A Reappraisal of the Forecasting Performance of Corn and Soybean New Crop Futures

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Forecasting performance of December corn and November soybean futures contracts during the previous spring was evaluated using the commonly specified price-level and percent-change models. These models invoke different assumptions regarding stationarity. Using Stein's analytical framework, results for the price-level model suggest avoidable social loss existed in the soybean market since 1973, because November futures provided biased forecasts. Regression R^2s for both corn and soybeans declined substantially between 1952–

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1972 and 1973–1997, suggesting total social loss increased. By contrast, results from the percent-change model suggest only unavoidable social loss existed in the corn and soybean markets, because the futures provided unbiased forecasts. R^2 increased for corn but declined for soybeans, suggesting unavoidable social loss declined for corn, but increased for soybeans. The important, conflicting nature of the results from the two models underscores the importance of examining alternative model specifications when evaluating price forecasting performance. Jrl Fut Mark 19: 604–618, 1999

INTRODUCTION

The performance of agricultural markets is drawing increased attention because recent changes in United States farm policy have reduced the role of government and increased the role of the private market in guiding resource allocation decisions (Nelson & Schertz, 1996). One measure of a market's performance is the social loss resulting from nonoptimal resource allocation. Stein (1981) shows that this social loss is a multiple of the square of the forecast error between the forward price when production decisions are made and the spot price when consumption decisions are made. Stein also shows that avoidable social loss is minimized when the forward price at planting equals the expected spot price at harvest. Substantial evidence exists that U.S. agricultural producers use futures prices in forming price expectations and allocating production resources (for example, Gardner, 1976; Hurt & Garcia, 1982; Chavas, Pope, & Kao, 1983; Eales, Engel, Hauser, & Thompson, 1990). Thus the price-forecasting performance of agricultural futures markets is a key factor in assessing the performance of agricultural markets.

Two commodities affected by the changes in farm policy are corn and soybeans, the crops that generate the most cash receipts in the U.S. Therefore the forecasting performance of corn and soybean new crop futures contracts (December corn and November soybeans) is of particular interest.

In a classic article, Tomek and Gray (1970) regressed the price of December corn and November soybean futures contracts at harvest on the respective contract's price during the previous spring. Using data for 1952 through 1968, the authors found that the spring-time quote of these futures contracts was an unbiased forecast of the price observed on the contracts' expiration date. Furthermore, R^2 was high, indicating that the spring-time quote provided useful information about the harvest quote. Heifner (1971), Kofi (1973) are among those who offered comments on and extensions of this work.

More recently, Kenyon, Jones, and McGuirk (1993) updated Tomek and Gray's price-level model using data from 1974 through 1991. These authors found that neither the December corn nor November soybean regression equation was statistically significant at the 5% test level. They concluded that these futures contracts no longer were good forecasts of harvest prices.

In assessing these different findings, it is important to note that the specification of the evaluation model may affect the findings (Barnhart & Szakmary, 1991; Tomek, 1997). Although it is not the only model specification issue, stationarity is an important concern. The price-level model assumes that prices are stationary in levels. However, agricultural prices may not be stationary in levels (for example, Ardeni, 1989; Beck, 1994), implying that the price-level model may generate inappropriate hypothesis tests. Tests for stationarity could be applied; however, as Newbold and Vougas (1996) point out, they are imprecise in small samples. Clearly, studies of the forecasting performance of corn and soybean harvest futures involve small samples. Thus uncertainty exists regarding the presence or degree of nonstationarity in corn and soybean new crop futures. In this situation, Newbold, Agiakloglou, and Miller (1993) argue that alternative choices for the order of integration need to be assessed for their impact on hypothesis tests.

Given recent market-oriented changes in U.S. farm policy, as well as the importance of corn and soybeans to the U.S. economy, the striking change in the price-level forecast performance of corn and soybean new crop futures contracts found by Kenyon, Jones, and McGuirk (1993), and the potential importance of model specification in determining empirical results, the present study reexamines the forecasting performance of December corn and November soybean futures contracts. We estimate the commonly used price-level model and percent-change model (for example, Fama & French, 1987; Barnhart & Szakmary, 1991) for the 1952–1997 period. The latter model is one procedure used to account for nonstationarity in commodity price levels. Not surprisingly, empirical findings are found to vary significantly by model. Starkly different implications result for the forecasting performance of corn and soybean new crop futures contracts, for the marketing and managerial behavior of agribusinesses and farms, and for understanding the potential impact of the recent changes in farm policy. These starkly different implications underscore the importance of using alternative model specifications when evaluating forecast performance.

MODEL SPECIFICATION ISSUES

The price level model used to evaluate forecasting performance of new crop corn and soybean futures prices is:

$$S_{t,h} = \alpha + \beta F_{t,s} + \varepsilon_t \quad (1)$$

where $S_{t,h}$ is the closing price of the December corn or November soybean futures contract on a day during its delivery month in year t and $F_{t,s}$ is the closing price of the futures contract on a day during the previous spring. $F_{t,s}$ is a forecast of $S_{t,h}$. During the delivery month at the delivery location, futures and cash prices should be nearly the same because of delivery arbitrage. Thus $S_{t,h}$ is both a futures and spot (that is, cash) price. Utilization of a futures price during its delivery period to measure spot price avoids biases introduced by inaccurate spot price data.

Hypothesis tests are derived from eq. (1) in a straightforward manner. If $\alpha = 0$ and $\beta = 1$, then $E(S_{t,h}) = F_{t,s}$. This observation leads to the joint null hypothesis test for bias in the spring forecast: $\alpha = 0$ and $\beta = 1$. Ability of the spring forecast to provide useful information regarding the subsequent harvest price is evaluated by testing the equation's R^2 for significance. Using Stein's framework, changes in R^2 over time provide evidence of changes in the magnitude of total social loss, whereas the test for bias provides evidence on the existence of avoidable social loss.

In order for the estimation of eq. (1) to provide appropriate tests of a market's forecasting performance, it must be the appropriate specification of the evaluation model. One important assumption invoked by eq. 1 is that the price series being evaluated are stationary. If the price series are not stationary, then the test statistics will have nonstandard distributions—that is, not the t-distribution. Furthermore, the regression R^2 can be misleadingly large if the dependent variable is not trend stationary (for example, McGuirk & Driscoll, 1995).

The importance of stationarity for tests of forecasting performance is based on a conceptual argument and empirical findings. The usual null hypothesis is that markets are strong form efficient. A commonly assumed data-generating process for a strong form efficient market is a random walk with drift, in which the error term is assumed to be independently and identically distributed with mean 0 and variance σ^2. It is well known that the conditional mean and variance of this random walk are both linear in time (Campbell, Lo, & MacKinley, 1997, p. 32). Thus the null hypothesis of strong form market efficiency can be interpreted as implying nonstationarity. In addition, numerous studies find that commodity futures prices are nonstationary in levels, but stationary after appropriate differencing (for example, Ardeni, 1989; Beck, 1994).

The statistical distinction between trend stationary and integrated processes is imprecise for many reasons (Newbold &Vougas, 1996). These reasons include the relatively low power of unit root tests in moderate size samples and the circumstance that any model from one class can be arbitrarily close to a model from the other class. Our sample size is relatively small to begin with (1952–1997). Furthermore, another important factor in evaluation of forecasting performance is the consideration that a potential change in the data-generation process may have occurred. Empirical support for such a change comes from the statistically different variance of the regression forecast errors when the analysis period is broken into two subperiods, 1952–1972 and 1973–1997. Conceptual reasons for believing that the data-generating process may have changed between these two subperiods include higher general inflation, a sharp reduction in government stocks of farm commodities, and changes in farm policy that reduced the importance of price supports in establishing floors under market prices.

Changes in the data-generation process can be either explicitly modeled or accommodated by creating subsets of the data. We chose to follow Kenyon, Jones, and McGuirk (1993), and divide the data into two subperiods. Such a choice further reduces the number of observations available to test for stationarity.

The lack of statistical precision in testing for stationarity leads Newbold, Agiakloglou, and Miller (1993) to urge that, whenever uncertainty exists regarding the presence or degree of nonstationarity, alternative choices for the order of integration should be assessed for their impact on hypothesis tests. If nonstationarity is thought to exist, cointegration is the theoretically preferred approach to address it. However, tests for cointegration are valid only asymptotically. Beck (1994) evaluates several approaches for addressing nonstationarity in commodity futures prices. She finds that the error correction representation of the cointegration approach and Fama and French's (1987) approach of regressing the percent of change in the cash price on the futures-cash basis measured as a percent difference generally yield similar empirical results regarding the unbiasedness of price forecasts.[1]

Given the preceding discussion, we estimate both Tomek and Gray's (1970) price level model [that is, eq. (1)] and Fama and French's (1987)

[1]The error correction model is theoretically preferred to the percent-change model as a test of market efficiency because it tests whether lagged spot and futures prices provide information on future spot prices (Beck, 1994; Barnhart & Szakmary, 1991). However, when evaluating forecast bias, Beck finds that both models usually yield the same empirical results.

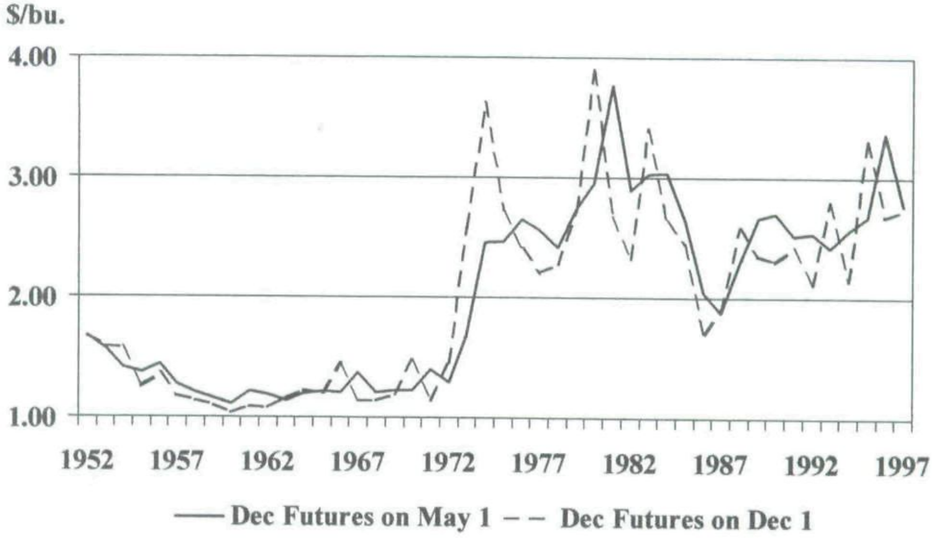

FIGURE 1
December corn futures prices on 1 May and 1 December 1952–1997

percent-change model to evaluate the potential impact of using different evaluation models to assess the forecasting performance of new crop corn and soybean futures contracts. The percent-change model is:

$$\ln S_{t,h} - \ln S_{t,s} = \alpha + \beta[\ln F_{t,s} - \ln S_{t,s}] + \varepsilon_t \qquad (2)$$

where $S_{t,h}$ is the cash price at harvest in year t, $S_{t,s}$ is the cash price during the previous spring, $F_{t,s}$ is the spring-time quote of the new crop futures contract, and ln is the natural logarithm. Thus, model (2) involves evaluating how well the spring-time basis of the harvest futures contract (expressed as a percentage difference[2]) forecasts the observed percent change in cash price between spring and harvest. This performance is evaluated by testing R^2 for significance and the joint hypothesis of $\alpha = 0$ and $\beta = 1$ for unbiased forecasting ability.

$S_{t,h}$, which is used in both eqs. (1) and (2), is measured as the closing December corn (November soybean) futures price on 1 December (1 November). $S_{t,s}$, which is used only in eq. (2), is measured as the closing corn (soybean) May futures price on 1 May. $F_{t,s}$, which is used in both eqs. (1) and (2), is also measured on 1 May.

[2]The independent variable in eq. (2) also can be thought of as a new crop–old crop spread.

[3]The year 1973 is often excluded from analyses of the corn and soybean markets because it is viewed as a transition year between two different pricing regimes (for example, Kenyon, Jones, & McGuirk, 1993). The post-1972 regressions were estimated with and without 1973. Some quantitative differences existed, but the general qualitative story did not change. Thus 1973 was included in the analysis.

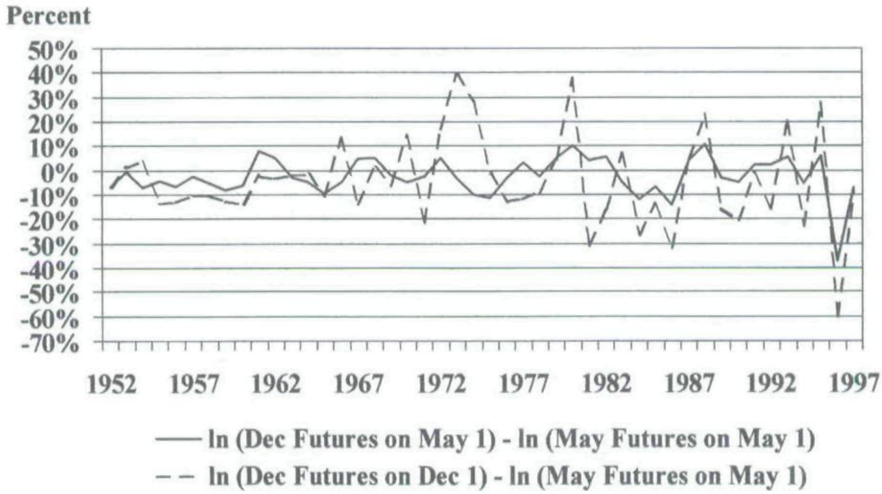

FIGURE 2
Percent difference relationships for corn futures prices 1952–1997

DESCRIPTIVE ANALYSIS

The December corn futures prices observed on 1 May and 1 December over the period 1952–1997 are presented in Figure 1. Figure 2 presents the percentage change in cash corn prices between 1 May and 1 December, as well as the December corn futures basis on 1 May, expressed in percentage terms. The comparable graphs for soybeans are presented in Figures 3 and 4.

Examination of the figures suggests that prices were more variable during the 1973–1997 period than during the 1952–1972 period.[3] Standard deviations generally were at least twice as large during the 1973–1997 period for the price levels, percent change in cash price, and the 1 May basis expressed as a percent (Table I). The 1 May basis experienced the smallest increase in standard deviation, whereas the largest increase occurred for the price level variables.

Tests for the difference between new crop futures prices observed on 1 May and 1 November (1 December) are also presented in Table I. Excluding soybeans over the 1952–1972 period, none of the t-statistics are significant at the 5% test level, implying that on average the spring and harvest quotes are not significantly different. For soybeans over the 1952–1972 period, the November futures price on 1 May is significantly lower than the November futures price on 1 November at the 5% test level. A comparable result is found for the percent difference variables.

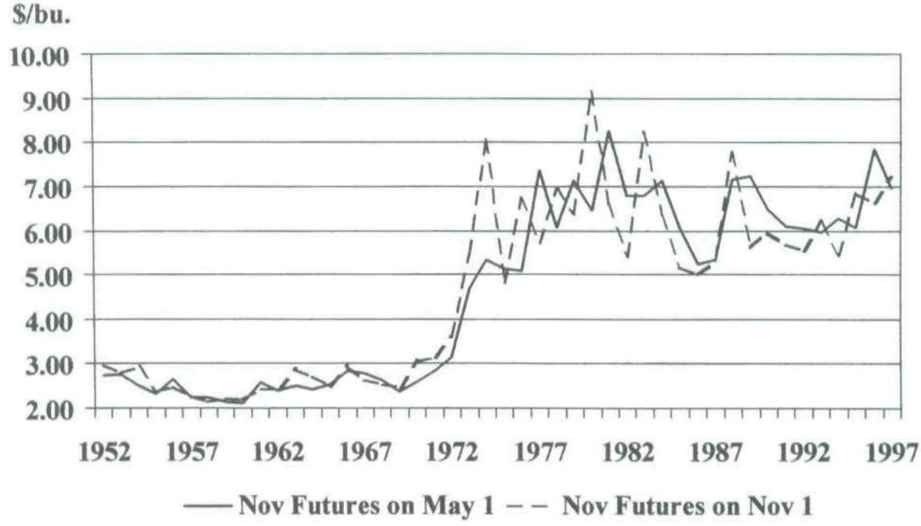

FIGURE 3
November soybean futures prices on 1 May and 1 November 1952–1997

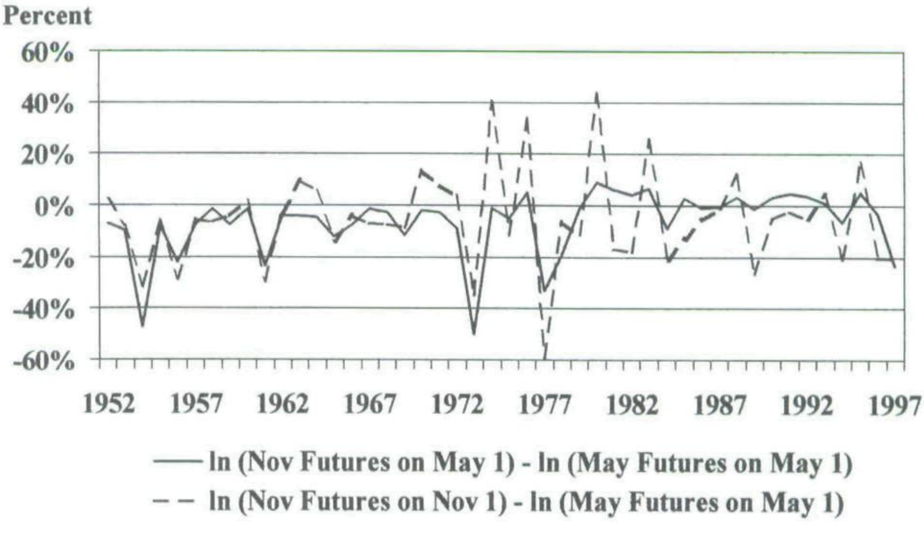

FIGURE 4
Percent difference relationships for soybean futures prices 1952–1997

This evidence suggests that, over the 1952–1972 period, normal backwardation existed in the spring quotes of the November soybean futures.

Mathematical properties of expectations suggest that the realized values of a variable should vary more than its expected values. However, it is an empirical question whether this difference is statistically signifi-

TABLE I

Selected Statistics for Corn and Soybean Prices, 1952–1997

Price Variable By Time Period	*Unit*	*Mean*	*Standard Deviation*	*t-statistic for Difference in Mean*	*F-Ratio for Difference in Variance*
Corn: 1952–1972					
December futures					
1 May	cents	128.6	14.5		
1 December	cents	126.6	19.0	−0.70	1.71
Differences					
Basis on 1 May	percent	−2.4	5.1		
Cash price change	percent	−4.5	10.1	−0.91	4.04[a]
Corn: 1973–1997					
December futures					
1 May	cents	262.6	43.3		
1 December	cents	259.4	51.3	−0.30	1.41
Differences					
Basis on 1 May	percent	−2.7	10.0		
Cash price change	percent	−4.4	24.0	−0.42	5.80[a]
Soybeans: 1952–1972					
November futures					
1 May	cents	253.3	26.2		
1 November	cents	263.7	37.1	2.34[a]	2.01
Differences					
Basis on 1 May	percent	−9.4	10.5		
Cash price change	percent	−5.8	12.4	2.27[a]	1.38
Soybeans: 1973–1997					
November futures					
1 May	cents	635.9	91.5		
1 November	cents	631.8	110.6	−0.16	1.46
Differences					
Basis on 1 May	percent	−4.0	13.9		
Cash price change	percent	−4.3	24.1	−0.31	3.02[a]

Notes: Source: Original calculations.
[a]Indicates significance at the 5% test level

cant. As expected, the standard deviation is smaller during the previous spring than during harvest for all situations presented in Table I. The variance of the spring-time basis is significantly less at the 5% test level than the variance of the subsequent percent change in cash price, except for soybeans over 1952–1972 period. By contrast, no statistically significant difference exists between the variance of the spring-time price levels and variance of the harvest price levels. Thus the evidence is mixed on whether the spring-time expected price observations are statistically less variable than the realized harvest price observations.

TABLE II

Regression Between Harvest and Spring-time Futures Prices, December Corn and November Soybean Contracts, 1952–1997

Crop	*Period*	α	β	R^2	*D.W.*	*F-test* $\alpha = 0, \beta = 1$	*F-test* R^2
			Price-Level Model				
Corn	1952–72	7.38	0.93	0.50	2.56	0.29	19.27[a]
		(27.32)	(0.21)				
	1973–97	148.01	0.42	0.13	2.02	3.16	3.37
		(61.45)	(0.23)				
Beans	1952–72	−40.55	1.20	0.72	1.57	3.48	48.61[a]
		(43.87)	(0.17)				
	1973–97	440.02	0.30	0.06	2.60	4.12[a]	1.53
		(156.60)	(0.24)				
			Percent-Change Model				
Corn	1952–72	−3.40	0.44	0.05	2.68	1.19	0.97
		(2.47)	(0.44)				
	1973–97	−0.45	1.45	0.36	1.41	0.73	13.19[a]
		(4.05)	(0.40)				
Beans	1952–72	3.14	0.95	0.65	1.40	2.52	35.40[a]
		(2.22)	(0.16)				
	1973–97	−0.77	1.06	0.38	2.50	0.06	14.35[a]
		(3.97)	(0.28)				

Notes: Standard error of the coefficient is presented in parentheses. Source: original calculations.
[a]Indicates significance at the 5% test level.

REGRESSION ANALYSIS

Diagnostic Tests

Three diagnostic tests were conducted. One was the Durbin-Watson test for first-order autoregressive errors. The values for this test are reported in Table II. None of these values were significant at the 5% test level, with positive autocorrelation being the alternative hypothesis.

The second diagnostic test was for heteroskedasticity, which is often found to be a characteristic of commodity prices. Eight tests are included in the SHAZAM (1997) computer program, including the ARCH (1), Harvey, and Glejser tests. Substantial evidence of heteroskedasticity is found for the entire 1952–1997 period, especially for the price-level model. By contrast, when the data is divided into the two subperiods, almost no evidence of heteroskedasticity is found except for the soybean price-level model over the 1952–1972 period. Two of the eight tests are significant at the 5% test level in this situation. White's correction for heteroskedasticity was used for soybeans over the 1952–1972 period, but the qualitative meaning of the results did not change. To be consistent across the different subperiods and commodities, the results without a correction for heteroskedasticity are presented.

The third diagnostic test concerned the possible bias that may arise because the explanatory variable is a lagged value of the dependent variable (Elam & Dixon, 1988; Johnston, 1972). The bias is caused by a correlation between the independent variable and previous values of the error term. Williams and Wright (1991, p. 186) postulate that this bias can arise in forecast performance analyses of the type used in this study because of the presence of stocks. Stocks link spot and futures prices together through the supply of storage function.

Tests for the presence of the lagged dependent variable problem and an approximate estimation of the potential bias are valid only in large samples, a requirement not met by this data set. Nevertheless, to provide a crude measure of the potential impact of this problem, we conducted a test and calculated the bias (see Johnston, 1972, pp. 300–320, for a detailed discussion).

The statistical test involved regressing the error term from the original regression on the first lagged value of the error term and the forecast variable [that is, independent variable in eqs. (1) and (2)]. The coefficient on the lagged error term is tested for significance. None of these coefficients are significant at the 5% test level.

Johnston (1972) provides two bias calculation formulas based on whether the error term in the regression equation is assumed to be independent or to have a serial correlation with a value less than 1. As expected, the bias results suggest strongly that beta is underestimated in the above equations. However, there is no pattern to the magnitude of the bias by model, commodity, or period. The insignificance of the tests and lack of consistency in the magnitude of the bias suggest that the lagged dependent variable problem should not invalidate the comparative performance of the two alternative forecast evaluation models.

Results

Results of the regression estimation of forecast evaluation models (1) and (2) for the 1952–1972 and 1973–1997 periods are presented in Table II. As a check, we conducted analyses for the same time periods as Tomek and Gray (1970), 1952–1968, and Kenyon, Jones, and McGuirk (1993), 1974–1991. We closely replicated their results.[4] To conserve space, these

[4]Slightly different observation dates have been used for spring-time and harvest prices. Tomek and

results are not reported here, but are available from the authors upon request.

R^2 in the price-level model is substantially smaller during the 1973–1997 period than during the 1952–1972 period, declining from 0.50 to 0.13 for corn and from 0.72 to 0.06 for soybeans.[5] The R^2s are significantly different from zero at the 5% test level during the earlier period, but are insignificant during the later period. For the percent-change model, R^2 declined for soybeans (0.65 to 0.38), but increased for corn (0.05 to 0.36). Except for corn during the 1952–1972 period, the R^2s are significant.

The F-test of bias in the regression parameters finds that spring-time price of the November soybean futures contract is a biased estimator of the harvest price of the contract during the 1973–1997 period. All other F-tests are insignificant at the 5% test level.

Stein divides forecast error into avoidable and unavoidable social loss. Avoidable social loss exists if the forward price at planting is a biased estimate of the expected spot price at harvest. If the forward price at planting provides an unbiased estimate, then only unavoidable social loss exists. Over the planting-to-harvest period for crops, a prominent cause of unavoidable social loss is the difference between expected and realized production caused by weather. Evidence of change in the level of total social loss (that is, avoidable plus unavoidable social loss) can be obtained by comparing changes in the level of the regression R^2 for the same functional form.

Given Stein's (1981) framework and assuming the price-level model, the decline in R^2 from 0.72 to insignificance implies that total social loss for the soybean market increased. Because the soybean harvest futures contract provided biased forecasts of the price level during the 1973–1997 period but unbiased forecasts during the 1952–1972 period, avoidable social loss existed during the later period but not during the earlier period. Thus avoidable social loss increased in the soybean market.

Total social loss associated with the soybean market also increased between the 1952–1972 and 1973–1997 periods if the percent-change

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Gray (1970) used the settlement price on 30 April of the December corn (November soybean) futures contract as the spring-time quote and the settlement price on the contract's last trading day as the harvest quote. Kenyon, Jones, and McGuirk (1993) used the settlement price of the December corn (November soybean) contract on 15 April as the spring-time quote and the settlement price on 15 December (November) as the harvest quote. Given the similarity of the results generated by these two studies and this study for the 1952–1968 period, findings do not appear to be sensitive to alternative dating assumptions.

[5] Because prices cannot be negative, the natural logarithms of price levels are often used as the price level variable. The regression equations and associated significance tests changed little when the natural logarithm of prices was used.

model is assumed to be the correct specification. However, because the soybean harvest futures contract provided unbiased forecasts in the percent-change model, avoidable social loss does not exist. Hence, assuming the percent-change model specification is correct, the increase in total social loss in the soybean market can be ascribed to an increase in unavoidable social loss.

For corn, no evidence of avoidable social loss is found. Total social loss increased (that is, R^2 decreased) if the price-level model is assumed, but decreased (that is, R^2 increased) if the percent-change model is assumed. Therefore, if the price-level model is assumed to be correct, unavoidable social loss increased in the corn market. By contrast, if the percent-change model is assumed to be correct, unavoidable social loss declined.

CONCLUSIONS AND IMPLICATIONS

This analysis evaluates the forecasting performance of the December corn futures contract and November soybean futures contract during the previous spring. Regression equations are estimated using the price-level model and the percent-change model. The former model assumes stationarity in price levels, whereas the latter model is one procedure used to account for nonstationarity in commodity price levels. This approach allows us to test the impact of two plausible, alternative model specifications on the evaluation of forecasting performance.

Empirical estimation of these two models yields vastly different findings regarding the forecasting performance of the new crop corn and soybean futures contracts. Using Stein's (1981) framework to assess these findings, results for the price-level model suggest that avoidable social loss has existed in the soybean market since 1973 because the November soybean futures provided biased forecasts. Furthermore, the regression R^2s for both corn and soybeans declined substantially between the 1952–1972 and 1973–1997 periods, suggesting that total social loss has increased. By contrast, the empirical results generated by the percent-change model suggest that only unavoidable social loss existed in the corn and soybean markets because the forecasts were unbiased. R^2 increased for the corn equation but declined for the soybean equation, suggesting unavoidable social loss declined for corn, but increased for soybeans.

These vastly different findings yield starkly different implications. The price-level model results for soybeans suggest that low-information trading strategies are possible in the November soybean contracts because the price forecasts are biased. This finding also implies that the

November soybean futures contract may be inefficient. By contrast, the percent-change model results suggest that low-information trading strategies are not likely to be profitable because no bias is found. Furthermore, the unbiased price forecasts are consistent with an efficient market. These conflicting findings suggest that the different, plausible specifications of the forecast evaluation model is reason for continuing debate on whether agricultural futures markets are efficient (see the debate between Zulauf & Irwin, 1997, and Wisner, Blue, & Baldwin, 1997).

For individual producers, an efficient futures market underscores the importance of costs of production relative to marketing when it comes to survival in a commodity market (Zulauf & Irwin, 1997). Excluding those few producers who have unique access to important information or possess exceptional forecasting skills, the producers who survive will be those who have the lowest cost of production because attempts to improve revenue through better marketing will meet with limited success. The existence of an inefficient market increases the importance of managing marketing relative to managing production costs because there are reasons for expecting that the payoff to marketing can be larger.

If futures markets provide unbiased forecasts, individual producers can use them to guide production decisions without on average expecting to suffer financial losses due to changes in prices between planting and harvest. By contrast, if the futures markets provide biased forecasts, then individual producers may suffer financial losses from misallocating resources unless they simultaneously hedge production.

The low R^2s and biased forecasts for the price-level models since 1972 may raise questions regarding the reliance of the 1996 Farm Bill on the private market to allocate resources. If the results of this model are correct, public policy makers probably would be more willing to enact supply and demand management programs or, in the current context, to view the 1996 Farm Bill as potentially flawed. Of course, the question arises whether past farm programs caused the existence of the avoidable social loss. In this situation, public policy makers also are probably more willing to question the performance of futures markets.

By contrast, the results from the percent-change model mute the argument for public intervention in the market's supply and demand determination and public investigation of futures market performance. R^2 for corn and soybeans is only between 0.35 and 0.40 for the 1973–1997 period. However, for corn, it did increase from 0.05 during the 1952–1972 period. Corn was much more affected by government programs than soybeans and the level of government involvement declined substantially during the later period.

The relatively low R^2s in both the price-level and percent-change models during the recent 1973–1997 period suggest that producers may find it worthwhile to search for additional information because futures markets are not able to predict future prices with a great degree of success. The relatively low R^2s also raise questions about whether total social loss, whether avoidable or unavoidable, is too large. One possible public policy response is to make additional public investment in data collection, analysis, and dissemination activities.

Based on the numerous studies that suggest that commodity prices are not stationary in price levels, we tend to side with the results and implications generated by the percent-change model rather than those generated by the price-level model. However, we admit that this statement cannot be made with a high degree of confidence, given the conflicting results from these two alternative, plausible model specifications. Thus our analysis underscores the importance of conducting sensitivity tests via alternative evaluation models when evaluating price-forecasting performance. Our analysis also underscores the need for more research on the forecasting performance of agricultural futures markets.

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