Does the Market Anticipate Smoothing in USDA Crop Production Forecasts?

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Abstract

This study examines whether market participants anticipate the predictable component in USDA revisions of corn and soybean production forecasts during 1970/71 through 2003/04 marketing years. The analysis revealed that markets consistently under-predicted October corn production revisions and over-predicted September soybean production revisions. These biases may be attributable to inefficient use of information about smoothing in USDA revisions. In all other cases market analysts seemed to be aware of USDA smoothing practices and generally efficiently incorporated this information into their own forecasts.

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The issue of forecast efficiency has been one of the central issues in agricultural economics and general economics literature for more than three decades. The popularity of this issue reflects a wide acceptance of the rational expectations hypothesis and the implications of forecast rationality for social welfare. The rational expectations framework implies that efficient forecasts are "optimal" as they have the lowest forecast errors. Stein demonstrated that "the optimality of resource allocation (defined as the sum of consumer and producer surplus) depends upon the accuracy of the forward price, at the time production decisions are made, as a forecast of the subsequent spot price when consumption occurs." (p. 223) Numerous studies reject the null hypothesis of forecast efficiency in macroeconomic forecasts (e.g., Nordhaus; Clements; Harvey, Leybourne and Newbold) and agricultural forecasts (e.g., Runkle, 1991; Mills and Schroeder). However, the inefficiency of these forecasts does not necessarily imply a reduction in welfare due to misallocation of economic resources. If markets anticipate and adjust for these forecast inefficiencies, the economic losses from resource misallocation may be negligible or non-existent.

Limited information exists on how the markets react to forecast inefficiency. Runkle (1992) investigated whether futures markets react efficiently to predictable errors in USDA announcements of farrowing intentions. Runkle (1991) earlier demonstrated that the two-quarter-ahead intentions announcement is a biased forecast of actual farrowings, and that the one-quarter-ahead intentions announcement is an inefficient forecast of actual farrowings. In order to examine the market reaction to these announcements, Runkle decomposed USDA forecast errors into predictable and unpredictable components. He found that the predictable component in these forecast errors had no effect on futures price changes following the announcement. Thus he concluded that market participants understand how the announced forecast deviates from an optimal forecast and take into account that deviation in determining their demand for futures after the announcement is made. Mills and Schroeder examined whether industry analysts anticipate USDA cattle on feed inventory revisions prior to their occurrence. The inventory revisions contained statistically significant biases in all categories of the initial reports. Revisions were also correlated over time. However, the authors found no statistically significant relationship between USDA inventory revisions and the private predictions of these revisions. They concluded that the persistence of cattle on feed revisions was not anticipated by industry analysts. Hence, it appears that the issue of market expectation of predictable components of inefficient forecasts does not have a general answer and has to be addressed for each particular case.

The purpose of this paper is to investigate whether market participants anticipate the predictable component in USDA revisions of corn and soybean production forecasts during 1970/71 through 2003/04 marketing years. Isengildina, Irwin, and Good demonstrate that USDA revisions of corn and soybean production forecasts are unbiased but inefficient. This inefficiency is expressed in positive correlation of forecast revisions, suggesting that these revisions are "smoothed." Smoothing in this context describes a process when forecasts do not efficiently incorporate all available information and carry it over into subsequent forecast revisions. The authors also demonstrate that correction for smoothing may result in economically meaningful improvements in forecast accuracy. However, if market participants are aware of the smoothing process, they may be already correcting for it in forming their own expectations. Market participants' expectations of USDA revisions are considered rational if they incorporate all available information, including information about smoothing. This study uses a basic rationality framework to test whether market analysts form unbiased and efficient expectations of the USDA revisions. Furthermore, a strong form efficiency test allows to determine whether any deviations from rationality found in the first step of the analysis may be contributable to omission of information about the USDA smoothing practices. This paper is organized as following: first the data used in this study is described, namely the USDA revisions of corn and soybean forecasts over 1970/71 through 2003/04 marketing years and the market expectation of these revisions. Second, the smoothing process in USDA revisions is demonstrated. Third, the rationality of market expectations of USDA revisions is tested.

Data

This study examines whether markets anticipate smoothing in USDA forecasts of corn and soybean production over 1970/71 through 2003/04 marketing years. USDA forecasts of corn and soybean production are fixed–event forecasts, which means that a series of forecasts (q_T) are available for the same terminal event T, such as annual crop production. These forecasts are typically released by the USDA from August through November and finalized in January.[4] Thus forecasts are released five times and four revisions are available in each marketing year for each crop (Table 1).

The forecast of the terminal event at time t is denoted as $q_{T/t}$ and the forecasting cycle has a length of T-1. In this context, T is defined as the last observation of the forecast series. For example, assume four monthly forecasts of production are made for a crop. The time index for the first forecast is t = 1, the second t = 2, etc., and the actual harvest production is $t = T = 5$. Hence, $q_{T/T}$, the last "forecast" in the series, is actual production and identical to q_T. The forecast revision at time t is denoted as $v_{T/t} = q_{T/t} - q_{T/t-1}$ where $t = 2,\ldots,T$ and the revision cycle has a length of T-2. Thus, forecasts of the terminal event are revised T-2 times, such as once a month. In order to standardize for increasing crop sizes over time, revisions are examined in percentage form:

(1) $$v_{T/t} = 100 * \ln\left(q_{T/t} / q_{T/t-1} \right) \qquad t=2,\ldots,5$$

where the revision cycle has a length of T-2=3 months for both crops.

The market expectation of these forecast revisions is introduced in this study as a combination of private pre-release estimates. Industry analyst's pre-release estimates have been used in several previous studies as a proxy of market expectations of government reports (e.g., Grunewald, McNulty, and Biere; Colling and Irwin; Garcia et al.; Egelkraut et al.). It is assumed that industry analysts are releasing their expectations of USDA forecasts rather than an independent forecast. This study uses an average of the changes in production forecasts by Conrad Leslie and Sparks Companies, Inc. as a proxy for market expectations of USDA forecast revisions during the period 1970 through 2000. Forecasts from these two firms are selected because they generally were considered to be the most influential and were widely-reported in the popular press during this period. The two firms used different procedures and sources for estimating crop size (Egelkraut et al., 2003). In addition, the history of forecasts by these two firms is available for an extended period of time. For the period 2001 through 2003, the market expectations are represented by changes in the "average trade guess" as reported by

Oster/Dow Jones (ODJ). The change was made because Conrad Leslie discontinued his service after 2000. Note that Sparks forecasts are included in the ODJ averages. Market expectations of USDA revisions are defined as the difference between the current market forecast and the previous USDA forecast in a percentage form:

(2) $$p_{T/t} = 100 * \ln(x_{T/t} / q_{T/(t-1)})$$

where $p_{T/t}$ is the market expectation of USDA revision at time t and $x_{T/t}$ is the market expectation of USDA forecast at time *t*. The empirical analysis is restricted by availability of the private estimates for September, October, and November revisions, but not for January revisions.

USDA Revisions Smoothing

Smoothing of USDA revision of corn and soybean production forecasts was analyzed in the Isengildina, Irwin, and Good study. They examine efficiency of USDA forecast revisions of corn and soybean production forecasts during the 1970/71 - 2002/03 period using Nordhaus' framework designed for fixed-event forecasts. According to Nordhaus, weak form efficiency of fixed-event forecasts may be described by two conditions. First, the forecast *error* at time *t* is independent of all forecast revisions up to time *t*:

(3) $$\mathrm{E}\left[e_{T/t} \middle| v_{T/t}, ..., v_{T/2} \right] = 0 \qquad t = 2, \ldots, T\text{-}1$$

Second, the forecast *revision* at time *t* is independent of all revisions up to time *t*-1:

(4) $$\mathrm{E}\left[v_{T/t} \middle| v_{T/t-1}, ..., v_{T/2} \right] = 0 \qquad t = 3, \ldots, T$$

Because forecast errors may be defined in terms of future revisions:

(5) $$e_{T/t} = q_T - q_{T/t} = v_{T/t+1} + ... + v_{T/T}$$

conditions (3) and (4) imply each other. Typically, fixed-event forecast efficiency is tested in terms of revisions. According to equation (4), if forecasts are efficient, their revisions should follow a random walk. If, instead, forecast revisions are correlated and forecasts move consistently up or down, they are said to be inefficient. Weak form efficiency in forecast revisions generally is examined empirically by estimating a regression of the following form:

(6) $$v_{T/t} = \alpha v_{T/t-1} + \zeta_{T/t} \quad t = 3, \ldots, T$$

where α is the regression slope coefficient, $\zeta_{T/t}$ is a standard, normal error term and the number of observations is equal to *T-2*. This equation provides an estimate of the first-order serial correlation of revisions. The null hypothesis here is α=0, which, if not rejected, implies that forecast revisions are efficient.

The results of Isengildina, Irwin, and Good's empirical estimation of equation 6 is presented in Table 1. These results demonstrate that α coefficients were significantly different from zero in all cases for corn and in most cases for soybeans. Estimated correlation coefficients ranged from 0.25 to 0.79 for corn and from 0.08 to 0.32 for soybeans. All estimated coefficients were positive, which indicates positive correlation in forecast revisions, consistent with Nordhaus' hypothesis of forecast "smoothing." Because forecast revisions were analyzed in percentage form, obtained coefficients may be interpreted as point elasticities. Thus, a 0.79 coefficient for November versus October corn revisions means that a one percent positive revision of the corn production forecast in October is expected to be followed by 0.79 percent positive revision in November. Therefore, these estimated coefficients describe a predictable component in the future revisions. This predictable component may be calculated by multiplying a revision at time (*t-1*) by α. In the remainder of the paper we examine if markets are aware of this predictability in USDA revisions and whether they correctly incorporate it into their expectations of these revisions.

Rationality of Market Expectations.

There is anecdotal evidence that market analysts are aware of the USDA smoothing process. For example, AgResource, a prominent market advisory service, made this statement following release of the June 2000 winter wheat production forecast: "NASS is going to be particularly sensitive about making a drastic reduction in their July and August estimate. ARC anticipates USDA will take a conservative approach and slowly reduce production levels in July, August and September." (June 26, 2000). Similar concerns were expressed by Agrivisor-Zwicker, another market advisory service, with respect to the September 1999 corn production forecast: "While some private guesses are coming in as much as 400 million bushels less the USDA's 9.561 billion bushel August estimate, few expect USDA to come off their August number by more than 200 million bushels" (September 2, 1999). Figures 1 and 2 review the degree of market anticipation of smoothing in USDA revisions by plotting USDA corn and soybean production forecasts against market predictions of these forecasts. This graphical analysis shows that market predictions closely follow USDA forecasts, which indicates substantial anticipation of USDA revisions smoothing by market analysts.

The market's level of anticipation of USDA forecast revisions has not been formally tested. In this study we apply a basic rationality framework to test whether markets expectations of USDA revisions include information about the smoothing process. Rationality of market expectations of USDA revisions is equal to the mathematical expectation of $v_{T/t}$, conditioned on the information known at time t; that is,

(7) $$p_{T/t} = E(v_{T/t} \mid I_t)$$

where I_t is the information available at time t, and E is the mathematical expectations operator. Forecast rationality may be tested empirically by running the following regression:

(8) $$v_{T/t} = \delta_0 + \delta_1 p_{T/t} + \chi' X_t + \varepsilon_t$$

where X_t is the vector of variables in the information set at time t, and ε_t is the error term. Unbiasedness requires that, in regression 8 without X_t variables, the coefficients be restricted to $\delta_0=0$ and $\delta_1=1$. Weak form efficiency implies that unbiasedness condition is satisfied and there is no serial correlation in the error term. Strong form efficiency imposes the additional requirement that any variable known at time t or before be orthogonal to ε_t; that is, the vector $\chi=0$ for any vector $X_t \in I_t$. In this study we explore whether the information about USDA forecast smoothing available at time t conforms to this requirement.

Information about USDA forecast smoothing is introduced in this study as a predictable component of revision at time t, which is calculated by multiplying a revision at time ($t-1$) by an autocorrelation coefficient between these two revisions, such as α coefficient from the Isengildina, Irwin, and Good study. A potential problem with using α coefficient from the Isengildina, Irwin, and Good study to construct the predictable components in revisions, is that they are based on the information for the entire study period (1970/71-2002/03). This information was not available within the sample. This problem may be alleviated by computing out-of-sample α coefficients. The first subset for this calculation included the 1970/71 through 1979/1980 period. This subset was used to compute α coefficients for the 1980/1981 marketing year. The subset for calculating α coefficients for the following (1981/82) marketing year included an additional observation and consisted of 1970/71 through 1980/81 years. Thus, subsets for computing α coefficients for the following years increased with more observations becoming available and ending with the 1970/71-2002/2003 subset for the 2003/04 α coefficients calculation. This procedure generated out-of-sample α coefficients, which were used for the empirical analysis of strong form efficiency of market expectations of USDA revisions of corn and soybean production forecasts during 1980/81 through 2003/04 period.

Results

Table 2 presents the results of the empirical estimation of equation 8 without X_t variables, which includes a test of bias and serial correlation of market expectations of USDA revisions of corn and soybean production forecasts during 1970/71-2003/04 period. Notable are relatively high values of adjusted R^2, which ranged from 0.67 to 0.86 for both crops. This indicates that market anticipates a large amount of variation in USDA revisions of corn and soybean production, which is consistent with graphical analysis presented in Figures 1 and 2. The results demonstrate that market expectations of USDA revisions were unbiased in half of the cases and biased in the other half. Specific cases where unbiasedness was rejected include October revisions of corn production forecasts and September and November revisions of soybean production forecasts. In these cases, the intercepts were not statistically different from zero, but the estimated coefficients were statistically different from one, which caused the null hypothesis of no bias to be rejected based on the results of the joint F-test.

Interestingly, the direction of bias in market expectations was different between corn and soybeans. Thus, for October revisions of corn production forecasts the bias was expressed in $\delta_2>1$, which implies that the slope of the regression line was steeper than would be expected for the unbiased expectations. This finding suggests that market projections consistently under-predicted USDA October revisions of corn production forecasts. If this is a response to USDA smoothing practices, market projections appear to overcompensate for it in this case. The situation is the opposite in soybeans. For both September and November revisions of corn production the bias was expressed in $\delta_2<1$, which implies that the slope of the regression line was flatter than would be expected for unbiased expectations. This finding suggests that market projections consistently over-predicted USDA September and November revisions of soybean production forecasts. This finding may also be interpreted as underestimation of the USDA smoothing process on the part of the market analysts.

Serial correlation of market expectations of USDA revisions of corn and soybean production forecasts during 1970/71-2003/04 period was tested using a Chi-square statistic. This statistic corresponds to the Box-Pierce test that the residual autocorrelations are jointly zero. The results of these tests presented in Table 2 fail to reject the null hypothesis of zero autocorrelation in residuals in all cases. Thus, market expectations of USDA revisions of corn and soybean production forecasts during 1970/71-2003/04 period were efficient with respect to past errors.

The second part of the analysis was to examine whether the information about smoothing was omitted from these inefficient forecasts using the strong form efficiency tests. This analysis was conducted for a smaller sample restricted to October and November revisions during 1980/81 through 2003/04 marketing years. These data limitations resulted from the use of September revisions to calculate a predictable component in October revisions and the use of the 1970/71-1979/80 period to compute out-of-sample α coefficients needed for calculation of the predictable component in forecast revisions in the later years. The results of the tests of bias and strong form efficiency for the 1980/81 through 2003/04 period are presented in Table 3. Tests of bias were duplicated for this sample to control for the sample period effects. The results demonstrate that in this sample the bias is retained only in market expectations of October corn production revisions. Differently from the 1970/71 through 2003/04 sample, market expectations of November soybean production revisions become rational, while there is a potential for irrationality in November corn production revisions expressed in δ_2>1, although not strong enough to yield a significant joint F test. Interestingly, the addition of information about smoothing does not improve the expectation of the October corn production revisions in this sample. This finding suggests this information is already included in market expectations of these revisions and the bias in these expectations is caused by reasons other than smoothing. Information about smoothing, however, is able to correct bias in expectations of November corn production revisions. This information is statistically significant and may reduce the forecast error variance of market expectations of these revisions by two percent. Thus, even though there appear to be some inconsistencies with rationality in market expectations of USDA corn and soybean production forecast revisions, the economic effect of these inconsistencies appears negligible.

Summary and Conclusions

This study examined whether market participants anticipate the predictable component in USDA revisions of corn and soybean production forecasts during 1970/71 through 2003/04 marketing years. Adjusted R^2 values were generally high suggesting that market anticipates a large amount of variation in USDA revisions of corn and soybean production. The analysis revealed that market expectations of USDA revisions were generally unbiased except for October corn production revisions and September soybean production revisions. Some deviations from rationality were also detected in expectations of November soybean production revisions in the earlier years and in November corn production revisions in the later years. It appears that market analysts generally under-predicted USDA revisions in corn and over-predicted revisions in soybeans.

Statistical evidence demonstrates that biases in the expectations of November corn production revisions in the later years may be attributable to omission of information about smoothing in USDA revisions. The inclusion of information about forecast smoothing for November corn production revisions resulted in only marginal improvements in forecast error variance of market expectations (two percent). Thus, even though there appear to be some inconsistencies with rationality in market expectations of USDA corn and soybean production forecast revisions, the economic effect of these inconsistencies appears negligible. In all other cases markets seemed to be aware of USDA smoothing practices and generally efficiently incorporated this information into their own forecasts. Even though consistent biases were detected in market expectations of October corn production revisions, they were likely caused by reasons other than smoothing as statistical evidence indicates that information about smoothing was efficiently incorporated in these expectations.

Overall, this study demonstrated that market analysts generally correctly anticipated and adjusted for inefficiencies in the USDA forecast revision process. Hence, the observed inefficiency in USDA corn and soybean production forecasts was not likely to result in a reduction in welfare due to misallocation of economic resources. Thus, not only forecasts themselves, but also their interpretation by the markets should be included in rationality analyses in order to draw conclusions about their welfare impacts.

References

Clements, M.P. "Evaluating the Rationality of Fixed-Event Forecasts," *Journal of Forecasting* 16(1997):225-239.

Colling, P.L., and S.H. Irwin. "The Reaction of Live Hog Futures Prices to USDA Hogs and Pigs Reports." *American Journal of Agricultural Economics* 72(1990):84-94.

Egelkraut, T.M., Garcia, P, S.H. Irwin, and D.L. Good. "An Evaluation of Crop Forecast Accuracy for Corn and Soybeans: USDA and Private Information Agencies," *Journal of Agricultural and Applied Economics* 35(2003):79-95.

Garcia, P., S.H. Irwin, R.M.Leuthold, and Li Yang. "The Value of Public Information in Commodity Futures Markets." *Journal of Economic Behavior and Organization* 32(1997):559-570.

Grunewald, O., M.S. McNulty, A.W. Biere. "Live Cattle Ftures Response to Cattle on Feed Reports." *American Journal of Agricultural Economics* 75(1993):131-137.

Harvey, D.I, S.J. Leybourne, and P. Newbold. "Analysis of a Panel of UK Macroeconomic Forecasts," *Econometrics Journal* 4(2001):S37-S55.

Isengildina, O., S.H.Irwin, and D.L.Good. "Are Revisions to USDA Crop Production Forecasts Smoothed?" Working Paper, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 2004.

Mills, J.B., and T.C. Schroeder. "Are Cattle on Feed Report Revisions Random and Does Industry Anticipate Them?" Selected Paper presented at Western Agricultural Economics Association Annual Meetings, Long Beach, CA, July 28-31, 2002.

Nordhaus, W.D. "Forecasting Efficiency: Concepts and Applications," *Review of Economics and Statistics* 69(1987):667-674.

Runkle, D.E. "Are Farrowing Intentions Rational Forecasts?" *American Journal of Agricultural Economics* 73(1991):594-600.

Runkle, D.E. "Do Futures Markets React Efficiently to Predictable Errors in Government Announcements?" *Journal of Futures Markets* 12(1992):635-643.

Stein, J.L. "Speculative Price: Economic Welfare and the Idiot of Chance." *Review of Economics and Statistics* 63(1981):223-232.

Table 1. Correlation Tests for USDA Corn and Soybean Production Forecast Revisions, 1970/71-2002/03 Marketing Years.

	Revisions Dependent Variable	Revisions Independent Variable	Estimated Coefficient	*t* -statistic	*p* -value
Panel A: Corn					
	October	September	0.25	2.78	0.009
	November	October	0.79	7.31	0.000
	January	November	0.32	2.49	0.018
Panel B: Soybeans					
	October	September	0.08	0.67	0.505
	November	October	0.32	3.19	0.003
	January	November	0.26	1.80	0.082

Notes: All tests are based on percentage revisions and use OLS regressions with 33 observations. The results reported in the table are the same as that reported in Table 2 of Isengildina, Irwin and Good.

Table 2. Test of Bias and Serial Correlation of Market Expectations of USDA Revisions of Corn and Soybean Production Forecasts, 1970/71-2003/04 Marketing Years.

	Constant	Market Expectation	Joint F-test	Chi-Square Statistic	Adjusted *R2*
Panel A: Corn					
September	0.17	0.95	0.62	11.13	0.86
	(0.66)	(-0.71)			
October	-0.03	1.37	2.53*	8.96	0.67
	(-0.13)	(2.24)**			
November	0.04	1.09	0.64	7.62	0.83
	(0.27)	(1.02)			
Panel B: Soybeans					
September	0.14	0.82	5.16**	7.13	0.84
	(0.50)	(-2.97)**			
October	0.16	1.03	0.16	7.52	0.67
	(0.54)	(0.22)			
November	0.25	0.78	3.88**	8.61	0.72
	(1.61)	(-2.56)**			

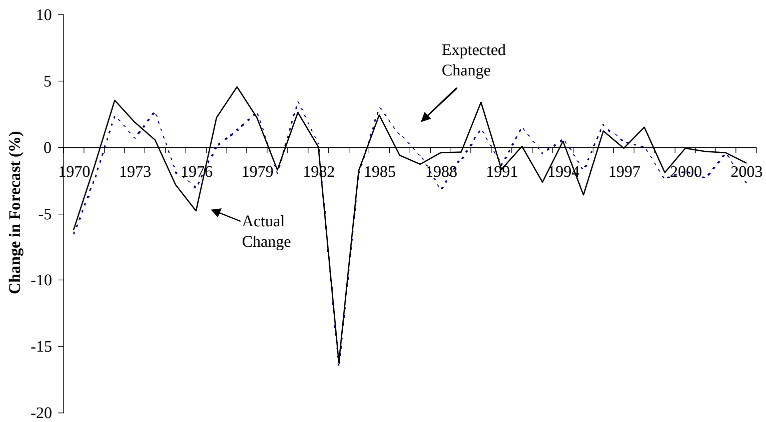
Notes: All tests are based on percentage revisions and use OLS regressions with 34 observations. One star indicates statistical significance at the ten percent level, two stars indicate significance at the five percent level. Numbers in parenthesis are t-statistics testing difference of the coefficient from zero, except for market expectations where the difference from one is tested. The critical value of Chi-square distribution with 10 degrees of freedom is 15.99 at the ten percent level.

Table 3. Rationality of Market Expectations of USDA Revisions of Corn and Soybean Production Forecasts, 1980/81-2003/04 Marketing Years.

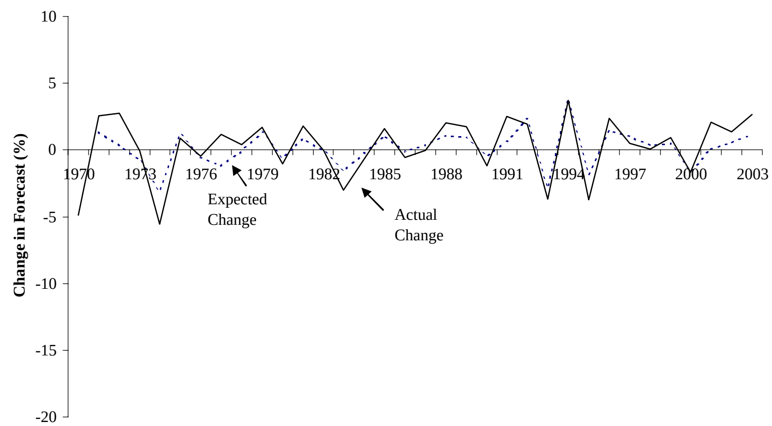
	Constant	Market Expectation	Smoothing Information	Joint F-test	Adjusted *R2*
Panel A: Corn					
October					
Bias	-0.05	1.35		4.81**	0.86
	(-0.28)	(3.07)**			
Efficiency	0.02	1.29	0.15	3.33*	0.86
	(0.13)	(2.40)**	(1.23)		
November					
Bias	-0.17	1.17		1.96	0.88
	(-1.00)	(1.89)*			
Efficiency	-0.18	0.97	0.34	0.72	0.90
	(-1.14)	(-0.25)	(1.96)*		
Panel B: Soybeans					
October					
Bias	0.25	1.16		0.61	0.69
	(0.68)	(0.98)			
Efficiency	0.25	1.16	-0.05	0.58	0.68
	(0.64)	(0.97)	(-0.15)		
November					
Bias	0.11	0.96		0.26	0.80
	(0.67)	(-0.37)			
Efficiency	0.12	0.95	0.06	0.30	0.79
	(0.70)	(-0.48)	(0.35)		

Notes: All tests are based on percentage revisions and use OLS regressions with 34 observation One star indicates statistical significance at the ten percent level, two stars indicate significance at the five percent level. Numbers in parenthesis are t-statistics testing difference of the coeffic from zero, except for market expectations where the difference from one is tested.

Panel A: September



Panel B: October



Panel C: November

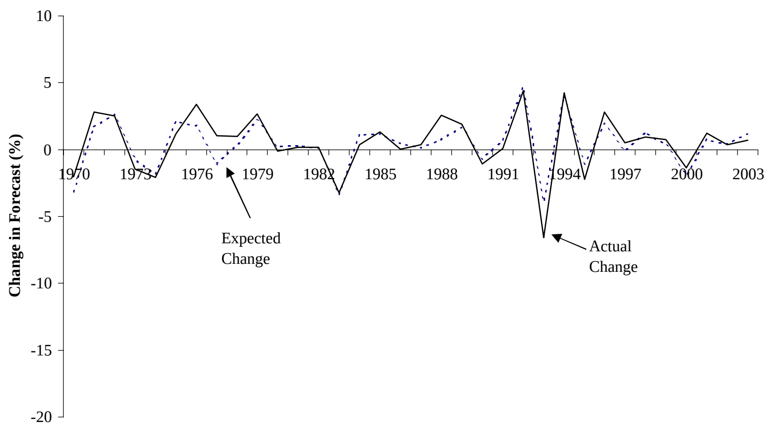
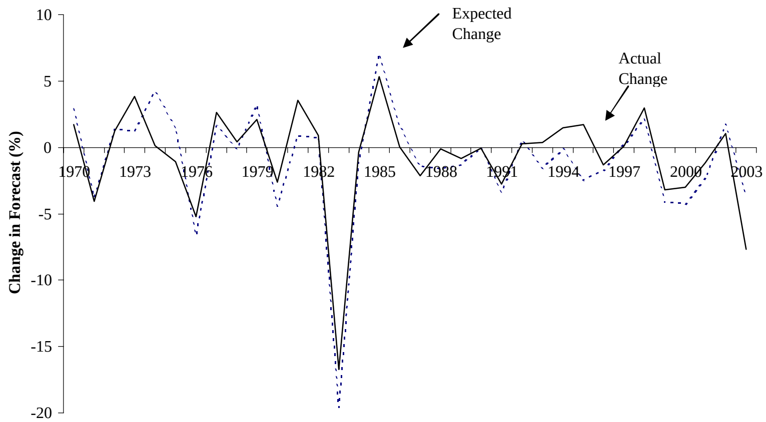
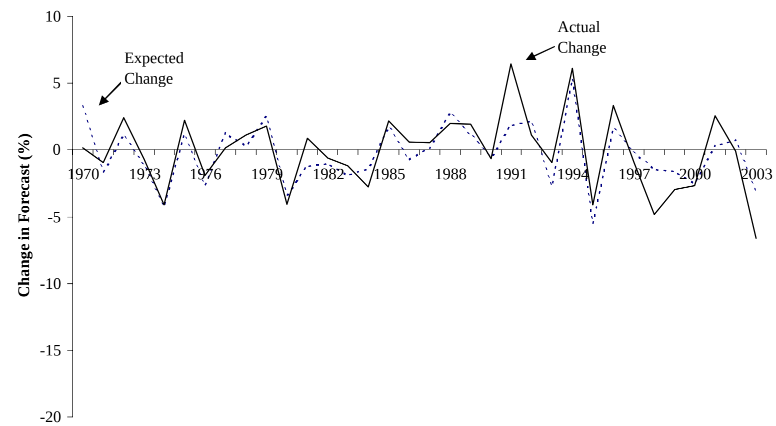


Figure 1. Actual and Expected Changes in USDA Corn Production Forecasts, 1970-2003

Panel A: September



Panel B: October



Panel C: November

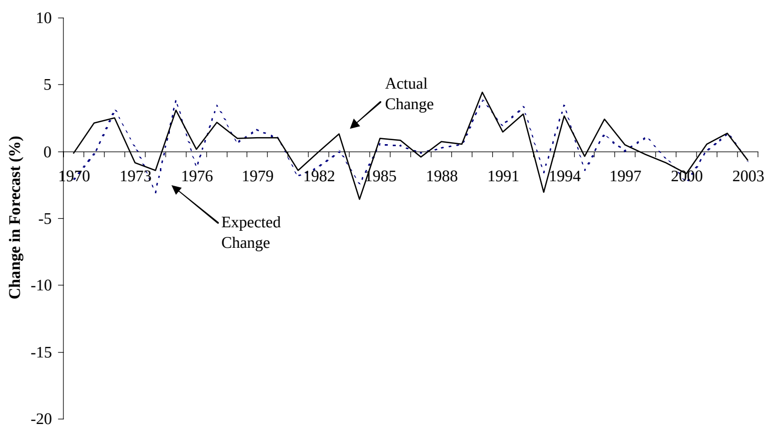


Figure 8. Actual and Expected Changes in USDA Soybean Production Forecasts, 1970-2003