQ, with Trends.

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