Journal of Agricultural and Resource Economics 40(1):124–143 ISSN 1068-5502

A Nonparametric Search for Information Effects from USDA Reports

Jeffrey H. Dorfman and Berna Karali

Two nonparametric tests are employed to investigate the potential information value of USDA crop and livestock reports. If daily returns on days that reports are released (announcement days) differ when compared to non-announcement days for a sizeable number of commodities from a set of seven futures markets studied, we deem the report to contain market-moving information. The question of report value has been unsettled in the literature with results varying somewhat across studies and across reports. This study finds market-moving value in five of the USDA reports investigated, with six other reports showing little or no market-moving value in the markets examined. While most of our results confirm and add robustness to earlier results, there are some differences both for certain reports and certain commodities.

Key words: futures markets, information value, nonparametric tests, USDA reports

Introduction

Much research has investigated the informational content of various USDA reports (Colling and Irwin, 1990; Mann and Dowen, 1996; Irwin, Good, and Gomez, 2001; Isengildina, Irwin, and Good, 2006; McKenzie, 2008; Isengildina-Massa et al., 2008; Adjemian, 2012; Karali, 2012). The basic premise of this research is that futures prices should change by larger amounts on days that reports are released (announcement days) than on normal days if a report contains new information of value in the marketplace. These price changes are then used to construct a statistical test of the information value of the various reports, generally employing a linear regression model with dummy variables used to designate days on which reports are released. Regression analyses and parametric tests such as the F-test and t-test rely on independence and normality of the stochastic process, yet futures returns are commonly found to be autocorrelated and leptokurtic, meaning that the tails are fatter than would be found if they were normally distributed (see Hall, Brorsen, and Irwin, 1989). This paper will take a nonparametric approach as demonstrated in early literature on this topic by Sumner and Mueller (1989), Fortenbery and Summer (1993), and Isengildina-Massa et al. (2008), who also employed nonparametric tests.

Research on this topic is important for evaluating the benefit of USDA reports relative to the costs of producing them as well as for understanding how well futures markets incorporate information into prices (the price discovery process). Research on these questions has been somewhat mixed, so there is still debate over the amount of information contained in these reports relative to price determination. To allow for more flexibility in the effect of information within the reports, we propose employing nonparametric tests for the equality of the distributions of daily returns on days with announcements versus days with no announcements. If announcement days have a different

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The authors would like to thank participants at the NCCC-134 Conference and the Department of Agricultural Economics and Rural Sociology at the University of Idaho for their helpful comments.

Review coordinated by Christopher S. McIntosh.

distribution of price changes than non-announcement days, we will find evidence in favor of valuable information in the USDA report(s). If not, then the report is not valued by the market.

As a first approach we use a Kolmogorov-Smirnov test, which imposes no distributional assumptions on the daily returns and allows for testing if two samples come from the same distribution. It is based on the cumulative distribution function of daily futures returns, rejecting the equality of the two distributions when the empirical cumulative distribution functions of the two samples diverge by "too large" a distance. By placing daily returns from days with announcements in one sample and daily returns from the remaining days in the other sample, a nonparametric test for information value in the reports can be performed. This is a different approach than that taken by Sumner and Mueller (1989), Fortenbery and Summer (1993), and Isengildina-Massa et al. (2008), who employed the Savage Scores test, the Kruskal-Wallis test, and the Van der Waerden Scores test. However, as discussed by Hájek (1969), the power of those tests depends on the underlying sample distribution. In contrast, the Kolmogorov-Smirnov test does not require any assumptions on the sample distributions.

The second approach is a new application of the Henriksson-Merton test for information value to daily returns on days with announcements. If knowing whether there was an announcement on a particular day improves the prediction of a particular event, then the announcements contain valuable information. The innovation here is in carefully defining the "events" that will be predicted and in utilizing this test outside the arena of forecasting performance evaluation. We perform tests on whether conditioning on announcement days helps to predict large movements in absolute daily returns (that is, do prices change by more than some threshold percentage?). If conditioning on announcement days aids in such qualitative prediction, then the announcements contain information of value to market participants.

Henriksson-Merton tests were developed for forecast evaluation and have been used in that manner previously in the futures market literature to test for information value in energy market supply forecasts (Sanders, Manfredo, and Boris, 2008) and in distant delivery futures markets (Schnake, Karali, and Dorman, 2012). This application expands their use in the literature, since they are not actually employed to evaluate forecasting performance but rather to answer the underlying question of value in USDA reports as expressed through changes in daily return distributions attributed to the release of those reports. Extending the usefulness of the Henriksson-Merton test in this way is an additional contribution of this paper.

The advantage of these nonparametric testing approaches compared to approaches that have been employed more commonly is that information effects that are not simply a constant increase in some measure, such as the absolute value of the percentage change in price, can be uncovered more easily by testing for equality of distribution than they can be in a regression model framework. Imagine that a series of monthly reports contained up-to-date production forecasts that led to either extremely large price changes when the market was surprised or no price change when the market correctly anticipated the information in the report. On non-announcement days, the distribution of price changes might be uniform. A regression model framework might not find information in such reports if the days with large price changes were offset, in terms of average effect, by the no-change days (when the reports are correctly anticipated).[1] The Kolmogorov-Smirnov test will be able to spot such an effect because the bimodal distribution of daily returns on announcement days will have a different distribution than the uniform distribution of daily returns on non-announcement days. The Henriksson-Merton test would find information in such a situation if the probability of large daily return is higher or lower on announcement days than on non-announcement days, creating a difference in the conditional event probabilities. The tradeoff in taking a nonparametric approach is that while these methods can uncover more diverse forms of information impacts than

[1] The traditional event-study approach can circumvent this issue by measuring abnormal returns relative to normal returrns (Campbell, Lo, and MacKinlay, 1997). Further, regression approaches that use private forecasts revealed prior to USDA report releases to tease out the surprise component of the reports can also avoid this issue (Colling and Irwin, 1990; Carter and Galopin, 1993; McKenzie, 2008).

can the regression-based methods used in recent studies, nonparametric tests also tend to have lower test power. Thus, more types of information value can be uncovered (lowering the bar in one sense to finding informational content in the USDA reports), but it will be harder to show them to be statistically significant (raising the bar back up in terms of the probability of rejecting a null hypothesis of no information value).

Our results provide new and, at times, different insights on questions about the value of USDA commodity and market reports compared to previous studies. This adds robustness to previous findings as we build a consensus on certain reports that clearly have or lack market-moving information value. Where our results contradict earlier findings, they should also spark discussion about the comparative advantages of different ways to test for information value in the broader context of settings beyond USDA report announcement effects.

Methodology

Kolmogorov-Smirnov Two-Sample Test

Because the various USDA reports are unlikely to contain equal amounts of information or to cause identical changes in the distribution of price changes, we perform a series of Kolmogorov-Smirnov two-sample tests on the reports separately and in several groupings.

The Kolmogorov-Smirnov two-sample test for equality of probability distribution functions is based on the distance between the empirical cumulative distribution functions (cdf) of the two samples being tested (Massey, 1951). For any value of the random variable being studied, $F_n(c)$ is defined as the percentage of the sample observations for the data set $\{x_i; i = 1, \ldots, n\}$ that is less than or equal to c. This is the empirical cdf. For the second sample, of potentially different size m, under consideration, the analogous empirical cdf is defined as $G_m(c)$. The Kolmogorov-Smirnov test statistic is simply given by

(1) $$KS = sup_c|F_n(c) - G_m(c)|.$$

The distribution of this test statistic is a scaled version of the Kolmogorov distribution that can be derived from the supremum of the absolute value of a Brownian bridge, with published tables of critical values available for reference. For the two-sample test that we employ, the scale factor that one applies to the KS test statistic in equation (1) to transform the test statistic to the standard distribution is $[nm/(n+m)]^{1/2}$. Given these definitions and formulas, the computation of the Kolmogorov-Smirnov two-sample test is straightforward, and existing tables can be used to make decisions about whether to reject or not reject the null hypothesis at the desired level of statistical significance.

Henriksson-Merton Test

The Henriksson-Merton test analyzes the correct prediction of some qualitative (or categorical) event for data being studied (Henriksson and Merton, 1981; Pesaran and Timmermann, 1992). The observed forecast accuracy of the specified event is transformed into probabilities, with P_{ij} being the probability that the realized event falls in category i and the forecasted event falls in category j. When the probabilities of k categories are represented in a contingency table, it takes the form of a matrix that we call $\boldsymbol{P}$:

(2) $$\boldsymbol{P} = \begin{bmatrix} P_{11} & P_{12} & \ldots & P_{1k} \\ P_{21} & P_{22} & \ldots & P_{2k} \\ \vdots & \vdots & \vdots & \vdots \\ P_{k1} & P_{k2} & \ldots & P_{kk} \end{bmatrix}.$$

Each row of $\boldsymbol{P}$ measures the probability of correct and various incorrect forecasts of the times when the actual event fell into category i. Thus, the main diagonal of P holds the probabilities of correct predictions. Henriksson and Merton (1981) developed the test for the case of two categories because their original application was to qualitative forecasts (an upward or downward movement in a stock price), while Pesaran and Timmermann (1994) extended the nonparametric procedure for the general case of k categories. To test the null hypothesis of no discernible improvement in event prediction from the inclusion of information from some external source, one examines

$$H_0^* : \sum_{i=1}^{n} (\hat{P}_{ii} - \hat{P}_{i0}\hat{P}_{0i}) = 0. \tag{3}$$

In our simple 2×2 case, the test simplifies so that the test of H_0^* is based on the statistic

$$HM = \sum_{j=1}^{2} \sum_{i=1}^{2} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}, \tag{4}$$

where O is the observed number of forecasts that fall in that cell of the contingency table and E is the expected number of forecasts in that cell. The test statistic is distributed as a $\chi^2(1)$ and the expected number of forecasts in a cell is the product of the row and column sums divided by the total number of forecasts.

Data

Futures Returns

We analyze daily returns on soybean, soybean meal, soybean oil, corn, feeder cattle, live cattle, and lean hogs futures contracts. The analyzed crop futures contracts are traded at the Chicago Board of Trade (CBOT) and the livestock futures contracts in our data set are traded at the Chicago Mercantile Exchange (CME).

We construct rolled-over nearby futures series by splicing the nearby contract price at the end of the month preceding expiration with the second nearby contract price.[2] This procedure eliminates price observations during the delivery period, which may contain anomalies. Daily returns on these selected futures contracts are measured as

$$R_{it} = 100 \times (\ln F_{it} - \ln F_{i,\,t-1}), \tag{5}$$

where $\ln F_{it}$ is the natural logarithm of the settlement price of commodity i's futures contract on day t. This close-to-close price change measure captures any noninstantaneous reactions to USDA reports.[3] Because some of the USDA reports studied (Crop Progress, Feed Outlook, Livestock, Dairy, and Poultry Outlook, and Oil Crops Outlook) were first available in 1995, we study the sample period from January 1995 through April 2009.

Table 1 presents summary statistics for daily returns and their absolute values on both non-announcement and announcement days. Out of 3,319 trading days in our sample, there were 1,127 days with report releases. As seen in the table, average daily returns, R_t, are negative on announcement days for all commodities. The average absolute daily returns, $|R_t|$, on announcement

[2] Prices of the same contract month are used while calculating daily returns. Thus, one observation is lost for each contract when the splicing occurs at the expiration of the nearby contract.

[3] This return measure makes the estimated announcement effects more conservative if the impact is disseminated into prices instantaneously in the opening. Using both close-to-close and open-to-close returns, Isengildina, Irwin, and Good (2006) show that announcement effects are robust across return measures.

days are larger for six of the seven commodities, suggesting possible value in the reports being studied.[4]

We also study the impact of the identical selected USDA reports on distant futures contract prices in addition to the nearby contract. Because of the time it takes to produce livestock and the limited ability to adjust the time when they are brought to market, it is important to investigate more distant delivery contracts for impact from USDA report releases. This is necessary in case information contained in a report today causes large changes in the price, for example, of cattle for delivery in eight months while having little effect on the nearby contract because those cattle are nearly ready for market and the remaining feed they will receive is likely already contracted for or purchased. Furthermore, because of the storability of crops the USDA reports might have different effects on futures contracts written on the new crop than they have on futures contracts written on the old crop. Thus, the distant futures contracts chosen for the crops studied are the harvest contracts. Accordingly, the November contract is used for soybeans and the December contract is used for soybean meal, soybean oil, and corn.[5] For livestock futures contracts we employ the contracts that are seven to eight months out as the distant contract. Table 2 presents the futures contracts used in each calendar month for our analysis of distant contracts.

While a few of the reports present small samples of report days to be tested, nonparametric tests place a high burden on the test statistic to reach statistical significance (higher than for parametric tests) to account for the uncertain distribution involved. This is particularly true in small samples. Thus, when the sample is small, the bar for significance is high.

USDA Reports

We analyze eleven USDA reports that have been widely studied in the literature. These include Acreage and Prospective Plantings (two reports that we analyze as a single report, explained further below); Cattle; Cattle on Feed; Crop Progress; Feed Outlook; Grain Stocks; Hogs and Pigs; Livestock, Dairy, and Poultry Outlook; Oil Crops Outlook; and World Agricultural Supply and Demand Estimates (WASDE). Earlier studies have shown that markets move on several of these report release days.

At the end of every March, the National Agricultural Statistics Service (NASS) publishes a Prospective Plantings report, which contains the expected plantings as of March 1st for several crops, including corn and soybeans. NASS then releases an Acreage report at the end of every June to present planted and/or harvested acreages for those crops. Because both of these reports are published only once a year and both represent supply conditions for crops, we combine the release days of these two reports in our analysis. During the growing season, weekly Crop Progress reports are published by NASS to communicate planting, fruiting, and harvesting progress and overall

[4] Futures contracts are subject to daily price limits and their price movements therefore may not reflect complete market reaction to new information or events. Soybean contracts were subject to daily price limits of 30 cents per bushel from 10/18/1976 to 8/27/2000, 50 cents from 8/27/2000 to 3/28/2008, and 70 cents afterwards (Park and Irwin, 2005). The earliest price limit found for soybean meal is $20 per short ton, which is the current limit. For soybean oil, the price limit was 2 cents per pound before 3/28/2008 and 2.5 cents afterwards. Corn price limits were 12 cents per bushel from 7/15/1993 to 8/27/2000, 20 cents from 8/27/2000 to 3/28/2008, and 30 cents afterwards (CME Group, 2011). Feeder cattle price limits were 1.5 cents until 02/13/2004 and raised to 3 cents afterwards. Live cattle price limits were 1.5 cents until 12/25/2003, raised to 3 cents on 12/26/2003, then to 5 cents on 12/29/2003, and back to 3 cents after 02/23/2004 (Isengildina, Irwin, and Good, 2006). Live hogs futures were switched to lean hogs futures starting with the February 1997 contract. The price limit for live hogs was 1.5 cents per pound. For lean hogs, the limit was 2 cents, raised to 3 cents after 4/25/2006. Using these price limits, the proportions of the days with limit moves during the study period were 0.97% for soybeans, 0.33% for soybean meal, 0.55% for soybean oil, 1.47% for corn, 2.77% for feeder cattle, 2.19% for live cattle, and 4.19% for lean hogs. Park (2000) argued that, in general, price limits do not directly impact return volatility. Further, McKenzie, Thomsen, and Dixon (2004) showed that the existence of price limits is unlikely to fail to detect a price reaction when it in fact exists. Based on these earlier results and because limit move days represent a small portion of our data, no adjustments to prices were made.

[5] Depending on the calendar month, the harvest contract might be the same as the nearby contract. For example, in November of current year the harvest contract for soybean meal, soybean oil, and corn is the December contract of that year, which is also the nearby contract for these commodities.

Table 1. Summary Statistics

	$R_t = 100 \times (\ln F_t - \ln F_{t-1})$				$\lvert R_t \rvert = \lvert 100 \times (\ln F_t - \ln F_{t-1}) \rvert$			
	Mean	**Min.**	**Max.**	**Std. Dev.**	**Mean**	**Min.**	**Max.**	**Std. Dev.**
Non-Announcement Days								
Soybeans	0.019	−7.318	6.445	1.429	1.061	0	7.318	0.957
Soybean Meal	0.062	−8.236	6.246	1.569	1.168	0	8.236	1.049
Soybean Oil	−0.003	−7.239	8.039	1.448	1.073	0	8.039	0.972
Corn	−0.024	−7.699	7.397	1.510	1.099	0	7.699	1.036
Feeder Cattle	0.005	−6.010	3.348	0.847	0.627	0	6.010	0.569
Live Cattle	−0.003	−6.357	3.564	0.947	0.713	0	6.357	0.624
Lean Hogs	0.041	−6.649	6.306	1.507	1.133	0	6.649	0.994
Announcement Days								
Soybeans	−0.033	−6.996	6.078	1.599	1.163	0	6.996	1.097
Soybean Meal	−0.046	−8.105	7.528	1.722	1.265	0	8.105	1.169
Soybean Oil	−0.072	−6.721	6.433	1.576	1.157	0	6.721	1.072
Corn	−0.065	−7.584	6.968	1.714	1.281	0	7.584	1.141
Feeder Cattle	−0.013	−3.177	2.785	0.876	0.656	0	3.177	0.580
Live Cattle	−0.027	−3.541	3.708	0.925	0.696	0	3.708	0.609
Lean Hogs	−0.171	−6.881	6.881	1.636	1.233	0	6.881	1.088
Announcement Day Dummy Variables		n						
Acreage and Prospective Plantings		28						
Crop Progress		474						
Feed Outlook		162						
Grain Stocks		52						
Oil Crops Outlook		158						
WASDE		151						
Cattle		23						
Cattle on Feed		156						
Hogs and Pigs		50						
Livestock, Dairy, and Poultry Outlook		169						
Total Reports		1,423						
Announcement Days		1,127						

Notes: Sample period spans from January 1995 to April 2009. The variable n for the announcement day dummy variables represents the total number of report releases.

condition of selected crops, again including corn and soybeans. Feed Outlook reports are published monthly by the Economic Research Service (ERS) and present supply, use, prices, and trade for feed grains. Grain Stocks reports, published quarterly by NASS, contain stocks of multiple crops as well as the number and capacity of on- and off-farm storage facilities. Oil Crops Outlook reports are released monthly by ERS and include supply, use, prices, and trade for oil crops, primarily soybeans and related products. The World Agricultural Outlook Board releases WASDE reports every month to provide comprehensive forecasts of supply and demand for major U.S. and global crops and U.S. livestock.

On the livestock side, we consider Livestock, Dairy, and Poultry Outlook reports issued monthly by ERS, containing current and forecasted production, prices, and trade volumes for each of these sectors. Additionally, we consider three reports published by NASS. Cattle reports, released twice annually, contain inventory numbers and values for all cattle and calves as well as number of operations and size group estimates by class. Monthly Cattle on Feed reports present the total number of cattle and calves on feed, placements, marketings, and other disappearances; number of

Table 2. Distant Futures Contracts Used in Empirical Analyses

	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Jan_t	Nov_t	Dec_t	Dec_t	Dec_t	Aug_t	Aug_t	Aug_t
Feb_t	Nov_t	Dec_t	Dec_t	Dec_t	Sept_t	Oct_t	Oct_t
Mar_t	Nov_t	Dec_t	Dec_t	Dec_t	Oct_t	Oct_t	Oct_t
Apr_t	Nov_t	Dec_t	Dec_t	Dec_t	Nov_t	Dec_t	Dec_t
May_t	Nov_t	Dec_t	Dec_t	Dec_t	Jan_{t+1}	Dec_t	Dec_t
June_t	Nov_t	Dec_t	Dec_t	Dec_t	Jan_{t+1}	Feb_{t+1}	Feb_{t+1}
July_t	Nov_t	Dec_t	Dec_t	Dec_t	Mar_{t+1}	Feb_{t+1}	Feb_{t+1}
Aug_t	Nov_t	Dec_t	Dec_t	Dec_t	Mar_{t+1}	Apr_{t+1}	Apr_{t+1}
Sept_t	Novt_t	Dec_t	Dec_t	Dec_t	Apr_{t+1}	Apr_{t+1}	Apr_{t+1}
Oct_t	Nov_t	Dec_t	Dec_t	Dec_t	May_{t+1}	Jun_{t+1}	Jun_{t+1}
Nov_t	Nov_{t+1}	Dec_t	Dec_t	Dec_t	May_{t+1}	Jun_{t+1}	Jun_{t+1}
Dec_t	Nov_{t+1}	Dec_{t+1}	Dec_{t+1}	Dec_{t+1}	Aug_{t+1}	Aug_{t+1}	Jul_{t+1}

Notes: The subscript, t or $t + 1$, refers to the year of the futures contract expiration date relative to the year t of the daily price being computed.

feedlots; and fed cattle marketings. Hogs and Pigs reports are issued quarterly and contain data on U.S. pig crop inventory numbers by class and weight group, the value of hogs and pigs, farrowings, and farrowing intentions. The report release schedule for this report was changed to monthly from January 2001 through September 2003, but the quarterly schedule was resumed after September 2003. We include all report release days, including those monthly reports, in our data set.

Because release times vary across reports, the dummy variables representing report release days should be constructed carefully. Some reports are released before markets open and others after markets open. We expect that the impact of reports released before markets open would be observed on the release day. Accordingly, for reports released before markets open (Acreage, Feed Outlook, Grain Stocks, and Livestock, Dairy, and Poultry Outlook), the announcement day dummy variables take the value of 1 on the exact release date. In addition, we expect that the impact of reports released after markets close would be observed on the next trading day. Therefore, the announcement day dummy variables take the value of 1 on the day following the release for reports announced after markets close. Dummy variables for Prospective Plantings and WASDE reports reflect changes in their release times during our sample period.

Table 1 shows the number of times that each report was released during our sample period. In total, there were 1,438 report releases in 1,127 trading days (there is some overlap in report releases). Our main analysis is based on a comparison of the daily futures returns on days with a specific report release with those on days without that specific report release. Therefore, the days with more than one report release (23% of announcement days) might be a concern for event-clustering bias; our results should therefore be interpreted carefully. As a robustness check for this potential bias, we also compare the daily returns on days with a specific report release to those on days with no announcement of any kind.

Finally, we note that—perhaps surprisingly—the release days of all of the reports vary (except for Crop Progress, Cattle, and Cattle on Feed) so that we do not need to worry too much about a day-of-the-week effect confounding our results. To be cautious, we report some limited analysis searching for any day-of-the-week effect on Crop Progress reports and seasonal effects for Acreage and Prospective Plantings; each of these reports is released only once per year. Such worries prove unfounded.

Results and Discussion

Given the large number of test results presented, it is worth noting that to truly find market-moving information in these reports requires the number of significant results to exceed the significance level of the tests. That is, at a 0.10 significance level, more than 10% of the tests should be significant

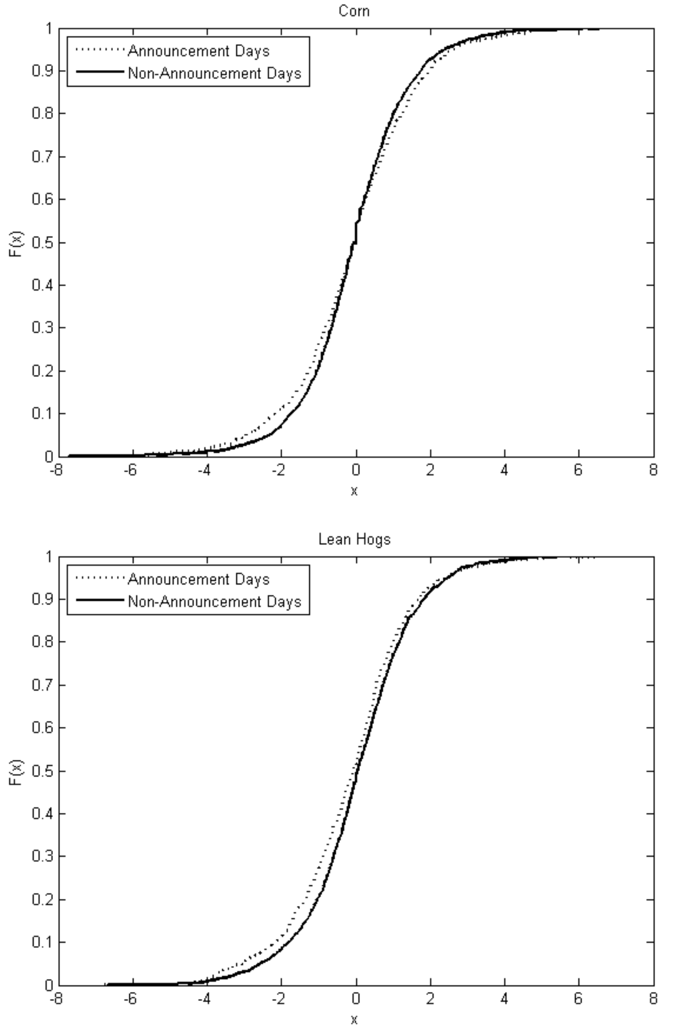

Figure 1. Statistically Different Empirical Cumulative Distribution Functions on Announcement vs. Non-Announcement Days

before we can claim to find something of note. This acknowledges that there are almost certainly some false positive results given this large number of tests.

Kolmogorov-Smirnov Test Results

Table 3 presents the two-sample Kolmogorov-Smirnov test statistics and their p-values for the tests of the nearby contract. Each USDA report under study is tested separately for each of the seven selected commodities. Results show that daily return distributions of soybeans, soybean meal, soybean oil, and corn futures contracts are not identical on the days with Acreage and Prospective Plantings report releases compared to their counterparts on days without these reports. Similarly, the results for the Grain Stocks report show significant differences on report days for the identical crops. On the days with WASDE releases, significant differences in the distribution of daily returns are found for the same four crop futures (soybeans, soybean meal, soybean oil, and corn) as well as for feeder cattle. Thus, these three reports seem to have a nontrivial impact on the return distributions

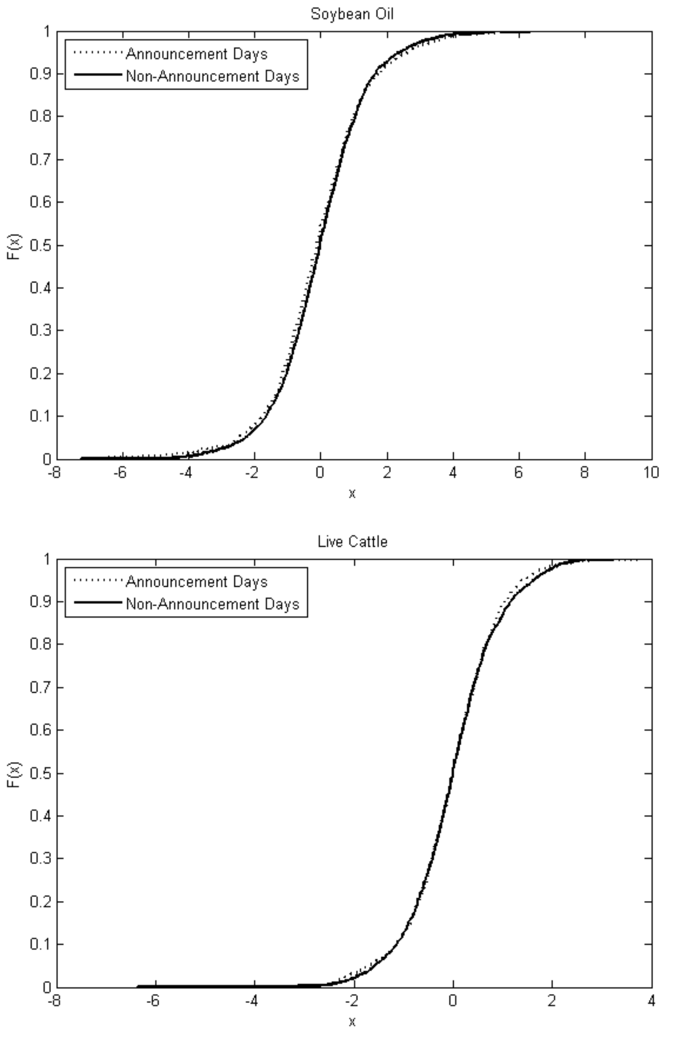

Figure 2. Statistically Indifferent Empirical Cumulative Distribution Functions on Announcement vs. Non-Announcement Days

of a variety of commodity futures, with significant effects found widely across our seven futures markets.

In contrast, Crop Progress reports are found to affect only the distributions of lean hogs futures returns, while the Kolmogorov-Smirnov tests for both the Feed Outlook and Oil Crops Outlook reports did not result in rejecting the null hypothesis of identical distributions on days with these reports versus days without these reports for any of the seven commodities tested. Thus, these three reports do not seem to have an impact on futures returns of selected commodities. According to this test, we would not find market-moving value in these three reports.

Similar to the last three crop-focused reports, the livestock-focused reports do not show much value in the Kolmogorov-Smirnov test results on nearby contracts. The Cattle on Feed and the Livestock, Dairy, and Poultry Outlook reports only show significant changes on announcement days for one commodity each: corn for the Cattle on Feed report and lean hogs for the Livestock, Dairy, and Poultry Outlook reports. The Hogs and Pigs reports show significant changes in the distribution of daily returns for soybeans, soybean meal, and corn futures. Thus, among the livestock-focused reports, we only find clear value in the Hogs and Pigs report.

When all of the USDA reports are combined into a single test of (any) announcement versus non-announcement day returns, the Kolmogorov-Smirnov test statistics are found to be significant for soybean meal, soybean oil, corn, and lean hogs. Figures 1 and 2 show empirical cumulative distribution functions of some selected commodities on announcement versus non-announcement days. The distance between the cumulative distribution functions on announcement and non-announcement days for corn and lean hogs (figure 1) are statistically significant compared to the non-significant differences for soybean oil and live cattle (figure 2).

Table 4 presents results of Kolmogorov-Smirnov tests on livestock futures contracts seven-to-eight months out and on crop futures contracts after harvest on the same set of USDA reports as in table 3. These results show broad agreement with those in table 3. While Cattle on Feed and the Hogs and Pigs Reports pick up one and two additional significant test results, in general little has changed. The same reports that showed value across a range of commodities before still show value using the distant delivery or harvest contracts and reports that did not show market-moving value across a range of commodities before still do not show value. We conclude that the Kolmogorov-Smirnov results are robust to the delivery horizon of the futures contracts tested.

We further group USDA reports that are directly related to crops and to livestock. Accordingly, crop report days include the days on which any of the Acreage and Prospective Plantings, Crop Progress, Feed Outlook, Grain Stocks, Oil Crops Outlook, and WASDE reports are released. Similarly, livestock report days include the days with any of the Cattle; Cattle on Feed; Hogs and Pigs; and Livestock, Dairy, and Poultry Outlook report releases. We then compare daily return distributions on crop report days to those on non-announcement days, those on livestock report days to non-announcement days, and those on crop report days to livestock report days. Table 5 presents these results for grouped reports. For the nearby contracts, only the return distributions of soybean oil, corn, and lean hogs are different on the days with crop report releases compared to days with no report releases. Corn and lean hogs return distributions are also found to differ across livestock report days and non-announcement days. For the distant contracts the return distributions of soybeans and soybean meal (in addition to those just mentioned) are also found to be different on days with crop report releases. There is, however, no difference in the return distributions across crop report days and livestock report days. Once the USDA reports are grouped into crop and livestock reports, their impacts on return distributions are statistically indistinguishable. Comparing these results to those of the "all reports" tests in table 4 suggests that valuable reports may be more concentrated in the crop reports relative to the livestock reports, which makes some intuitive sense given that sudden changes in production forecasts are much rarer in livestock markets.

A final robustness check was performed to ensure that our results are not simply a product of either seasonal or day-of-the-week effects. Because the Prospective Plantings report only appears in March and Acreage only appears in June, we repeated the tests using nearby contracts for each one against only the days from the just-preceding WASDE release until either the Prospective Plantings or Acreage report's announcement day. These results were consistent with the previous ones, finding mostly significant differences in the returns on our four crop-related contracts and no significant differences for the livestock contracts.

Crop Progress, Cattle, and Cattle on Feed are the only reports with a consistent release day (Monday after market close for Crop Progress and Friday after market close for Cattle and Cattle on Feed). Given that there were few significant results for any of these three reports, we restricted our tests for a day-of-the-week effect to the Crop Progress reports. We checked the returns on release days (Tuesday in our dating scheme) against returns on non-Tuesdays for the period without Crop Progress reports (January, February, and March) for days with no other reports. The results find a significant day-of-the-week effect only for the lean hogs contract. This suggests that our one significant finding for Crop Progress, which was for

Table 3. Kolmogorov-Smirnov Test Results for Nearby Contracts

Report	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Acreage and Prospective Plantings	0.291*	0.259*	0.269*	0.294*	0.185	0.154	0.133
	(0.014)	(0.039)	(0.029)	(0.013)	(0.269)	(0.491)	(0.675)
Crop Progress	0.025	0.038	0.039	0.044	0.038	0.048	0.091*
	(0.961)	(0.587)	(0.574)	(0.399)	(0.587)	(0.288)	(0.002)
Feed Outlook	0.049	0.047	0.061	0.050	0.042	0.051	0.051
	(0.847)	(0.878)	(0.594)	(0.834)	(0.940)	(0.810)	(0.806)
Grain Stocks	0.331*	0.367*	0.270*	0.327*	0.100	0.108	0.106
	(0.000)	(0.000)	(0.001)	(0.000)	(0.666)	(0.566)	(0.584)
Oil Crops Outlook	0.044	0.045	0.039	0.042	0.047	0.047	0.052
	(0.932)	(0.918)	(0.974)	(0.954)	(0.882)	(0.889)	(0.795)
WASDE	0.122*	0.136*	0.123*	0.129*	0.117*	0.073	0.093
	(0.025)	(0.009)	(0.024)	(0.015)	(0.035)	(0.418)	(0.153)
Cattle	0.170	0.117	0.152	0.179	0.207	0.171	0.138
	(0.485)	(0.894)	(0.630)	(0.416)	(0.252)	(0.478)	(0.743)
Cattle on Feed	0.065	0.087	0.077	0.111*	0.071	0.072	0.077
	(0.552)	(0.202)	(0.321)	(0.048)	(0.426)	(0.418)	(0.326)
Hogs and Pigs	0.215*	0.199*	0.124	0.230*	0.125	0.159	0.161
	(0.017)	(0.034)	(0.414)	(0.009)	(0.403)	(0.151)	(0.140)
Livestock, Dairy, and Poultry Outlook	0.075	0.064	0.076	0.087	0.054	0.045	0.115*
	(0.313)	(0.511)	(0.296)	(0.169)	(0.726)	(0.900)	(0.026)
ALL	0.037	0.045*	0.044	0.056*	0.036	0.027	0.078*
	(0.261)	(0.097)	(0.102)	(0.017)	(0.271)	(0.656)	(0.000)

Notes: Two-sample Kolmogorov-Smirnov test statistics and their p-values (in parentheses) are shown. Single asterisks (*) represent significance at the 10% level.

Table 4. Kolmogorov-Smirnov Test Results for Distant Contracts

Report	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Acreage and Prospective Plantings	0.289*	0.320*	0.248*	0.258*	0.205	0.188	0.162
	(0.013)	(0.004)	(0.048)	(0.035)	(0.159)	(0.236)	(0.402)
Crop Progress	0.033	0.032	0.041	0.066	0.044	0.025	0.085*
	(0.748)	(0.781)	(0.504)	(0.504)	(0.412)	(0.954)	(0.005)
Feed Outlook	0.044	0.057	0.062	0.047	0.051	0.067	0.058
	(0.924)	(0.673)	(0.586)	(0.586)	(0.799)	(0.476)	(0.668)
Grain Stocks	0.331*	0.316*	0.220*	0.278*	0.141	0.119	0.134
	(0.000)	(0.000)	(0.007)	(0.000)	(0.193)	(0.371)	(0.241)
Oil Crops Outlook	0.053	0.092	0.040	0.062	0.050	0.069	0.074
	(0.780)	(0.138)	(0.961)	(0.580)	(0.831)	(0.438)	(0.363)
WASDE	0.111*	0.102*	0.101*	0.136*	0.088	0.069	0.060
	(0.033)	(0.060)	(0.068)	(0.004)	(0.155)	(0.400)	(0.588)
Cattle	0.156	0.133	0.163	0.178	0.119	0.144	0.165
	(0.596)	(0.788)	(0.540)	(0.427)	(0.884)	(0.699)	(0.521)
Cattle on Feed	0.081	0.130*	0.071	0.092	0.089	0.066	0.132*
	(0.274)	(0.012)	(0.426)	(0.154)	(0.179)	(0.520)	(0.010)
Hogs and Pigs	0.186*	0.184*	0.120	0.172*	0.187*	0.114	0.225*
	(0.059)	(0.061)	(0.455)	(0.097)	(0.056)	(0.523)	(0.011)
Livestock, Dairy, and Poultry Outlook	0.085	0.065	0.075	0.100*	0.042	0.058	0.083
	(0.189)	(0.485)	(0.309)	(0.075)	(0.939)	(0.635)	(0.209)
ALL	0.047*	0.045*	0.044	0.063*	0.032	0.026	0.081*
	(0.069)	(0.036)	(0.106)	(0.004)	(0.420)	(0.653)	(0.000)

Notes: Two-sample Kolmogorov-Smirnov test statistics and their p-values (in parentheses) are shown. Single asterisks (*) represent significance at the 10% level.

Table 5. Kolmogorov-Smirnov Test Results for Report Groups

	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Nearby Contracts							
Non-Announcement vs. Crop Report Days	0.044	0.049	0.051*	0.060*	0.032	0.037	0.081*
	(0.188)	(0.111)	(0.091)	(0.029)	(0.571)	(0.385)	(0.001)
Non-Announcement vs. Livestock Report Days	0.041	0.061	0.043	0.070*	0.059	0.035	0.091*
	(0.656)	(0.186)	(0.602)	(0.089)	(0.210)	(0.811)	(0.009)
Crop vs. Livestock Report Days	0.056	0.046	0.048	0.057	0.052	0.048	0.071
	(0.385)	(0.644)	(0.580)	(0.360)	(0.478)	(0.597)	(0.151)
Distant Contracts							
Non-Announcement vs. Crop Report Days	0.052*	0.050*	0.055*	0.077*	0.028	0.027	0.065*
	(0.071)	(0.086)	(0.045)	(0.001)	(0.724)	(0.742)	(0.011)
Non-Announcement vs. Livestock Report Days	0.051	0.067	0.036	0.076*	0.048	0.037	0.124*
	(0.357)	(0.113)	(0.781)	(0.046)	(0.452)	(0.774)	(0.000)
Crop vs. Livestock Report Days	0.058	0.053	0.062	0.061	0.060	0.034	0.075
	(0.337)	(0.450)	(0.265)	(0.286)	(0.297)	(0.927)	(0.108)

Notes: Two-sample Kolmogorov-Smirnov test statistics and their p-values (in parentheses) are shown. Crop reports include Acreage and Prospective Plantings, Crop Progress, Feed Outlook, Grain Stocks, Oil Crops Outlook, and WASDE. Livestock reports include Cattle, Cattle on Feed, Hogs and Pigs, and Livestock, Dairy, and Poultry Outlook. Single asterisks (*) represent significance at the 10% level.

the lean hogs contract, might simply be a day-of-the-week effect. However, this does not change the overall conclusion of the Kolmogorov-Smirnov test results that Crop Progress contains little, if any, market-moving information value. Similarly, since Cattle had no significant results and Cattle on Feed only one for the nearby contracts, there is little to worry about in terms of false positives as a result of day-of-the-week effects.

Henriksson-Merton Test Results

For the Henriksson-Merton test, we define two different events: a daily return that is more than one standard deviation from the mean and a daily return that is more than two standard deviations from the mean. These are tested separately to ensure that the results are not overly sensitive to our arbitrary definition of a "big" move. We then apply the Henriksson-Merton test to determine whether large price movements are more common on announcement days than non-announcement days. Conditioning on announcement days, we compute the probabilities of correct and incorrect forecasts of large price movements. Test statistics and p-values for the nearby contracts are presented in table 6. The left side of table 6 contains results for one standard deviation moves, while results for two standard deviation moves are on the right side of the table.

Starting with results for the one standard deviation moves, we find that Acreage and Prospective Plantings and Grain Stocks report days each help predict large price movements in five of the seven commodities: soybeans, soybean meal, soybean oil, corn, and feeder cattle. WASDE report days also aid in predicting large price movements in the above four crop futures contracts but not in the three livestock futures. Test statistics for Crop Progress and Feed Outlook report days are significant only for live cattle, and Oil Crops Outlook reports have informational value in predicting large price movements only for lean hogs. While Cattle report days are found to have informational value for predicting large price movements in futures for soybeans and lean hogs (but not feeder cattle or live cattle), the Cattle on Feed reports aid in predicting large price movements only for feeder cattle. Livestock, Dairy, and Poultry Outlook reports only have an impact in predicting large price movements for soybean oil. Hogs and Pigs report days, on the other hand, have informational value for big moves in soybeans, soybean meal, corn, and lean hogs. When all reports are combined, informational value in predicting large price movements is found for all commodities except for soybean oil and live cattle (these two commodities have p-values less than 0.20).

Looking at the two standard deviation moves on the right side of table 6, we find somewhat stronger evidence of information value in a few cases in the same set of reports that had already shown information value. Hogs and Pigs shows six significant results instead of four and WASDE shows five instead of four. Crop Progress moves from one to three significant results, perhaps moving it into the "valuable" category. In general, however, the results are consistent across the two different definitions of a large price movement.

Moving to the distant delivery contracts, results are displayed in table 7 in a similar manner, with one (two) standard deviation moves on the left (right) side of the table. Again, results are consistent with earlier test results. Cattle on Feed reports show much more information value with the distant delivery contracts for one standard deviation moves, having three significant results compared to one with the nearby contract. However, for the two-standard-deviation-move tests, Cattle on Feed is significant for three commodities with both the nearby and the distant contracts; there is no change when the delivery horizon is shifted.

Overall, the Kolmogorov-Smirnov tests find significant effects in roughly three times as many instances as would be expected from Type I errors, while the Henriksson-Merton tests show positives at approximately four times the expected rate. Thus, these results are not just a product of the large number of hypotheses examined.

Table 6. Henriksson-Merton Test Results for Nearby Contracts

Report	One-Standard Deviation							Two-Standard Deviations						
	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Acreage and	28.707*	11.794*	19.979*	27.103*	8.315*	0.079	0.389	20.246*	15.168*	3.744*	37.596*	7.702*	0.271	0.082
Prospective Plantings	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.779)	(0.533)	(0.000)	(0.000)	(0.053)	(0.000)	(0.006)	(0.603)	(0.775)
Crop Progress	0.202	0.398	0.141	1.933	1.024	7.540*	2.566	0.274	0.103	1.327	0.969	3.018*	2.742*	2.957*
	(0.653)	(0.528)	(0.708)	(0.164)	(0.312)	(0.006)	(0.109)	(0.601)	(0.748)	(0.249)	(0.325)	(0.082)	(0.098)	(0.086)
Feed Outlook	0.252	0.001	0.003	0.536	0.063	2.836*	1.788	0.131	0.758	0.224	0.104	1.289	0.270	0.258
	(0.615)	(0.971)	(0.960)	(0.464)	(0.802)	(0.092)	(0.181)	(0.718)	(0.384)	(0.636)	(0.747)	(0.256)	(0.603)	(0.612)
Grain Stocks	39.194*	19.554*	18.521*	40.775*	4.144*	0.148	0.098	30.749*	21.218*	3.209*	63.241*	3.309*	0.393	0.011
	(0.000)	(0.000)	(0.000)	(0.000)	(0.042)	(0.701)	(0.754)	(0.000)	(0.000)	(0.073)	(0.000)	(0.069)	(0.531)	(0.974)
Oil Crops Outlook	0.262	0.024	0.810	0.132	0.016	0.913	3.010*	0.995	0.647	0.158	1.024	0.134	0.626	0.062
	(0.608)	(0.878)	(0.368)	(0.716)	(0.900)	(0.339)	(0.083)	(0.319)	(0.421)	(0.691)	(0.312)	(0.714)	(0.429)	(0.804)
WASDE	19.502*	12.660*	13.484*	32.683*	2.602	1.130	0.004	4.843*	9.436*	3.529*	31.664*	1.448	4.712*	2.138
	(0.000)	(0.000)	(0.000)	(0.000)	(0.107)	(0.288)	(0.951)	(0.028)	(0.002)	(0.060)	(0.000)	(0.229)	(0.030)	(0.144)
Cattle	6.816*	0.306	0.031	1.108	0.893	0.019	3.915*	6.145*	0.033	0.088	0.418	2.299	0.333	0.098
	(0.009)	(0.580)	(0.861)	(0.293)	(0.345)	(0.891)	(0.048)	(0.013)	(0.856)	(0.767)	(0.518)	(0.129)	(0.564)	(0.755)
Cattle on Feed	2.205	1.906	1.197	0.453	8.049*	2.344	0.134	6.819*	0.001	4.407*	0.008	0.143	0.977	2.843*
	(0.138)	(0.167)	(0.274)	(0.501)	(0.005)	(0.126)	(0.714)	(0.009)	(0.975)	(0.036)	(0.927)	(0.706)	(0.323)	(0.092)
Hogs and Pigs	3.633*	5.684*	0.331	7.515*	1.619	0.047	7.511*	6.848*	8.033*	3.598*	3.926*	6.442*	1.562	3.444*
	(0.057)	(0.017)	(0.565)	(0.006)	(0.203)	(0.828)	(0.006)	(0.009)	(0.005)	(0.058)	(0.048)	(0.011)	(0.211)	(0.063)
Livestock, Dairy, and	0.982	0.031	3.007*	0.244	0.105	1.436	0.069	0.296	0.392	0.006	0.720	0.203	1.063	0.129
Poultry Outlook	(0.322)	(0.860)	(0.083)	(0.621)	(0.746)	(0.231)	(0.792)	(0.587)	(0.531)	(0.940)	(0.396)	(0.652)	(0.303)	(0.719)
ALL	8.867*	4.575*	1.766	14.473*	5.170*	2.269	4.075*	7.535*	2.020	1.911	6.374*	0.749	0.001	6.845*
	(0.003)	(0.032)	(0.184)	(0.000)	(0.023)	(0.132)	(0.044)	(0.006)	(0.155)	(0.167)	(0.012)	(0.387)	(0.973)	(0.009)

Notes: Henriksson-Merton test statistics and their p-values (in parentheses) are shown. Single asterisks (*) represent significance at the 10% level.

Table 7. Henriksson-Merton Test Results for Distant Contracts

	One-Standard Deviation							Two-Standard Deviations						
Report	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs	Soybeans	Soybean Meal	Soybean Oil	Corn	Feeder Cattle	Live Cattle	Lean Hogs
Acreage and	28.740*	39.080*	19.048*	22.935*	11.398*	0.910	11.739*	57.498*	19.660*	6.673*	25.596*	6.939*	1.314	13.064*
Prospective Plantings	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.340)	(0.001)	(0.000)	(0.000)	(0.010)	(0.000)	(0.008)	(0.252)	(0.000)
Crop Progress	3.775*	0.355	1.546	5.599*	0.408	0.597	3.805*	0.128	0.194	0.001	0.019	0.018	0.168	3.046*
	(0.052)	(0.551)	(0.214)	(0.018)	(0.523)	(0.440)	(0.051)	(0.721)	(0.659)	(0.969)	(0.891)	(0.894)	(0.682)	(0.081)
Feed Outlook	0.105*	0.001	0.103	0.403	0.090	1.038	0.127	0.571	0.464	0.055	0.042	2.378	0.119	1.171
	(0.746)	(0.972)	(0.748)	(0.526)	(0.764)	(0.308)	(0.722)	(0.450)	(0.496)	(0.814)	(0.838)	(0.123)	(0.731)	(0.279)
Grain Stocks	53.315*	61.335*	24.603*	46.265*	8.729*	0.175	9.110*	62.344*	20.718*	13.461*	36.600*	6.816*	0.218	11.477*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.676)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.009)	(0.640)	(0.001)
Oil Crops Outlook	0.001	0.099	0.116	0.342	0.914	6.038*	0.206	0.519	0.004	0.038	0.060	1.360	0.437	0.597
	(0.973)	(0.753)	(0.733)	(0.559)	(0.339)	(0.014)	(0.650)	(0.471)	(0.950)	(0.845)	(0.806)	(0.243)	(0.508)	(0.440)
WASDE	30.871*	19.503*	9.155*	39.623*	0.063	0.687	0.118	20.566*	10.836*	10.454*	32.813*	5.423*	0.750	0.021
	(0.000)	(0.000)	(0.002)	(0.000)	(0.801)	(0.407)	(0.731)	(0.000)	(0.001)	(0.001)	(0.000)	(0.020)	(0.387)	(0.884)
Cattle	7.629*	1.536	0.507	2.831*	2.561	0.488	0.032	6.038*	2.558	0.313	0.086	2.195	0.452	0.057
	(0.006)	(0.215)	(0.476)	(0.092)	(0.110)	(0.485)	(0.858)	(0.014)	(0.110)	(0.576)	(0.769)	(0.138)	(0.501)	(0.811)
Cattle on Feed	5.702*	3.594*	2.009	2.529	10.850*	1.033	0.024	6.603*	1.545	3.935*	0.123	2.945*	1.497	1.545
	(0.017)	(0.058)	(0.156)	(0.112)	(0.001)	(0.309)	(0.878)	(0.010)	(0.214)	(0.047)	(0.726)	(0.086)	(0.221)	(0.214)
Hogs and Pigs	3.117*	1.875	0.000	1.701	0.016	2.012	27.261*	10.288*	7.112*	3.326*	3.620*	6.171*	4.108*	79.689*
	(0.077)	(0.171)	(0.986)	(0.192)	(0.898)	(0.156)	(0.000)	(0.001)	(0.008)	(0.068)	(0.057)	(0.013)	(0.043)	(0.000)
Livestock, Dairy, and	0.765	0.173	2.596	0.001	0.117	0.050	0.973	0.261	1.277	0.122	0.065	1.124	0.342	0.902
Poultry Outlook	(0.382)	(0.678)	(0.107)	(0.976)	(0.733)	(0.823)	(0.324)	(0.609)	(0.258)	(0.727)	(0.799)	(0.289)	(0.559)	(0.342)
ALL	22.098*	13.590*	5.632*	26.017*	6.891*	0.149	6.239*	19.487*	5.541*	8.832*	12.119*	5.205*	1.406	22.431*
	(0.000)	(0.000)	(0.018)	(0.000)	(0.009)	(0.700)	(0.012)	(0.000)	(0.019)	(0.003)	(0.000)	(0.023)	(0.236)	(0.000)

Notes: Henriksson-Merton test statistics and their p-values (in parentheses) are shown. Single asterisks (*) represent significance at the 10% level.

Discussion

There are some differences between the Kolmogorov-Smirnov and Henriksson-Merton test results. In general, the Henriksson-Merton test detects informational value by looking for large price movements, while the Kolmogorov-Smirnov test detects differences by examining discrepancies in daily return distributions. The Kolmogorov-Smirnov test statistics are significant in twenty-two out of seventy-seven cases with the nearby contracts and in twenty-five cases with the distant contracts, while the Henriksson-Merton test statistics for one standard deviation (two standard deviation) moves are significant in thirty (thirty-one) cases with the nearby contracts and in thirty-three (thirty-five) with the distant contracts. In terms of qualitative differences, the Kolmogorov-Smirnov test finds differences in lean hogs return distributions on Crop Progress release days, while the Henriksson-Merton test finds information value for live cattle returns. Trading days with Cattle on Feed report releases have different distributions than the days without Cattle on Feed releases for corn price changes, but these report days have informational value only in predicting large price changes in feeder cattle futures. A similar conflict occurs for Livestock, Dairy, and Poultry Outlook reports. While the Kolmogorov-Smirnov test statistic is significant for lean hogs, the Henriksson-Merton test statistic is significant for soybean oil. The only case where the Kolmogorov-Smirnov test results in more tests statistics that are significant is the WASDE report. Even though the distributions of feeder cattle daily returns are found to differ across WASDE report days and non-WASDE report days, these reports do not contain information value that helps predict large price changes in feeder cattle futures.

Our informational value test results are somewhat different than those found in previous literature. In earlier studies, Hogs and Pigs reports are found to affect the variance of returns on soybean meal, soybean oil, corn, lean hogs (Karali, 2012), and live cattle (Isengildina, Irwin, and Good, 2006). However, our tests do not detect any informational value in these reports for soybean oil and live cattle price changes. While Isengildina, Irwin, and Good (2006) report a change in the variance of live cattle futures returns on Cattle on Feed report days, we find informational value on these report days for feeder cattle but not for live cattle. Karali (2012) shows that the variance of returns on soybean meal and corn futures increases on the days with Crop Progress reports; however, we find informational value in these reports only for live cattle price changes. Isengildina, Irwin, and Good (2006) find that WASDE reports affect the return variances of live cattle and lean hogs and Karali (2012) find that the WASDE reports affect return variances for soybeans, soybean meal, and corn. While this study further discovers informational value on WASDE report days for soybean oil, we fail to do so for live cattle and lean hogs. Even though we include tests of distant contracts, the lower rate of market-moving information in livestock markets may be the result of the biological production lags inherent in those commodities.

As a further robustness check, we computed results comparing announcement days for each report against days with no announcements of any kind, which reduces the sample size but protects against event clustering issues by removing any effects of other reports from the days forming the control group. We also computed results for subsamples of the data by year to look for any trend in the value of information in the USDA reports. In both cases, the results are essentially unchanged and so are not reported or discussed further here. Having conducted two different tests using two different delivery horizons, two different definitions of a large price move, and two different definitions of non-announcement days, we believe that these results have proven remarkably robust.

Lastly, while we have analyzed inter-day effects, one could in principle check for intra-day moves in response to the report releases (at least the ones released in the morning). This strikes us as less interesting as a significant price move. A price move after a report release that is reversed before markets close would most likely be the result of a mistaken impression of the report's content. As market participants study reports more carefully during the day they would adjust their reactions.

Conclusions

This paper analyzes eleven different USDA reports in search of information value that might be revealed by differences in the daily returns of seven commodity futures contracts between days on which reports are released and non-announcement days. To formally test for these different return distributions we use two nonparametric tests. The Kolmogorov-Smirnov test examines whether the empirical cumulative distribution functions of daily returns on announcement and non-announcement days are equivalent. The Henriksson-Merton test determines whether large absolute daily returns are more (or less) likely to occur on announcement days compared to non-announcement days. These tests have not been used previously in other studies of the information value of USDA reports.

Our results show that five of the eleven USDA reports clearly contain market-affecting information across multiple commodities of the seven futures contracts examined, while six of the reports showed little evidence of information market-moving value. The valuable reports are Acreage and Prospective Plantings (two reports analyzed as a single report), Grain Stocks, WASDE, and the Hogs and Pigs report. When all of the announcement days are combined to test "any report announcement days" versus non-announcement days, the results come down convincingly in favor of information value in the set of all USDA reports. These information-value test results are consistent between the two nonparametric tests even though they test for somewhat different characteristics within the distributions of daily future price returns. The results provide support for continued funding and release of these reports.

We confirm earlier findings of value in at least some of these USDA reports both individually and when testing them as a single, joint set of reports. In particular, the Hogs and Pigs reports and WASDE reports were previously found to be associated with significant moves in multiple commodity markets by Isengildina, Irwin, and Good (2006) and Karali (2012), whose results mostly match our own. There are, however, some differences between earlier findings and our results, especially for live cattle futures. Even though the Cattle on Feed, Hogs and Pigs, and WASDE reports were shown to move live cattle futures prices in earlier studies, we fail to find in these reports any market-moving informational value that significantly affects live cattle daily returns.

Importantly, information value testing of reports such as these is a process that can only prove one side of the hypothesis. The reports found to cause significant market impacts certainly have value, as shown by the commodity price changes their release can engender. Reports that do not display market-moving information value in our tests may still be valuable in other ways. For example, some of the reports inform other reports (such as Crop Progress to WASDE). Reports might be useful to input suppliers in making stocking decisions or to other businesses for purposes that do not reveal themselves in commodity futures markets. Thus, while we can prove some reports valuable, we cannot prove the remainder to be valueless.

There is still work to do on the value of these USDA reports, but researchers may be starting to focus collectively on which reports have the most value and impact across a range of commodities and which others only affect at best one or two commodity markets. Further investigation on the value of USDA reports related to crops can be carried out by testing separately whether reports closer to harvest have additional information compared to reports released earlier in the production season.

[Received August 2013; final revision received November 2014.]

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