Volume 3 Number 1

December 1985

Agricultural Economics Journal of Student Papers

PAPERS

MINUTES

The Impact of Domestic Policies, Foreign Competition, and Real Exchange Rate Changes on the Price of Hard Red Winter Wheat

by

Nancy K. Osborn
Oklahoma State University

ABSTRACT

The objective of this study was to determine the relative impacts of U.S. carry-over stocks of hard red winter wheat, the CCC loan rate, the quantity of wheat exported by Argentina, and the relative U.S. and Argentine exchange rate changes on the Gulf price of hard red winter wheat. This analysis involved the use of a base model, estimated by an ordinary least squares regression, and ten additional equations using exchange rate variables from individual countries. Statistically, exchange rates had little impact on price, with the other variables affecting Gulf price significantly.

NOTE: The author would like to gratefully acknowledge the advisement of Dr. Robert Oehrtman and Dr. David Henneberry of Oklahoma State University and the support of the Texas Tech University Agricultural Economics Department.

The Impact of Domestic Policies, Foreign Competition and Real Exchange Rate Changes on the Price of Hard Red Winter Wheat

Introduction

The decade of the 1970's will always be remembered as the boom years for the export markets in agriculture, while the first part of the 1980's may well be recalled as the bust. From 1970 to 1981, exports of hard red winter wheat increased 84 percent, from 10.6 million metric tons (MMT) in 1970 to almost 19.5 MMT in 1981. Since that time, exports have declined both in volume and in value. During the seventies, Oklahoma wheat farmers increased their dependence on foreign markets (Henneberry) by exporting over 60 percent of their harvests. Because of this dependence on the export market, the decrease in export volume has contributed significantly to financial difficulties in the farm sector. In recent years, the United States has gone from holding the major share of world wheat markets to becoming the world's residual supplier of wheat. One of the most important factors contributing to this loss of market share is the price of U.S. wheat relative to world price. Other factors leading to this decline in export volume are the strength of the dollar relative to other currencies, the recent worldwide recession, and the lack of negotiation skills on the part of our government. Domestic farm programs have kept the price of wheat high through the 1980's, providing a price floor for U.S. wheat farmers and a price umbrella for world wheat producers (Schuh). In order to restore stability to the farm sector in Oklahoma, a solution to the problem of declining exports of hard red winter wheat must be found.

Objective and Methodology

The objective of this paper is to examine the impact of government domestic policies, foreign competition, and real exchange rate changes upon the Gulf price of hard red winter wheat, and to draw a relationship between these factors and the volume of U.S. exports of this commodity. There are several different ways in which this type of analysis can be performed. An aggregate set of exchange rate variables representative of the entire export market for hard red winter wheat can be developed, or the analysis can be approached on a country by country basis, measuring the effects of exchange rate changes for each importing country. The latter method was chosen in order to determine if the responsiveness of price varies between developed and lesser developed countries. This analysis was performed on ten of the twelve countries that imported the greatest quantity of hard red winter wheat during the period from 1970 to 1982. These ten countries imported 45 percent of the U.S. hard red winter wheat exports during that time. The sample set of countries includes one industrialized country (Japan) and nine developing and lesser developed countries (Brazil, Chile, Columbia, India, Israel, Mexico, Nigeria, Peru, and South Korea). Data was unavailable for the two centrally-planned countries among the top twelve importers, the U.S.S.R. and the People's Republic of China.

The Hypothetical demand function for hard red winter wheat in the export market is thought to be a function of the price of the product (in this case, Gulf price), the price of competing products, income, and population. By analyzing the Gulf price component of the demand function, resulting conclusions can be drawn about export demand for U.S.

hard red winter wheat. The factors used in this analysis that affect the price of hard red winter wheat are

(1) Carryover stocks of U.S. hard red winter wheat

(2) CCC loan rate

(3) Argentine wheat exports

(4) Real exchange rate changes in the U.S. dollar

(5) Real exchange rate changes in the Argentine peso

Empirical Model

The empirical model consists of one base equation and ten individual country equations. The proposed model for the base equation is

$$\text{Price}_t = B_0 + B_1\text{Stocks}_t + B_2\text{Loan Rate}_t + B_3\text{Arg Exports}_t$$

where Price is the annual price of U.S. No. 2 hard red winter wheat, Gulf f.o.b., in dollars per metric ton; Stocks is the annual carryover stocks of U.S. hard red winter wheat in MMT; Loan Rate is the annual price level of the CCC loan rate in dollars per metric ton; and Arg Exports is the annual quantity of wheat exported from Argentina in MMT. The ten individual country equations include the three variables from the base equation, in addition to the two exchange rate variables. The proposed model for each country is

$$\text{Price}_t = B_0 + B_1\text{Stocks}_t + B_2\text{Loan Rate}_t + B_3\text{Arg Exports}_t + B_4\text{US Exchg Rate}_t + B_5\text{Arg Exchg Rate}_t$$

where 'US Exchg Rate' is the real annual change in the exchange rate of the individual country's currency in terms of dollars, and Arg Exchg Rate is the real annual change in the exchange rate of the individual country's currency in terms of Argentine pesos.

The quantity of Argentine[1] exports should have a negative coefficient because of its negative impact on price. In the same way, as the quantity of stocks increases, thereby increasing the immediate available supply, price should increase. The loan rate provides a price floor, so its value should have a positive coefficient. The coefficient of the Argentine exchange rate variable should also be positive, indicating that as the strength of the peso rises, alternative demand for U.S. wheat, priced in terms of the cheaper dollar, also rises, increasing the price. Finally, the coefficient of the U.S. exchange rate variable can be either negative or positive. If positive, it can be assumed that as the dollar strengthens relative to the peso, the actual price the buyer in the importing country must pay increases. If the coefficient is negative for an individual country, then the strength of the dollar has reached a point where that country has reduced its demand for U.S. hard red winter wheat, causing price to fall.

Findings

The data set for this model consisted of annual data for the period from 1970 to 1982, providing 13 observations. The data for the CCC loan rate, carryover stocks, Argentine exports, and Gulf price were taken fronm the Wheat Outlook and Situation Yearbook, while the financial statistics were obtained from the International Monetary Fund's International Financial Statistics.

The results of the base equation are as follows:

$$\underset{t}{\text{Price}} = \underset{(10.10)}{144.16} - \underset{(8.01)}{9.51}\ \underset{t}{\text{Stocks}} + \underset{(7.04)}{1.75}\ \underset{t}{\text{Loan Rate}} - \underset{(2.30)}{8.96}\ \underset{t}{\text{Arg Exports}}$$

where the t-values are in parentheses, the degrees of freedom = 9, R^2 = .91885, and the Durbin-Watson statistic = 2.02. When the data from the base equation is included with the two exchange rate variables and run on a country by country basis, the best results are from the Japanese series:

$$\underset{t}{\text{Price}} = \underset{(1.74)}{54.25} - \underset{(9.52)}{9.48}\ \underset{t}{\text{Stocks}} + \underset{(6.53)}{1.57}\ \underset{t}{\text{Loan Rate}} - \underset{(2.48)}{7.91}\ \underset{t}{\text{Arg Exports}} + \underset{(2.46)}{85.78}\ \underset{t}{\text{US Exchg Rate}} + \underset{(1.50)}{16.72}\ \underset{t}{\text{Arg Exchg Rate}}$$

where the degrees of freedom = 7, R^2 = .97, and Durbin-Watson = 2.05.

The results of the base equation are very much as expected, and in fact do not leave very much room for explanation by the exchange rate variables in the ten individual country equations. The R^2 of the base equation indicates that the model explains over 91 percent of the variation in the dependent variable, Gulf price. The signs of the coefficients are as expected and the Durbin-Watson statistic indicates that serial correlation is not a problem with the model. All of the variables in the base equation are significant at the 95 percent level.

However, the results of the ten individual country equations do not add significantly to the model in any case. The best results are illustrated above, and show that the Japanese model adds less than seven

percent to the explanatory power of the variables. South Korea provided the weakest results of the individual equations, adding less than one percent to the F^2. In addition, Japan was the only country where the real change in the yen/dollar exchange rate was significant at the 95 percent level. The real change in the U.S. exchange rate was not significant in the other nine equations, and the real change in the Argentine exchange rate was not statistically significant in any of the equations.

Conclusion

The price of hard red winter wheat is only one component of the export demand for hard red winter wheat, but an analysis of price enables us to examine the factors which may indirectly impact that demand. First, the importance of the strong dollar's role in the decline of U.S. agricultural exports may be overestimated (Batten and Belongia). These results indicate that the impact on price of real changes in the U.S. exchange rate is not as statistically significant as many would like to believe. Second, although carryover stocks enable U.S. producers to respond rapidly to an increase in world price (witness the 1970's), stocks have a strong dampening effect on price movements. Third, Argentina's willingness to accomodate world demand for hard red wheat by offering below market interest rates and price discounts (Henneberry) has helped increase its market share and contributed to the U.S.'s unwanted role of residual supplier. Finally, the domestic farm policies pursued by the U.S. government provide an incentive for U.S. farmers to produce more wheat, while at the same time providing a price umbrella for world producers to increase their production.

A combination of factors has led to the financial crisis being faced by U.S. and Oklahoma wheat producers. Working to improve the performance of the United States in the world wheat market may help to alleviate future financial stress.

Footnotes

[1]Argentina was chosen because of its status as the U.S.'s only major competitor in the hard red wheat world market, according to Mr. Dale Minnick of the Oklahoma Wheat Commission.

References

Batten, Dallas S. and Michael T. Belongia. "The Recent Decline in Agricultural Exports: Is the Exchange Rate the Culprit?" Federal Reserve Bank of St. Louis Review (October 1984): 5-14.

Henneberry, David M. "International Agricultural Trade and Oklahoma Exports." Paper presented during the International Trade Conference, Stillwater, Oklahoma, 1985.

Henneberry, David M. and Shida Henneberry. "The Impact of Foreign Exchange Rates on Agricultural Exports." Economic Issues in Agriculture, Oklahoma State University Cooperative Extension Service, January 1985.

Schuh, G. Edward. "Future Directions for Food and Agricultural Trade Policy." American Journal of Agricultural Economics 66(1984): 242-247.

Wheat Outlook and Situation Yearbook. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service, 1973-84.