The Value of Government Information in an Era of Declining Budgets

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Abstract

USDA situation and outlook information contributes to the efficient operation of agricultural commodity markets. But, traders cannot adjust their price or uncertainty expectations to information that they do not have. In 2013, the USDA curtailed the publication of its crop report for the first time since the nineteenth century due to an appropriations lapse. We examine corn and soybean derivatives data around the scheduled October 2013 WASDE and find that markets for these commodities did not display characteristic patterns in terms of uncertainty resolution and price changes that are normally observed around scheduled USDA release times. We then construct the path that corn and soybean implied volatility would have taken if an average October report had been published. Although we do estimate significant announcement effects (in terms of uncertainty resolution and price adjustment) after the first report that was issued by USDA following the shutdown, we are unable to detect that it carried any enhanced effects.

Keywords: announcement effects, Crop Production, futures, Grain Stocks, implied volatility, options, shutdown, USDA, WASDE

Selected Paper prepared for presentation at the 2016 Agricultural and Applied Economics Association Annual Meeting, Boston, MA, July 31-August 2nd, 2016

The views expressed in this paper are those of the authors and may not be attributed to the Economic Research Service or the U.S. Department of Agriculture. This research is supported by USDA Cooperative Agreement #58-0111-14-009. This work is preliminary and should not be cited without permission.

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Many studies show that prices for domestic futures and options contracts react to the publication of important government reports about the situation and outlook for major commodities (see, e.g., Isengildina-Massa et al., 2008b; Adjemian, 2012). Under the assumption that these markets are efficient,[1] price changes at United Stated Department of Agriculture (USDA) crop report announcement time represent realignment of trader expectations based on new information. Whether or not the government's information and forecasts correspond exactly to the beliefs of the average trader, statistically significant changes in forward commodity prices upon report announcement indicate newsworthiness and informational value (Adjemian and Smith, 2012).

Ultimately—as a public good—more accurate information about market conditions improves resource allocation decisions throughout the supply chain. To generate these reports, USDA commits substantial resources to the collection and analysis of survey information from across the growing region. Some researchers have argued that, in the absence of government action, private firms would step in and provide commodity situation and outlook information to market participants (Just, 1983; Salin et al., 1998). Leaving aside the questions of the accuracy (which may be affected by scale economies) or sufficiency of the service that may be offered by private alternatives, or even the welfare impact of increased costs on smaller consumers resulting from such a transition, it is worth exploring the counterfactual: what is the empirical effect of absent government reports?

Declining federal budgets put this question into sharp relief. In 2011, the National Agricultural Statistics Service (NASS) canceled several longstanding reports due to financial constraints, including those depicting the national soybean crush, fats and oils stocks, cotton

[1] Weak-form efficient markets react to new public information.

stocks and processing, and a quarterly wheat millings survey (Ingwersen, 2014; Micik, 2015). Although each of these reports resumed publication by 2015, in many cases due to direct calls from market participants, a steadily growing federal debt leaves in question the future stability of government support for agricultural data collection and dissemination.

After an appropriations lapse, the U.S. government shutdown routine operations from October 1st through October 16th, 2013. Due to an inability to collect necessary data, or to convene and discuss their implications, the USDA canceled two reports that had been previously scheduled for simultaneous release on the morning of October 11th: the World Agricultural Supply and Demand Estimates (WASDE)—USDA's premier situation and outlook report—and the supporting NASS Crop Production report (Abbott, 2013).[2] Previously, these reports had routinely provided traders, market participants, and observers with the government's balance-sheet-view of supply and demand conditions for major US agricultural commodities. Their absence broke a streak of consecutive publications stretching back to inception dates of 1980 and 1866, respectively. USDA production forecasts from 2013 are shown in figure 1; the October values are notably missing.

With domestic and international production, trade, and consumption estimates; forecasts of end-of-year stock and average farm-price level; and a description of important market developments, WASDE announcements are closely watched by market observers and have been shown to generate shocks to expected commodity prices and volatility levels (Isengildina-Massa

[2] Due to shared information and contemporaneous publication, we refer to the WASDE alone from here since it is the headline report. In addition to the October WASDE and Crop Production reports, two weekly crop progress reports that had been scheduled during the shutdown were canceled. USDA postponed a Cattle on Feed and peanut report until after the resumption of normal operations.

et al., 2008b; Adjemian, 2012). The October 2013 shutdown provides a natural experiment to study the effects of the absence of government information about major domestic crops.

Using historical Chicago Mercantile Exchange (CME) futures and options data for corn and soybeans, we conduct an event study to test for market impacts (or the absence of impacts) on price levels and implied volatility around the time of the scheduled release of the missing October 2013 WASDE. In doing so, we search for evidence of pricing errors and uncertainty that might be attributed to lower information quality about the first harvest following the drought conditions and tight stocks of 2012/2013. Because our estimation strategy could be confounded by market-wide uncertainty generated by the shutdown, we include a control for the Chicago Board Options Exchange Volatility Index (VIX).

We show that typical commodity futures price and implied volatility responses observed around report release dates do not occur during the government shutdown and absence of the October 2013 WASDE report. Failure to discover these systematic updates provides supporting evidence about the important role played by government agricultural reports in guiding markets to more efficient price and uncertainty equilibria. We further quantify the impact of the missing report by demonstrating that it contributed to heightened uncertainty in both the corn and soybean markets, compared to the levels that likely would have been observed had historical information patterns held (at that time of the crop year), indicating the increased cost of insuring against adverse price changes in the absence of government crop information.

Background

USDA began issuing monthly crop reports in 1866, to inform producers and users of commodities about market conditions. At first covering only cotton and tobacco, many commodities have been added or removed to these publications over time, but the reporting schedule remained consistent for 147 years.[3] The collection of supply, demand, and price estimates published in the WASDE report is generated by a consensus process that draws together data and experts from several USDA agencies (Vogel and Bange, 1999). Due to its sensitivity, each report is generated under high-security "lockup" conditions, and released at noon in the Eastern U.S. Time Zone (ET), during active trading hours.[4]

WASDE reports can be organized according to a forecasting cycle: the May report contains the first supply, demand, and price estimates for the coming marketing year. The August report includes the first NASS production forecast based on detailed, farm-level surveys; these continue through November. Final production estimates are reported in January. The January WASDE is also released alongside a quarterly NASS Grain Stocks report, which informs the market about government information regarding on- and off-farm inventory levels. Other Grain Stocks reports appear in late March, June, and September. The first and second of these are published contemporaneously with NASS Planting Intentions and Acreage reports. WASDE reports from May through July are influenced by these NASS reports. From February through April, WASDE balance sheets remain relatively unchanged, except for small refinements.[5]

[3] Report delays have been observed, however; the WASDE originally scheduled for September 12th, 2001 was actually issued two days later, following the terrorist attacks.

[4] From 1994-2012, the report was published at 7:30am ET in advance of market opening; previously, the release time was 3:30pm ET, after the close of daytime trading sessions.

[5] The location of the shutdown in the crop forecasting cycle is notable. With a WASDE that normally includes crop production survey information, October reports have a higher likelihood of containing information that corn and soybean traders would find valuable. Were the shutdown to have occurred in say, February or March, we may not be able to detect a similarly significant effect, since those reports are not normally market-moving.

Prior research has demonstrated significant market impacts on commodity futures prices of crop production reports (Gorham, 1978; Miller, 1979; Hoffman, 1980; Sumner and Mueller, 1989; Colling and Irwin, 1990; Grunewald, McNulty, and Biere, 1993; Garcia et al., 1997; Isengildina, Irwin, and Good, 2006). McKenzie showed that corn traders would be willing to pay for advance access to the August crop production report (2008). A growing literature focuses specifically on the impact of WASDE. Fortenberry and Sumner (1993) do not detect a price reaction to WASDE from the mid- to late-1980s, and wonder whether private forecasts had improved enough to anticipate government announcements. Isengildina-Massa et al. (2008a) show that another price series from the same period exhibits a strongly significant impact. In two studies, Isengildina-Massa et al. (Isengildina-Massa et al., 2008a; Isengildina-Massa et al., 2008b) find that corn and soybean markets exhibit significant announcement effects around WASDE publication, and that the effect is particularly pronounced during those months when the report includes NASS crop production forecasts. Isengildina, Irwin, and Good (2006) also show that WASDE affects cattle and hog prices. Adjemian (2012) finds that that WASDE generates announcement effects in soybean, wheat, and that existing market conditions (e.g., stock levels) can amplify these effects. And Kauffman (2013), Lehecka, Wang, and Garcia (2014), and Adjemian and Irwin (2016) all show that most of the information provided by WASDE is absorbed by each market in a matter of minutes.

The 2013 harvest was a bumper crop for both corn and soybeans. Following the drought plagued prior year, which saw the lowest corn production level since 2006, the U.S. 2013 crop reversed a three-year trend of declining production for both commodities. It was also a year of relatively consistent information about corn, and slightly higher than average uncertainty about

soybeans—at least from USDA's perspective. Figure 2 shows the average and maximum absolute change in the monthly USDA production forecast (from May-November, and January). Out of the twenty corn and soybean harvests from 1995-2014, USDA's average forecast changes of 0.8% and 2.23% that year ranked 19th and 4th, respectively, compared to the highs of 4.37% and 4.67% observed in the previous year. In terms of maximum shocks experienced over the forecasting period, corn came in dead last at 1.34% (compared to *16.89%* the prior year), while the largest forecast shock of 4.82% represented the 7th highest for soybeans observed over 1995-2014. Another way to look at where 2013 falls in terms of harvest uncertainty is represented by figure 3, which shows the average production forecast revisions from September-November over the period of interest—focusing on the location in the forecasting cycle corresponding to the government shutdown. USDA's November forecast revisions that year differed by 1.05% and 3.46% for corn and soybeans, respectively, compared to the values published in the September WASDE. These amount to the 13th and 11th highest revisions observed from 1995-2014. Differing harvest-size certainty profiles between corn and soybeans afford some useful variation for our analyses: where the effect of a missing report might be muted for corn (given the consistency of its 2013 harvest), the soybean effect could be elevated.

Data

USDA WASDE reports including production forecasts from 1980/81-present are maintained online by Cornell's Mann Library, and can be accessed freely. We associate each report with the proper close-to-close change in implied volatility and absolute returns of the harvest futures contract (December for corn, November for soybeans) according to the time at which the report

was published (see, e.g., Adjemian, 2012), for contracts that have not yet reached the expiry month. For a portion of the analysis, we also associate those reports with the IV and futures returns for the nearest delivery contract (that has not yet reached the expiry month). We purchased daily corn futures and options data from Bloomberg data service, who calculate annualized implied volatilities for active futures contracts. The Chicago Board Options Exchange maintains the VIX to capture daily market expectations about near-term volatility of the S&P 500 Index. Intraday futures and options prices were purchased from the CME and include both electronic and regular session trades; we calculated corresponding intraday implied volatilities according to Black (1976) using out-of-the money put and call options with strike prices that were no more than 10 percent greater or less than the current futures prices.

Methods

Traders use government commodity information to inform and adjust their expectations about market fundamentals. If private sources of such information are unable to approximate the government's role—at least over the short-term—missing USDA information could lead to heightened uncertainty, absent price reactions that would otherwise occur at scheduled report release times, and perhaps greater certainty and price shocks once revised information is presented after experiencing an extended period without it. Commodity prices and implied volatilities are noisy, so we search for empirical evidence supporting these potential outcomes at different observational frequencies: monthly, daily, and intraday.

At the monthly frequency, we calculate the average end-of-day implied volatility and VIX levels, and absolute close-to-close futures return.[6] Rather than splitting these data according to calendar month, we break them up according to the WASDE release schedule. For example, we identify as "January" the period of time beginning with the first day that could be affected by the January report to the trading day immediately preceding the release of the February report. The panels of figure 4 show the time series of these variables for corn and soybeans; in each panel, the missing report is indicated by a vertical red bar. For each commodity, we difference the series to determine the change in the average IV and returns, and model each as a function of the change in VIX as well as the lagged value of the other dependent variable of interest (e.g., returns in the case of IV). We include lagged values of the outcome variable and the VIX to model any autocorrelation, directly, monthly dummies to capture seasonality, and both linear and quadratic time trends. Finally, we include three dummy variables for the months around the missing report to identify any abnormally heightened or dampened uncertainty or futures returns denoted by the monthly averages.[7] These models are estimated via linear regression.

Our daily models are built in a similar way, but focus on the daily percentage change in implied volatility or absolute change in futures prices.[8] These models include additional controls for intra-crop year (these enter as linear and quadratic values during each crop year) and day-of-week effects (dummies). Indicator variables for important report publication dates are also included, segregated by the month of publication (e.g., August WASDE, or September Grain

[6] Absolute returns are used since they represent realized market volatility. Nominal returns are not very informative for our purposes, since USDA information could just as easily lead to higher or lower prices. Averaging those returns loses the magnitude of the information shocks.
[7] Because no report was published in October 2013, we use the day it was scheduled to split the data: 10/11/2013.
[8] We preserve the nominal implied volatility changes since USDA reports are assumed to be uncertainty-resolving, leading to lower IV levels.

Stocks); the coefficient on each of these indicators represents the average impact of the report on IV levels or price volatility. Furthermore, to study the impact of the missing report, we include a set of six dummy variables for the three trading days before and after the publication of each October WASDE, offering the construction of an event window for the average report released each October.

For the intraday analysis, we transform the futures price data into natural logarithms and construct minute-by-minute percentage returns for a two hour event window around each of the scheduled release times of each October WASDE report over the period 1995 – 2013. For the IVs, we first create a type of IV index by normalizing minute-by-minute IV's with respect to the average IV observed across each event window for every year in the sample period, since systemic volatility varied considerably over the period of interest.[9] To isolate the event window, we begin by calculating implied volatilities and returns: 60 minutes before announcement, starting from the minute t=-60 through minute t=-1, and 60 minutes after announcement, from minute t=1 through minute t=60. Based on Kauffman(2013), Lehecka, Wang, and Garcia (2014), and Adjemian and Irwin (2016), we determined that a window of 60 minutes prior to the release of the report and 60 minutes after the release is sufficient to capture market absorption of news, as traders form positions and prices adjust to the new information contained in each report.[10]

[9] An additional issue is that our intraday IV series reflects the IV recovered from the most recent OTM option with a strike within 10 percent of the underlying futures price. It is well known that IV can vary systematically over moneyness giving rise to "smile" patterns where IVs from options further from the money are higher than those nearer to the money or to "smirks" where OTM puts trade at a premium relative to similarly OTM calls, or vice versa. This introduces unwanted noise into our IV time series because variation is driven, in part, by the fact that options are being drawn from different points on the IV surface. The problem is compounded by the fact that trading in options was thin during some portions of our study period. For this reason, we average the IV series over blocks of the pre- and post-event windows to assure that IV changes or lack thereof can be detected accurately.

[10] Using more trading minutes could potentially lead to the problem of other information influencing market prices and decreasing our ability to measure the response of the market to the October report.

Minute t=0 represents the time of report release, minute t=1 is the first minute after the new information in the report was released, and minute t=-1 the last minute before the report was released.

The data provide eighteen distinct pre-2013 observations for each minute in the event window, representing the time series of corn and soybeans IV and futures prices on scheduled October report days. Given the small sample size, we use a Gaussian kernel estimator to generate smoothed multivariate empirical distributions that simulate the "normal" behavior of futures and IV during the event window around the scheduled publication time. We narrow the window to the twenty-one trading minutes around the scheduled publication time to focus attention on the intraday period most affected by USDA announcements: our results are displayed on a per-minute basis for futures returns. Since options are far more lightly traded in the sample and IVs are calculated over differing levels of moneyness, we aggregate IV levels for the ten trading minutes preceding and following the moment of scheduled USDA WASDE announcement. For each unit of time in the analysis (twenty-one for futures, and two for IV per each commodity), we perform 1000 iterations of 18 futures returns and IV draws, each representing a pre-2013 year in the sample. By drawing from multivariate distributions we preserve the historical cross-commodity correlation structure at announcement time observed in figure 5, as commodity prices changes are positively correlated in the immediate aftermath of an October WASDE.[11] Then, we rank simulated futures returns (after converting them to absolute value) and normalized IVs by commodity from smallest to largest value. We thus generate simulated

[11] Although wheat is not a focus of the current study, we include it in this portion of the analysis for completeness since it is among the most liquid of the agricultural derivatives markets.

confidence bands at the 10% and 90% levels using the simulated CDF's of absolute returns and normalized IVs, and plot the time path of the futures return and normalized IV that occurred around the scheduled release of the 2013 October WASDE.

Results

The raw data presented in figures 5 and 6 do not clearly depict an abnormal decrease in monthly average implied volatility, or change in average realized volatility, for the corn or soybeans harvest contracts in October 2013 when compared to the other Octobers from 1995-2014. Likewise, tables 1 and 2 do not provide any evidence for a change in the average level of annualized implied or realized volatility in October 2013, compared to what would be normally expected in an ordinary October: no statistical significance is assigned to the coefficient on Oct2013 (or Sep2013 and Nov2013) in any of the models across the two tables. If, on the other hand, the Oct2013 variable was significant and positive in an IV model, that would indicate that the change in IV from the trading month following the September 2013 WASDE to the trading month that would have followed the October 2013 WASDE was less uncertainty-resolving than normal. Such a finding in the case of the return model could instead indicate systemic under- or overreaction compared to normal conditions. Overall, we are unable to detect a notable increase in implied volatility or change in realized volatility over the period of observation, using monthly data.

In contrast, more frequent daily data establish abnormal IV and absolute return behavior around the missing report. The raw absolute returns and IV data presented in figures 8 and 9 demonstrate that, in general, October WASDE reports lead to reductions in implied volatility and

higher than average changes in realized prices for both corn and soybeans. The red dots in each chart further show that in October 2013, these effects were not observed on market uncertainty and return levels in conjunction with the missing report. Indeed, a linear regression similar to the one used for monthly data confirms that after controlling for other determinants like time trends, seasonality, equity market uncertainty (from the VIX), and day-of-week effects, the average October WASDE report is associated with a marked reduction in implied volatility and elevated absolute returns on the day of publication for both commodities.

Panel *a* of figures 10 and 11 show these results graphically in the form of seven-day event windows for corn and soybean IVs. From the closing value observed on the day prior, to the closing value on the day of its release, the average October WASDE leads to a reduction in harvest contract IV of 6.4 percentage points for corn, and 16 percentage points for soybeans. To place these findings in context, panel *b* of these figures shows the effect of each major USDA report (WASDE and Grain Stocks) released over the calendar year on the IV. For both commodities, the October report is among the most important in terms of uncertainty reduction for the harvest contract.[12] Using those results, in panel *c* of both figures, we plot the daily time path observed for IV during the seven-trading-day period scheduled for WASDE release in October 2013 (10/8/13-10/16/13), as well as the counterfactual path that IV *would have followed* had a USDA report been published on that day exhibiting the effect associated with an average October report. In addition, we plot uncertainty bands around the counterfactual path based on the standard error associated with the estimate of the effect on an October report recovered from

[12] That the November WASDE is the most important for corn, but not for soybeans in these charts is understandable, since the current harvest contract for corn is still active. By the time of the November WASDE release, the soybean harvest series pulls from the contract that is to deliver the following November.

our regression analysis. In the panels, the mean counterfactual path is about 2-3 points lower than the actual IV path for corn, and 3-4 points lower for soybeans, quantifying the loss in market uncertainty resolution that would normally be expected at that point in USDA's crop forecasting cycle, if the government shutdown had not prevented the writing and publication of a WASDE.

Figure 12 shows the results of our intraday simulation of the distribution of normalized implied volatility in the twenty minutes surrounding October WASDE announcements from 1995-2012. For both commodities, but particularly for soybeans, the implied volatility level usually decreases immediately following the USDA announcement. The relative magnitude of these changes match well with the results from our models that use daily data: the average October report seems to have a larger effect on the soybean harvest contract. On October 11th, 2013, the intraday corn IV level did not decrease at the scheduled announcement time (but stayed within the 90% confidence bands predicted by the simulation). For soybeans, the average intraday IV level that day actually increased substantially in the two ten-minute periods bracketing the release time, to a level well outside that predicted by the 90% confidence level of the simulated normalized distribution. These findings for both commodities are consistent with the relative consistency of news about the corn harvest that year in historical terms, while the soybean outlook was a murkier than average.

Figure 13 presents our intraday simulation results for absolute futures returns. As in prior research (e.g., Adjemian and Irwin, 2016) we demonstrate that, ordinarily, the moment of scheduled publication for a USDA report is characterized by a spike in price volatility. On October 11th, 2013, however—the date of the missing WASDE—futures returns for corn and soybeans

exhibited no such spike. That is, corn and soybean markets did not react to a report that did not exist, as expected.

Finally, we were not able to establish using monthly or daily data that the November 2013 WASDE report led to any steeper drops in implied volatility, or larger spikes in futures volatility. The coefficient on Nov2013 in tables 1 and 2 is not statistically significant. Table 3 shows the relevant indicator variable coefficients from models estimated using daily data. In the table, although the November report ordinarily leads to a negative shock of 19.2 percentage points for the implied volatility represented by December corn options, and 5.01 percentage points for January soybean options (at the 12% significance level), the November 2013 report did not lead to a steeper reduction in IV at commonly accepted statistical significance levels.[13] Similarly, while November WASDEs normally lead to significant price changes in the corn (0.4%) and soybean (0.69%) futures markets, we were unable to detect that the November 2013 report generated larger than expected price changes. By the first post-shutdown report date, CBOT corn and soybean markets had adjusted to a level that makes identification of enhanced announcement effects difficult in the presence of noise. As a natural experiment, the timing of the appropriations lapse limits the generalizability of this result: 2013 was generally a quiet year in terms of changes to USDA harvest expectations. If the shutdown had occurred the prior year amidst a historic drought, or if USDA's reporting capacity had been limited for a longer stretch of time, it is possible if not likely that the first post-shutdown report would carry a larger than average announcement effect.

[13] However, all coefficients in the table do at least display the proper sign.

Conclusion

By disseminating survey results about farm plantings, acreage levels, inventories, and production, USDA provides can improve the decisions and plans of market participants. As a public good, the information is provided free of charge, but the process of collecting it is costly. An established literature validates the importance of USDA situation and outlook information to the efficient operation of agricultural commodity markets, by searching for announcement effects, or anomalous changes in option implied volatility or futures prices that coincide with the publication of a report.

But traders cannot adjust their price or uncertainty expectations to information that they do not have. In 2013, a US government shutdown curtailed the release of the first USDA crop report since the nineteenth century, offer the chance—for the first time—to observe the operation of commodity markets that operate in the absence of government information. Using both daily and intraday data, we find that neither corn nor soybean displayed characteristic patterns in terms of uncertainty resolution and price changes that are normally observed around scheduled USDA release times. We then construct the path that corn and soybean implied volatility would have taken if an average October report had been published. Although we do estimate significant announcement effects (in terms of uncertainty resolution and price adjustment) after the first report that was issued by USDA following the shutdown, we are not able to detect that it carried any enhanced effects.

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Table 1. Impact of missing October 2013 report on the change in monthly average implied and realized volatility (absolute futures returns) in the CBOT Dec. corn contract, 1995-2015

	(1)	(2)
	Implied Volatility	**Absolute Returns**
Lag IV	-0.094	-0.10
	(0.071)	(0.24)
Lag Returns	0.044**	-0.27***
	(0.021)	(0.072)
VIX	0.083**	0.13
	(0.041)	(0.14)
Lag VIX	0.037	0.016
	(0.041)	(0.14)
Sep2013	-16.1	-27.2
	(10.8)	(36.6)
Oct2013	5.82	-47.4
	(10.6)	(35.8)
Nov2013	10.5	44.3
	(10.6)	(35.7)
jan	-5.67	49.8***
	(3.66)	(12.4)
feb	-8.46**	38.8***
	(3.35)	(11.3)
mar	1.12	55.4***
	(3.31)	(11.2)
apr	-8.73**	53.7***
	(3.50)	(11.8)
may	-3.23	48.7***
	(3.29)	(11.1)
jun	-14.0***	73.9***
	(3.42)	(11.6)
jul	-13.3***	37.6***
	(3.32)	(11.2)
aug	-14.3***	19.2*
	(3.30)	(11.2)
sep	-8.22**	30.6***
	(3.34)	(11.3)
oct	-0.25	29.3**
	(3.37)	(11.4)
nov	-19.6***	22.5*
	(3.65)	(12.3)
Constant	9.08**	-27.8**
	(3.66)	(12.4)
Observations	248	248
R-squared	0.329	0.284

Notes: Standard errors are shown in parentheses. A linear and quadratic time trend were estimated, but are not displayed to conserve space. Statistical significance is denoted by: *** p<0.01, ** p<0.05, * p<0.1

Table 2. Impact of missing October 2013 report on the change in monthly average implied and realized volatility (absolute futures returns) of the in the CBOT Nov. soybean contract, 1995-2015

	(1)	(2)
	Implied Volatility	**Absolute Returns**
Lag IV	-0.23***	-0.13
	(0.069)	(0.23)
Lag Returns	0.078***	-0.22***
	(0.021)	(0.070)
VIX	0.046	0.11
	(0.039)	(0.13)
Lag VIX	0.020	0.0083
	(0.039)	(0.13)
Sep2013	-7.21	-26.2
	(10.0)	(33.4)
Oct2013	-9.13	-25.6
	(10.0)	(33.3)
Nov2013	-4.43	-12.7
	(10.0)	(33.4)
jan	-3.34	28.6***
	(3.15)	(10.5)
feb	-3.04	17.7*
	(3.14)	(10.5)
mar	2.02	30.5***
	(3.09)	(10.3)
apr	-3.30	18.0*
	(3.15)	(10.5)
may	-0.84	31.0***
	(3.07)	(10.2)
jun	-5.72*	54.3***
	(3.14)	(10.5)
jul	-11.6***	27.3**
	(3.21)	(10.7)
aug	-11.5***	3.87
	(3.10)	(10.3)
sep	0.50	12.5
	(3.12)	(10.4)
oct	-4.42	7.24
	(3.20)	(10.7)
nov	-10.4***	-3.28
	(3.15)	(10.5)
Constant	5.23	-6.55
	(3.40)	(11.3)
Observations	248	248
R-squared	0.229	0.229

Notes: Standard errors are shown in parentheses. A linear and quadratic time trend were estimated, but are not displayed to conserve space. Statistical significance is denoted by: *** p<0.01, ** p<0.05, * p<0.1

Table 3. Regression results for announcement effect of ordinary and 2013 November WASDE reports, using daily data from 1995-2014

Model Dep. Var.	**Nov. WASDE**	**Nov. 2013 WASDE**
Corn - IV Chg.	-19.2***	-3.9
	(1.4)	(5.9)
Corn - Returns	0.4*	0.002
	(0.24)	(1.02)
Soybean - IV Chg.	-5.01	-1.25
	(3.19)	(13.53)
Soybean - Returns	0.69***	0.9
	(0.23)	(0.97)

Notes: Standard errors are shown in parentheses. The harvest contract (December) is used for corn; the January delivery contract is used for soybeans. Statistical significance is denoted by: *** p<0.01, ** p<0.05, * p<0.1

Figure 1. USDA Production Forecasts for 2013/14 in millions of bushels

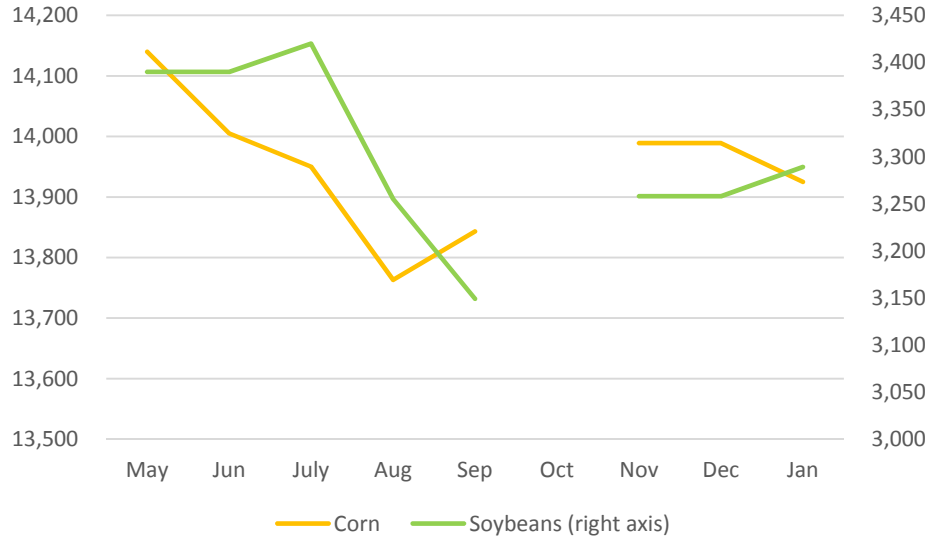


Figure 2. Mean and Maximum Abs. % Change to USDA Production Forecast, 1995-2014

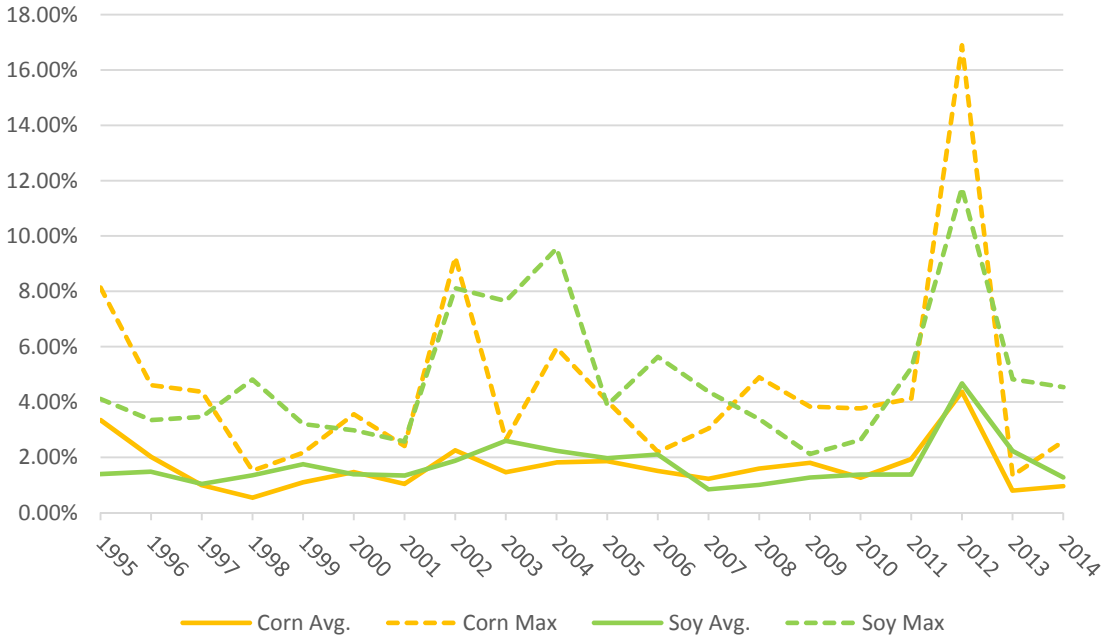


Figure 3. Absolute % Change in USDA November Production Forecast, 1995-2014

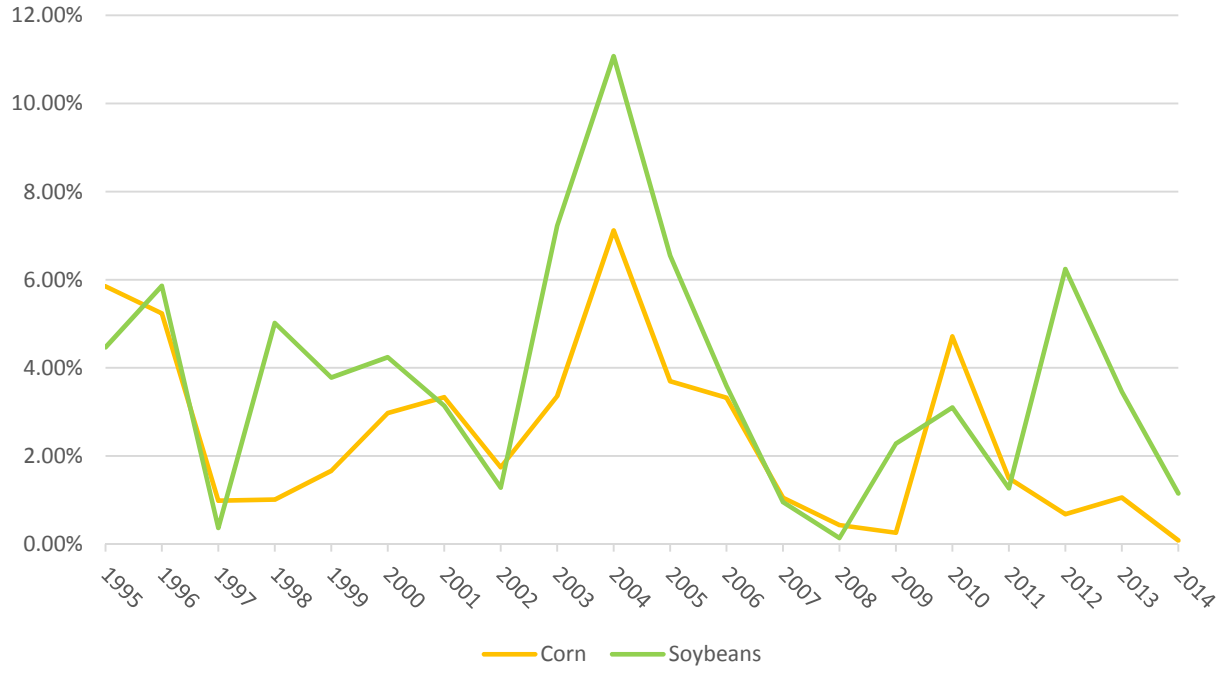


Figure 4a. Average CBOT corn Dec. contract volatility in the month following scheduled WASDE publications, 1995-2015

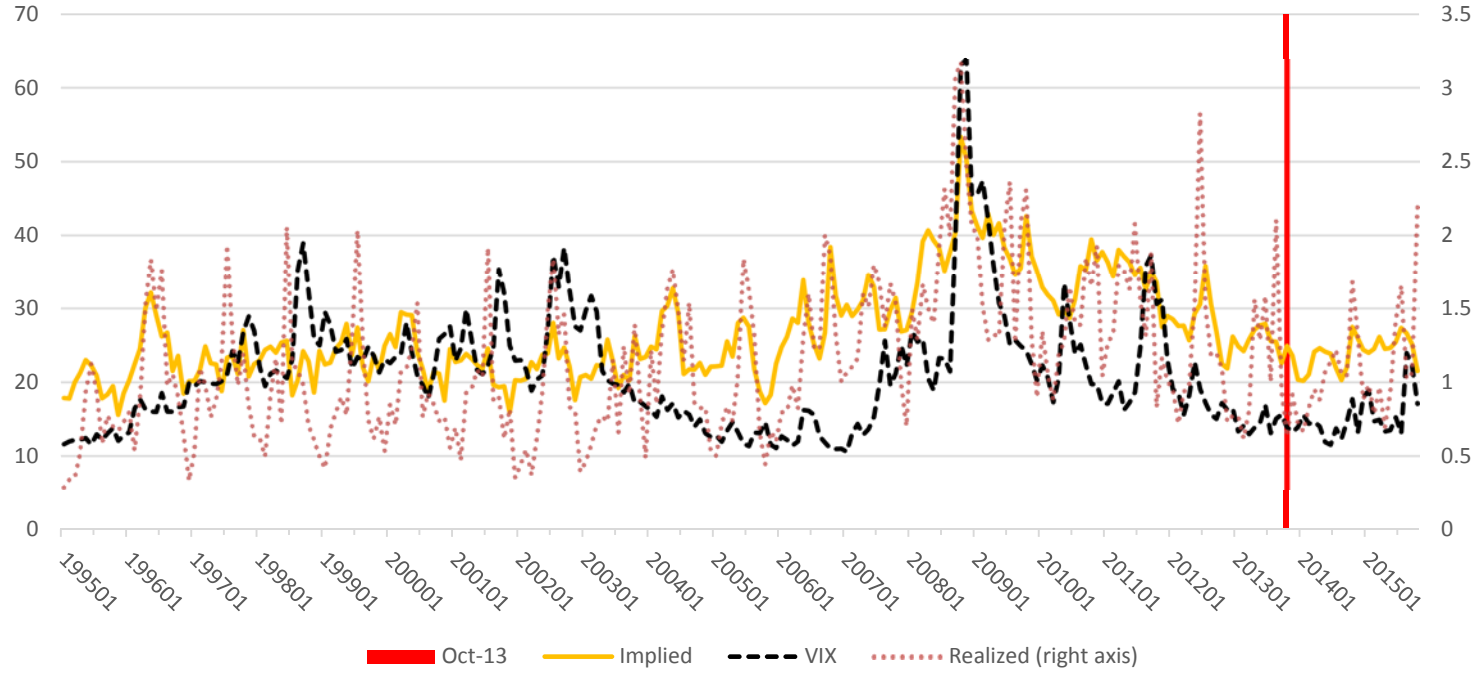


Figure 4b. Average CBOT soybean Nov. contract volatility in the month following scheduled WASDE publications, 1995-2015

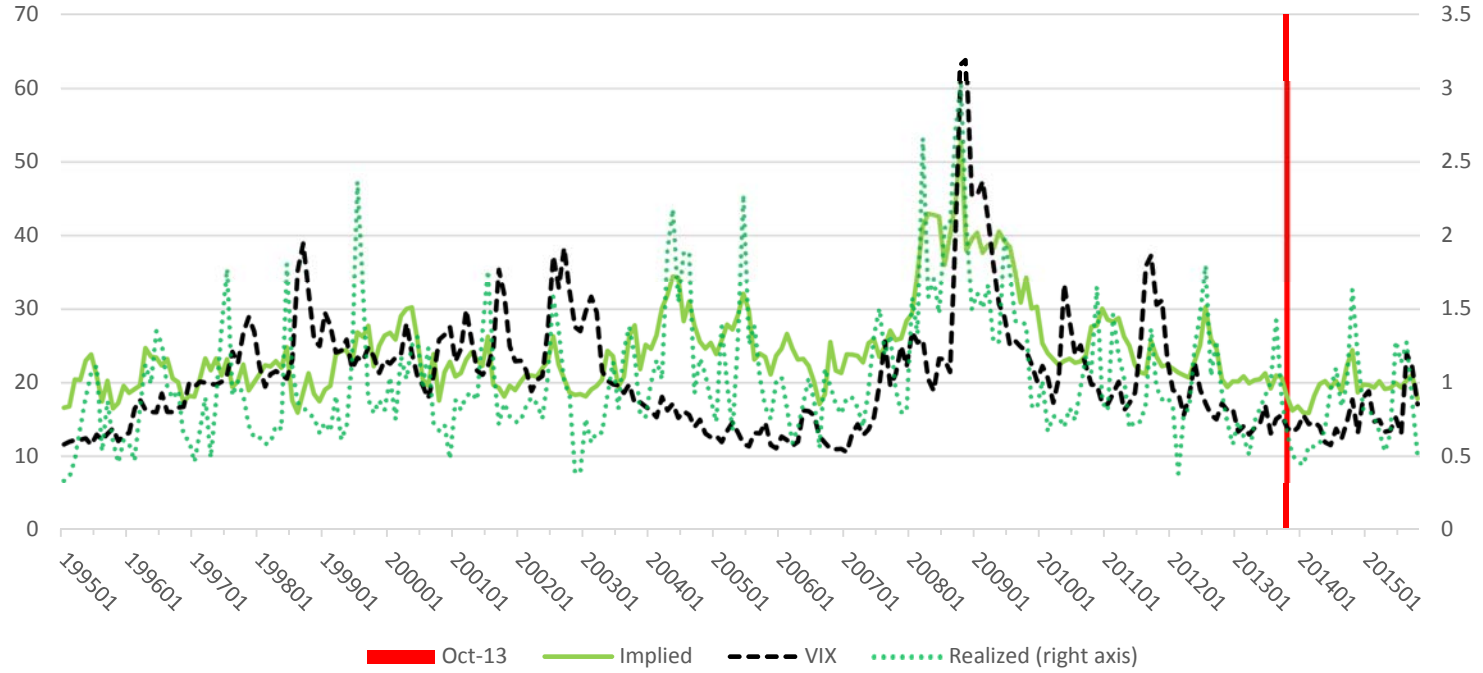


Figure 5. Pearson correlation coefficient of minute-by-minute cross-commodity returns around the scheduled release of the October WASDE report, 1995-2012

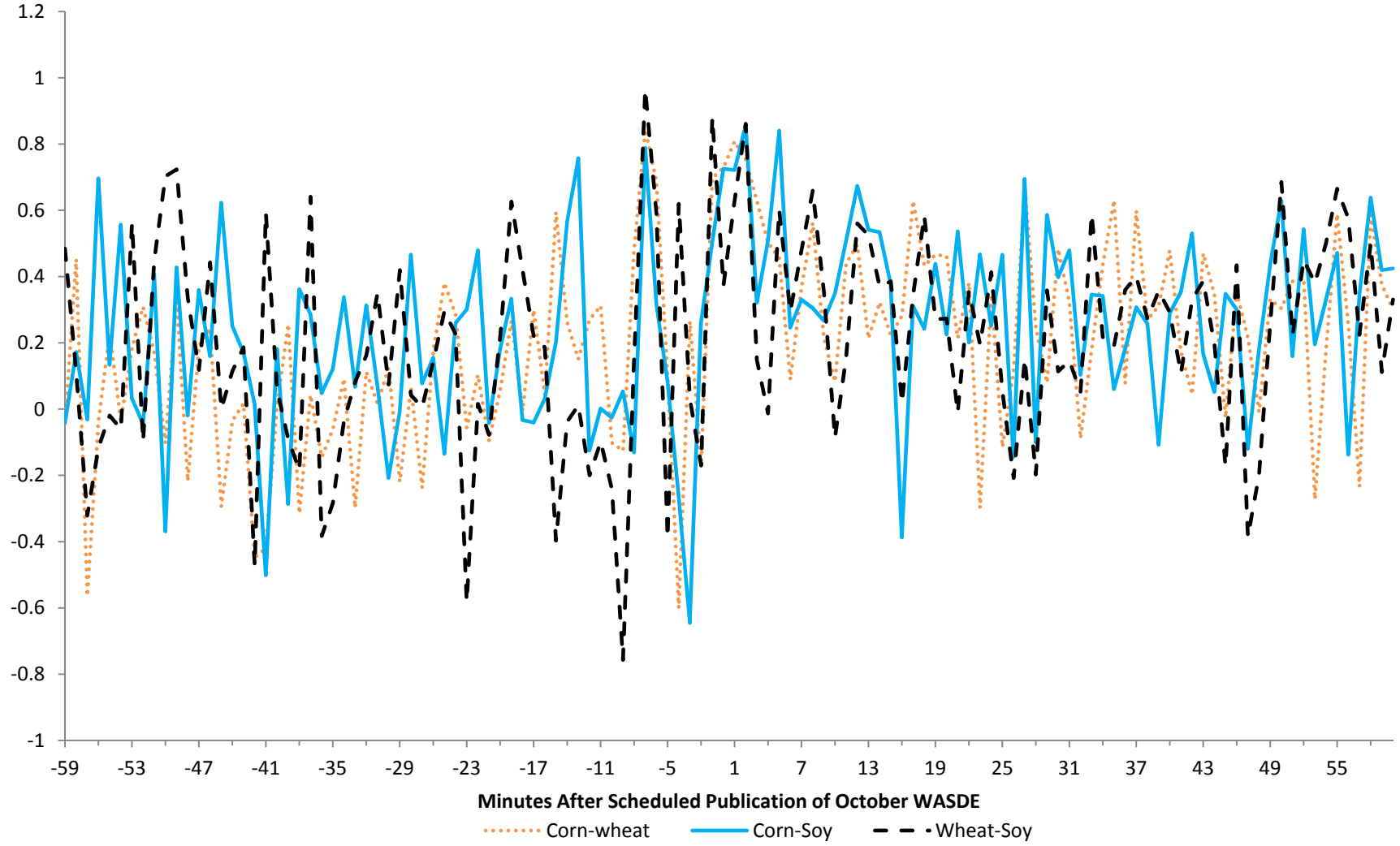
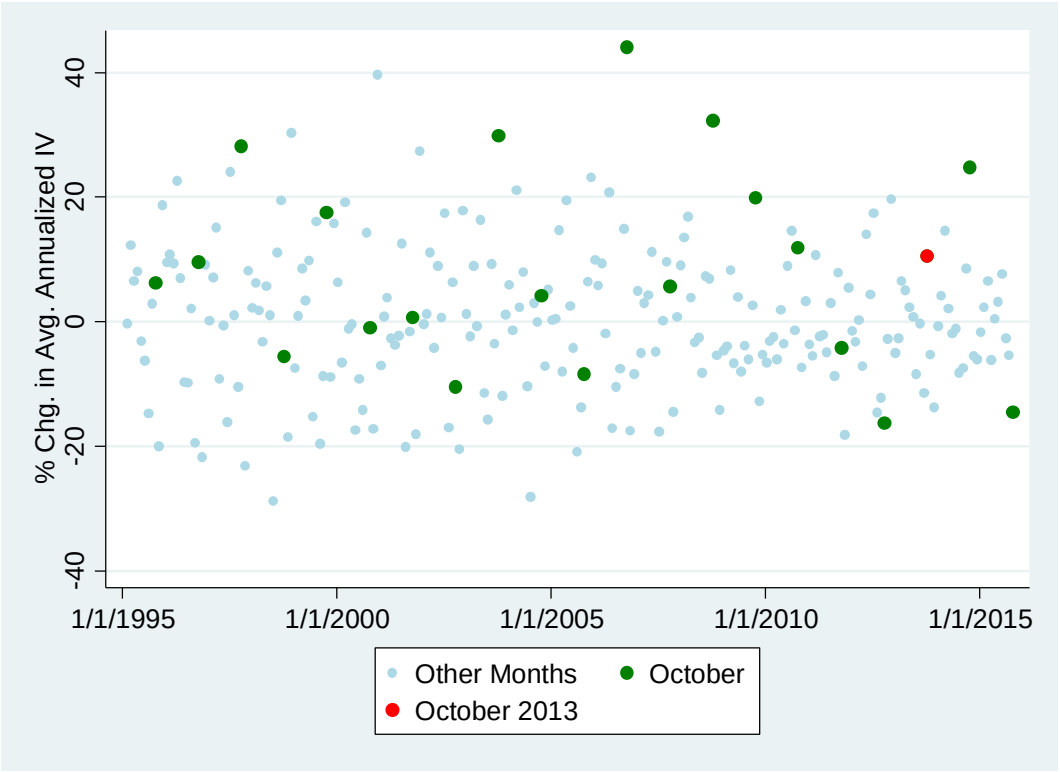


Figure 6. Average % change in CBOT corn Dec. contract implied and realized volatility in the month following scheduled WASDE publication, 1995-2015

Panel a. Implied volatility



Panel b. Absolute Returns

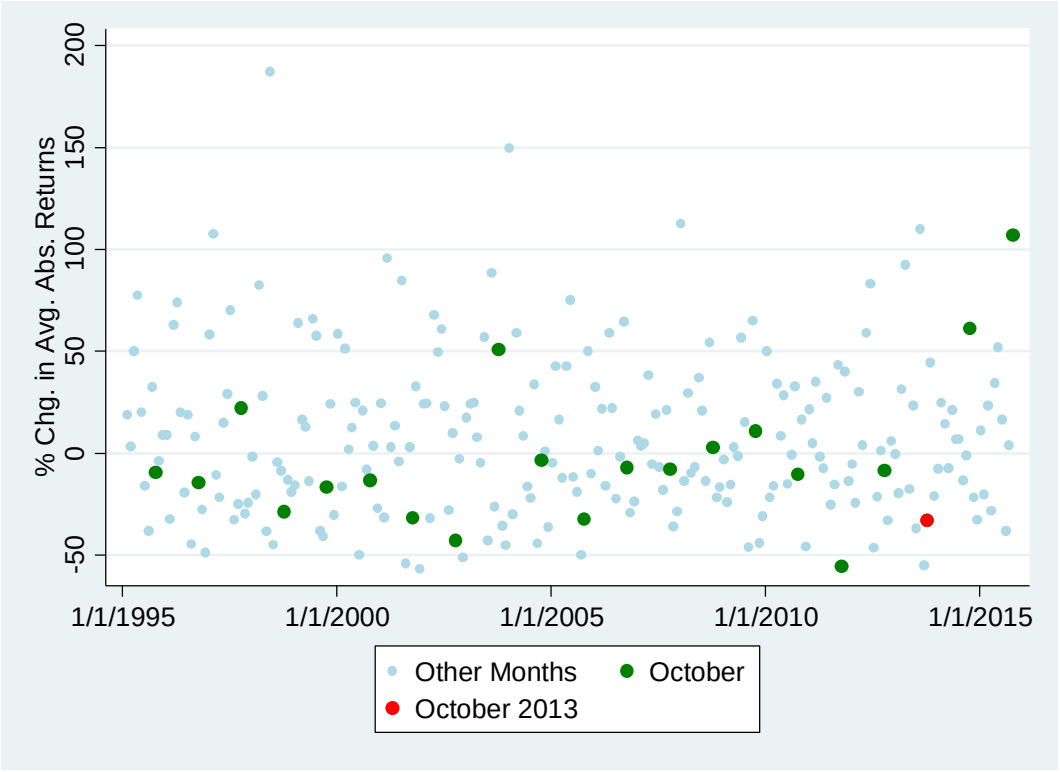
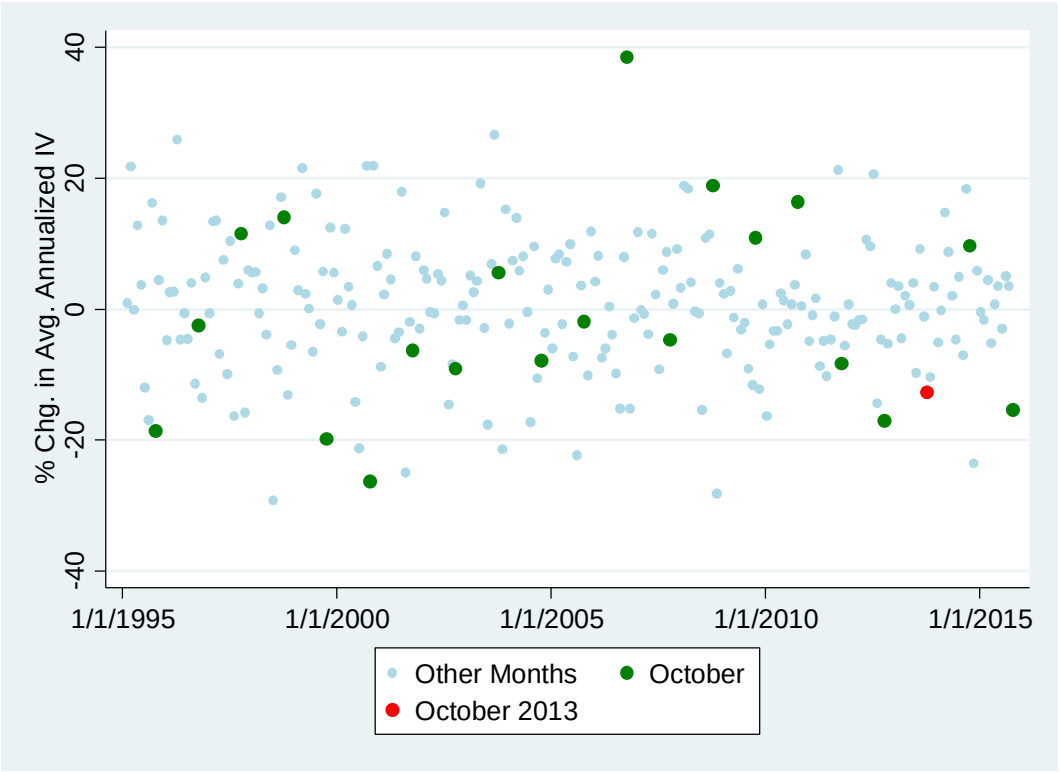


Figure 7. Average % change in CBOT soybean Nov. contract implied and realized volatility in the month following scheduled WASDE publication, 1995-2015

Panel a. Implied volatility



Panel b. Absolute returns

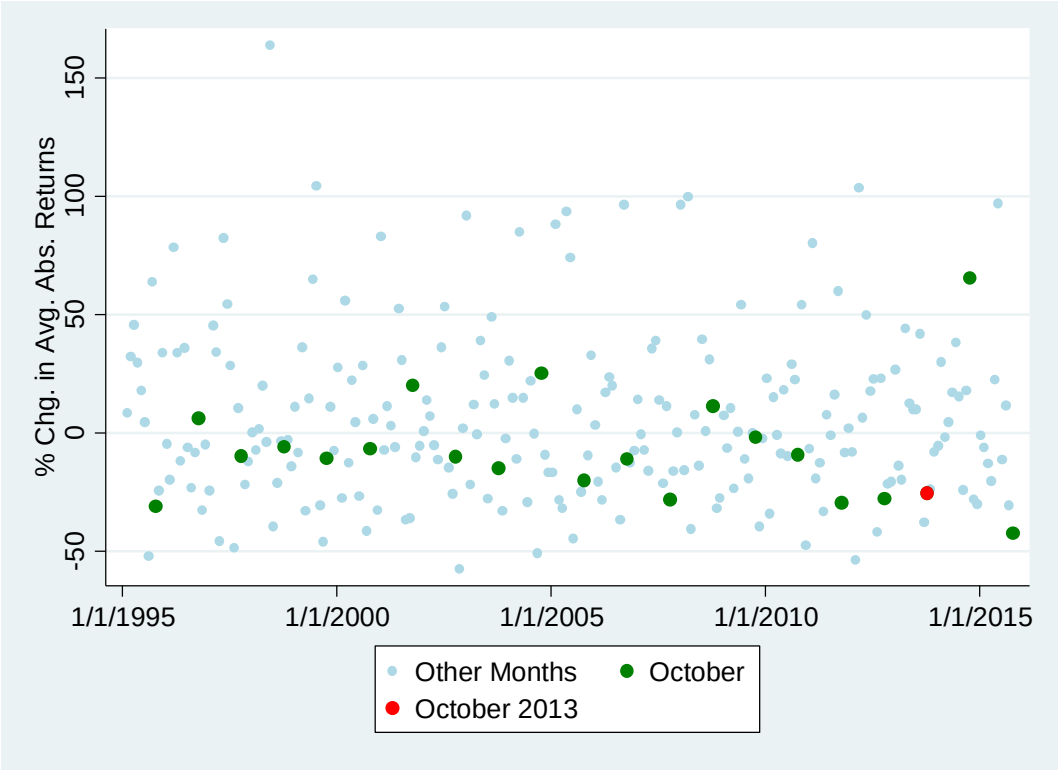
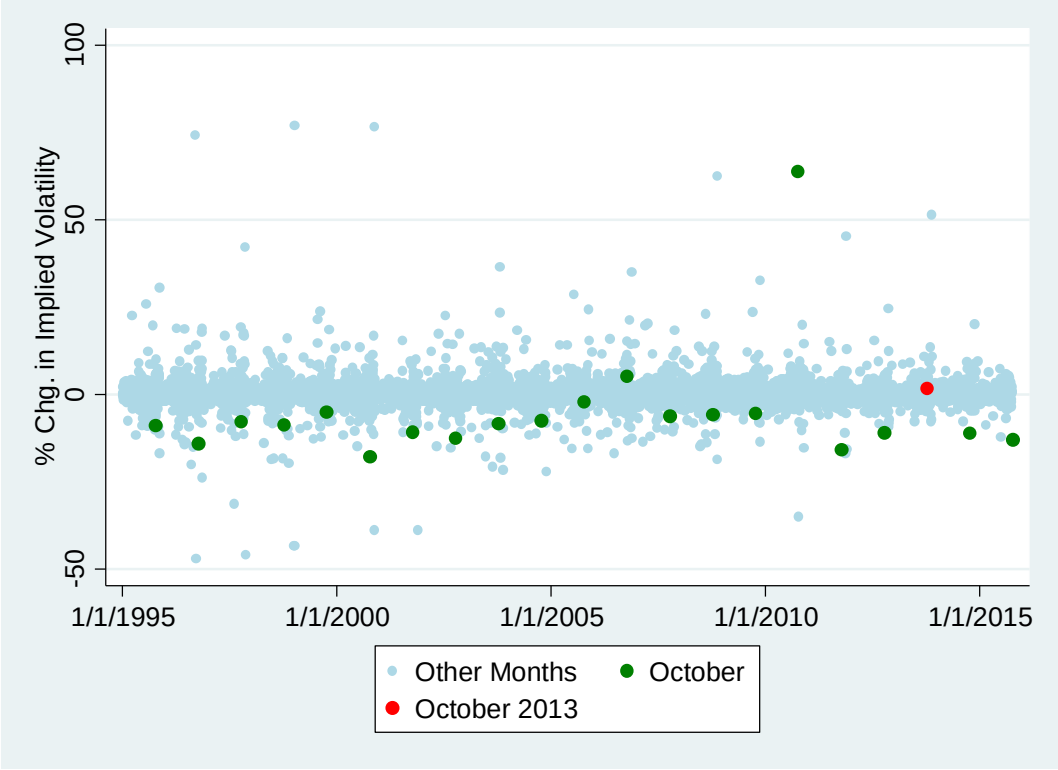


Figure 8. CBOT corn market implied and realized volatility of the Dec. contract immediately following scheduled WASDE publication, 1995-2015

Panel a. Implied volatility



Panel b. Absolute returns

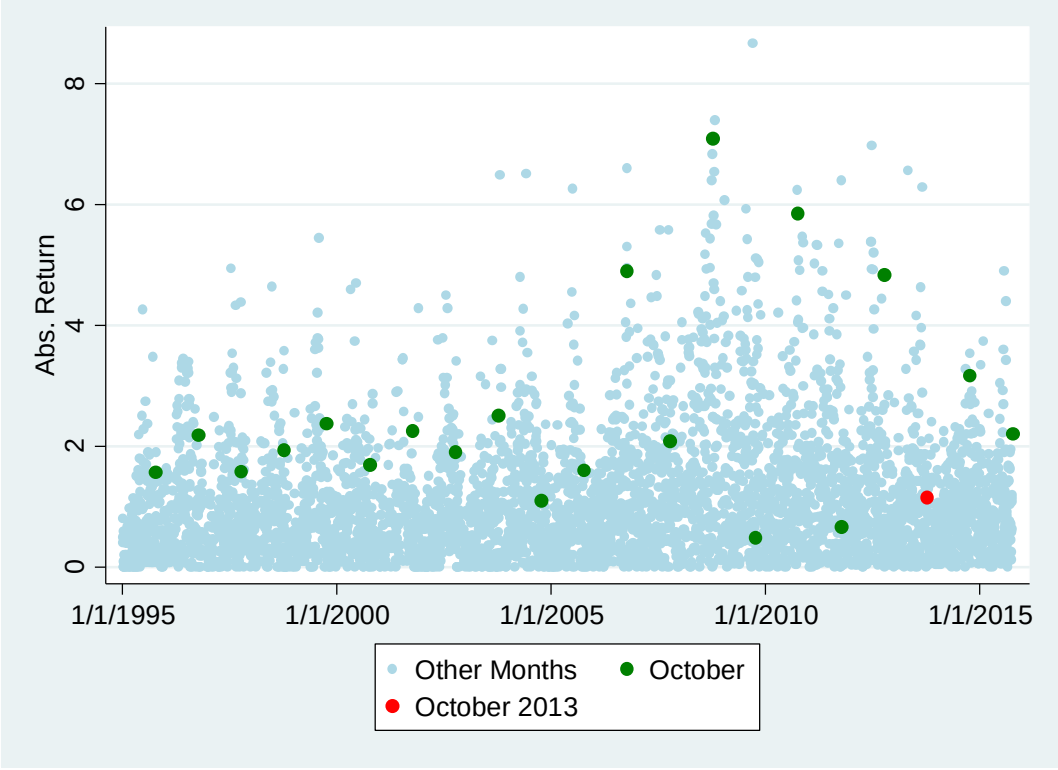
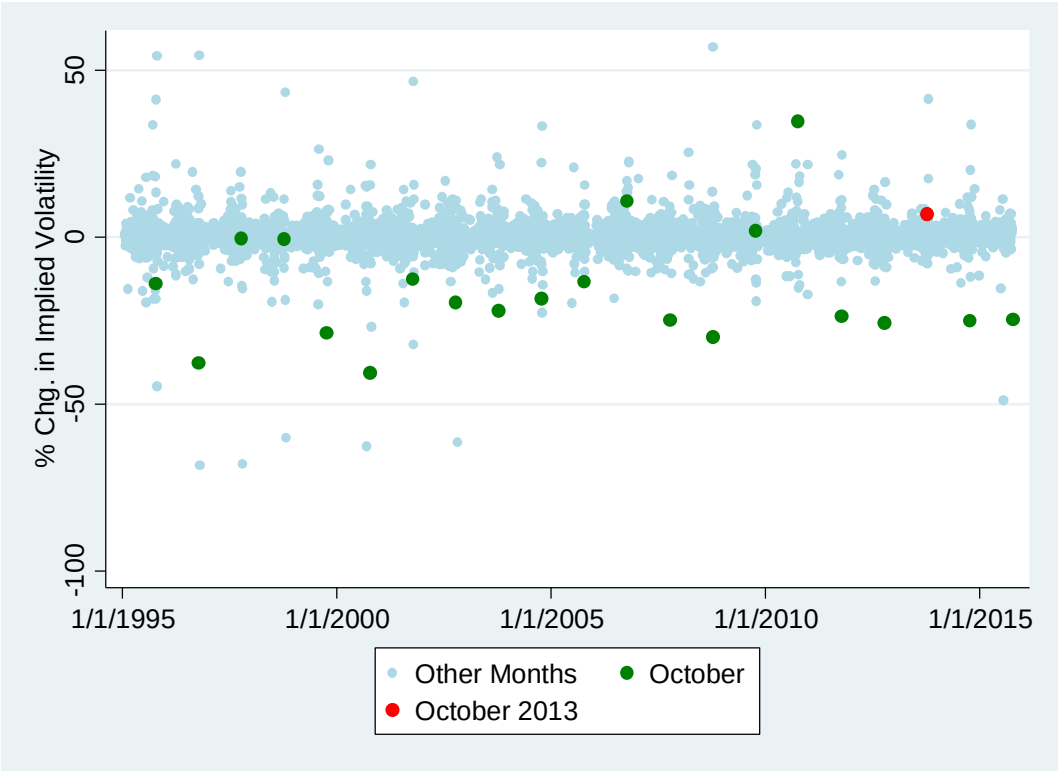


Figure 9. CBOT soybean market implied and realized volatility of the Nov. contract immediately following scheduled WASDE publication, 1995-2015

Panel a. Implied volatility



Panel b. Absolute returns

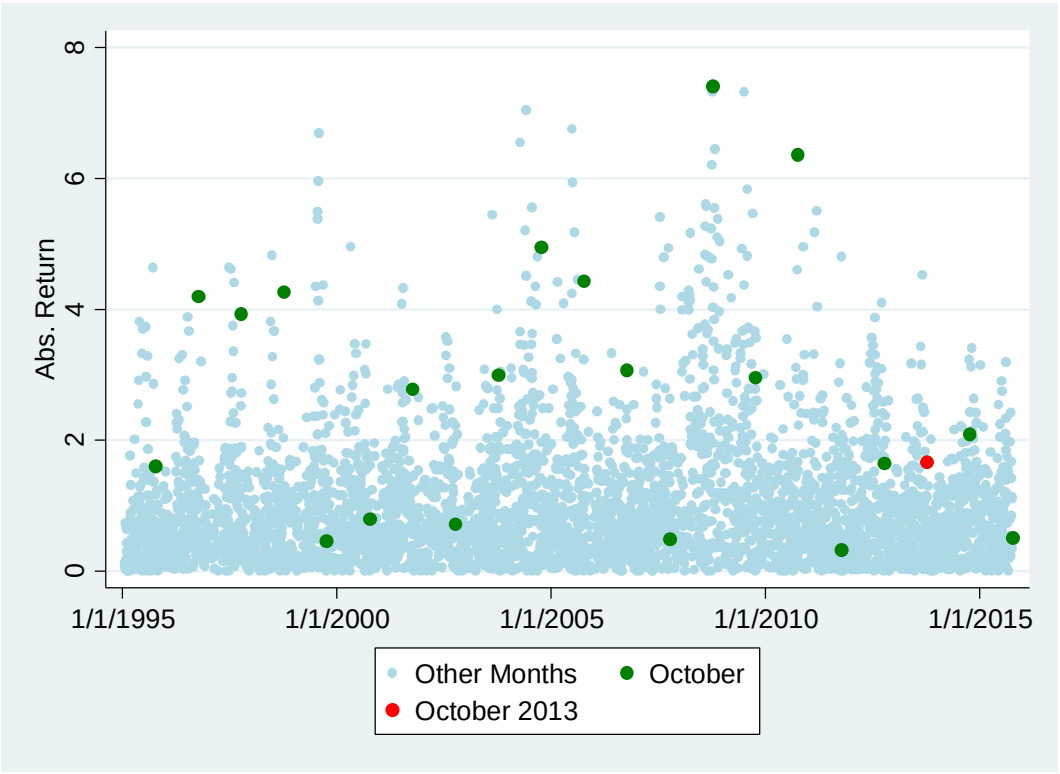
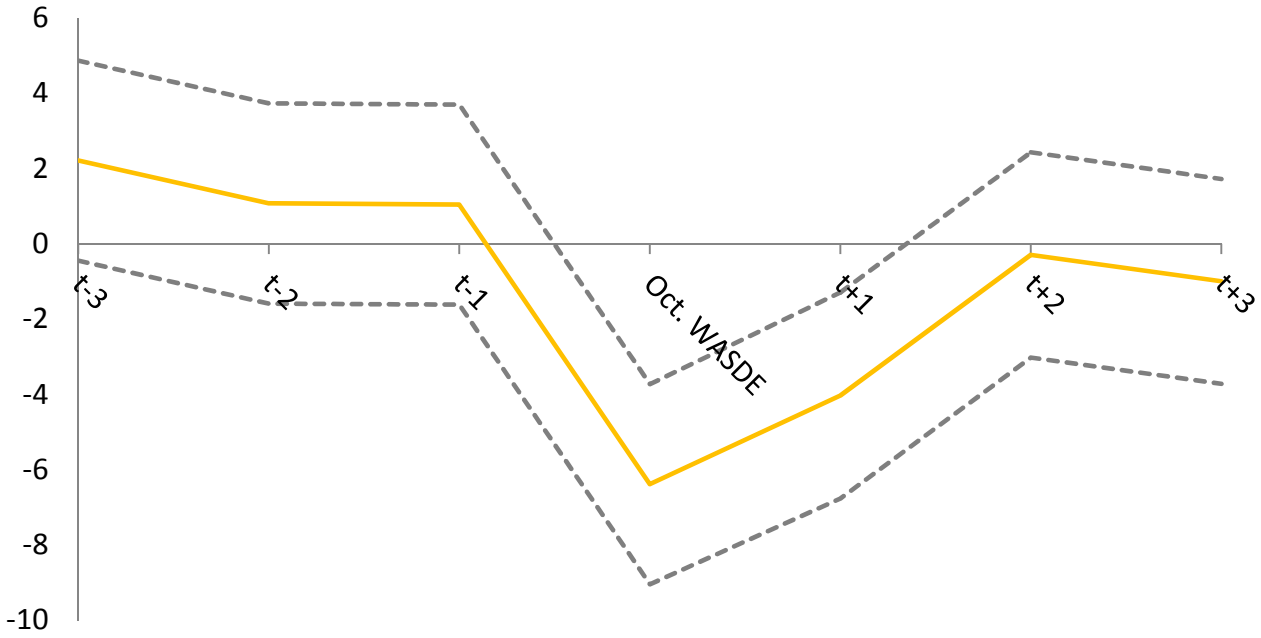
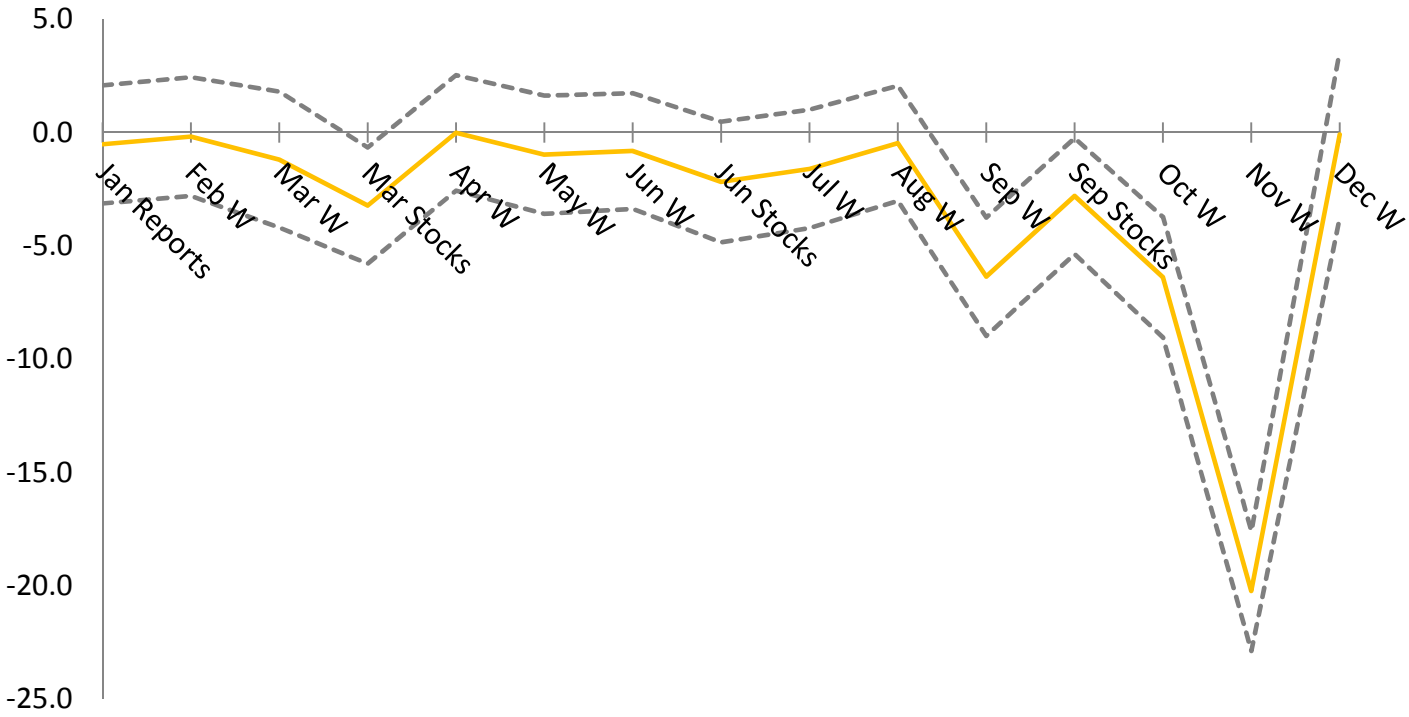


Figure 10. Effect of USDA reports on the CBOT corn Dec. contract implied volatility
Panel a. Generic October report on the 7-day event window (% change in IV)



Panel b. USDA Reports over the calendar year (% change in IV)



Panel c. Actual and alternative path of implied volatility in October 2013, had a WASDE report been published

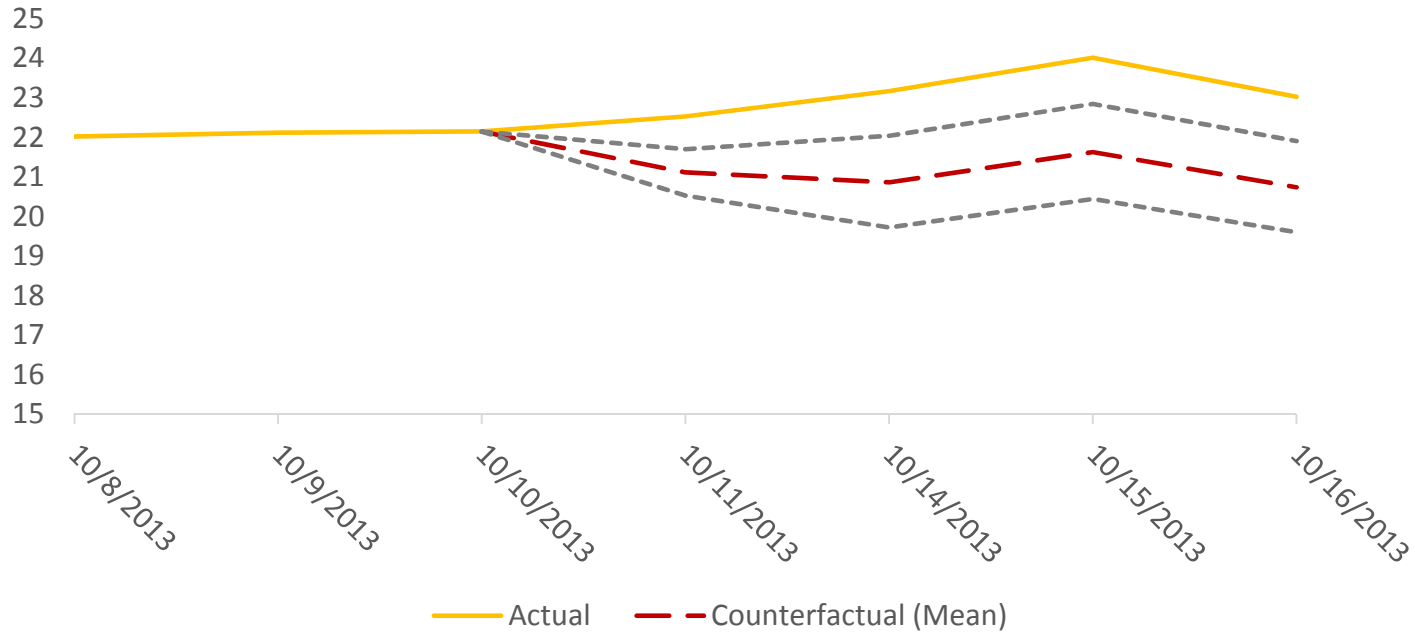
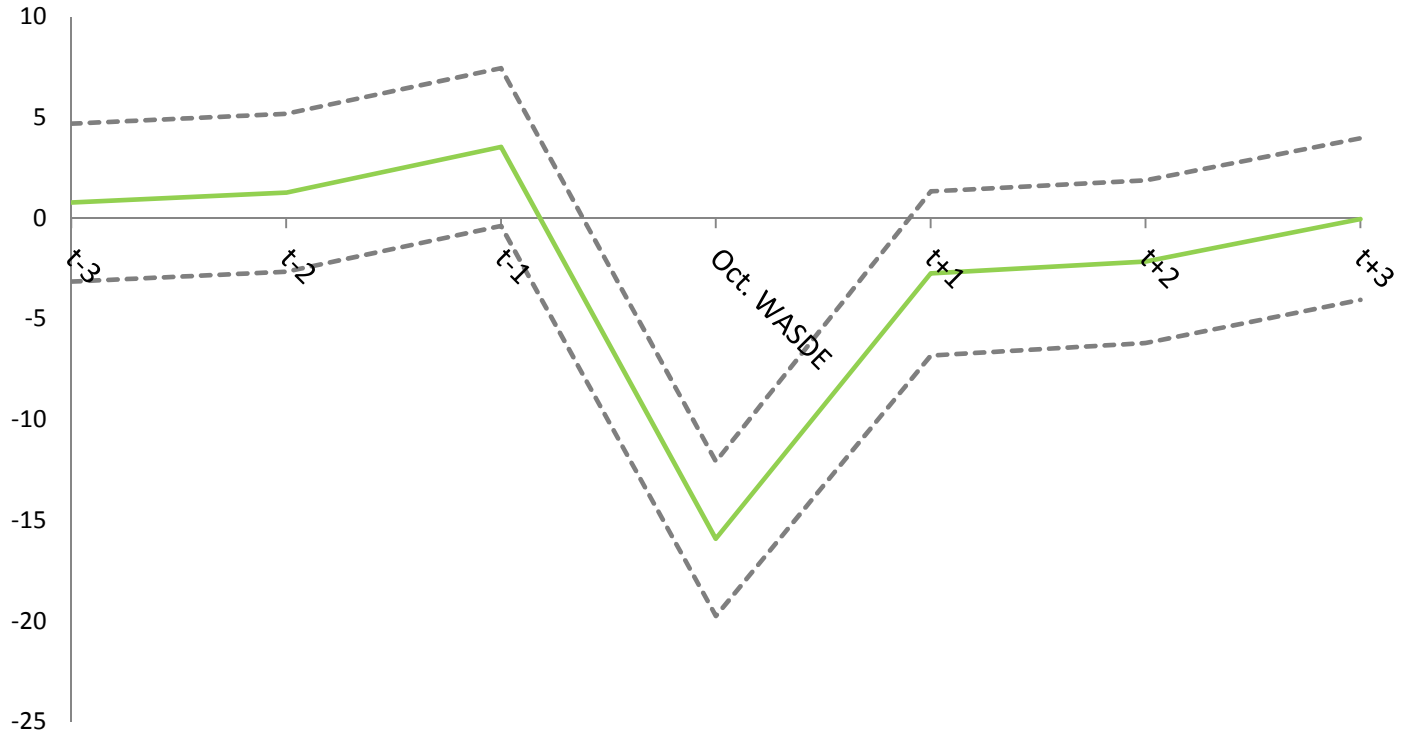


Figure 11. Effect of USDA reports on CBOT soybean market implied volatility

Panel a. Generic October report on the 7-day event window (% change in IV)



Panel b. USDA Reports over the calendar year (% change in IV)

Panel c. Actual and alternative path of implied volatility in October 2013, had a WASDE report been published

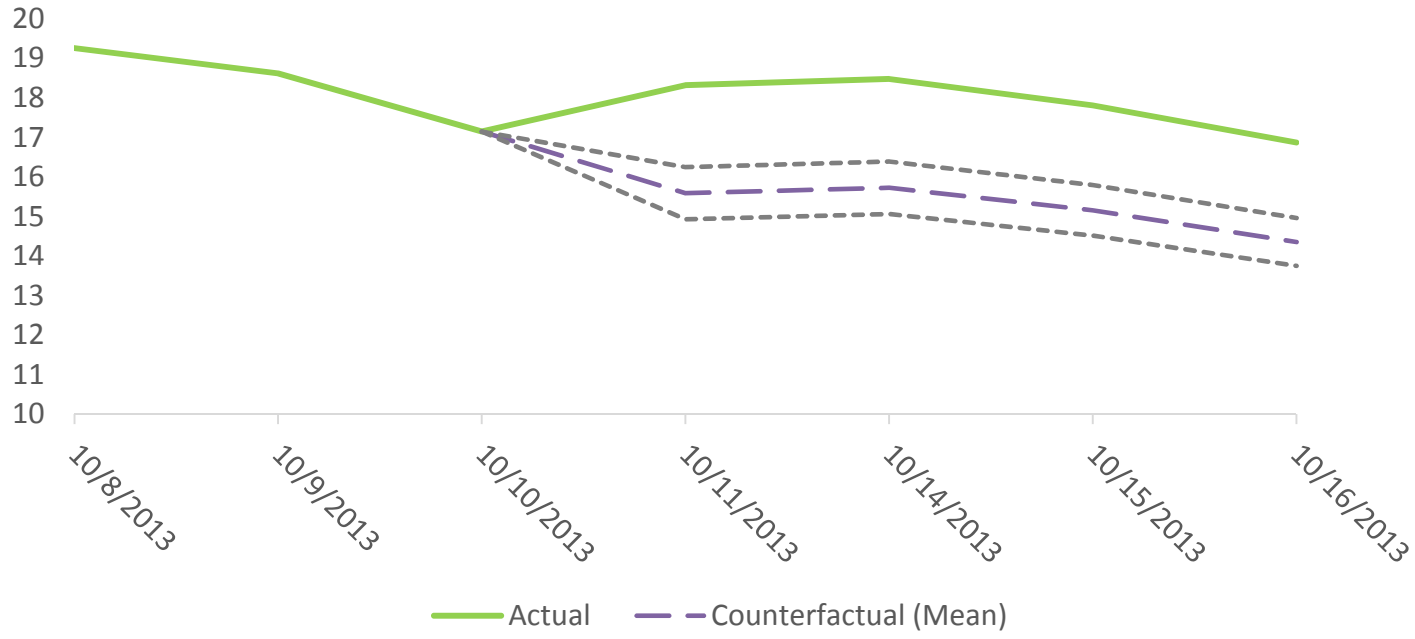
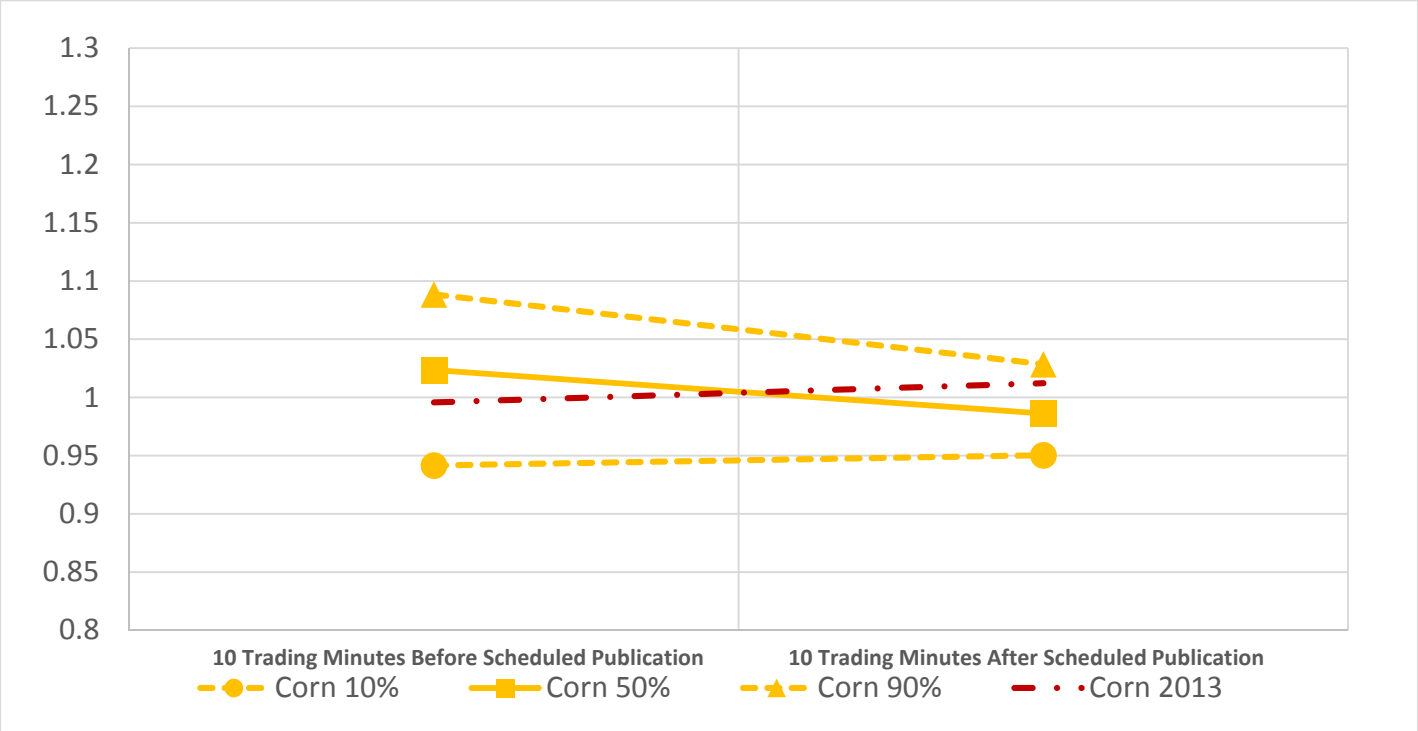
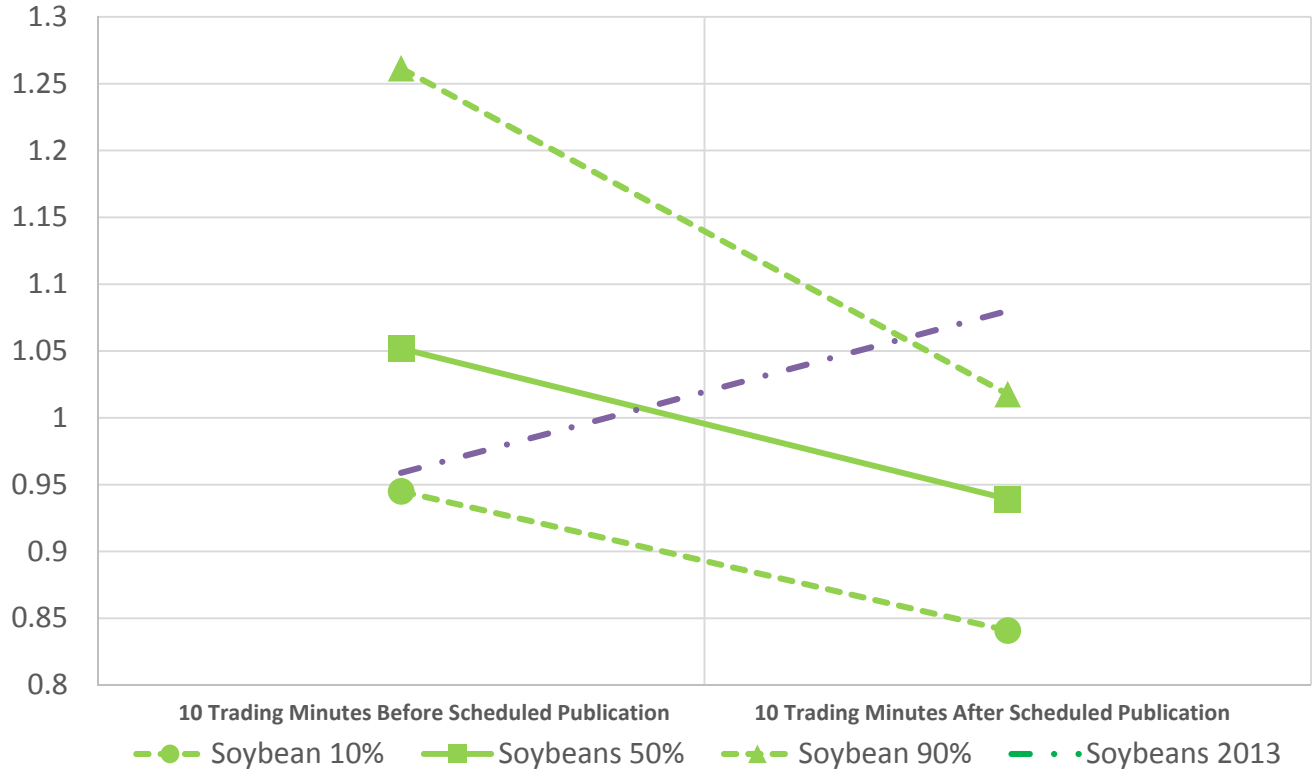


Figure 12. Simulated average normalized intraday implied volatility around the announcement time of October WASDE reports, 1995-2012, compared to levels observed on the scheduled 2013 release day

Panel a. Corn



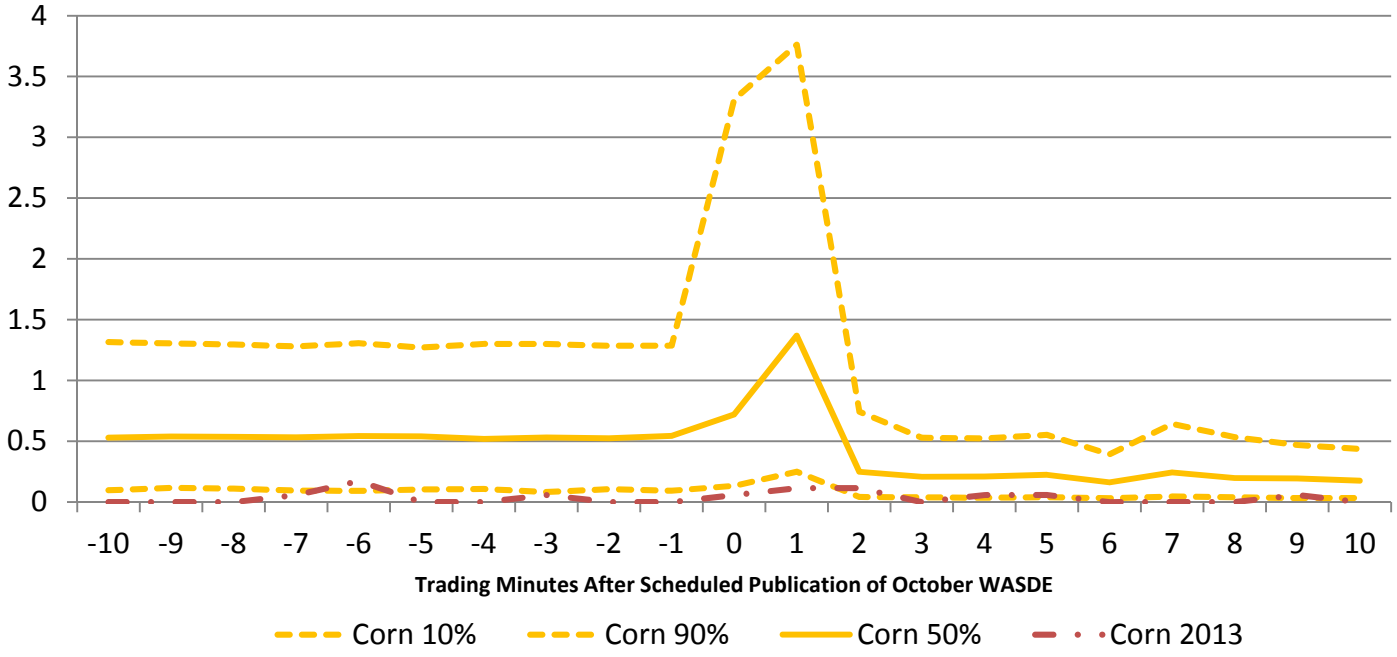
Panel b. Soybeans



Note: Implied volatility index values are shown on the vertical axis of both panels. At a value of 1, the normalized implied volatility is equal to the average IV level observed in the twenty trading minutes around the announcement time that of that year's report.

Figure 13. Simulated absolute futures returns around the announcement time of October WASDE reports, 1995-2012, compared to levels observed on the scheduled 2013 release day

Panel a. Corn



Panel b. Soybeans