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How Does Structural Change in the Global Soybean Market Affect the U.S. Price?

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Expanded soybean production in South America means that the U.S. soybean price is increasingly affected by supply conditions there. This structural change has altered the relationships among U.S. soybean production, use, stocks, and price. Our analysis shows that South American production, combined with the U.S. carryover stocks-to-use ratio, provides a strong basis for forecasting the price received by U.S. soybean farmers. Based on our regression model, we estimate that, everything else held equal, a 1-percent increase in South American production decreases the U.S. price by about one-quarter percent, on average.

Keywords: Soybeans, price forecast, structural change, South America, Argentina, Brazil

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Introduction

One of the most important changes in the soybean sector is the emergence of South America as a major competitor to U.S. producers in global markets. In addition to putting downward pressure on U.S. prices, this change has altered important economic relationships used for economic forecasts, most notably the relationship between the stocks-to-use ratio and price. In this analysis, we estimate (1) an equation for forecasting U.S. season-average soybean prices and (2) the impact of increased South American soybean production on U.S. soybean prices.

Statistical forecasting equations are an important element of USDA price forecasts. Structural change in the soybean market has made previous forecasting equations much less reliable. USDA commodity analysts have always used individual and consensus judgments to arrive at official USDA price estimates (Vogel and Bange), but forecasting equations are important in guiding the decisionmaking process. Because of diminished accuracy of forecasting equations, these tools are less accurate, forcing commodity analysts to rely more on ad-hoc adjustment factors to account for the structural change.

Before the emergence of South America as a major global competitor, the U.S. stocks-to-use ratio was closely correlated with the U.S. season-average price. During the 1990s, however, this useful relationship began to change. The model developed here continues to use the U.S. soybean carryover stocks-to-use ratio but adds a variable to account for South American soybean production. These variables together provide a strong basis for U.S. price forecasts.

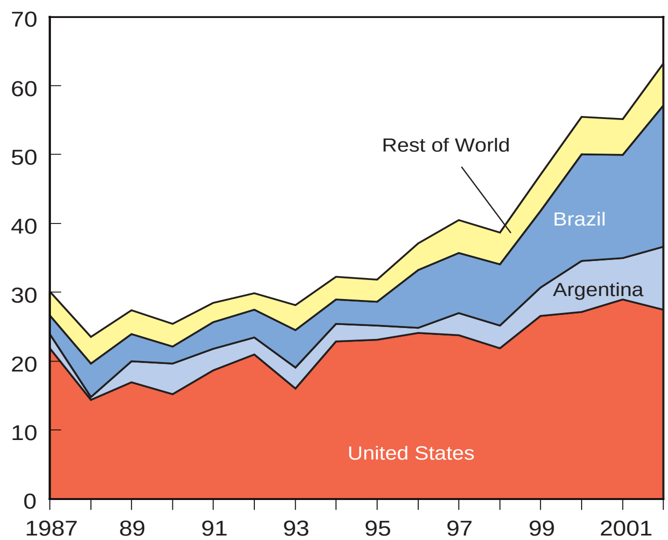
This research also found that dramatic increases during the 1990s in South American soybean production have had an impact on the season-average soybean price received by U.S. farmers. We estimate that a 1-percent increase in South American soybean production reduces the season-average soybean price received by U.S. farmers by about one-quarter percent. Furthermore, growth in South American soybean production is expected to continue.

Background

Brazil and Argentina have become major competitors to the United States in the global soybean market (figures 1 and 2). This structural change has had a substantial impact on the market dynamics of the soybean sector and has complicated price-forecasting efforts. Traditionally, the United States was the dominant country in the global soybean market. However, soybean production in both Brazil and Argentina increased sharply between 1990 and 2002. This led to a large increase in the South American share of world markets. U.S. soybean production also increased in the 1990s, but this increase was much smaller than the production increase from South America.

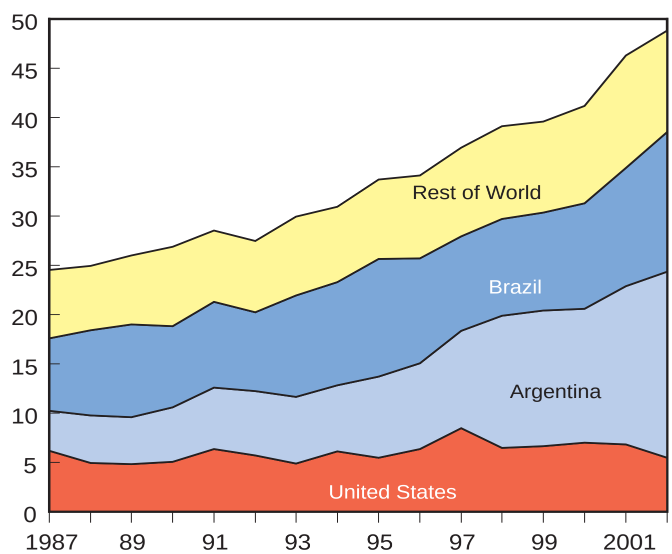
Seasonal cropping patterns in Brazil and Argentina are roughly 6 months different from those of the United

Figure 1
World soybean exports
Mil. tons



Source: Foreign Agricultural Service, USDA.

Figure 2
World soy-meal exports
Mil. tons



Source: Foreign Agricultural Service, USDA

States (that is, they harvest their crop in the spring when U.S. producers are planting).This dual-seasonal pattern has additional market implications because it makes global soybean supplies much steadier throughout the marketing year. This changes pricing, marketing, and stock holding patterns. Now there is a major harvest every 6 months as opposed to every 12 months.

Agricultural production in Argentina and Brazil has been traditionally concentrated in the northern third of Argentina and the bordering southern portion of Brazil (this region also shares borders with Paraguay and Uruguay). This warm, humid, and semitropical area is highly productive for agriculture. A critical change has been the expansion of agricultural production into the center-west region of Brazil. Today, the center-west rivals the south as Brazil's primary agricultural production region, and there remains a large potential for further expansion (Schnepf, Dohlman, and Bolling).

The center-west lies entirely within South America's tropical zone, and Brazil has developed new crop varieties that grow well in this environment. Vast tracts of virgin lands that can be used for agricultural production remain undeveloped. A significant portion of these virgin lands are savanna-like flat lands—referred to as cerrado—which can easily and inexpensively be converted to agricultural production. Brazil can also increase crop production by shifting pastureland into cropland. Because of these untapped land resources, Brazil has a tremendous capacity to increase its agricultural production (most notably its soybean production). According to a Foreign Agricultural Service/USDA report, Brazilian agricultural cropland could increase by 250-300 percent (Shean).

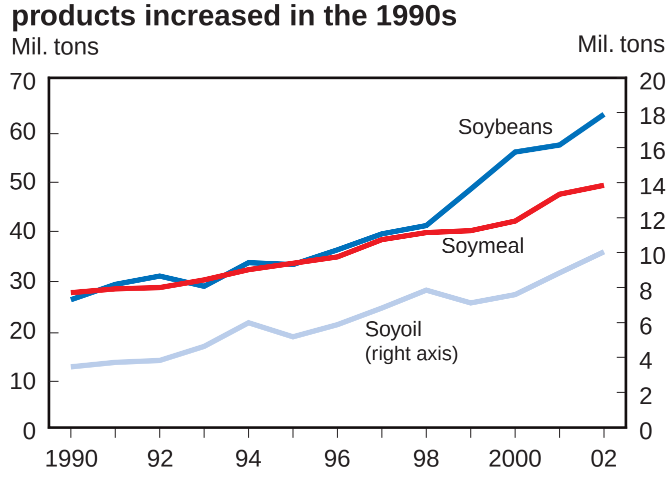
Superior infrastructure in the United States has been its primary competitive advantage over Brazil and Argentina in agricultural production and marketing. The United States has a widespread internal transportation network that can quickly and inexpensively move large volumes of commodities from producers to consumers. This includes a navigable inland waterway system encompassing the Mississippi River and its many tributaries, and an extensive network of rail lines and paved highways. The United States has also traditionally had greater storage capacity for agricultural commodities. Because of these advantages, transportation and marketing costs have traditionally been significantly lower for U.S.-produced commodities than commodities from either Brazil or Argentina. However, investments in Brazilian and Argentine infrastructure are starting to narrow this gap, making Brazil and Argentina more competitive in world markets[1].

The Parana-Paraguay river system is an important waterway serving Argentina's grain and oilseed sector. The Amazon River and its many tributaries represent significant potential for expanded/improved grain transportation in Brazil, and infrastructure development is beginning to open Brazil's interior agricultural areas to export markets. Both Brazil and Argentina have also invested in rail lines and paved highways that can be used for agricultural marketing. In addition, the transformation of both Brazil's and Argentina's economies from currencies that were pegged to the dollar during the 1990's to floating exchange rates have also improved their incentives for agricultural production. There is additional potential for both countries (but Brazil in particular) to improve their marketing and transportation efficiencies and further enhance their global competitiveness.

Growth in consumption has kept pace with the dramatic increases in soybean production. Between 1990 and 2002, global trade in soybeans, soy-oil, and soy-meal increased 145 percent, 190 percent, and 80 percent, respectively (figure 3). A major factor in the oilseed sector for the past several years has been China's large soybean imports. As investment in domestic crushing capacity swelled, China's imports went from almost nothing in

[1]Flaskerud compared estimated soybean production costs and actual freight rate costs to Rotterdam for the center-west region of Brazil, for North Dakota, and for Iowa. The comparisons indicated that production costs plus freight rate costs to Rotterdam are lower for Brazil's center-west region. This finding helps explain the growth in South American soybean production.

Figure 3
Global trade of soybeans and soybean products increased in the 1990s



Source: Foreign Agricultural Service, USDA.

the early 1990s to 18 million tons in 2003. While U.S. soybean trade with China increased substantially during this period, China's imports (especially from Brazil and Argentina) increased even more (figure 4).

An Economic Model for Soybeans

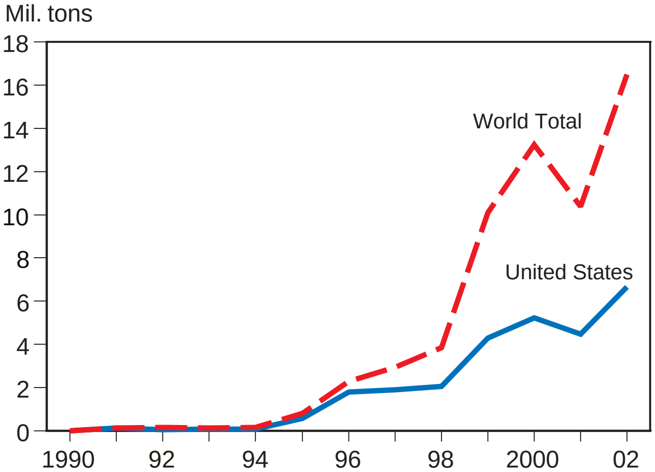
The economic model presented in this section provides conceptual background for our soybean price-forecasting equation. It also helps to explain how changes in the soybean market previously discussed are changing the relationships among key U.S. soybean variables.

Equations 1 through 5 represent a structural model of the U.S. soybean market. That model is used to explain the relationship between the stocks-to-use ratio and price. The stocks-to-use ratio is commonly used to forecast prices because it incorporates a variety of supply and demand variables. Changes in the relationships between price and the dependent variables in equations 2 through 5 define structural change and can affect the relationship between the stocks-to-use ratio and price. The structural model is also used to explain how structural change from South American production and increased world use alter the relationships between price and the dependent variables in equations 2 through 5, as well as the relationship between stocks-to-use ratio and price.

Equation 1 is an identity describing the U.S. soybean market. It shows that carryover from the previous marketing year, plus the harvest at the beginning of the current marketing year, equals use in the current marketing year plus the carryover from the current marketing year into the next marketing year. Soybean imports are negligible and were left out of the equation.

Figure 4

China soybean imports



Source: Foreign Agricultural Service, USDA.

(1) $C_{t-1} + H_t = U_t + C_t$

where:

C_t = U.S. carryover in year t,

C_{t-1} = U.S. carryover in year t - 1

H_t = U.S. production (harvest) in year t,

U_t = utilization in year t (U.S. consumption and U.S. exports), and

t = represents a marketing year which begins at harvest and ends at the beginning of the following harvest.

C_t and U_t in equation 1 are determined jointly for marketing year t, given H_t, the harvest outcome, and C_{t-1}, the carryover from the previous marketing year. H_t is realized at the beginning of marketing year t, and C_{t-1} is determined in the previous marketing year jointly with U_{t-1}.

Equations 2 through 5 show that each of the variables in equation 1 is a function of price.

(2) $H_t = f_1(E(p_t)) + e_t$

(3) $U_t = f_2(p_t)$

(4) $C_t = f_3(p_t, E(p_{t+1}, p_{t+2}, \ldots\ldots))$

(5) $C_{t-1} = f_4(p_{t-1}, E(p_t, p_{t+1}, \ldots\ldots))$

Equation 2 shows that the harvest outcome is a function of expected price and an error term (all yield variations are in the error term). The price expectation is formed at, and prior, to planting. The error term represents unforeseen yield variability. Equations 3 and 4 show that year t use and carryover depend on current-year price. Carryover also depends on expected price in future marketing years. Equations 3 and 4 in the structural model do not have error terms because year t supply ($H_t + C_{t-1}$) is exactly divided between current-year use and carryover. Equation 5 shows that carryover for year t-1 differs from the carryover for year t in equation 4 by having all the time (marketing year) indexes reduced by 1.

Use of mathematical algorithms, particularly dynamic programming, to solve equations 1 through 5 has greatly improved our understanding of the relationships among carryover, production, utilization, and price (Makki et al.). The improved understanding helps in forming hypotheses about the relationship between the U.S. soybean carryover stocks-to-use ratio and the U.S. soybean season-average price and about the relationships of structural change variables with season-average price. The stocks-to-use ratio is a comprehensive variable in that it incorporates both supply and demand effects on price and is used widely by commodity analysts for forecasting price (Westcott and Hoffman). However, the relationship between stocks-to-use ratio and price is altered by structural change.

Equations 1 through 5 imply that a large supply in year t, due to a large yield outcome, results in a large carryover and utilization and a low price. Conversely, a small supply in year t due to a low yield outcome results in low utilization and carryover and a large price.

The stylized structural model by itself is not sufficient for forming a hypothesis about the effect of the stocks-to-use ratio on price. An additional assumption is needed. The assumption we use is that the demand for carryover (equation 4) is more elastic than demand for current-year use (equation 3). The greater price elasticity for carryover implies that carryover will decrease proportionally more than current-year use when supply is small and price is high, resulting in a smaller stocks-to-use ratio. It also implies that carryover will increase proportionally more than current-year use when supply is large and price is low, resulting in a larger stocks-to-use ratio.The additional assumption implies the hypothesis that an increase in the stocks-to-use ratio will result in a smaller price.

Increased South American soybean production reduces U.S. price by increasing world supplies. It also affects the price-quantity relationships in equations 2, 3, 4, and 5. Equation 2 is affected because the increased South American production reduces the expected price for U.S. soybeans[2]. Equation 3 is affected because there is less export demand for U.S. soybeans at each price level; soybean exports typically account for 35-40 percent of total U.S. soybean use. Equations 4 and 5 are affected because U.S. carryover is smaller at each current price level due to the effect of increased South American production on future price expectations[3].

Whether carryover will decrease more (less) than current year use at each price level, resulting in a smaller (larger) stocks-to-use ratio at each price level, is an empirical question.

Equation Estimation and Selection

A forecasting equation for the U.S. season-average soybean price was selected based on equation statistics and on our understanding of the soybean market as discussed in the previous section. We experimented with several structural change and policy variables. The U.S. stocks-to-use ratio was important in all our equation experiments. Our approach was to keep the forecasting model as simple as possible and to avoid "mining" the data. We first tried using only the stocks-to-use ratio. We experimented with using the 1975-2002 period and several periods with later beginning dates. Most likely, the stocks-to-use ratio would be the only independent variable in the absence of structural change. None of the equations were satisfactory because they had low Durbin-Watson statistics and low t values. We then included South American production and started the analysis in 1987, which was about the time that South American production began to increase. We also tried global use in the regression analysis but decided not to use it on statistical grounds as a result of its high correlation with South American production. Our final estimated equation is shown in equation 6, and the variable definitions are provided in table 1.

$$(6)\ \ln SP = 4.62 - 0.41 \cdot \ln SUR^{*} - 0.52 \cdot \ln PSA^{*}$$
$$\qquad\qquad (t=-8.50) \qquad\qquad (t=-7.45)$$

R-bar-sq = 0.75
F-Value = 23.41
Standard error of regression = 0.0808
Durbin-Watson statistic = 2.22
Estimation period: 1987-2002
* Significant at the 99-percent level

Table 1—Variable definitions

Variable name	Definition
SP	U.S. season-average soybean price ($/bushel)
SUR	U.S. soybean carryover stocks-to-use ratio (expressed as a ratio)
PSA	Soybean production in South America (million bushels)
Ln	Natural logarithm

[2]There would likely be structural change in equation 2 even without increased South American production due to increased U.S. productivity and policy changes.

[3]For simplicity, we are not including other variables (such as South American production) in equations 1-5 because their influence is captured indirectly by their impact on soybean price. Changes in these other variables represent structural change in the soybean market.

Ordinary least squares was used to estimate this equation. The quantity data used for estimating this and our other equations were taken from USDA's production supply and distribution database at http://www.fas.usda.gov/psd/.[4] Price data are prices received by farmers, as reported by the National Agricultural Statistics Service.(http://usda.mannlib.cornell.edu/reports/nassr/price/pap-bb/).Since the data were converted to logarithms, the variable coefficients estimate the percent change in price for a 1-percent change in the variable.

We used the CUSUM and CUSUM of squares tests to examine the stability of the coefficients and the error term in the forecasting equation[5]. The test statistics were within the pair of 5-percent critical values for both tests indicating stability of both the coefficients and of the error term variance. This result provides additional support for using our equation to forecast the season-average soybean price.

We dropped South American production from the price-forecasting equation and performed the CUSUM and CUSUM of squares tests on the remaining coefficient (the coefficient for the log of the stocks-to-use ratio) and on the error variance. The test statistic for both tests fell outside one of the two 5-percent critical values. The test results support the notions that South American production is a major source of structural change in the market for U.S. soybeans and that our forecasting equation adequately accounts for this structural change.

Ex Post Price Forecasting and Evaluation

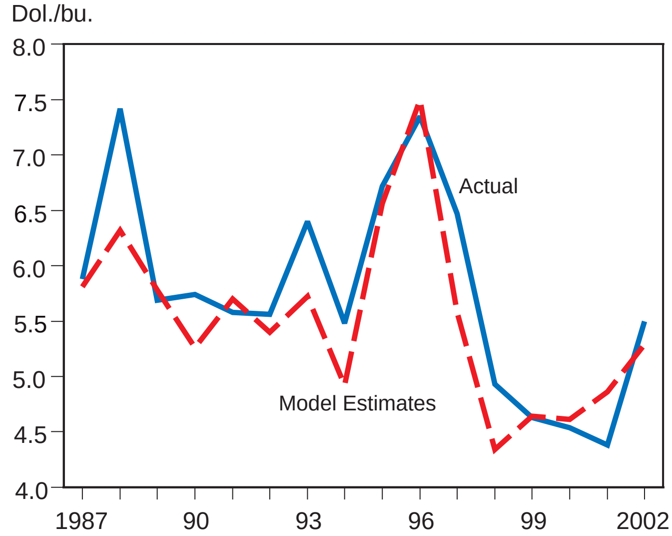
We next examined the *ex post* forecasting capability of our regression equation. *Ex post* forecasts from the estimated equation (6) and actual outcomes are displayed in figure 5 over the model's estimation period. The prices estimated from the model follow the general trend of the actual prices, and the mean absolute deviation and mean absolute percentage differences are $0.36/bu and 6 percent, respectively.

[4]Data in this database are reported in metric tons. We converted to bushels using 1 metric ton = 36.7437 bushels (USDA, 1992).

[5]The original source for these tests is Brown, Durbin, and Evans. Test descriptions can be found in most econometric, texts.

Figure 5

Soybean prices: actual and model estimates



A potential problem with the model has to do with turning point errors. A turning point error can be defined statistically when either of the following inequalities (7 or 8) hold.

(7) $(Predicted_t - Actual_{t-1})(Actual_t - Actual_{t-1}) < 0$

(8) $(Predicted_t - Predicted_{t-1})(Actual_t - Actual_{t-1}) < 0$

Predicted prices are derived from the models, and corresponded with actual prices. The subscripts t and t-1 represent current and lagged time periods, respectively. Defined in this way, inequalities 7 and 8 measure whether the model's predicted year-to-year changes are directionally the same as changes in actual prices. Turning point errors can occur in two ways: first, when actual prices indicate a turning point but predicted prices do not and, second, when actual prices do not indicate a turning point, but predicted prices show a turning point. The different definitions for the occurrence of a turning point in equations 7 and 8 relate to whether the change in the predicted price is measured relative to the previous year's actual price (equation 7) or the previous year's predicted price (equation 8). Both measures are useful, but the appropriate measure depends on the intended use of the model. For short-term forecasting applications, where the previous year's actual price is known, the former definition is better. For longer-term applications, where the previous year's price is not known, the latter definition is better (Westcott and Hoffman).

Turning point errors using the first definition were identified in the years 1990 and 2001. Turning point errors using the second definition were identified in 1990, 1991, 1999, and 2001. The fairly numerous turning point errors highlight the difficulty in price forecasting in the changing environment of the soybean industry.

Ex ante Price Forecasting and Evaluation

Forecasts from our equation and from World Agriclutural Supply and Demand Estimates (WASDE) for the marketing years in columns 2 and 3 in table 2 were compared. We used only data available to and forecasts made by, USDA commodity analysts on the dates in column 1 when making the equation forecasts. For each forecast, the price model was reestimated using the latest revised data for the marketing years shown in column 6. Soybean price forecasts were then made with each reestimated equation using the WASDE stocks-to-use ratio and South American production forecasts for the periods shown in columns 4 and 5.

Table 3 contains the estimated equation coefficients used to forecast price and contains selected equation statistics. As a test of our model, we re-estimated the equation using only the data that were available to analysts at the time they were making USDA forecasts. Data revisions make the coefficients for equation 6 slightly different from the coefficients for the 2002 equations in table 3. Equation 6 is based on data revisions through August 2003.[6] Data are frequently revised each month as new information becomes available. Frequent data revisions make the equations represented in table 3 different from one another.

Beta1 is the equation intercept. Beta2 is the coefficient for the U.S. stocks-to-use ratio. Beta3 is the coefficient for South American production. All the beta coefficients are significant at the 1-percent level. Equations within each year in table 3 vary slightly because data in the last data year, and sometimes in the next-to-last

[6]See Vogel and Bange for a discussion of data revisions.

Table 2—Ex ante price forecasting and evaluation schematic

Date of forecast (column 1)	Equation U.S soybean price forecast (column 2)	WASDE U.S. soybean price forecast[1] (column 3)	WASDE U.S. Stocks-to-use ratio forecast[1] (column 4)	WASDE South American production forecast[1] (column 5)	Equation data (column 6)
July 2000	2000	2000	2000	2001	1987 - 1999
Aug. 2000	2000	2000	2000	2001	1987 - 1999
Sept. 2000	2000	2000	2000	2001	1987 - 1999
Oct. 2000	2000	2000	2000	2001	1987 - 1999
Nov. 2000	2000	2000	2000	2001	1987 - 1999
Dec. 2000	2000	2000	2000	2001	1987 - 1999
July 2001	2001	2001	2001	2002	1987 - 2000
Aug. 2001	2001	2001	2001	2002	1987 - 2000
Sept. 2001	2001	2001	2001	2002	1987 - 2000
Oct. 2001	2001	2001	2001	2002	1987 - 2000
Nov. 2001	2001	2001	2001	2002	1987 - 2000
Dec. 2001	2001	2001	2001	2002	1987 - 2000
July 2002	2002	2002	2002	2003	1987 - 2001
Aug. 2002	2002	2002	2002	2003	1987 - 2001
Sept. 2002	2002	2002	2002	2003	1987 - 2001
Oct. 2002	2002	2002	2002	2003	1987 - 2001
Nov. 2002	2002	2002	2002	2003	1987 - 2001
Dec. 2002	2002	2002	2002	2003	1987 - 2001

[1]The WASDE forecasts were taken from *World Agricultural Supply and Demand Estimates*, and *Oil Crop Outlook* for the months and years in column 1.

Each row in table 2 shows:
1) the month and year in which an equation forecast and the WASDE forecasts were made (column 1),
2) the marketing year for which the equation price forecast and the WASDE price forecast were made and the marketing year for which the WASDE stocks-to-use ratio forecast was made (columns 2, 3, and 4),
3) the year for which the South American production forecast was made (column 5), and
4) the marketing years for the equation data (column 6).

Table 3—Soybean price forecasting equations

Year[1]	Month[1]	Beta1	Beta2	Beta3	$\bar{R}$	DW[2]
2000	July	4.00	-0.40	-0.43	0.75	2.40
2000	Aug.	4.05	-0.40	-0.43	0.73	2.34
2000	Sept.	4.12	-0.40	-0.44	0.71	2.25
2000	Oct.	4.01	-0.40	-0.43	0.75	2.40
2000	Nov.	4.00	-0.40	-0.43	0.75	2.42
2000	Dec.	4.02	-0.40	-0.43	0.75	2.40
2001	July	4.48	-0.41	-0.50	0.79	2.14
2001	Aug.	4.47	-0.41	-0.49	0.78	2.14
2001	Sept.	4.53	-0.41	-0.50	0.77	2.06
2001	Oct.	4.45	-0.41	-0.49	0.79	2.18
2001	Nov.	4.44	-0.41	-0.49	0.79	2.19
2001	Dec.	4.43	-0.41	-0.49	0.79	2.21
2002	July	4.91	-0.40	-0.55	0.79	1.84
2002	Aug.	4.95	-0.39	-0.55	0.77	1.78
2002	Sept.	4.95	-0.39	-0.55	0.77	1.78
2002	Oct.	4.89	-0.40	-0.55	0.79	1.86
2002	Nov.	4.88	-0.40	-0.55	0.79	1.88
2002	Dec.	4.86	-0.40	-0.55	0.79	1.89

[1]Each equation is based on the latest available data for the month and year indicated. Year is also the marketing year for which the season-average soybean price is forecast.

[2]All the Durbin-Watson test statistics are in the do-not-reject range at the 5-percent level of significance.

data year, are revised from month to month. The corrected R squares range from 0.71 to 0.79.

Table 4 contains summaries of the equation and (WASDE) forecast errors. Equation forecast errors were about the same as the WASDE forecast errors for 2000 and 2001, but much larger for 2002. Interestingly, the ex-ante forecast errors for 2000 and 2001 are smaller than the ex-post forecast errors for the 1987-2002 period, as reported in the previous section.

An explanation of the larger forecast errors for 2002 is that there are other structural changes that our model is not picking up. This is a common problem with statistical models. Although our research shows that this model has statistical validity, other structural changes such as consolidation at the farm production, handling, and transportation levels can affect supply requirements and stock-holding patterns.

Impact of South American Production on U.S. Farm Price

Our forecasting equation was used to examine the downward pressure on U.S. soybean prices from South American production. Understanding this downward

Table 4—Mean absolute and mean absolute percentage forecast errors for forecasting equation and for WASDE forecasts[1]

Year	Equation absolute mean errors	WASDE absolute mean errors	Equation absolute percentage errors	WASDE absolute percentage errors
2000	0.20	0.22	4.3	4.9
2001	0.20	0.22	4.7	4.9
2002	0.63	0.23	11.7	4.2

[1]Mean absolute errors are in dollars per bushel.

price pressure is important for budgeting counter-cyclical payments and marketing assistance loan program benefits for soybeans under the Farm Security and Rural Investment Act of 2002.[7]

The coefficient for South American production in equation 6 says that, other things equal, a 1-percent increase in South American production reduces the price of U.S. soybeans by about one-half percent. However, other things are not equal. Increased South American production has a direct effect on the U.S. soybean price, but there is also an indirect effect on the stocks-to-use ratio. The direction of this indirect effect is an empirical question. An argument could be made that increased South American production will increase U.S. stocks because of greater world supplies and global competition. It could also be argued that the U.S. stocks-to-use ratio will be smaller because a major South American harvest is just 6 months after the U.S. harvest, meaning that there is less need to carry stocks into the next marketing year. The second argument, which we tend to agree with, is consistent with the idea that the traditional role of the United Sates, as the residual supplier in the global soybean market, is diminishing as South American production becomes a more significant factor in the soybean industry.

To analyze both the indirect and direct effects, we used a procedure first developed by Buse (shown below) that uses both elasticity coefficients in equation 6. The procedure requires us to estimate the change in the U.S. stocks-to-use ratio from a 1-percent increase in South American production. We estimated this change to be -0.64 percent by regressing the log of the stocks-to-use ratio on the log of South American production. The equation below shows our calculation for the percent

[7]The October and February WASDE soybean price forecasts are used in calculating advanced counter-cyclical payments.

change in the U.S. soybean price given a 1-percent increase in South American production.

Percent U.S. soybean price change = (-0.41)(-0.64%) + (-0.52)(1%) = -0.26%

This equation indicates that a 1-percent increase in South American production reduces the U.S. soybean price by 0.26 percent. This equation combines the direct and indirect effects of South American production on the U.S. soybean price. The indirect effect is via the effect of South American production on the U.S. stocks-to-use ratio. Declines in the soybean season-average price increase USDA counter-cyclical expenditures when the season-average price is between the target price minus the direct payment rate and the national loan rate.[8] A 0.26-percent decrease in price when the season-average price is in this range is between 1.3 and 1.4 cents per bushel. This translates to an increase in USDA expenditures (when counter-cyclical payments are made) of between $20.2 million and $21.8 million for every 1-percent increase in South American production. The calculations are shown below.[9]

- $0.013 per bushel * (soybean enrolled base acres * 0.85) * national counter-cyclical program yield = 0.013 * (53.8 million acres * 0.85) * 34.0 = $20.2 million
- $0.014 per bushel * (soybean enrolled base acres * 0.85) * national counter-cyclical program yield = 0.014 * (53.8 million acres * 0.85) * 34.0 = $21.8 million

Conclusions

This research examines the changing structure of the global soybean industry and provides forecasts for season-average soybean prices. Expanded competition from South America is having a significant impact on the soybean market and on soybean price-forecasting equations. We found that the U.S. stocks-to-use ratio and South American soybean production were sufficient variables for forecasting price. The evaluation of our forecast equation involved making ex ante forecasts, using only the information available at the time USDA forecasts were made. Our analysis argues that the indirect effect of South American production on the U.S. soybean price should be considered when making price forecasts and when budgeting for counter-cyclical payments.

[8]The target price, direct payment rate, and national loan rate for soybeans under the 2002 Farm Act are $5.80, $0.44, and $5.00, respectively.

[9]Payment acres are 85 percent of enrolled base acres. The enrolled base acres are preliminary and based on 2002 direct and counter-cyclical program enrollment. Note that there are two base yields used in the current farm program, one for program payments and one for counter-cyclical payments.

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