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The Value of USDA Crop Progress and Condition Information: Reactions of Corn and Soybean Futures Markets

Georg V. Lehecka

This paper investigates the informational value of USDA crop progress and condition information by analyzing reactions of corn and soybean futures markets from 1986 to 2012. Results show significant differences between close-to-open return variabilities on report-release trading days and pre- and postreport days. Additionally, market prices tend to react rapidly and rationally to new crop-condition information. Strongest reactions are found for July and August, when weather conditions are most critical for the crop, and reactions have increased over time. Overall, these results suggest that reports have substantial informational value.

Key words: condition, corn, futures markets, market efficiency, market reactions, progress, public information, soybeans

Introduction

Each week during the growing season (April through November), the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA) releases a Crop Progress (CP) report. The report contains weekly estimates of crop progress and the condition of selected crops in major producing states. Those estimates represent direct assessments of the overall status of a crop on a weekly basis throughout the growing season. Even though weather information is widely and almost instantly available, weekly CP reports are considered to be an important source of information on crop development and conditions; these reports are among the most requested publications distributed by NASS between monthly Crop Production and World Agricultural Supply and Demand Estimates (WASDE) reports.[1] They provide information for projecting crop yields and, hence, crop supplies for the coming harvest. Combined with demand expectations, they lead to crop price expectations.

A large body of empirical research has examined the value and impact of public information in agricultural markets. These studies have mostly focused on USDA reports such as corn and soybean production forecasts (Fortenbery and Summer, 1993), harvest forecasts (Garcia et al., 1997), and, in particular, WASDE reports on corn and soybean prices (Isengildina-Massa et al., 2008), hogs and pigs (Colling and Irwin, 1990), cattle on feed (Grunewald, McNulty, and Biere, 1993), and

Georg V. Lehecka is a doctoral candidate in the Department of Economics and Social Sciences at the University of Natural Resources and Life Sciences, Vienna.
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Review coordinated by Larry Makus.

[1] Personal email communication with Julie Schmidt. February 27, 2013.

cold storage reports on cattle and hog prices (Isengildina, Irwin, and Good, 2006). The majority of studies found the release of USDA reports to have significant market impacts, indicating that public information released by USDA generates economic welfare benefits (Falk and Orazem, 1985).

Despite these findings, the value of public agricultural information programs has been debated for several reasons. The growth of private firms providing information and analysis on agricultural markets (Egelkraut et al., 2003; Good and Irwin, 2006; McKenzie, 2008) challenges the value of public information; these private information services may substitute for public programs (Just, 1983; Salin et al., 1998). Federal budget restrictions, particularly in recent years, have also raised concerns about the value of public information programs in agriculture. Finally, some studies have reported negative evidence of market reactions to the release of USDA reports (Fortenbery and Summer, 1993; Marone, 2008).

While CP reports are widely followed by market analysts, very little academic research has focused on their informational value. Research by Karali (2012) focusing on the effects of a number of USDA reports on the conditional return variances and covariances in related agricultural futures markets is the only event study that includes CP reports. Furthermore, only a few academic studies have formally investigated the use of crop-condition information, for example in modeling crop yields (Dixon et al., 1994; Kruse and Smith, 1994; Fackler and Norwood, 1999; Irwin, Good, and Tannura, 2009). In fact, the informational value of the USDA's CP reports is not well studied, and no detailed academic analysis on market reactions to their release is available. If progress and condition data simply replicate what is already known from private-sector analysis and weather information and this knowledge is reflected in market prices (and the release of reports therefore does not lead to any significant market reactions), then the CP reports should be reconsidered (e.g., Just, 1983; Salin et al., 1998).

This study provides new and extensive empirical evidence for the economic value of USDA progress and condition information in corn and soybean futures markets. Rather than focusing on a single test of informational value, two lines of event study methods are considered: (i) announcement effects are tested on differences in return variabilities on report-release trading days and pre- and postreport days (e.g., Sumner and Mueller, 1989; Isengildina-Massa et al., 2008), and (ii) changes in crop-condition information are tested for rapid and rational price reactions (e.g., Grunewald, McNulty, and Biere, 1993; Garcia et al., 1997). A range of alternative tests act as a check on the robustness and consistency of results across different methodologies. In addition, the sample period for the study extends from 1986 through 2012 and provides sufficient observations to test for different market reactions to progress and condition information, differences in individual calendar months over the growing season, and changes in the market reaction over time due to changing supply/demand conditions and U.S. agricultural policy regimes.

Event Studies and Market Efficiency

Event studies are based on the idea that information is valuable to market participants in an efficient market if prices react to the announcement of information ("event") (Campbell, Lo, and MacKinlay, 1997). New crop progress and condition information will change market participants' supply perceptions, and these changed expectations will be reflected in movement in the market price. Since the direction in which the expectations are changed is *a priori* unknown, movements in market prices can either be positive or negative. While an average of market price movements is perhaps zero, the variabilities of price returns around the release of important new announcements should be greater than the "normal" variability on days without announcements (Sumner and Mueller, 1989; Isengildina-Massa et al., 2008).

This reasoning assumes that markets are less than strong-form efficient. In a market that is strong-form efficient (Fama, 1970), futures prices reflect all public and private information. Markets should fully anticipate not only information contained in news announcements, but also all private ("insider") information possessed by market participants. The variabilities of price returns around releases of announcements would be the same as on days without any announcements. However, previous studies on market efficiency mostly reject that markets—including agricultural futures markets—are strong-form efficient (e.g., Fama, 1991; Zulauf and Irwin, 1998). Thus, this paper assumes that agricultural futures markets are less than strong-form efficient and that news announcements may therefore have an effect on markets.

Under semi-strong-form efficiency, prices should adjust to publicly available new information very rapidly and in an unbiased way (Fama, 1970). CP reports are released at 4:00 p.m. EST on the first business day of the week, after the end of the daily trading session and before the subsequent trading session opens at the Chicago Board of Trade (CBOT). New information should be reflected instantaneously in futures prices as soon as trading begins. Price adjustments for corn and soybean futures should therefore be reflected in returns based on closing prices before and opening prices after reports are released. Further, if the new information is valuable to market participants and the market is (semi-strong-form) efficient, then price adjustments should be rapid and rational in the direction indicated by unanticipated (i.e., "bullish" or "bearish") information contained in reports.

Crop Progress and Condition Data

CP reports contain weekly cumulative planting, fruiting, and harvesting progress and crop condition of selected crops in major producing states over the growing season. These estimates are based on survey data collected from around 4,000 respondents. Based on standard definitions, respondents subjectively estimate the progress of their crops through the stages of development and the progress of producer activities. They then provide subjective evaluations of crop conditions. Respondents are asked to report for the entire week ending on Sunday. County data are summarized to state levels, weighting each county's reported data by county acreage estimates. Finally, state-level data are compiled into a national-level summary by weighting each state by its acreage estimates. Data are reviewed at all stages for reasonableness and consistency. Progress data for corn are expressed as a percentage of the crop planted, silking, dough, dented, mature, and harvested and for soybeans as a percentage of the crop planted, blooming, setting pods, dropping leaves, and harvested. Condition data are expressed as a percentage of the crop in excellent, good, fair, poor, and very poor condition. These estimates should reflect the effects of all variables on the status of a crop, such as temperature, precipitation, planting date, solar radiation, insect infestation, and disease.[2]

The data analyzed in this study (the "events") were released from 1986 to 2012 from early April through the end of November and include the releases of 940 CP reports containing progress or condition information for corn and 890 CP reports containing progress or condition information for soybeans. Reports are divided into two groups. The first group consists of reports that contain both progress and condition information (554 and 486 reports for corn and soybeans, respectively). The second group consists of reports that are limited only to progress information at the beginning (during planting) and at the end (during harvesting) of the growing season (386 and 404 reports for corn and soybeans, respectively). Specific calendar months with condition and progress or only progress information included in CP reports vary from year to year due to the progress of particular crops.[3] Data are obtained from the USDA National Agricultural Statistics Service Quick Stats website.

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[2] While CP reports contain both different stages of progress and an evaluation of condition, crop condition could already include the effects of the development and progress on crop quality. That is, changes in condition information over the growing season could potentially be of greater importance for market participants than stages of progress.

[3] Information restricted only to progress data for corn and soybeans tends to be included in reports, particularly in April and November and to some degree in May and October. Another possibility to divide the data into groups would be to focus on different crop progress stages (planting, different fruiting, and harvesting progress). However, since the different progress stages on a U.S. national level overlap with one another and with condition data, the available data are divided into two groups of reports that can be clearly distinguished: one group of reports that includes both progress and condition information, and one group of reports that is limited to progress information alone.

Table 1. Weekday Statistics for Corn and Soybean Close-to-Open Returns, April to November, 1986–2012

	Corn		Soybeans	
	Nonweekend	Weekend	Nonweekend	Weekend
Mean	0.00	−0.12***	0.01	−0.10***
Median	0.00	−0.13	−0.02	−0.10
Variance	0.38	1.24	0.30	1.13
F-stat.	3.29***		3.77***	
Data points	3,631	941	3,429	881

Notes: Returns are computed as the difference in the natural logarithm of price multiplied by 100. Weekend returns are defined as calculated based on the closing price before the weekend and the opening price after the weekend. F-statistics represent a test on the null hypothesis of equal return variances. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**, ***) denote significance at the 5% and 1% levels.

Futures Price Data

Daily opening and closing (settlement) prices of new-crop corn (December) and soybean (November) futures contracts are collected over the period 1986 through 2012. New-crop contracts are used because the progress and condition information contained in CP reports is mainly new-crop information. Since report-release events are always on the first business day of the week, day-of-the-week effects in futures returns and their variabilities must be taken into account (e.g., Junkus, 1986; Yang and Brorsen, 1994; Isengildina, Irwin, and Good, 2006). Specifically, weekend overnight effects may bias tests to detect differences in close-to-open return variabilities on report-release trading days and pre- and postreport days. Previous studies (e.g., Ferris and Chance, 1987; Fleming, Kirby, and Ostdiek, 2006) have indicated that the variabilities of close-to-open returns over the weekend (e.g., Friday close to Monday open) tends to be higher than over other days of the week.[4]

Summary statistics for weekend and nonweekend close-to-open returns are given in table 1 for corn and soybeans from April to November, 1986 through 2012. Weekend returns are based on the closing price before the weekend and the opening price after the weekend. The variances of close-to-open returns over the weekend are significantly greater, and returns show a significant negative mean. These effects will substantially bias results for market reactions to the release of CP reports. Thus, since CP reports are always released on the first business day of the week, the analyses in this paper are limited only to weekday returns. That is, close-to-open returns over the weekend are omitted.

The analysis of market reactions (particularly announcement effects in return variability) to the release of CP reports could also potentially be biased by the release of other USDA reports. For corn and soybean markets from April through November, these reports include NASS publications such as monthly Crop Production reports, quarterly Grain Stocks reports, annual Acreage reports (released in June), monthly WASDE reports issued by the World Agricultural Outlook Board, and monthly Feed Outlook and monthly Oil Crops Outlook reports released by the Economic Research Service. In comparison to weekly CP reports, these reports are not published on a particular day of the week. Assuming that report-release days are distributed evenly over weekdays, they will not have a systematic impact on the analysis of market reactions to the release of CP reports. However, an analysis of day-of-the-week distributions for these reports from 1986 through 2012 (April through November) shows that there is a tendency for NASS reports and the WASDE report to be released at the end of the business week, particularly on Fridays.[5] Since analyses are limited only

[4] Event studies on other reports (e.g., WASDE, cattle on feed, cold storage) may not have to consider weekend effects because these reports are released less frequently and not on a particular day of the week. Weekend effects may be distributed evenly over their report-release events since reports are released on different days of the week. However, weekend returns will not be sampled evenly around CP report releases because reports are issued on Monday or the following day.

[5] From 1986 through 2012 (April through November), out of 509 released WASDE, Crop Production, Grain Stocks, and Acreage reports, 141 (27.70%) were released on Fridays, 127 (24.95%) on Thursdays, 82 (16.11%) on Wednesdays, 100 (19.65%) on Tuesdays, and only 59 (11.59%) on Mondays.

to weekday returns (Friday close to Monday open returns are omitted), other USDA reports released on Fridays do not impact the analysis of market reactions. However, market-reaction results may still be biased downward because other reports are not evenly distributed over CP report-release and non-CP report-release days.[6] To examine whether results are sensitive to the release of other USDA reports, announcement effects in return variability are also tested, excluding days with other USDA report releases.

Previous event studies have discussed that the analysis of market reactions is complicated by limit moves (e.g., Sumner and Mueller, 1989; Colling and Irwin, 1990; Isengildina-Massa et al., 2008). Limit moves in futures markets restrict daily futures price movements and may therefore bias estimates of price reactions. Tests may underestimate the significance of announcement effects and price impacts. However, only a small portion of trading days have limit moves.[7] In addition, results obtained by Park (2000) suggest that price and volatility impacts tend to continue on trading days after a limit move in agricultural futures markets. Finally, McKenzie, Thomsen, and Dixon (2004) conducted Monte Carlo simulations to assess the inferential accuracy of event studies on daily futures returns in the presence of price limits. Their results indicated that price limits are not likely to substantially bias market-reaction tests. Since they represent only a small portion of the data and are unlikely to lead to biased results in market reactions, no adjustments for limit price moves are made.

Methodology and Statistical Tests

Reactions to crop progress and condition information for corn and soybean markets are examined using two event-study methods. First, differences in close-to-open return variabilities are statistically tested for report-release trading days and pre- and postreport days (e.g., Sumner and Mueller, 1989; Isengildina-Massa et al., 2008). If CP reports contain valuable information for market participants in an efficient market, then price movements on report-release days will be larger than other days. Second, it is tested whether market prices react rapidly and rationally to new crop-condition information (e.g., Grunewald, McNulty, and Biere, 1993; Garcia et al., 1997). In an (semi-strong-form) efficient market, prices should react not only quickly but also in an unbiased way to new information entering the market, and no overreaction should exist. All statistical tests and data analyses are conducted with the statistical software package R (http://www.r-project.org/).

To test the null hypothesis that return variabilities for report days and pre-/postreport days are equal (no reaction), close-to-open returns are selected for the two trading days before the release of each CP report, the day of the release, and the two trading days after the release of each CP report, for a total of five days for each release over the sample period. A wider event window would frequently

[6] Of non-Fridays with at least one other released USDA report, only 16.48% (45 out of 273) days with other USDA reports fell on days with CP report releases, and 83.52% (228 out of 273) fell on days without CP report releases. That is, at least one other report was released on CP report days for 4.79% of reports containing corn information and 5.06% of reports containing soybean information.

[7] The daily price limit for CBOT corn contracts was set to ten cents/bushel (expandable to fifteen cents/bushel) until July 15, 1993; twelve cents/bushel (expandable to eighteen cents/bushel) from July 15, 1993, to August 27, 2000; twenty cents/bushel from August 27, 2000, to March 28, 2008; thirty cents/bushel (expandable to forty-five cents/bushel and seventy cents/bushel) from March 28, 2008, to August 22, 2011; and forty cents/bushel (expandable to sixty cents/bushel) since August 22, 2011 (Park and Irwin, 2005; CME Group, 2011). Of a total of 3,631 nonweekend price changes included in this study, corn futures were subject to limit moves seventeen times on a close-to-open basis and fifty-five times on a close-to-close basis, or 0.5% and 1.5%. On CP report-release days with reports containing corn progress or condition information, corn futures reached the limit only eight times on a close-to-open basis and seventeen times on a close-to-close basis out of 940 release days, or 0.9% and 1.8%. For CBOT soybean contracts, daily price changes were limited to thirty cents/bushel (expandable to forty-five cents/bushel) until August 27, 2000; fifty cents/bushel from August 27, 2000, to March 28, 2008; and seventy cents/bushel (expandable to 105 cents/bushel and 160 cents/bushel) since March 28, 2008 (Park and Irwin, 2005). On the 3,429 nonweekend price changes, soybean futures prices hit the limit nine times on a close-to-open basis and twenty-five times on a close-to-close basis, or 0.3% and 0.7%. On CP report-release days with reports containing soybean progress or condition information, soybean futures reached the limit only two times on a close-to-open basis and seven times on a close-to-close basis out of 890 release days, or 0.2% and 0.8%.

Table 2. Summary Statistics for Corn and Soybean Nonweekend Close-to-Open Returns, April to November, 1986–2012

	Corn		Soybeans	
	r	$\|r\|$	r	$\|r\|$
Mean	0.00	0.35***	0.01	0.29***
Median	0.00	0.20	0.00	0.16
Variance	0.37	0.25	0.28	0.20
Skewness	1.11***	3.91***	1.09***	4.95***
Kurtosis	14.67***	22.14***	24.25***	36.62***
Jarque-Bera	42,986***	107,722***	108,830***	264,275***

Notes: Returns (r) are computed as the difference in the natural logarithm of price multiplied by 100. Data are selected for two trading days before the release of each CP report, the day of the release, and two trading days after the release of each CP report, or a total of five days for each release over the sample period. Number of observations is 4,700 for corn and 4,418 for soybeans. Tests on the skewness and kurtosis are D'Agostino and Anscombe-Glynn tests for normal samples, respectively. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**, ***) denote significance at the 5% and 1% levels.

overlap with report-release days in the following or previous week due to holidays. Close-to-open futures returns for a specific CP release are computed as

$$r_{t,i} = \ln\left(\frac{p^o_{t,i}}{p^c_{t-1,i}}\right) \times 100, \tag{1}$$

where $t = -2, \ldots, 0, \ldots, +2$, $p^o_{t,i}$ is the opening price for trading day t and event i, $p^c_{t-1,i}$ is the closing (settlement) price for trading day $t-1$ and event i, and $r_{0,i}$ represents the return between the closing price before report release and the opening price after report release. Only nonweekend returns are considered. That is, returns between closing prices before and opening prices after the weekend are omitted. For example, if a CP report is released on Monday without any holidays, $r_{-1,i}$ represents Thursday-to-Friday and $r_{-2,i}$ represents Wednesday-to-Thursday close-to-open returns.

Summary statistics for corn and soybean close-to-open returns are given in table 2. The means of both the corn and soybean returns are very small and insignificantly different from zero. On the other hand, the mean of the absolute returns is significantly different from zero, reflecting the variabilities in price movements. Significant skewness and kurtosis statistics indicate that return distributions are positively skewed and have fatter tails than a normal distribution. This is confirmed by Jarque-Bera tests, which strongly reject the null hypothesis of normality in all cases. Non-normality is a well-known distributional characteristic of commodity futures returns, which appear to be skewed and leptokurtotic (e.g., Yang and Brorsen, 1994). This indicates that assumptions of normality in subsequent tests will be violated. Hence, nonparametric tests that do not rely on the assumption of normality are used as a robustness check to control and confirm the results of parametric tests.

Announcement effects for the release of CP reports are tested by the null hypothesis that return variabilities for report days and pre-/postreport days are equal. Two-tailed F-tests of equality of variances are applied directly to returns. Report day variance is the variance of close-to-open returns on report-release days ($r_{0,i}$), and pre-/postreport day variance is the variance of close-to-open returns on pre-/postreport days ($r_{-2,i}$, $r_{-1,i}$, $r_{1,i}$, and $r_{2,i}$) for all events i. The null hypothesis for the F-test is that the ratio of return variances of report days and pre-/postreport days is equal to 1. As a nonparametric equivalent of the F-test to test for equal variabilities, robust to non-normality of returns, the null hypothesis is also tested using Kruskal-Wallis χ^2 rank sum tests applied to absolute returns (see Sheskin, 1997; Conover, 1999, for test details).

Rational price reactions to new condition information are initially examined by classifying weekly changes in conditions into "bullish," "bearish," and "neutral" price signals. As a proxy for overall condition, the sum of the percentages of the crop in excellent and good condition is compared on a weekly basis.[8] Decreases in the sum of the percentages of the crop in excellent and good condition from one week to the next are considered to be "bullish," increases to be "bearish," and

[8] Using the sum of the percentages of the crop in excellent and good condition as a proxy for overall crop conditions is an approach commonly used by market analysts and previous studies (e.g., Irwin, Good, and Tannura, 2009).

constant values to be "neutral" price signals. In general, the relationship between corn and soybean futures prices and changes in condition data should be negative. If a report shows that conditions are lower than in the previous report, then prices should rise after the release of the report, and vice versa.

Previous studies (e.g., Colling and Irwin, 1990; Grunewald, McNulty, and Biere, 1993; Garcia et al., 1997) distinguished between unanticipated and anticipated/expected components of information. Prices will react only to the unanticipated or "news" component of the information, so previous studies have investigated how unanticipated components influence commodity futures prices. In this framework, unanticipated information is defined as the difference between private information and information contained in USDA reports. In the case of condition data, unanticipated information would be defined as the difference between private condition estimates and condition data contained in CP reports. USDA reports analyzed in previous studies are released on a monthly or less frequent basis, and industry estimates, surveys, and forecasts are available as proxies for private information. However, CP reports are released weekly over the growing season, and prereport estimates are unavailable for corn and soybean crop condition.

It must therefore be assumed that the crop-condition information contained in CP reports for the previous week serves as a proxy for available private and anticipated information, and the unanticipated component of crop condition is encompassed by the change in conditions revealed in the CP report from the previous week to the next. However, the market will update condition estimates based on weather information within a week and may anticipate some of the information contained in the next CP reports. That is, the "news" component of the information may be less than measured by the change of reported conditions from one week to the next. Market impact measurements based on weekly changes of conditions in CP reports may therefore be biased downward.

Returns for the three groups of price signals are analyzed on report-release and postreport trading days. Price impacts should only occur instantly after the release of the report, reflected by close-to-open returns ($\ln\left(\frac{p^o_{0,i}}{p^c_{-1,i}}\right)$) for the report-release day ($t = 0$). To test for price impacts in the following trading sessions, open-to-close returns ($\ln\left(\frac{p^c_{0,i}}{p^o_{0,i}}\right)$) during the day trading session of the report-release day ($t = 0$) are analyzed. Close-to-close returns ($\ln\left(\frac{p^c_{1,i}}{p^c_{0,i}}\right)$ and $\ln\left(\frac{p^c_{2,i}}{p^c_{1,i}}\right)$) for the following two postreport trading days ($t = 1$ and $t = 2$) are also considered, examining the possibility of predictable price patterns up to two days after report releases. The null hypothesis tested is that return means for the three categories of price signals are 0. This is tested by T-tests and Wilcoxon signed-rank tests, which are equivalent nonparametric procedures that do not assume normality (see Sheskin, 1997; Conover, 1999).

Furthermore, the null hypothesis that there are no price impacts from unanticipated information is tested by specifying the regression

$$(2) \qquad \ln(p^o_{t,i}) - \ln(p^c_{t-1,i}) = \beta_0 + \beta_1[\ln(GX_i) - \ln(GX_{i-1})] + \varepsilon_{t,i},$$

where the dependent variable ($\ln(p^o_{t,i}) - \ln(p^c_{t-1,i})$) is the close-to-open return on the report-release trading day ($t = 0$) and event i, the independent variable ($\ln(GX_i) - \ln(GX_{i-1})$) is the difference between the sum of the percentages of the crop in excellent and good condition for event i and the previous week $i-1$, and $\varepsilon_{t,i}$ is the error term. Again, the possibility of predictable price patterns up to two days after the release of reports is examined as in the previous analysis. The null hypothesis of $H_0 : \beta_1 = 0$ is tested. Condition data are transformed via natural logarithms; hence, the analysis is performed on a percentage basis. In addition, the potential for heteroskedasticity is considered, and Breusch-Pagan tests for heteroskedasticity are performed for regression models.

Tests are generally conducted for all announcement weeks jointly from early April through the end of November as well as for individual calendar months. Further, subsample periods are considered. Previous event studies of agricultural futures markets (e.g., Garcia et al., 1997;

Isengildina-Massa et al., 2008) have shown that market reactions to USDA reports may vary over time due to changing market conditions and different U.S. agricultural policy regimes. To examine possible changes in market reactions over time, the entire sample is divided into four subsamples (1986–1989, 1990–1995, 1996–2001, and 2002–2012). The sample split follows the reasoning laid out by Isengildina-Massa et al. (2008). The first subsample is characterized by large year-to-year carryover of government owned stocks of grains and, consequently, low uncertainty with respect to future market conditions. In the other three subsample periods, year-to-year carryover of government owned stocks of grains was either low or nonexistent, and the uncertainty regarding future market conditions is therefore higher. The third and fourth subsamples are also characterized by increased market orientation of farm programs due to the 1996 and 2002 Farm Bills, and the fourth subsample is characterized by greater uncertainty due to the financial crisis and the Great Recession. Theoretically, progress and condition information should be more valuable to market participants (i.e., greater market reactions) when uncertainty about future market conditions is higher and aggregate grain stock levels are low (Falk and Orazem, 1985; Williams and Wright, 1991).

Results

Table 3 shows statistical test results on the return variabilities of report days and pre-/postreport days for the entire sample period, 1986 through 2012. Return variances on CP report-release days are 1.49 times greater than pre-/postreport day variances for corn and 1.37 times greater for soybeans. The presented parametric and nonparametric test statistics show that the increase in return variabilities on report days is consistently significant (both parametric and nonparametric tests are significant) for corn and soybeans at the 1% level.[9] These results indicate that new crop progress and condition information contained in USDA's CP reports generally changes supply expectations of market participants, as they are reflected in greater movements in the futures-market price.[10]

Announcement effects of CP reports presented in this study can also be compared to other less frequent USDA reports, such as WASDE reports. For instance, Isengildina-Massa et al. (2008) found that WASDE reports (1985–2006) cause (close-to-open) return variances on report-release days to be 3.7 times greater than pre-/postreport day variances for corn futures and 3.84 times greater than pre-/postreport day variances for soybean futures. However, WASDE reports are released only monthly, while CP reports lead to announcement effects on a weekly basis (over the growing season). Thus, while a direct comparison of the cumulative informational value may be difficult, announcement-effect results obtained for CP reports indicate substantial informational value even in comparison to less frequent and widely followed USDA reports such as WASDE reports.

Results in table 3 also show that return variances on report-release days containing both progress and condition information are 1.66 times greater than pre-/postreport day variances for corn and 1.58 times greater for soybeans. The increase in return variabilities on report days is significant at the 1% level. On the other hand, for reports containing only progress information (at the beginning and end of the growing season), return variances on report-release days are similar to pre-/postreport day variances for corn and soybeans. The null hypothesis that return variabilities for report days and

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[9] Other parametric (Bartlett, Levene, and Brown-Forsythe) and nonparametric (Mann-Whitney, chi-square) tests on absolute returns are applied to ensure that results are not sensitive to test selection (Sheskin, 1997; Conover, 1999). These additional tests reject the null hypothesis that return variabilities for report days and pre-/postreport days are equal at the same level of significance. Moreover, the same results are obtained from all tests when comparing report day return variability to prereport, postreport, and combined pre- and postreport day return variability. To conserve space, these results are not presented. They are available from the author upon request.

[10] Excluding returns on (report and pre-/postreport) days with other USDA report releases (WASDE, Crop Production, Grain Stocks, Acreage, Feed Outlook and Oil Crops Outlook reports) from the sample slightly increases the magnitude of test statistics, consistent with the relatively greater concentration of other USDA reports released on non-CP report-release days. However, hypothesis test results lead to unchanged conclusions. These alternative results are available from the author upon request.

Table 3. Futures Return Volatility Test Results for Crop Progress Reports for Corn and Soybeans, Nonweekend Close-to-Open Returns, April to November, 1986–2012

	Corn						Soybeans					
Reports	*N*	Report Day Variance	Pre-/Postreport Day Variance	Diff. in Reports and Pre-/Postreport Variance	*F*-Stat.	Kruskal-Wallis χ^2-Stat.	*N*	Report Day Variance	Pre-/Postreport Day Variance	Diff. in Reports and Pre-/Postreport Variance	*F*-Stat.	Kruskal-Wallis χ^2-Stat.
All	940	0.51	0.34	0.17	1.49***	22.96***	890	0.36	0.26	0.10	1.37***	16.60***
Condition & Progress	554	0.67	0.40	0.26	1.66***	22.32***	486	0.53	0.33	0.19	1.58***	32.66***
Progress	386	0.27	0.25	0.03	1.12	3.13	404	0.16	0.17	−0.01	0.95	0.10
April	114	0.22	0.18	0.04	1.23	7.19**	114	0.07	0.05	0.02	1.35**	0.68
May	116	0.49	0.30	0.19	1.64***	13.78***	116	0.25	0.18	0.07	1.40**	0.37
June	120	0.63	0.52	0.10	1.20	3.08	120	0.28	0.47	−0.20	0.58***	0.80
July	119	1.35	0.67	0.68	2.02***	15.68***	119	1.16	0.57	0.58	2.02***	14.06***
August	120	0.81	0.33	0.48	2.47***	10.67***	120	0.61	0.26	0.35	2.36***	21.45***
September	115	0.18	0.20	−0.03	0.87	0.88	115	0.16	0.12	0.03	1.27	8.16***
October	120	0.20	0.22	−0.03	0.89	2.55	120	0.10	0.13	−0.04	0.72**	1.38
November	116	0.09	0.29	−0.20	0.32***	1.28	66	0.12	0.33	−0.21	0.37***	0.02

Notes: Returns (r) are computed as the difference in the natural logarithm of price multiplied by 100. N denotes the number of reports included in the sample. Report day variance denotes the variance of close-to-open returns on report-release days ($r_{0,i}$) and pre-/postreport day variance denotes the variance of close-to-open returns on pre-/postreport days ($r_{-2,i}$, $r_{-1,i}$, $r_{1,i}$, and $r_{2,i}$) for all $i = 1, \ldots, N$. Reports are divided into two groups: one group of reports that includes crop progress and condition information, and one group of reports that is limited only to crop progress information at the beginning (during planting) and at the end (during harvesting) of the growing season. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**,***) denote significance at the 5% and 1% levels.

pre-/postreport days are equal could not be rejected. This may imply that, in particular, changes in crop conditions tend to change market participants' supply expectations.[11]

Further, table 3 presents test results for individual calendar months from April through November. It shows consistent and robust evidence of market reactions for both corn and soybean futures prices only in July and August. Return variances on reports in July are 2.02 times greater than pre-/postreport variances for corn and for soybeans. Return variances on reports in August are 2.47 times greater than pre-/postreport variances for corn and 2.36 times greater for soybeans. The changes are not only greatest in relative but also in absolute values. In absolute terms, CP reports in July cause the largest absolute changes in return variances for corn (0.68) and soybean futures (0.58), followed by August with absolute changes in return variances for corn (0.48) and soybeans (0.35).

A study conducted by Tannura, Irwin, and Good (2008) showed that crop-yield variation can be largely explained by precipitation and temperature (besides technological improvements) during the reproductive periods for corn and soybeans in the U.S. Corn Belt. They provided evidence that corn and soybean yields are overwhelmingly determined by summer (July and August) weather conditions. Thus, as condition information included in CP reports reflects changes in temperature and precipitation, market reactions are strongest during July and August. Besides July and August, only in May and only for corn is the null hypothesis of equal return variances on report and pre-/postreport days consistently and significantly rejected. This may be because of planting date information,[12] and the very first condition information in a year for corn tends to be included in CP reports in May, which may result in greater changes in market participants' expectations.

Results for the four subsample periods are presented in table 4. Most important, return variances on report-release days are found to be generally similar to pre-/postreport day variances for corn and soybeans in the first and second subsample periods; the null hypothesis that return variabilities are equal could not be rejected. For the third and fourth subsample periods, however, consistently significant results are obtained for all CP reports and reports containing condition and progress information for corn and soybeans, while only mixed evidence is found for reports containing only progress information (with the exception of corn in the fourth sample period).[13] This may suggest that information contained in CP reports is more valuable to market participants (i.e., greater market reactions) when uncertainty about future market conditions is higher. However, the greater market reactions over time can only indirectly be attributed to higher uncertainty about future market conditions. Greater market reactions may also be due in part to more (semi-strong-form) efficient markets or better access to information among market participants as a result of improved information technology.[14]

Table 5 presents return means for the three categories of price signals ("bullish," "bearish," and "neutral") for close-to-open ($\ln\left(\frac{p^o_{0,i}}{p^c_{-1,i}}\right)$) and open-to-close ($\ln\left(\frac{p^c_{0,i}}{p^o_{0,i}}\right)$) returns on the report-

[11] This does not necessarily imply that progress information is without value, because it is impossible to fully disentangle the separate impacts of progress and condition information due to the combined nature of CP reports.

[12] Besides the direct impact of weather on crop condition, planting date has been demonstrated to be an additional determinant for corn and soybean yields (Egli, 2008). "Late" planting tends to result in lower yields than timely planting (Pecinovsky and Benson, 2001; Nafziger, 2008; Nielsen, 2008). Planting date has been included as an additional factor to crop conditions in forecasting corn and soybean yields (e.g., Irwin, Good, and Tannura, 2009).

[13] Announcement effects are also tested for individual calendar months over the four subsample periods. Results for individual calendar months lead to the same conclusion as for the entire sample and for all report-release dates in the subsample periods: Announcement effects are consistently significant in July and August, but only in the third and fourth sample periods. These results are not presented and are available from the author upon request.

[14] NASS reports have been distributed in a variety of different ways: mail, fax, email, Internet. When NASS has reports to release, it provides advance copies to several media outlets for review in a secured location at its headquarters building. After the official report release, members of the press are free to distribute the information using whichever media channel they care to employ. In the past (prior to email and Internet), this would have been the quickest method of distribution to the public. As technology has changed, so have media distribution channels. Hence, improved information technology (email and Internet access) provide better and faster access to market information for market participants.

Table 4. Futures Return Volatility Test Results for Crop Progress Reports for Corn and Soybeans, Nonweekend Close-to-Open Returns, April to November, 1986–1989, 1990–1995, 1996–2001, 2002–2012

	Corn						Soybeans					
Reports	***N***	**Report Day Variance**	**Pre-/Postreport Day Variance**	**Diff. in Reports and Pre-/Postreport Variance**	***F*-Stat.**	**Kruskal-Wallis χ^2-Stat.**	***N***	**Report Day Variance**	**Pre-/Postreport Day Variance**	**Diff. in Reports and Pre-/Postreport Variance**	***F*-Stat.**	**Kruskal-Wallis χ^2-Stat.**
1986–1989												
All	139	1.19	0.84	0.35	1.41**	0.02	133	0.87	0.79	0.08	1.10	0.24
Condition & Progress	74	1.85	1.14	0.71	1.62**	0.21	65	1.41	1.19	0.22	1.18	0.13
Progress	65	0.45	0.42	0.03	1.06	0.31	68	0.36	0.36	−0.00	0.99	0.07
1990–1995												
All	209	0.52	0.49	0.03	1.06	1.07	200	0.59	0.48	0.10	1.21	0.56
Condition & Progress	120	0.59	0.56	0.03	1.05	0.09	105	0.86	0.56	0.29	1.52***	0.00
Progress	89	0.42	0.40	0.02	1.05	2.21	95	0.29	0.37	−0.08	0.79	0.58
1996–2001												
All	209	0.58	0.29	0.29	1.97***	5.28**	199	0.22	0.06	0.17	3.83***	17.34**
Condition & Progress	117	0.82	0.33	0.49	2.51***	9.26***	106	0.37	0.08	0.29	4.62***	34.64***
Progress	92	0.20	0.25	−0.04	0.82	0.01	93	0.05	0.03	0.01	1.40**	0.25
2002–2012												
All	383	0.21	0.10	0.11	2.10***	46.75***	358	0.12	0.06	0.07	2.17***	18.35**
Condition & Progress	243	0.26	0.13	0.13	2.05***	32.23***	210	0.17	0.07	0.10	2.55***	26.70***
Progress	140	0.13	0.06	0.07	2.34***	14.29***	148	0.06	0.05	0.02	1.42**	0.25

Notes: Returns (r) are computed as the difference in the natural logarithm of price multiplied by 100. N denotes the number of reports included in the sample. Report day variance denotes the variance of close-to-open returns on report-release days ($r_{0,i}$) and pre-/postreport day variance denotes the variance of close-to-open returns on pre-/postreport days ($r_{-2,i}$, $r_{-1,i}$, $r_{1,i}$, and $r_{2,i}$) for all $i = 1, \ldots, N$. Reports are divided into two groups: one group of reports that includes crop progress and condition information, and one group of reports that is limited only to crop progress information at the beginning (during planting) and at the end (during harvesting) of the growing season. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**,***) denote significance at the 5% and 1% levels.

Table 5. Futures Price Impacts to Crop-Condition Price Signals for Corn and Soybeans, Nonweekend Postreport Returns, April to November, 1986–2012

	Bullish Price Signal				Bearish Price Signal				Neutral Price Signal			
	Mean	**SE**	***T*-Stat.**	**Wilcoxon *W*-Stat.**	**Mean**	**SE**	***T*-Stat.**	**Wilcoxon *W*-Stat.**	**Mean**	**SE**	***T*-Stat.**	**Wilcoxon *W*-Stat.**
Corn returns												
N			206				201				120	
close-to-open $t = 0$	0.30	0.06	4.71***	12,064***	-0.13	0.06	−2.15**	5,842***	0.01	0.05	0.27	2,404
open-to-close $t = 0$	-0.03	0.11	−0.31	9,005	-0.06	0.10	−0.59	8,433	-0.10	0.17	−0.60	3,109
close-to-close $t = 1$	0.18	0.11	1.60	11,234	-0.13	0.12	−1.11	8,752	0.17	0.17	0.95	3,554
close-to-close $t = 2$	-0.22	0.13	−1.74	6,243	-0.12	0.12	−0.94	6,370	0.05	0.18	0.27	2,680
Soybean returns												
N			204				160				95	
close-to-open $t = 0$	0.17	0.06	2.97***	12,237***	-0.12	0.06	−1.99**	3,682***	0.06	0.05	1.15	2,294
open-to-close $t = 0$	-0.18	0.11	−1.61	9,754	0.06	0.10	0.65	6,343	-0.24	0.15	−1.57	1,876
close-to-close $t = 1$	0.10	0.10	0.98	11,202	-0.00	0.11	−0.04	6,295	0.08	0.18	0.45	2,435
close-to-close $t = 2$	-0.18	0.12	−1.58	6,854	0.15	0.12	1.29	5,093	-0.15	0.20	−0.76	1,605

Notes: Returns (r) are computed as the difference in the natural logarithm of price multiplied by 100. N denotes the number of reports included in the sample. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**,***) denote significance at the 5% and 1% levels.

release trading day ($t = 0$) and close-to-close returns ($\ln\left(\frac{p^c_{1,i}}{p^c_{0,i}}\right)$ and $\ln\left(\frac{p^c_{2,i}}{p^c_{1,i}}\right)$) on the following two postreport trading days ($t = 1$ and $t = 2$), respectively. Results indicate a significant and consistent pattern for corn and soybean futures returns. "Bullish" price signals lead to significantly positive price reactions and "bearish" price signals are followed by significantly negative price reactions only for the close-to-open report-release trading day.[15] "Neutral" signals do not cause any significant price reaction. These results suggest that prices react quickly and rationally in the indicated direction to condition information included in CP reports. Even though weekly changes in crop conditions are used only as proxies for unanticipated information (and market impact measurements may therefore be biased downward), price impacts are still observable on report-release days.

OLS estimations of equation (2) for corn and soybeans futures returns for the entire sample period and the four subsamples are presented in table 6 and for individual calendar months in table 7. Results generally indicate that corn and soybean markets respond significantly and rapidly to condition changes. The signs of significant coefficient estimates are consistent with expectations: higher (lower) conditions lead to decreases (increases) in prices after the release of the report. For the entire sample period, coefficient estimates are significant only for the close-to-open return on the report-release trading day. Significant results could not be found for the open-to-close return of the report-release trading day or close-to-close returns on the following two postreport trading days.[16]

Subsample results for price impacts of condition changes are also given in table 6. For the first and second subsamples, with the exception of corn from 1986 to 1989, results do not generally suggest that corn and soybean prices react to changes in condition data after the release of reports. For the third and fourth subsamples, however, coefficient estimates are significant, as they are in the entire sample. This supports the findings of the previous analysis that information contained in CP reports may be more valuable to market participants (i.e., greater market reactions) when uncertainty about future market conditions is higher (as in the third and fourth subsample periods).

Results for individual calendar months (June through October) are presented in table 7.[17] In general, results lead to similar conclusions as for tests on different return variabilities: Price impacts are strongest in summer (July and August) when weather conditions (precipitation and temperature) are critical for the crop. As for the entire sample and the subsamples, the signs of significant coefficient estimates are consistent with expectations, with negative relationships between close-to-open returns and condition changes on trading days after the release of reports. For corn, significant price impacts on report-release trading days can be found for June through September, with strongest impacts in July and August. For soybeans, a significant coefficient estimate can be found only for July.

There are three further notable patterns of price reaction to condition changes in subsample periods presented in table 6 and individual calendar months given in table 7. For corn in the first subsample, there is a significant reaction indicated by the close-to-close return on the second postreport day, and significant reactions are found on the first postreport day for corn in July. Additionally, for soybeans in the fourth subsample, the relatively large change in sign and magnitude of coefficients from the close-to-open to the following open-to-close return on the report-release day suggests that overreaction may be present. However, these *ex post* results do not necessarily imply that a profitable trading strategy could have been developed to exploit these price patterns in the

[15] Significant return mean estimates for "bullish" and "bearish" price signals in table 5 show different magnitudes for corn and to a lesser degree for soybeans. Prices may react to "good" and "bad" news differently. This is tested by two-sample T- and Wilcoxon-tests (also known as Mann-Whitney-tests in the two-sample case). The null hypothesis tested is that the absolute magnitudes of price reactions for "bullish" and "bearish" price signals are equal. Only weak evidence for differences based on the T-test can be found for corn, and no significant difference can be found for soybeans.

[16] To assess whether prices react with different magnitudes to "bullish" and "bearish" news, quantile regressions are estimated for the entire sample period. While the estimated relationships have a tendency to be more negative for upper quantiles of price returns (i.e., greater decrease in conditions), meaning that "bullish" news has stronger price impacts than "bearish" news, these differences are only weakly significant for corn and not significant for soybeans.

[17] Since only a small number of observations fall in May (seven for corn) and November (five for corn and one for soybeans), the analysis for individual calendar months is restricted to June through October.

Table 6. Regression Estimates of Futures Price Impacts to Crop-Condition Changes for Corn and Soybeans, Nonweekend Postreport Returns, April to November, 1986–1989, 1990–1995, 1996–2001, 2002–2012

close-to-open $t = 0$		open-to-close $t = 0$		close-to-close $t = 1$		close-to-close $t = 2$	
$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$
Corn, 1986–2012 ($N = 527$)							
0.05	−3.89***	−0.06	0.48	0.05	−1.81	−0.13	−1.21
(0.03)	(0.54)	(0.07)	(1.09)	(0.07)	(1.16)	(0.08)	(1.21)
Corn, 1986–1989 ($N = 70$)							
0.03	−3.27**	−0.06	0.57	0.03	−0.68	0.01	−4.58***
(0.16)	(1.38)	(0.16)	(1.33)	(0.20)	(1.70)	(0.20)	(1.65)
Corn, 1990–1995 ($N = 114$)							
0.06	−2.04	0.02	−0.22	−0.17	−2.34	−0.13	−0.55
(0.07)	(1.09)	(0.07)	(1.13)	(0.12)	(1.83)	(0.11)	(1.65)
Corn, 1996–2001 ($N = 111$)							
0.19*	−10.15***	−0.02	−0.20	−0.15	−5.70	−0.09	4.75
(0.08)	(2.00)	(0.13)	(3.39)	(0.13)	(3.37)	(0.15)	(3.74)
Corn, 2002–2012 ($N = 232$)							
−0.04	−4.90***	−0.11	1.05	0.25	−1.59	−0.16	3.13
(0.03)	(0.63)	(0.14)	(2.83)	(0.13)	(2.78)	(0.14)	(3.03)
Soybeans, 1986–2012 ($N = 459$)							
0.02	−2.84***	−0.09	1.79	0.05	−1.41	−0.06	0.25
(0.03)	(0.60)	(0.07)	(1.22)	(0.07)	(1.25)	(0.08)	(1.38)
Soybeans, 1986–1989 ($N = 61$)							
0.03	−2.54	−0.10	0.34	−0.01	−0.08	0.02	−2.38
(0.15)	(1.57)	(0.16)	(1.61)	(0.21)	(2.15)	(0.21)	(2.03)
Soybeans, 1990–1995 ($N = 99$)							
0.04	0.07	0.02	−0.28	−0.16	−0.41	−0.09	−2.44
(0.10)	(1.52)	(0.07)	(1.15)	(0.13)	(2.05)	(0.13)	(2.11)
Soybeans, 1996–2001 ($N = 100$)							
0.06	−7.45***	0.00	−0.94	0.01	−4.10	−0.12	7.21
(0.06)	(1.46)	(0.15)	(3.87)	(0.14)	(3.69)	(0.17)	(4.32)
Soybeans, 2002–2012 ($N = 199$)							
−0.05	−5.13***	−0.14	8.25**	0.16	−3.36	0.04	6.10
(0.03)	(0.68)	(0.13)	(3.19)	(0.12)	(2.93)	(0.13)	(3.33)

Notes: Coefficient estimates are multiplied by 100. Standard errors are reported in parentheses. Regressions are checked for heteroskedasticity by Breusch-Pagan tests. Since the null hypothesis of homoskedasticity could not be rejected for most of the regressions (including the regressions for the entire sample), no corrections are considered necessary. New crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**, ***) denote significance at the 5% and 1% levels.

respective subsample periods due to the existence of price limits and execution costs. While there are estimates of execution costs and it is possible to account for limit days, execution costs might be much higher on report-release days, when price volatility increases.

Summary and Conclusions

This paper analyzes price and volatility reactions in the futures markets in response to the release of corn and soybeans progress and condition information using event study methodology. Aggregate U.S. crop progress and condition data for corn and soybeans and daily returns of new crop contracts (December corn and November soybeans) are considered from 1986 through 2012. Empirical results

Table 7. Regression Estimates of Futures Price Impacts to Crop-Condition Changes for Individual Calendar Months for Corn and Soybeans, Nonweekend Postreport Returns, 1986–2012

close-to-open $t=0$		**open-to-close** $t=0$		**close-to-close** $t=1$		**close-to-close** $t=2$	
$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_0$	$\hat{\beta}_1$
Corn, June ($N=105$)							
0.08	−3.15***	−0.02	2.37	0.08	0.27	−0.09	−1.52
(0.08)	(0.81)	(0.18)	(1.89)	(0.20)	(2.12)	(0.17)	(1.76)
Corn, July ($N=119$)							
0.10	−4.08***	−0.25	−1.64	−0.15	−5.48***	−0.18	−2.86
(0.10)	(1.22)	(0.14)	(1.66)	(0.17)	(1.95)	(0.19)	(2.13)
Corn, August ($N=120$)							
0.05	−6.07***	−0.11	−1.61	0.21	−1.20	−0.02	3.67
(0.08)	(1.90)	(0.13)	(3.01)	(0.14)	(3.23)	(0.15)	(3.50)
Corn, September ($N=113$)							
−0.02	−3.61***	−0.19	−0.18	−0.06	1.84	−0.43**	4.41
(0.04)	(1.15)	(0.14)	(4.34)	(0.12)	(3.55)	(0.20)	(6.54)
Corn, October ($N=58$)							
−0.03	0.37	0.17	13.51	0.18	6.77	0.28	−2.96
(0.06)	(2.67)	(0.28)	(13.23)	(0.29)	(13.95)	(0.23)	(10.93)
Soybeans, June ($N=59$)							
−0.03	−1.20	0.27	3.95	0.17	4.64	−0.55***	−1.81
(0.07)	(1.04)	(0.21)	(3.00)	(0.22)	(3.08)	(0.20)	(2.75)
Soybeans, July ($N=118$)							
0.09	−5.56***	−0.19	1.46	−0.08	−4.35	−0.03	−2.58
(0.09)	(1.38)	(0.16)	(2.28)	(0.16)	(2.41)	(0.19)	(2.67)
Soybeans, August ($N=120$)							
0.08	−1.06	−0.01	2.43	0.14	−4.31	0.01	3.08
(0.07)	(1.34)	(0.11)	(2.09)	(0.13)	(2.38)	(0.15)	(2.77)
Soybeans, September ($N=114$)							
−0.06	1.54	−0.23**	−0.80	0.01	3.68	−0.13	2.53
(0.04)	(0.88)	(0.11)	(2.68)	(0.10)	(2.40)	(0.14)	(3.76)
Soybeans, October ($N=47$)							
−0.04	1.50	−0.24	8.04	0.08	−1.93	0.46***	−2.06
(0.04)	(1.26)	(0.28)	(8.52)	(0.26)	(7.90)	(0.16)	(4.90)

Notes: Coefficient estimates are multiplied by 100. Standard errors are reported in parentheses. Regressions are checked for heteroskedasticity by Breusch-Pagan tests. Since the null hypothesis of homoskedasticity could not be rejected for most of the regressions (including the regressions for the entire sample), no corrections are considered necessary. New-crop futures contracts (December corn and November soybeans) are used. Double and triple asterisks (**, ***) denote significance at the 5% and 1% levels.

show that overall return variances on CP report-release days are significantly greater than pre- and postreport day variances. This indicates that new crop progress and condition information changes supply perceptions of market participants, as changed expectations are reflected in greater movements in the market price. Prices tend to react quickly and rationally to changes in condition information, as the direction of reactions is consistent with expectations and generally significant only for the close-to-open returns on the report-trading day. These reactions appear strongest for July and August, since corn and soybean yields are overwhelmingly determined by summer weather conditions. Finally, overall market reactions to CP reports have increased over time. From 1996 through 2012, results strongly suggest that corn and soybeans prices react to CP reports. From 1986 through 1995, however, results do not generally suggest market reactions. This may support findings of previous studies (e.g., Garcia et al., 1997; Isengildina-Massa et al., 2008) that public information is more valuable to market participants (i.e., greater market reactions) in times of low year-to-year carryover of stocks, greater uncertainty about future market conditions, and increased market orientation of farm programs (1996 through 2012).

Results imply that the USDA's CP reports have substantial informational value. Despite private-sector analysis and widely available weather information, the subjective and aggregated estimates of crop progress and condition collected by NASS provide additional and valuable information for participants in corn and soybean markets. Whether this value justifies the costs of providing public information, however, cannot be addressed by this analysis. Future research may investigate the use of condition data in improving crop-yield forecasts throughout the growing season (Kruse and Smith, 1994; Fackler and Norwood, 1999; Irwin, Good, and Tannura, 2009), in particular over the summer months when weather conditions (precipitation and temperature) are critical for the crop.

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