Conclusions and Implications

This report developed a statistical model that reflects current drivers of U.S. upland cotton prices in response to renewed authority for USDA to publish cotton prices and the growing challenges to accurate cotton price forecasting in recent years. A review of the theoretical framework for commodity price forecasting suggested that changes in supply should be included in a cotton price model because of the rapid growth in supply due to the spread of genetically modified varieties and other technologies. Several demand shifters were also included in the model. China's net trade as a proportion of world consumption was included to account for changes in export demand associated with China's commodity and trade policies. The impacts of U.S. farm policy were accounted for by including a variable representing the amount of cotton in the marketing loan program as a share of domestic consumption and by adjusting the dependent variable to reflect the historical impact of the User Marketing Certificate (Step 2) program, now discontinued.

Analysis of the cotton price forecasting model identified a structural break that occurred in the U.S. cotton industry in 1999. This structural break was likely caused by a combination of factors, including an increased export orientation of the U.S. cotton industry as the domestic textile industry contracted following the phasing out of the Multifiber Arrangement (for more information on the end of the MFA, see MacDonald and Vollrath, 2005). Thus, the proposed model was modified to include the world supply of cotton, to reflect the increased export orientation, and to correct for the observed structural change. The final model was subjected to extensive out-of-sample testing to ensure its appropriateness for forecasting.

The out-of-sample performance measures of the proposed cotton price model suggest that it is a considerable improvement over the naive forecast. Parameter estimates and forecast errors do not change much between a full sample and reduced sample used for out-of-sample forecasting, indicating the stability of the model. This stability is an improvement over past forecasting models that have been challenged by changing market conditions. Specifically, the out-of-sample forecasts from the proposed model are characterized by a lack of bias and relatively low variance. However, the in-sample root mean squared error of the nominal price predictions projected by this model is 6.0 cents/pound, which is about 10 percent of the 1974/75–2006/07 average for U.S. upland cotton farm prices. These errors suggest that there may be some variables omitted from the model that can be pursued in future research.

Omitted variables could include cotton quality characteristics, the role of polyester (cotton's primary substitute in textile spinning), and lower transmission of grain price shocks to significant non-U.S. cotton producers. For example, Olmstead and Rhode (2003) demonstrate that the average staple length of U.S. cotton rose during the historical sample used to estimate this model. The U.S. season-average price is equivalent to the value of the crop of upland cotton divided by its volume, and staple length is a key determinant of the price of a particular bale, or lot, of cotton. Olmstead and Rhode's data started in 1957, when the U.S. upland crop averaged 32.75 sixteenths of an inch long. In 2006/07 and 2007/08, it averaged 35.3 sixteenths, an increase since 1957 that in 2007/08 would be worth about 2 cents per pound (USDA/

AMS, 2008). However, the impact of these quality characteristics on the price of cotton was not included in this study as it is very difficult to quantify.

The proposed model is particularly informative in an environment of volatile commodity prices and the increased role of new players in futures markets. These developments and changing market institutions, such as the rise of electronic trading, have raised questions about the relationships among cash prices, futures prices, and supply/demand fundamentals. Specifically, there has been growing concern about changes in the relationship between futures prices and cash prices in the United States (Irwin et al., 2007). In March 2008, U.S. cotton futures demonstrated nearly unprecedented volatility. The basis between nearby futures and spot prices remained historically wide for several months afterward (fig. 8).

As a result, a cotton price forecast based on futures prices in 2008 would have been biased substantially upward. This is illustrated by the surge in the futures-based forecasts of farm prices for corn, wheat, and soybeans published by USDA's Economic Research Service during 2008 (U.S. Department of Agriculture, Economic Research Service, 2008). Therefore, while it would be irrational to ignore the information provided by futures markets when forecasting the U.S. farm price of cotton, it is also important to have forecasts that are independent of that information.

The out-of-sample performance of the proposed model was superior to that of alternative models. This comparison, however, does not include the consensus-based forecasts of USDA's Interagency Commodity Estimates Committee (ICEC) for cotton that became publicly available in the WASDE reports as of June 2008. The consensus forecasts were about as accurate as the proposed model, despite the handicap of preliminary supply and demand estimates. The advantage that the ICEC had in making its forecasts was the ability to incorporate additional information in its forecasting procedure that is hard to quantify within the framework of a statistical model. However, consensus forecasts are very specific to current events and difficult to replicate or adjust to changing circumstances. As such, they are of limited use when presenting policymakers

Figure 8

December ICE cotton contracts' basis, 2005-08

Cents/pound

Days until expiration
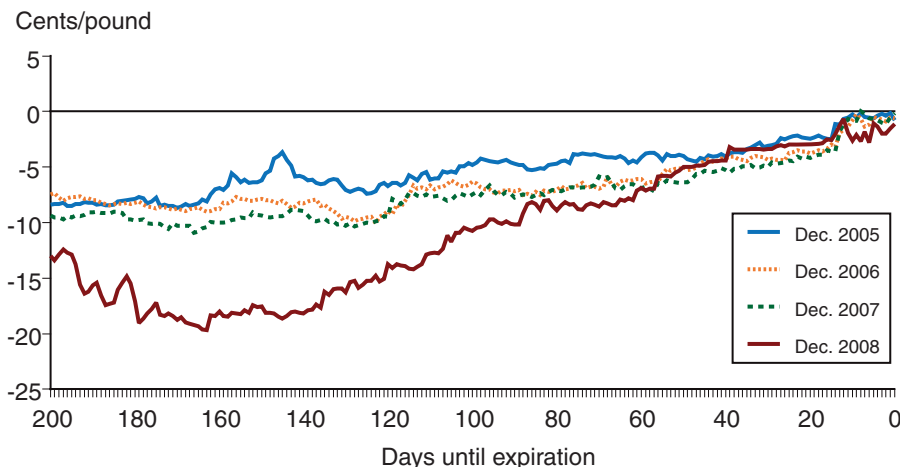
Source: Thompson Reuters Datastream.

with alternative scenarios. A further advantage of this report's model is the opportunity for checking consistency. USDA's ICEC sometimes adjusts its supply and demand outlook in response to prices, and this model provides an additional tool to aid in that process.

Future avenues for research relate to both world cotton markets and to the characteristics of USDA's supply and demand forecasts. While this study correctly identified some aspects of the structural change that has occurred in U.S. cotton markets since 1999, further examination of the sources of structural change and the channels through which it affects cotton prices is warranted. In addition, forecasts based on this model will depend not only on the parameters of the model, but will also be conditional on the forecasts of supply and demand used to derive any particular forecast of price. Intuitively, early-season forecasts are less reliable than late-season forecasts, but further research can inform these intuitions, and identify key points in the season with respect to dynamics of forecast performance within the forecasting season. Furthermore, the accuracy of specific supply and demand variables and their potential contribution to forecast errors should be examined with the goal of correcting for systematic errors in the cotton price forecasts.