COTTON PRICE VARIATION AND DOWNSTREAM PRICE RESPONSE
G.A. Raines III and M.A. Messura
Cotton Incorporated
Cary, NC

Abstract

Fluctuations in cotton yarn prices are influenced by several factors, including present and forecast supply and demand of inputs and textile product outputs, prices of alternative fibers, prices of raw materials, import and export penetration, and evolving competitive strategies in response to downstream price pressures. Yet perhaps no variable tends to have as much influence on cotton yarn prices as the price of the raw material itself. Fluctuations in cotton fiber prices paid by domestic textile mills coupled with low textile prices received by these mills may be leading to an unprecedented margin squeeze on these manufacturers. This study uses monthly data of fiber and yarn prices to study the relationship between raw material costs and asking prices of domestically-produced yarns and how this has relationship has evolved over time. Correlation analysis shows the responsiveness of yarn prices to cotton prices has strengthened over time across different yarn counts of open-end and ring-spun yarns. Further analysis shows yarn prices tend to be more responsive (i.e., elastic) to major cotton price declines rather than gains.

Introduction

Reports of the contracting textile industry in the United States seem ubiquitous. Since consuming a record 16.4 billion pounds of fiber in 1997, the domestic industry has retrenched production 12% to a forecasted 14.5 billion pounds of total fiber in 2002. Since 1997, the U.S. textile base has continued to experience waning employment, with shuttered or relocated spinning mills and lost capacity. Several factors may be contributing to the declining state of the industry. Surging imports of textiles and apparel continue to encroach upon domestic markets, displacing domestically-produced textiles and apparel. Several foreign textile and apparel suppliers to the U.S. do not offer reciprocal access of U.S. textile and apparel shipments to their domestic markets, hindering U.S. efforts to expand exports. Also, while total prices of wholesale goods and services continue to rise, during much of the 1990s apparel prices sold at retail began to sag. The inflationary nature of textile payables and deflationary nature of receivables continue to contribute to tighter margins imposed on domestic manufacturers, choking off opportunities for growth, investment, and ultimately sustained viability for several manufacturers in the industry.

Cotton, with a long and storied history in U.S. mills, felt a similar decline in usage since peaking recently. The most important natural fiber input in the U.S. textile industry, cotton saw domestic mill use decline 34% from a peak of 11.3 million bales in 1997/98 to a forecasted 7.5 million bales in 2002/03. Many yarn manufacturers, the largest consumers of cotton in the U.S., scaled back production or moved operations offshore since consuming a record amount of cotton in 1997, citing increased price pressures from buyers. The aim of this study is to examine the relationship between prices on domestic yarn manufacturers and note what types of yarns are most susceptible to those price pressures.

Methodology

Monthly mill delivered prices of raw cotton from USDA-AMS and asking prices of domestically-produced cotton yarns from Textile World Magazine were compiled to test the nature of their relationship and how this relationship has evolved over time using regression and correlation analyses. Yarns were divided into three primary classifications according to type and manufacturing process: Open-end (rotor) carded yarns, ring-spun carded yarns, and ring-spun combed yarns. Each of these three types of yarn was further divided according to yarn fineness, or count, using the indirect English count (Ne) scale. Domestic spun yarn production primarily consists of carded open-end yarns, with medium to coarse yarns accounting for the bulk of production. For this reason, the study initially focused on the relationship between mill-delivered prices of cotton and medium- to coarse-count open-end carded yarns.

Looking over the 18-year period of available data, a significant positive correlation exists between mill-delivered cotton prices and each yarn type and yarn count (Figure 1). Typical procurement and production times at the mill imply a delay in the responsiveness of cotton yarn prices to raw cotton prices. Therefore, different monthly lags were introduced to test the effect on correlations. Generally speaking, over the entire time period correlations for each yarn type and count tended to peak between a 2-5 month lag, and then steadily decline thereafter (Figure 2). Of the three yarn types studied, open-end carded yarns tended to have the weakest correlations across all yarn counts, with the strongest correlations evident during a 3-month lag. Ring-spun carded yarns displayed stronger correlations, with ring-spun combed yarn correlations stronger still, displaying the strongest correlations between 2-5 months. In all three yarn types, correlations during each monthly lag were generally higher for coarser-count yarns than for finer-count yarns. This may appear intuitive, as cotton procurement costs for producing coarser-count yarns generally represent a higher share of total production costs than for finer-count yarns.

After establishing the direct, linear relationship and strength of correlation between cotton prices and yarn prices, we focused on how the nature of the relationship may have evolved over time. In the U.S. textile industry, imports have come to play an ever more prominent role, accounting for a larger share of the market and offsetting domestic production. Therefore a key issue to test is the impact posed by imports of combed and carded yarns into the domestic market. In reviewing yarn imports over the 18-year time period, two clearly discernible periods were identified: 1984 – 1995, when the volume of imported cotton carded and combed yarns was relatively flat, and 1996 – 2002, when imports tripled from 360 million square meter equivalents to over 1.08 billion square meter equivalents. Open-end carded yarns during the first period, 1984 – 1995, displayed correlations that peaked at 0.42 during a two-three month lag, before steadily declining thereafter (Figure 3). During the latter period, 1996 – 2002, correlations for each yarn count and for each monthly lag were appreciably higher, peaking at 0.92 during a three to five month lag. A similar pattern was evident for ring-spun carded yarns. Single-count yarn correlations during the first period of relatively low yarn imports peaked during a two-month lag between 0.50 – 0.58 and steadily weakened thereafter (Figure 4). Correlations during the latter time period of increased imports were less responsive to monthly lags, but much stronger, reaching between 0.79 – 0.89 for yarn counts over each lag. Finally, ring-spun combed yarns displayed similar traits, with correlations during the earlier period peaking during a four to five month lag between 0.58 – 0.67 (Figure 5). During the latter time period, correlations again strengthened appreciably from the earlier time period to peak between 0.81 – 0.91 for each yarn count and lag period.

Generally speaking, in the cases of all three yarn types studied, coarser count yarns tended to have higher correlations than finer count yarns, and the latter time period of increased import penetration into the domestic market yielded substantially stronger correlations at each monthly lag than during the period of low import penetration. While the correlations all increased during the latter time period, the correlations appeared to be less influenced by lagging cotton prices than was evident during the earlier time period. This may seem intuitive, as the higher correlations yield less potential opportunity for relationships to strengthen much further. Additionally, over time as mills have implemented more diversified and competitive hedging and coverage strategies in cotton procurement, price correlations have tended to increase, while lagging effects have tended to be less responsive.

Year-over-year changes in apparel prices in the United States have tended to decline during most of the last decade for several reasons. As downstream final prices paid by the consumer have fallen, how has this impacted the responsiveness of yarn prices to cotton prices? We identified three discreet time periods over the 18 years studied: The first period, from 1984 – 1993, when year-over year prices of apparel sold at retail in the United States generally increased; period two, from 1993 – 1998 when apparel prices were regarded in a transitioning period of flat price changes; and period three, from 1998 – 2002, when apparel prices tended to decline from year-ago levels. Open-end carded yarn prices demonstrate increasing correlations to cotton prices for each count across each of the three periods of evolving apparel prices, with the strongest correlations during rising, flat, and declining apparel prices increasing from 0.39 to 0.70 to 0.91, respectively (Figure 6). Ring-spun carded yarn price correlations exhibit a similar pattern over these three periods, climbing from 0.38 to 0.68 to 0.92 as retail apparel prices gradually eroded (Figure 7). Ring-spun combed yarn price correlations continued the pattern, with the strongest correlations during rising apparel prices reaching 0.44, reaching 0.74 during the period of transitioning prices, and 0.92 during the period of declining apparel prices (Figure 8). As apparel prices gradually eroded during the 18-year period, increased price pressures began moving up the manufacturing pipeline, ultimately prompting increased attention to margins on the part of domestic yarn manufacturers. Consequently, correlations across all counts of both ring-spun and open-end yarns generally tended to increase during each of the three chronological periods studied.

Significant correlations between yarn prices and cotton prices exist and have tended to increase over time, responding to fundamental changes in a dynamic market. Over this time, during narrower periods of cotton price volatility, how have yarn prices responded? More specifically, when cotton prices experienced volatile increases or declines in price, did yarn prices tend to climb or fall by the same amounts (taking into account the optimum lags for maximum correlation)? During the period 1984 – 2002, ten periods of cotton price volatility were noted, when mill delivered cotton prices either rose or fell a minimum of 30% from a previous inflection point. Examining 18/1 Ne open-end carded yarns, cotton prices and yarn prices rose during four of these periods and fell during six. The elasticities of yarn price percentage changes to cotton price percentage changes during the six bear markets ranged from 0.09 to 0.83, with an average elasticity of 0.43. Conversely, during the four bull markets, elasticities ranged from 0.14 to 0.29, with an average elasticity of 0.21 (Figure 9). Ring-spun yarns exhibit a similar pattern; over the same ten volatile price periods, yarn price elasticities to cotton prices during the declining markets ranged from 0 to 0.58, averaging 0.26. During appreciating markets elasticities varied from 0.07 to 0.28, with an average of 0.18. In both cases, yarn prices tended to decline more when cotton prices declined than yarn prices rose when cotton prices rose. Put another way, yarn prices are more responsive (i.e., elastic) to cotton price declines than increases, implying manufacturers are unable to raise yarn prices as much during appreciating cotton markets as they lowered yarn asking prices during down markets.

Conclusions

As the textile industry has evolved over time, channels within the pipeline have become increasingly vertical and integrated, blurring the lines between industry segments. Rapid technological changes, automation, shifts to large-scale operations, restructuring, consolidation of enterprises, and information integration are a few of the major factors highlighting the evolving textile pipeline. Information integration in the retail channel may be one of the primary factors contributing to the downstream shift in power witnessed in the textile-retailer-consumer pipeline in recent decades. Previously, manufacturers and suppliers to a number of retailers were often in a better position, compared with any one retailer, to report on shifting styles and tastes and estimate market direction. In many situations, they chose SKUs and set volumes for retailers. Now point-of-sale information provides retailers with reliable information on market developments and hence gives them more leverage in dealing with upstream suppliers and manufacturers further from the ultimate consumers. In other words, direct measurable information of consumer behavior translates into market power. Application of this increased leveraged negotiation position is evident in the stronger correlations over time between prices paid for raw cotton by textile mills and asking prices for cotton yarns. With an overcapacity of textile yarn production and retail floor space, price pressures have moved upstream from consumer to retailer to manufacturer, ultimately contributing to tighter margins imposed on domestic manufacturers and increased attention to cotton procurement strategies in order to maximize dwindling margins between cotton costs and yarn sales.

Previous studies have shown weak correlations between cotton prices and prices of cotton apparel sold at retail. Future research could continue the correlation and regression to determine different responses to price pressures at different segments of the pipeline and how and why these responses may have evolved over time. Understanding these patterns of correlation throughout the textile pipeline may increase our understanding of the difficulty encountered by different segments of the textile pipeline when trying to pass along increases in input costs. Multiple regression analysis could examine the relative influence posed by factors such as import penetration or declining apparel prices on pricing at different segments in the industry pipeline. Given the increasing volumes of imported yarns into the U.S., further research could study if similar patterns of strengthening correlations over time between cotton prices and yarn prices are evident in foreign markets as well.

References

Abernathy, Frederick H., Dunlop, John T., Hammond, Janice H., and Weil, David (1999). A Stitch in Time, Oxford University Press.

American Textile Manufacturers Institute.

U.S. Department of Labor, Bureau of Labor Statistics.

Dickerson, K. (1999). Textiles and Apparel in the Global Economy. (3rd edition).

El Mogahzy, Yehia and Chewning, Charles H. (2001). Cotton Fiber to Yarn Manufacturing Technology, Cotton Incorporated.

Fiber Organon, March 2002.

Messura, M.A. and McLaren, D. (1998). "The Denim Market and Cotton Demand," Proceedings of the Beltwide Cotton Conferences, Volume I: 301-303.

McCreight, Dan J., Feil, Ralph W., Booterbaugh, James H., and Backe, Everett E. (1997). Short Staple Yarn Manufacturing, Carolina Academic Press.

Plassman, V.S. and Jones, E. (1999). "The Effect of Fiber, Yarn, and Fabric Prices on Mill Cotton Fiber Consumption," Proceedings of the Beltwide Cotton Conferences, Volume I: 259-268.

Textile World Magazine, f/k/a America's Textiles International. Various issues. Atlanta, GA: Billian Publishing.

U.S. Department of Agriculture, Agricultural Marketing Service, Market News Branch.

U.S. Department of Agriculture, Economic Research Service (2002). "Cotton and Wool Yearbook," November 2002.

U.S. Department of Commerce, International Trade Administration, Office of Textiles & Apparel.

Yarn Market Tracks Cotton Prices
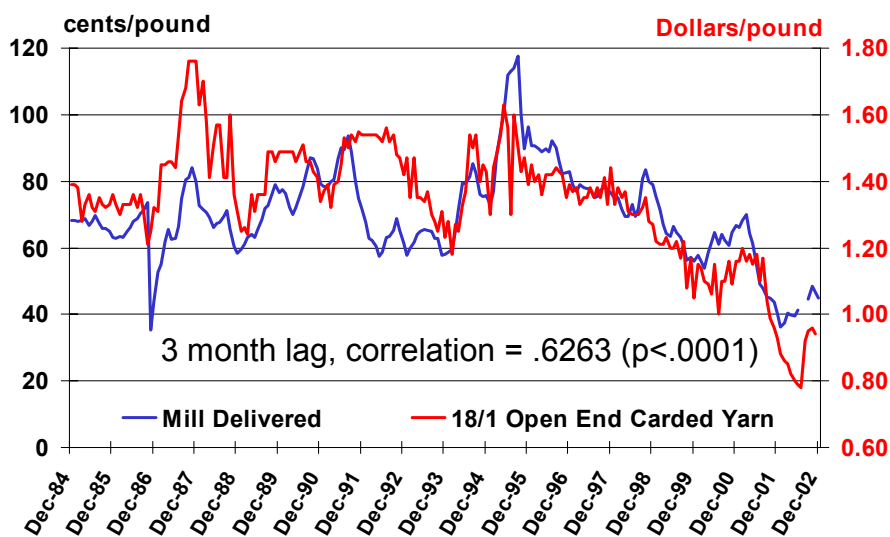
Sources: USDA – AMS and Textile World Magazine

Figure 1. Maximum correlation of mill-delivered cotton prices vs. 18/1 Ne open-end carded yarn prices utilizing optimum lag period.

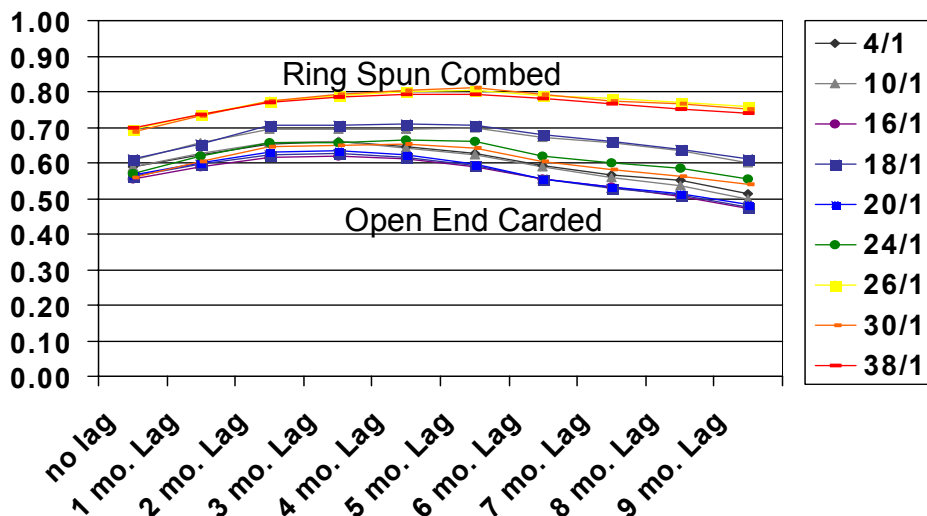## Correlations Between Cotton Prices and Various Yarn Types and Counts

Figure 2. Lagged correlations from 1984 – 2002 for different yarn counts and types vs. mill delivered cotton prices.

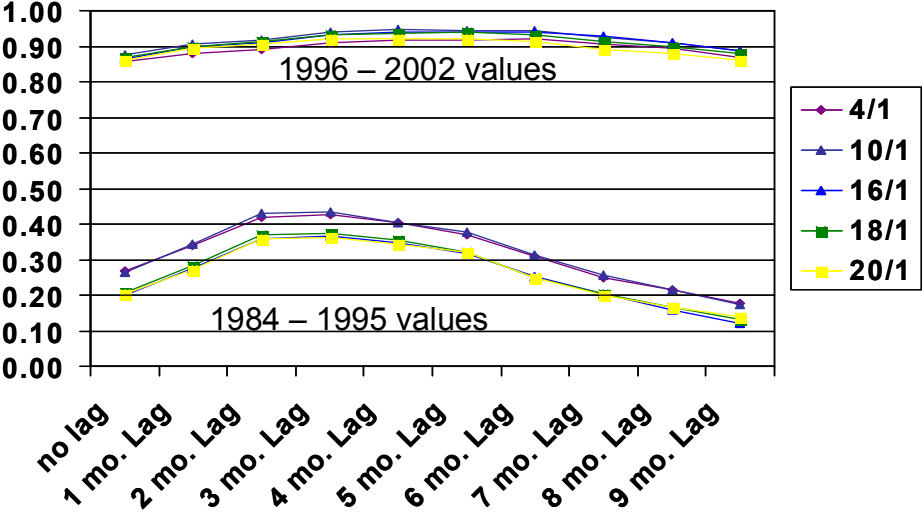# Correlations Between Cotton Prices and OE Carded Yarn Counts

"Pre- & Post-Import Periods"

1996 – 2002 values

1984 – 1995 values

Legend: 4/1, 10/1, 16/1, 18/1, 20/1

Figure 3. Lagged correlations for different counts of open-end carded yarns during different periods of yarn import penetration.

Correlations Between Cotton Prices and Ring Carded Yarn Counts
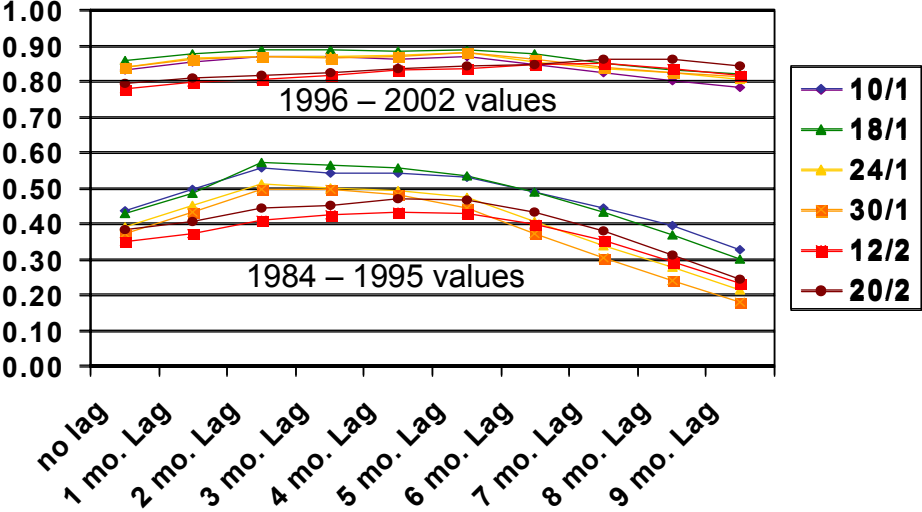
"Pre- & Post-Import Periods"

1996 – 2002 values

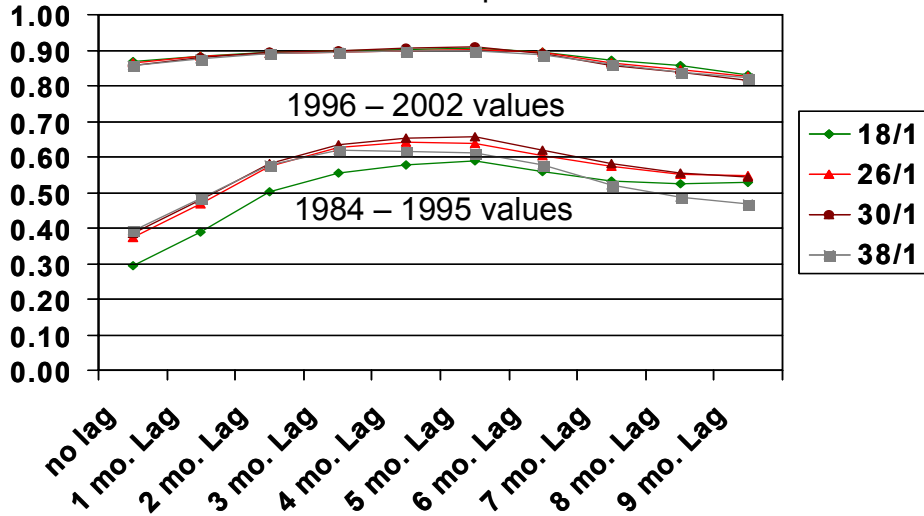1984 – 1995 values

Legend: 10/1, 18/1, 24/1, 30/1, 12/2, 20/2

Figure 4. Lagged correlations for different counts of ring-spun carded yarns during different periods of yarn import penetration.

Correlations Between Cotton Prices and Ring Combed Yarn Counts

"Pre- & Post-Import Periods"

1996 – 2002 values

1984 – 1995 values

Legend: 18/1, 26/1, 30/1, 38/1

X-axis: no lag, 1 mo. Lag, 2 mo. Lag, 3 mo. Lag, 4 mo. Lag, 5 mo. Lag, 6 mo. Lag, 7 mo. Lag, 8 mo. Lag, 9 mo. Lag

Figure 5. Lagged correlations for different counts of ring-spun combed yarns during different periods of yarn import penetration.

Correlations Between Cotton Prices and OE Carded Yarn Counts

Declining

Flat

Rising

Legend: 4/1, 10/1, 16/1, 18/1, 20/1

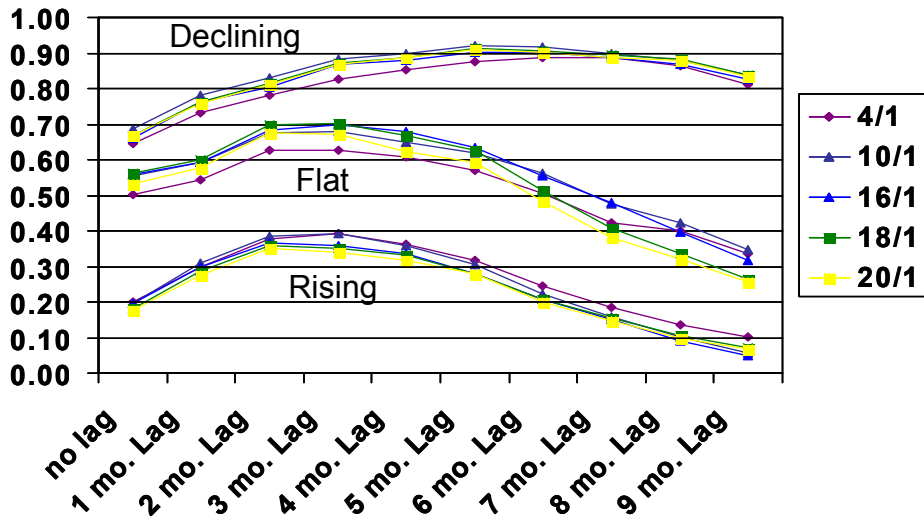X-axis: no lag, 1 mo. Lag, 2 mo. Lag, 3 mo. Lag, 4 mo. Lag, 5 mo. Lag, 6 mo. Lag, 7 mo. Lag, 8 mo. Lag, 9 mo. Lag

Figure 6. Lagged correlations for different counts of open-end carded yarns during different periods of retail apparel price fluctuations.

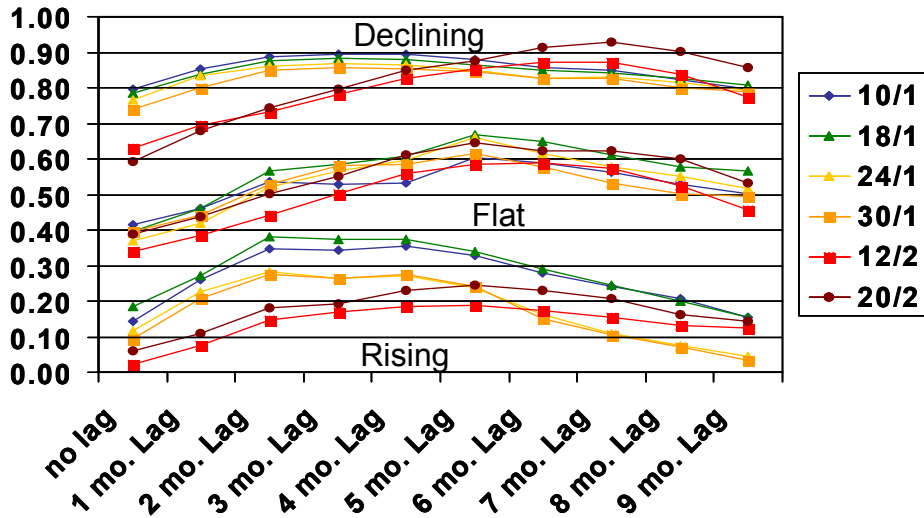# Correlations Between Cotton Prices and Ring Carded Yarn Counts

Figure 7. Lagged correlations for different counts of ring-spun carded yarns during different periods of retail apparel price fluctuations.

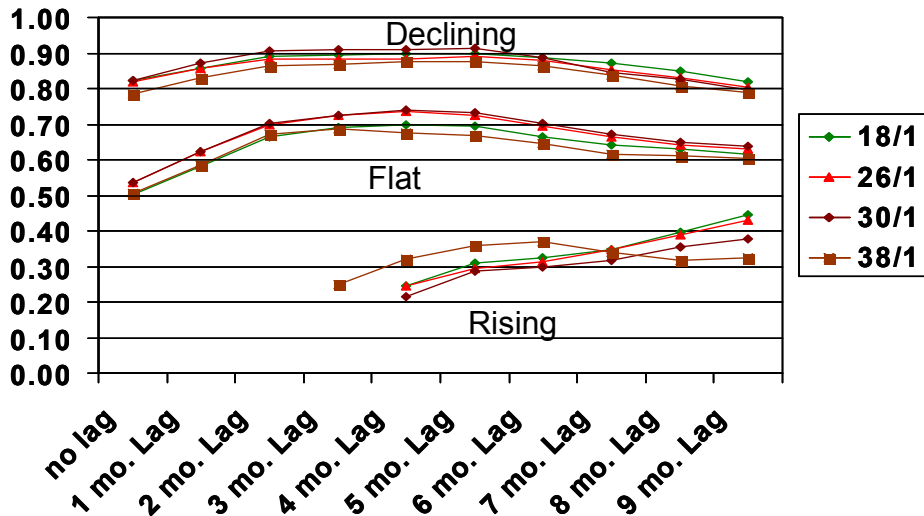# Correlations Between Cotton Prices and Ring Combed Yarn Counts

Figure 8. Lagged correlations for different counts of ring-spun combed yarns during different periods of retail apparel price fluctuations.

Slow Up, Quick Down:
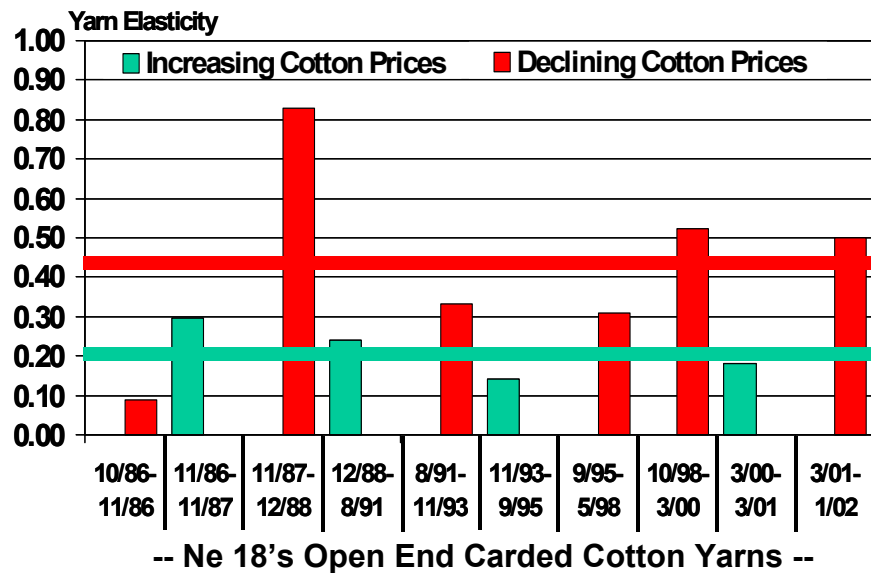## Yarn Price Elasticity and Fiber Price Direction

Figure 9. Yarn price elasticities to periods of volatile mill-delivered cotton price fluctuation.