

United States
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Economic
Research
Report
Number 80

September 2009

U.S. Cotton Prices and the World Cotton Market

Forecasting and Structural Change

Olga Isengildina-Massa
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National Agricultural Library Cataloging Record:

Isengildina-Massa, Olga

U.S. cotton prices and the world cotton market: forecasting and structural change.

(Economic research report (United States. Dept. of Agriculture. Economic Research Service); no. 80)

1. Cotton trade—Econometric models.
2. Cotton—Prices—United States—Forecasting.
 - I. MacDonald, Stephen A.
 - II. United States. Dept. of Agriculture. Economic Research Service
 - III. Title.

HD9875

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Abstract

This report analyzes recent structural changes in the world cotton industry and develops a statistical model that reflects current drivers of U.S. cotton prices. Legislative changes in 2008 authorized USDA to resume publishing cotton price forecasts for the first time in nearly 80 years. Systematic problems have become apparent in the forecasting models used by USDA and elsewhere, highlighting the need for an updated review of price relationships. A structural break in the U.S. cotton industry occurred in 1999, and world cotton supply has become an important determinant of U.S. cotton prices, along with China's trade and production policy. The model developed here forecasts changes in the U.S. upland cotton farm price based on changes in U.S. cotton supply, the U.S. stocks-to-use ratio (S/U), China's net imports as a share of world consumption, the foreign supply of cotton, and selected farm policy parameters.

Keywords: forecasting, cotton, price, demand, trade, structural change, farm programs.

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Acknowledgments

The authors appreciate the support for this project from the Small Grants Program of the Market and Trade Economics Division of the Economic Research Service, and the assistance of Carol Skelly and Hunter Colby of the World Agricultural Outlook Board in acquiring valuable data and insight. The authors thank the reviewers Linwood Hoffman, Alejandro Plastina, John Robinson, Carol Skelly, and Russell Tronstad for their comments, which helped to improve the paper substantially. Finally we gratefully acknowledge Dale Simms for editorial assistance and Wynnicke Pointer-Napper for layout and design.

Contents

Summary iii

Introduction 1

Data 2

Cotton Price Model 3

 Theoretical Model 3

 Empirical Analysis 5

Structural Change Test 12

Estimation Results 15

Conclusions and Implications 20

References 23

Recommended citation format for this publication:

Isengildina-Massa, Olga, and Stephen MacDonald. *Cotton Prices and the World Cotton Market: Forecasting and Structural Change*. Economic Research Report 80, U.S. Dept. of Agriculture, Economic Research Service. Sept. 2009.

Summary

In 1929, Congress passed legislation forbidding the U.S. Department of Agriculture from publishing cotton price forecasts. That ban was removed in the Food, Conservation, and Energy Act of 2008. Recent changes in world cotton markets required that a model to forecast cotton prices be developed. This report develops a reduced-form specification for a U.S. cotton price forecasting model based on expected changes in U.S. and global supply and demand factors.

What Is the Issue?

Although cotton price forecasts were not published by USDA between 1929 and 2008, USDA's Interagency Commodity Estimates Committee for cotton calculated unpublished price forecasts each month. USDA's models have tended to overestimate cotton prices in recent years, however, because of rapid ongoing structural changes in the cotton industry. Other agencies making cotton price forecasts have encountered similar problems. Given the poor predictive capability of existing cotton price forecasting models and the renewed authority of USDA to publish cotton price forecasts, it is important to review and improve the existing models. An updated and improved cotton price forecasting model will more accurately account for the factors now determining U.S. upland cotton prices and illuminate the interaction of commodity markets with U.S. and global supply and demand, macroeconomic developments, and policy shifts.

What Did the Study Find?

Structural change has altered the market for U.S. cotton since the 1990s. Shifts in textile trade policy, combined with significant liberalization of China's cotton production policies, have overturned longstanding global consumption and trade patterns. The result has been to shift the United States into a nearly unprecedented dependence on global markets. While about 60 percent of U.S. cotton was consumed domestically for the last 60 years of the 20th century, exports have significantly surpassed the use of cotton within the United States since 2001/02. As a result, U.S. cotton prices are no longer determined solely by domestic supplies and stocks.

To reflect these recent structural changes, the model draws on a number of variables to forecast changes in the U.S. cotton price: U.S. cotton supply, U.S. stocks-to-use ratio, China's net imports as a share of world consumption, the proportion of U.S. cotton in the loan program, and the world supply of cotton. The model explains 68 percent of the variation in the U.S. upland cotton price from 1974/75 through 2006/07. The results suggest that a 1-percent increase in U.S. supply from the previous year will cause U.S. cotton prices to drop about 0.9 percent, in real terms. Changes in foreign supply affect U.S. prices on a nearly one-to-one basis: prices fall as foreign supply rises.

U.S. commodity policy helps support U.S. cotton prices: a 1-percent increase in the end-of-season stocks covered by the loan program (with stocks measured as a proportion of U.S. cotton use) raises prices by 0.4 percent. Import demand by China continues to play an important role in determining prices: a 1-million-bale increase in China's net imports raises prices by 3.1 percent.

Given China's recent imports, this is equivalent to a 1-percent increase in China's cotton imports, as a share of world consumption.

How Was the Study Conducted?

A review of the theoretical framework for commodity price forecasting revealed that forecasting price as a function of a stocks-to-use ratio and demand shifters, which is the standard methodology, is sufficient only when changes in supply are very small or when changes in stocks-to-use are much greater than changes in supply. Since these conditions were not satisfied in the cotton markets because of the rapid growth in supply due to the spread of genetically modified varieties and other technologies, changes in supply were included in a proposed model. Several demand shifters were also included. 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 impact of the User Marketing Certificate (Step 2) program.

The Quandt-Likelihood Ratio test indicated significant structural change in the 1999/2000 marketing year. This structural break was likely caused by a combination of factors, including the increased export orientation of the U.S. cotton industry following the U.S. textile industry's contraction as the Multifiber Arrangement was phased out. Thus, the proposed model was modified to include the foreign 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.