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Abstract

The value of USDA reports in the U.S. agricultural commodity futures markets has been intensively researched, but few studies have examined market responses to USDA reports in overseas markets. This paper investigates announcement effects of major USDA reports using intraday Chinese soybean complex futures prices and volume from the Dalian Commodity Exchange for January 2010 to April 2020. Results suggest that USDA reports have substantial informational value for market participants in China. In particular, strongest price and volume reactions to the releases occur immediately after the market opens and can persist for as long as an hour, depending on the size of the information shock and market liquidity. Further, we show that the informational value of the World Agricultural Supply and Demand Estimates (WASDE) report does not appear to be diminished after China started to release its official balance sheets for major agricultural commodities.

Key words: Announcement effects, government news, USDA, Chinese commodity futures, intraday prices.

Introduction

China has become the most important consumer of food commodities in the global market; as of 2021 it is the world's largest agricultural importer ($133.1 billion in 2019, Jiang 2020) and the largest importer of soybeans.[2] While futures contracts with large volumes and commercial participation have historically had proximity to producing regions[3], the Dalian Commodity Exchange (DCE) has enjoyed increasing volumes and increasing use among global commodity handlers and other market participants. Increasing complexity of global supply chains that source product from disparate regions need tools to manage the spread between the price of imported commodities in producing regions and domestic prices, the rise of the DCE commodity futures contracts have helped to facilitate management of this basis risk (Economist 2021). This is especially true in the case of soybeans as China's share of global imports of soybeans have increased by more than 50% over the last 10 years.[1] However, not much is known about how interconnected the DCE futures contracts are to sources of information flows from global players in the associated commodities.

In this paper we hope to close this gap in information. We consider how quickly information from relevant USDA reports and the new China Agricultural Supply and Demand Estimates impacts and becomes fully incorporated into soybean no.1, soybean no. 2, soybean oil, and soybean meal futures contracts on the DCE.

[2] According to USDA Foreign Agricultural Service data.

[3] Contract offerings by the CME Group in North America, ICE and Euronext in Europe, B3 S.A. in Sao Paulo are notable examples.

A considerable body of work has examined the efficiency of commodity futures markets and their ability to transmit risk across space, time, and form. Regarding Chinese commodity futures, less work has been done, excepting the following. Wang and Ke (2005) found that DCE soybean futures are efficient, but the DCE wheat market was not. Ke et al. (2019) found that DCE played a secondary (but growing) role in global price discovery and that the soybean futures contract exhibited greater risk transmission than other commodity markets. Yang and Kerali (2022) find volatility spillovers between CBOT and DCE soybean futures, but less volatility spillover from the U.S. to China in recent years. Turvey et al. (2022), however found that price signaling had been strong between CBOT and DCE soybean futures contracts prior to trade conflict that began in 2018. However, after the trade dispute and retaliatory tariffs on U.S. soybeans went into effect, the price signaling between the two disappeared.

Similarly, there has been a large body of work that has studied the effect of USDA announcements on the associated U.S. commodity futures market prices. Isengildina-Massa et al. (2008a), Adjemian (2012), and McKenzie and Darby (2017) showed that USDA announcements had a significant impact on same day price returns of U.S. commodity futures, while Isengildina-Massa et al. (2008b) showed that implied volatility drops in the associated commodity futures markets after the same reports are released. These studies taken together support the notion that the reports contain information the market deems as important to price (Campbell et al. 1996).

There has been little work on USDA report impacts on international commodity futures markets. Mattos and Silveira (2015) showed that USDA crop reports impact Brazilian corn and soybean futures volatility, and McKenzie and Ke (2021) analyzed the USDA announcement

effect in the DCE commodity futures. They find that DCE soybeans react significantly and DCE corn reacts slightly to USDA report releases on the Chinese trading days following a USDA report release. They also find that volatility spillovers exist, with stronger upside risk spilling over from U.S. to Chinese markets than downside risk.

Other work analyzed intraday announcement effects and showed that U.S. commodity futures markets incorporate information from the USDA reports within a matter of minutes, based on a spike and return to baseline in volume and volatility (Lehecka et al. 2014 and Adjemian and Irwin 2018). However, there has not been a study of the intraday announcement effects of USDA reports on DCE markets.

In this paper we consider the intraday announcement effects of USDA reports on the following DCE futures contracts: soybeans no. 1, soybeans no. 2, soybean oil, and soybean meal. We consider contracts associated with the soybean complex because prior research has shown the most important market linkage between the U.S. and China is the soybean market. To our knowledge we are the first to consider the effects of USDA reports on soybean oil and soybean meal futures contracts on the DCE. With the U.S. ramping up soybean crushing capacity to increase biodiesel production from soybean oil. This will increase the supply of soybean meal without an commensurate increase in demand (Payen et al. 2021). Thus, exports of soybean meal from the U.S. could become more important over time. As commodity futures contracts on the DCE gain prominence among global market participants, it is critical to understand how efficient these markets are compared to established alternatives. Further, research has shown some shift in price discovery from U.S. futures markets to international markets that represent important

international markets outside the us, particularly in wheat (Arnade and Vocke 2015, Janzen and Adjemian 2017). Our paper contributes to this line of research by documenting the speed with which prices in China, the most important global consumer of soybean products, reacts to important supply and demand information from the U.S., the second biggest producer of soybeans in the world.

Background on Intraday Futures Data and U.S and Chinese Government Reports

Intraday Chinese Soybean Complex Futures Data

We use intraday transaction data for the Chinese soybean No.1, soybean No.2, soybean meal, and soybean oil futures traded at the Dalian Commodity Exchange (DCE). The No.1 and No2. soybean futures allow for the delivery of non-GMO and GMO soybeans, respectively. Although soybeans imported by China are mostly GMO soybean, previous studies find it has strong linkages with the U.S. soybean prices as it is more liquid (Han, Liang, Tang 2013; Li and Hayes 2017). We will present findings related to both soybean no. 1 and no. 2.

We focus on the most actively traded contract expirations as they dominate price discovery in storable commodity futures markets (Working 1948; Hu et al. 2020). It is worth noticing that the DCE also defines the most actively traded contract as the "dominant contract." Intraday transaction data timestamped to the millisecond are obtained from the Comprehensive Trading Platform (CPT), which is the most widely used electronic futures trading platform in China. The analysis period starts from January 4, 2010, when the CPT was introduced, and ends on April 30, 2021. However, for the soybean No.2 futures, we use the period after 2018 because the soybean

No.2 contracts became actively traded only after 2018 following the delivery rule changes[4].

USDA Reports

For comparison, we focus on the following major USDA grain market reports that are commonly studied in previous intraday analysis on USDA announcement effects (e.g., Lehecka, Wang, and Garcia 2014; Adjemian and Irwin 2018; Fernandez-Perez et al. 2018): the World Agricultural Supply and Demand Estimates (WASDE), Crop Production, Grain Stocks, Prospective Plantings, and Acreage reports. The monthly WASDE reports provide both U.S. and world supply and demand balance sheets for major grains, where China is typically listed as a major world soybean market. Although the other four reports only contain U.S. supply information, they could also affect Chinese soybean futures prices considering the U.S. is a major exporter. The monthly Crop Production reports include U.S. production information and are simultaneously released with the WASDE reports. The quarterly Grain Stocks reports provide the national and state-level grain stocks across the United States. Prospective Planting reports are released at the end of March each year and reflect expected planting acreage as of March 1st. Acreage reports are released yearly at the end of June and provide planted and/or harvested acreage information in the United States.

Institutional Backgrounds for the CASDE and WASDE Reports

On September 13th, 2015, China's Ministry of Agriculture and Rural Affairs (MARA) sent a

[4] The DCE announced the new delivery rules in May 2017 to improve liquidity. However, the new delivery rules only affected contracts with delivery dates after 2018. The average daily trading volume is only 1,620 before 2018 and 72,905 after 2018. Historical daily volume for the most active soybean No.2 contracts can be found in the appendix.

delegation to learn the U.S. agricultural report system with a particular interest in the preparation of the WASDE report[5]. The delegation was accommodated by the USDA and visited multiple USDA agencies, private agricultural information providers, commodity exchanges, universities, farms, etc. After the visit, on July 11th, 2016, China's MARA released the first Chinese Agricultural Supply and Demand Estimates (CASDE) report that is modeled after the WASDE report as described in the CASDE report introduction. The CASDE is the first report with regular agricultural supply and demand estimates released by a Chinese government agency without charge. Before, data related to agricultural markets in China were either released by government agencies or private companies for subscribers only.

The preparation and content of balance sheets in the CASDE report have many similarities with the WASDE report. The monthly WASDE report provides annual forecasts for the supply and use of major U.S. domestic and world agricultural products. It is prepared and released by the World Agricultural Outlook Board (WAOB), which chairs the Interagency Commodity Estimates Committees (ICECs). The analysts in the ICECs are from multiple USDA agencies. They compile and interpret information gathered from the USDA and other domestic and foreign official sources. Similarly, the CASDE report is reviewed and approved by the Chinese Agricultural Outlook Committee (CAOC). The CAOC chairs the Chinese Early Warning Information Analysis Team, which includes analysts who prepare the report by gathering and analyzing various information sources, including domestic production, stock, trade, weather

[5] See an official report about the visit. http://www.moa.gov.cn/gk/jcyj/201701/t20170122_5461605.htm (in Chinese)

map, remote sensing data, etc.

The CASDE report provides supply and demand balance sheets for corn, soybean, cotton, cooking oils, and sugar but does not include China's two most important staple food commodities, wheat and rice. The balance sheet for the soybean market uses the same format as the U.S. domestic balance sheet in the WASDE report. It provides four items: final estimates for the previous marketing year, current marketing year estimates, and projections in the current and previous month for supply (area planted, area harvested, yield per harvested hectare, production, imports) and use (crushing, food, seed, residuals, exports). It also includes estimates and projections for average wholesale and import CIF (cost, insurance, and freight) prices. Notably, beginning stocks are not included in the balance sheet as China is a net consumer. Balance sheets for the soybean oil market are similar; estimates and projections for supply (production and imports) and use (rural and urban consumptions) are also provided. Estimates and projections for prices are domestic wholesale and CIF prices for imports.

While the CASDE report models on the WASDE report, several key differences could limit its market influence. First, the CASDE report only provides Chinese domestic supply and demand information, while short-term agricultural commodity prices are more responsive to supply shocks in producing countries (Karali, Irwin, and Isengildina-Massa 2020; Janzen et al. 2014), particularly for the Chinese soybean market which highly depends on imports. Second, the CASDE report has a history of only five years, while the WASDE report has existed for nearly half a century. Even compared with the long-existing domestic private market reports that have been used by a large number of subscribers, the overall reliability and quality may still not

be competitive. Last but not least, for some reasons unknown, although the release dates for the CASDE reports are pre-scheduled, the actual release time during the day is not announced beforehand and occurs at different times with no discernable pattern. Interestingly, with only one exception, the CASDE reports are scheduled on the trading day before the release the WASDE report, which provides a unique experiment to show the relative informational value of the WASDE reports.

Methodology

USDA Report Release Schedule and DCE's Trading Hours

Figure 1 demonstrates the relationship between release time for USDA reports and trading hours at the DCE. Two different release schedules are used for USDA reports during the sample period. Before 2013, the USDA released its reports at 8:30 a.m. U.S. eastern standard time (EST) before the market opening. Beginning from January 2013, the USDA reports are released at 12 a.m. (EST) during the daytime trading hours. The local time in China is 12 hours ahead of the U.S. (EST), and the time difference becomes 11 hours during the U.S. Day Light Saving. On December 26, 2014, the DCE introduced a night trading session to the soybean complex futures. Before that, USDA reports were released during the halt trading hours at the DCE regardless of the change in USDA's release schedule. Initially, the night trading session at the DCE overlapped most of the daytime trading hours at the CBOT from 9:00 EST (8:00 during daylight saving) to 14:30 EST (13:30 during daylight saving), providing full-time overnight price discovery and risk management functions to traders. In this regime (regime 3 in figure 1), USDA reports were released during the night trading session and affected trading in real-time.

However, on May 8, 2015, the DCE reduced night trading hours from 5.5 hours to 2.5 hours as market participants complained that the prolonged night trading session increased labor costs and not much trading happened after midnight. Later, the DCE further reduced the night session trading hours to only 2 hours from 23:00 to 21:00 local time. In the trading regimes associated with a shortened night trading session (regime 4 and 5), USDA reports were released during a halt trading period. Previous studies find trading on USDA reports in real-time behaves differently than in halt trading periods (Adjemian and Irwin 2018; Joseph and Garcia 2018). However, because USDA reports only have real-time effects on the DCE soybean complex futures trading in regime 3, which only includes five WASDE reports, we drop the period December 26, 2014, to May 7, 2015, from our analysis. Hence, our analysis focuses on the USDA announcement effects on the following daytime trading sessions since it is the nearest trading period that could reflect the USDA news[6].

Constructing the Event Window for USDA Reports

During the sample period, the USDA released 123 WASDE and Crop Production reports, 43 Grain Stocks reports, 11 Perspective Planting reports, and 10 Acreage reports[7]. Because several reports were simultaneously released on the same day, there are 159 release days in the period of

[6] Unlike the CBOT, the DCE does not have Sunday night trading sessions. Therefore, even if a USDA report is released on a Friday, it affects the Monday daytime trading session first. Similarly, in case of a Chinese holiday, the DCE reopens in the first daytime trading session following the holiday. Hence, even when a USDA report is released during a Chinese holiday, it still affects the nearest daytime trading session first.

[7] The government shutdowns in 2013 and 2019 prevented the releases of two WASDE reports, and one Grain Stocks report during the sample period.

analysis[8]. However, recall that we exclude the 5-month period during which the USDA reports were released during the DCE night trading hours. Hence, five WASDE reports are dropped from the analysis.

To construct a baseline of normal market conditions, we consider three trading days before and after each release. To avoid the possible impact of the CASDE report, when the event window includes a CASDE report, we exclude the CASDE report day and expand the event window by including one more non-announcement trading day before the release day. Non-announcement days around two reports could overlap due to Chinese holidays between the two reports. In this case, we only count the overlapping non-announcement day(s) once. In addition, to avoid possible holiday effects, we exclude the trading day following a Chinese national holiday for both the announcement and non-announcement days.

Overall, there are 129 report days and 754 non-report days for the Soybean No.1, soybean meal, and soybean oil futures. For the soybean No.2 futures, because we only consider the period after 2018, there are 49 report days and 288 non-report days used for our analysis.

Volatility and Trading Volume Measures

Previous studies on the informational value of USDA reports have focused on announcement effects on price volatility and volume to test the semi-strong-form market efficiency hypothesis (Lehecka, Wang, and Garcia 2014; Joseph Garcia 2014; Adjemian and Irwin 2018). We construct minute-to-minute volatility and volume measures and compare their intraday patterns between

[8] For consistency and clarity, the release day refers to the day following the USDA report at the DCE.

release and non-release days. We follow Adjemian and Irwin (2018, 2020) and use the high-low volatility measure, which captures the maximum price movement in a short time interval. However, different from Adjemian and Irwin (2018, 2020), we normalize the high-low volatility measure by the price level to control the impact of changing underlying market conditions (Hasbrouck and Saar 2013; Hu, Serra, and Garcia 2021).

The high-low volatility measure $Highlow_t$ is defined as

$$HighLow_{t,d} = \frac{ln(High_{t,d}) - ln(Low_{t,d})}{ln(Medium_{t,d})},$$

where $High_{t,d}, Low_{t,d}$ and $Medium_{t,d}$ represent the highest, lowest, and medium price in the trading minute interval t on trading day d. To compare volatility on release and non-release days, we calculate the average high-low volatility ($\overline{Highlow}$) and express it in basis points (bps) for the trading minute interval t over all days for USDA release and non-release days as

$$\overline{Highlow}_t = 10000 \times \frac{1}{N} \sum_{d=1}^{N} HighLow_{t,d},$$

where N represents the total number of days that should be different for release and non-release days.

Same for trading volume, we calculate the average trading volume ($\overline{\text{Volume}}$) for trading minute interval t overall trading days for USDA release and non-release days as

$$\overline{Volume}_t = \frac{1}{N} \sum_{d=1}^{N} Volume_{t,d}.$$

Table 1 compares average minute-to-minute high-low volatility and trading volume between release and non-release days. The table further sorts the results for release days and surrounding non-release days by the size of news shock carried by the reference release day. Table 1 shows that

volume and volatility are generally higher on release days than non-release days for each commodity. However, average minute volatility and volume on release days versus non-release days is small. For example, soybean no. 2 average minute volatility is 1.12 on big shock release days versus 1.02 on non-release days, and average minute volume on big shock release days is 178.24 contracts versus 155.90 contracts on non-release days.

Table 2 presents average minute-level high volatility and volume on different report days. Across all four contracts considered, the Prospective Plantings report was associated with the highest volatility and volume compared to other reports. Next largest was the Grain Stocks report. This is to be expected because we the Prospective Plantings report only comes out once per year and sets expectations for production during that crop year. Grain Stocks is released quarterly and is very impactful to markets in short crop scenarios.

In cases when there are no trades in the minute of interest due to tranquil market conditions, both volatility and volume are considered zero as they reflect inactive trading. However, when no trading occurs due to price limit moves, we set both measures as missing observations as they are concealed by the price limits. Previous studies using intraday data have difficulty distinguishing price limit moves from tranquil markets as observations are missing in both cases (Adjemian and Irwin, 2018; Lehecka, Wang, and Garcia, 2014). As the DCE publishes information about price limit-moves, including dates and affected contracts on its website, we identify price limit moves based on the DCE's published information and set other missing observations as zero in the dataset.

Table 3 shows the number of price limit move days associated with each USDA report. We

further compare the number of price-limited trading with the total number of reports and the total number of price-limited trading during the sample period in the most active contracts. Overall, we found limited evidence that USDA reports lead to extreme price movements in the most active contracts, except in the soybean meal market, where 9 out of 12 limit moves during the sample period happened after the release of a USDA report. In particular, there were 9 Acreage reports released during the sample period, and one-third (3/9) of them caused the occurrence of price limit moves.

Modest differences in the average levels over an entire trading day can mask important differences during a brief period of price discovery at the beginning of a trading session following the release of new information. Therefore, our main contribution, to follow in the results section, is to break down the volume and volatility measures by minute of the trading day to illustrate the size of intraday impacts and how quickly they dissipate.

Measuring USDA Announcement Effects

The informational value of the USDA report is measured as the average difference between the minute-level volatility and volume on USDA release and non-release days. If the USDA report contains valuable information for overseas market participants at the DCE, then volatility and volume on release days should exceed the normal levels on non-release days. As the distribution of volatility and volume are non-normal in agricultural futures markets (Yang and Brorsen 1994), including Chinese agricultural futures markets (McKenzie and Ke 2021), to formally test the difference between high-low volatility and trading volume on release and non-release days, we use the non-parametric Wilcoxon test for volume and Kolmogorov-Smirnov test

for high-low volatility as in Adjemian and Irwin (2018, 2020).

Under the semi-strong form of market efficiency, prices react to public information only when the release contains unanticipated market "surprise" (Fama 1970). A set of previous studies measure market surprise as the difference between consensus expectations prior to the scheduled releases, and the USDA report estimates to identify the information content of the USDA reports (Colling and Irwin 1990; Garcia et al. 1997; Frank, Garcia, and Irwin 2008; McKenzie 2008, Fernandez-Perez et al. 2018). However, this approach is subject to measurement errors as survey-based forecasts may not come from a representative group of analysts. Additionally, it is impossible to disentangle the true market surprise when dealing with multiple simultaneously released information. (Adjemian and Irwin, 2018; Chen and Dorfman 2019; Karali, Irwin, and Isengildina- Massa 2020). To avoid the complication of measuring overseas market surprises associated with USDA reports, we follow Adjemian and Irwin (2018) and present our results for USDA announcements associated with large and small shocks, separately. Release days with a close-to-close return higher (lower) than the sample median are classified as "big shocks" (Small shocks") and will be compared with the surrounding non-release days.

Comparing Market Influence Between WASDE and CASDE

Previous studies on the relative informational value of the USDA reports compared with alternative information sources typically focus on private reports (Isengildina-Massa, Karali, and Irwin 2020; Egelkraut et al. 2003) and futures price information (Irwin, Gerlow, and Liu 1994). The fact that the CASDE report models the WASDE report and is released on the trading day before the WASDE report provides a good opportunity for comparing the market influence

between the two reports in an event study framework. Similarly, we define the three trading days before the CASDE report and the three trading days after the WASDE report as the non-release days and calculate averaged minute-level volatility and volume for the two reports and non-release days. We then compare averaged minute-level volatility and volume between the WASDE and CASDE reports. Again, the non-parametric Wilcoxon test and Kolmogorov-Smirnov test are used to test for the statistical significance of the differences in volatility and volume between the two reports, respectively.

If the CASDE report contains valuable fundamental information and is released on the day before the WASDE, we would expect to see the market impact of the WASDE report reduced after July 2016 as the CASDE report provides overlapped information (balance sheets for Chinese soybean markets) with the WASDE report. Hence, we also statistically test whether the value of the WASDE report on the DCE soybean complex futures declined after the introduction of the CASDE report. To show whether the release of the CASDE report affects the informational value of the WASDE report, the CASDE report release days are included as non-released days in the event window for the period of July 2016 and considered as non-WASDE report release days. Consistently, the announcement effect of the WASDE report is calculated as the average difference between volatility and volume on release and non-release days for each minute to account for the changing market volatility. Again, we use the Wilcoxon and Kolmogorov-Smirnov tests for changes in excess minute-level trading volume and high-low volatility. Because we only use the period after 2018 for the soybean No.2 contract, it is not included in this comparison. Because announcement effects are most pronounced after market

opens, we present changes in minute-level high-low volatility and trading volume for the first 5 minutes after the market opens.

Results

Intraday Market Reactions to USDA Announcements

Figure 2 and figure 3, compare average minute-level high-low volatility and trading volume between USDA announcement and non-announcement days, respectively. These figures show the typical U-shaped pattern of heightened volume and volatility at the beginning and end of regular trading hours. The red lines show volume and volatility on release days, while the blue lines show the same for non-release days. Generally, the red and blue lines are very close to one another, indicating there is not a profound difference between volume and volatility on release and non-release days. However, some separation is notable, especially in the case of volume of Soybean No 2.

Figure 4 and 5 display the periods where the informational value of the USDA reports are statistically significant. We define the informational value of USDA report to be the average difference of volume and volatility on USDA report days and non-report days. The differences are expressed in percentage using the non-release days as the baseline. We set the difference as 0 if the null hypothesis of equivalence between release and non-release days is rejected by the Kolmogorov-Smirnov test for volatility or the Wilcoxon test for volume test. Figures 4 and 5 show that the first minutes of trading in the regular session is where volume and volatility is likely to be statistically significantly higher on release days than non-release days, this is especially pronounced in the trading volume figure for soybean meal and soybean oil. The differences are

large as well, with all contracts and for both big and small shocks experiencing volume and volatility more than 25% higher and many contracts spending time with volume and/or volatility greater than 50% higher than non-release days.

Relative Informational Value of the WASDE Report Compared to the Chinese CASDE Report

Figure 6 presents average minute-level volatility and volume on WASDE, CASDE report release days and non-release days. We focus on the first trading session at the DCE as announcement effects are predominant in the first trading session in shown in previous sections. Further, since the WASDE and CASDE are directly comparable to each other, we focus on the WASDE report for this figure and leave out release days of other USDA reports considered in figures 2-5. In this figure it appears that the CASDE report does not generate greater volume or volatility response than non-release days. For comparison, we see that the WASDE report generally elicits greater volume and volatility than the CASDE release days and non-release days, with the difference most pronounced in soybean no. 2 volume, soybean meal volume and volatility. A light increase in volume is observed in soybean no.1 and soybean oil volume and soybean no.2 and soybean oil volatility.

Figure 7 shows which minute periods during the 9-10:15am period had a statistically significant difference between WASDE and CASDE release days in both volume and volatility. Here we see that WASDE release days generate at least some minute periods with higher volume and volatility than CASDE release days. Soybean no. 1 showed the least evidence of greater volumes and volatility on WASDE days than CASDE days, which is likely due to the no 1 contract consisting of non-imported non-GMO soybeans. Soybean meal is associated with the

largest differences between volume and volatility on WASDE and CASDE days, with volume on WASDE days spending several periods during the 9-10:15am session with around 50% greater volume and more than 75% greater volume in the first minutes off the open.

In table 4 we measure the change in informational value of the WASDE report after the introduction of the CASDE report. We defined the informational value of USDA reports to be the difference in volume and volatility after the release of USDA reports compared to non-release days. So the change in informational value is how much this spread has decreased. The idea is as follows, if the CASDE report has informational value to market participants, then the impact of the WASDE report (which is released shortly after the CASDE report and includes information in the CASDE) should be diminished.

For table 4, we focus on the first 5 minutes of the DCE trading day because our prior results show that impacts are concentrated in the first minutes of trading. In total, there are 54 pairs of WASDE and CASDE reports released during the sample period[9], hence we include 54 release days for each subsample period before and after the implementation of the CASDE report. Overall, the results show no diminished informational effects of the WASDE report. We have several point estimates across contracts and minutes in both positive and negative territory. However, the only statistically significant results are positive, which does not suggest decreased informational value.

Conclusions

[9] The January 2019 WASDE report was prevented by the government shutdown, and the February 2019 CASDE report was released after market close. Hence, those two releases are dropped from the analysis.

In this paper we estimated the intraday announcement effects of USDA reports on the DCE soybean complex futures contracts: soybeans no. 1, soybeans no. 2, soybean oil, and soybean meal. We show that supply and demand information in USDA reports is incorporated into the DCE price within one hour of trading after the report release. As the first paper to consider the effects of USDA reports on soybean oil and soybean meal futures contracts on the DCE, we show that DCE soybean meal and oil futures contracts also respond to supply and demand information in the USDA reports and incorporate this information within one hour. Further, we show that the informational value in the WASDE report does not appear to be diminished after the implementation of the CASDE report, as evidenced by no decline in the volume and volatility spike associated with the WASDE release.

Our study has some limitations in interpretation. As with all announcement effect event studies, we cannot be entirely certain that the increases in volume and volatility in DCE futures following USDA report releases are attributable to the report releases. We rely on the assumption that if we find consistently elevated volume and volatility over a large number of reports, then coincident but unrelated spikes will not be detected in the average reported. Similarly, we cannot be certain that our results are due to an information effect or whether we are simply observing cointegrated markets, so that when volume and volatility spikes in the U.S. market we observe it in the Chinese market as well. However, commercial commodity traders are sophisticated so it seems unlikely that traders of the DCE contracts would observe increased volatility in the U.S. futures markets and not realize what has caused it, so this concern seems unlikely.

Our work has several implications for future work. First, this study only considered futures

contracts in the soybean complex on the DCE. Further work could analyze the intraday effects on corn, wheat, and cotton futures markets to determine if the findings of prior work that those commodities are less impacted by information coming out of the USDA. Also, Brazil's CONAB published crop reports related to production in Brazil. Future work could consider whether DCE futures react to those reports in a similar fashion as they do to the U.S. reports. Finally, our work has implications for the understanding of futures market industrial organization. The CME Group has enjoyed dominance in the future exchange industry for more than a decade, buying or partnering with several other prominent futures exchanges in the U.S. and around the globe (The Economist 2013). However, our paper is one of a growing list showing that some contracts historically dominated by the CME Group are being incroached upon in volume and influence by contracts on other exchanges (Mattos and Silveira 2015, Janzen and Adjemian 2017).

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Figures

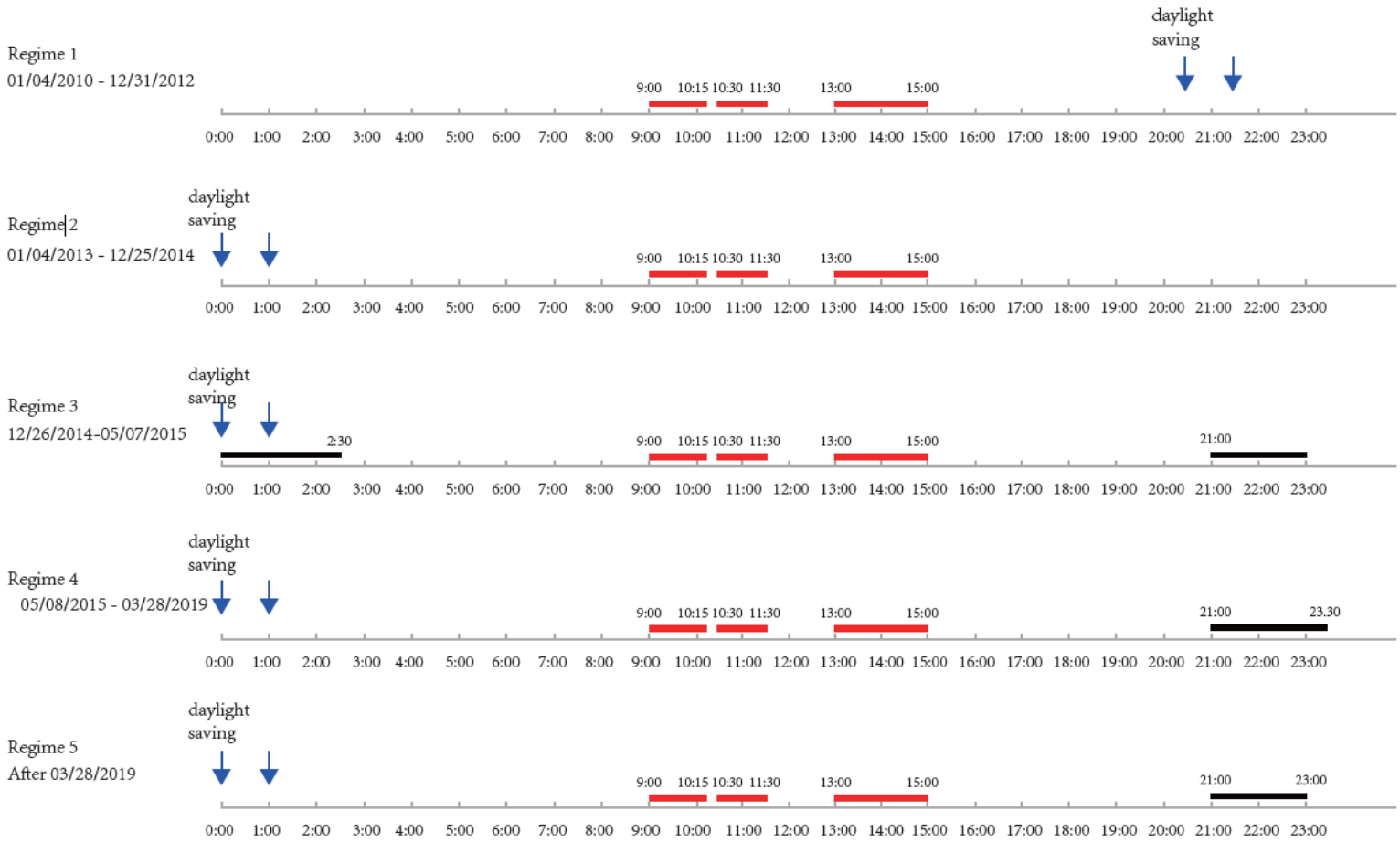

Figure 1: DCE trading hours (local time) and the report release schedules of major USDA reports (January 2010 – April 2021)

Note: red and black bars indicate day session and night session trading hours, respectively. Blue arrows represent the scheduled USDA announcement time

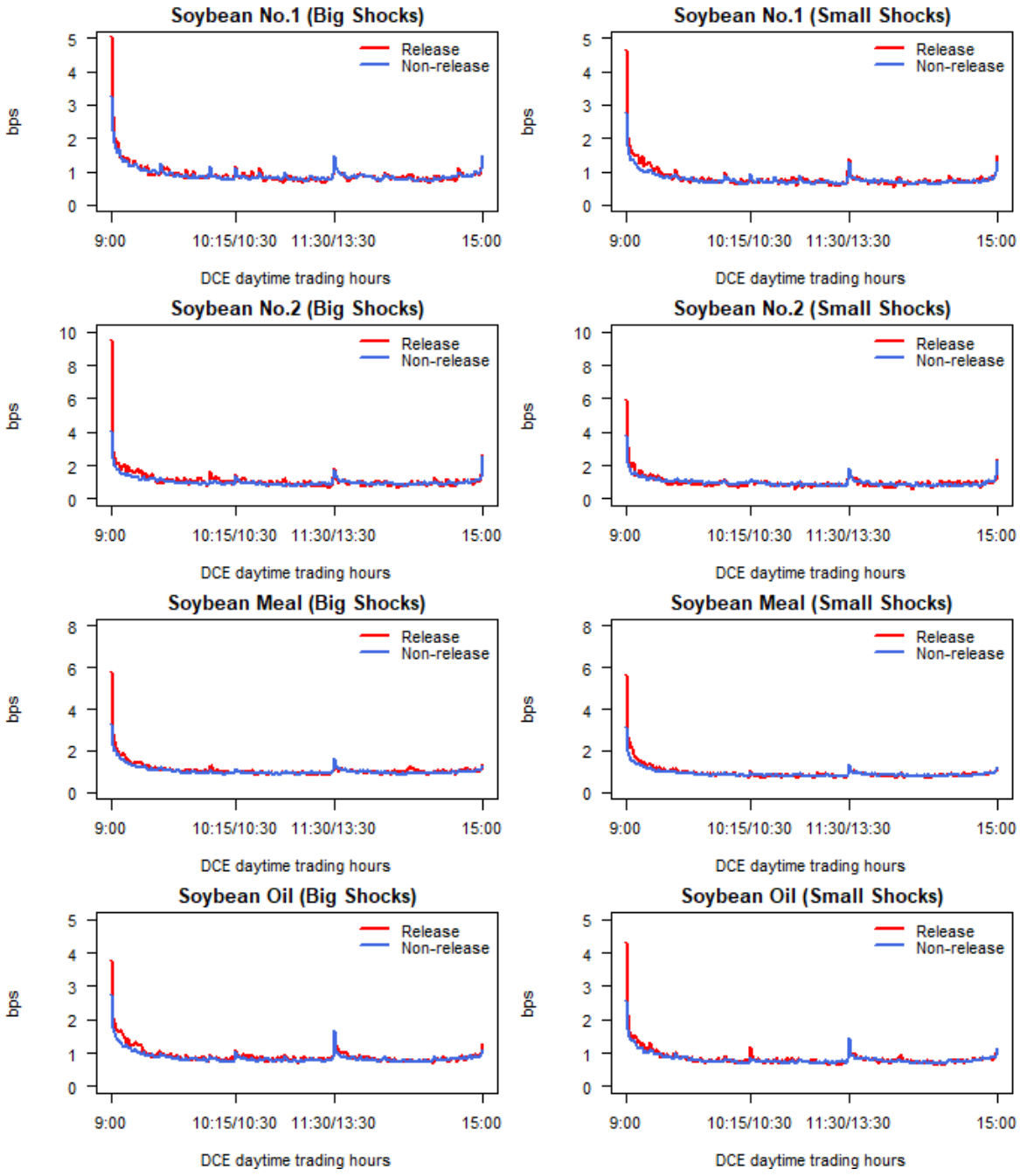

Figure 2: Average Minute-to-Minute High-Low Volatility during DCE Day Time Trading Hours Comparing USDA Release Days to Non-release Days

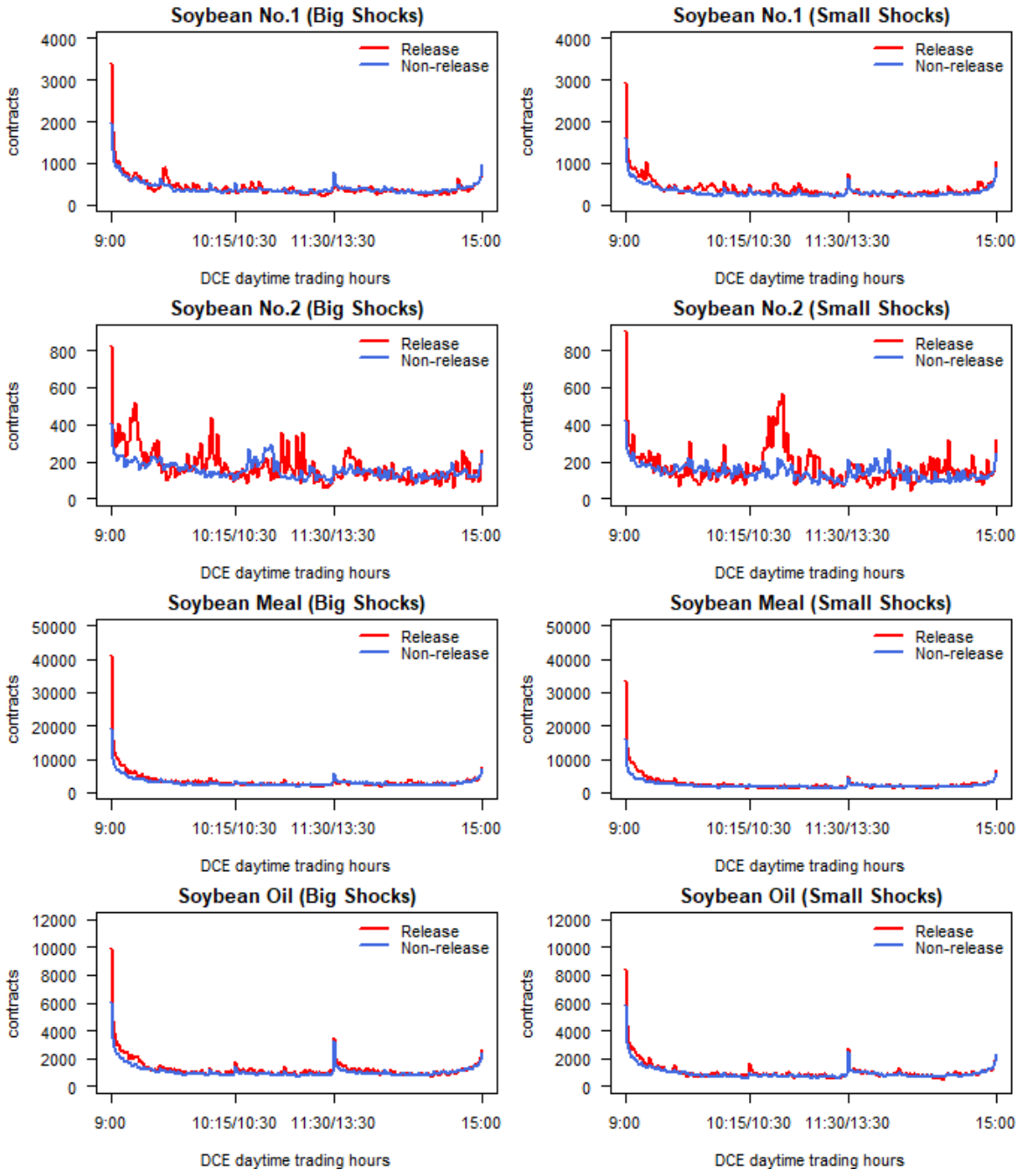

Figure 3: Average Minute-to-Minute Trading Volume during DCE Day Time Trading Hours by Comparing USDA Release Days to Non-release Days

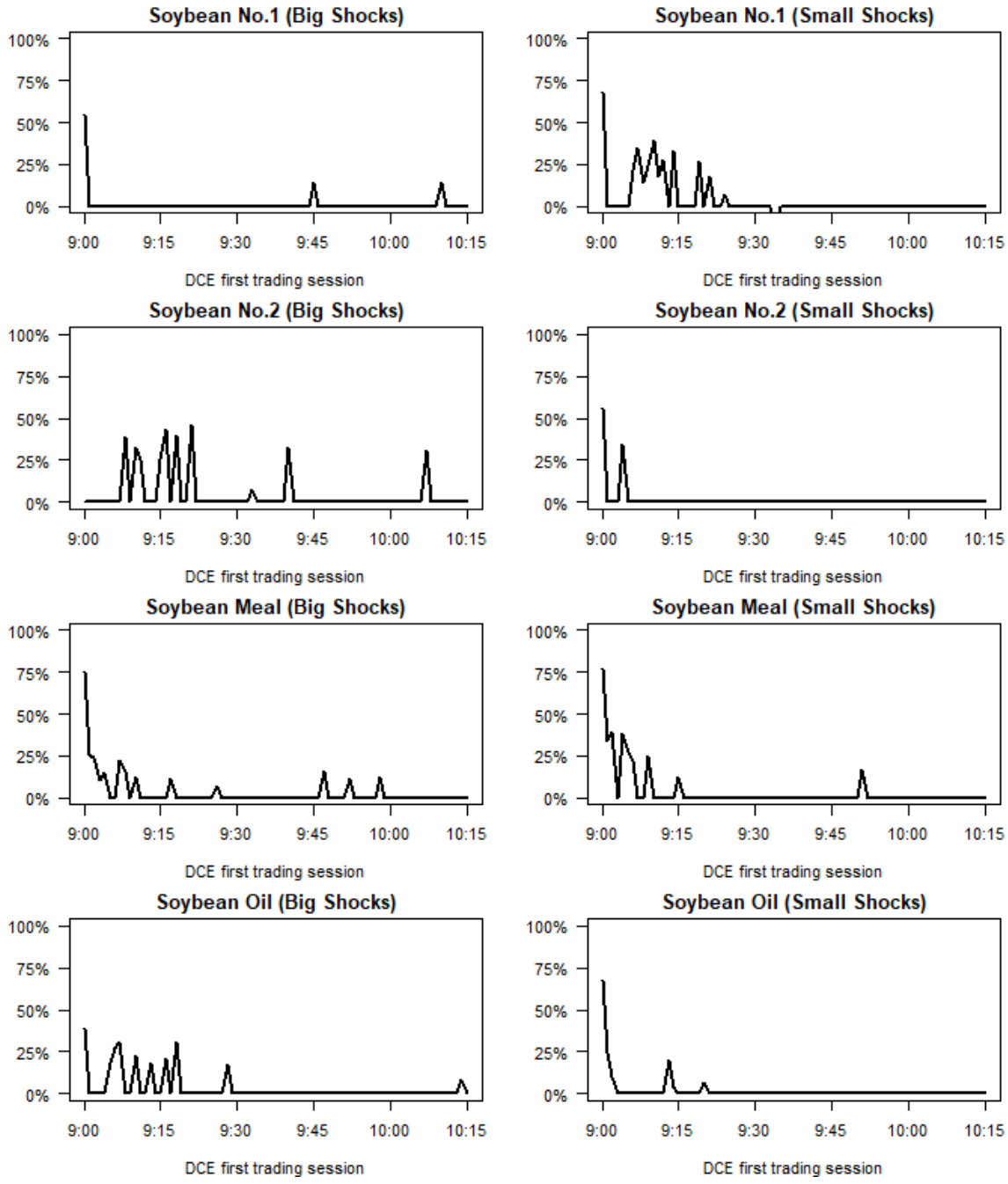

Figure 4: Difference of USDA Release vs Non-Release Minute-to-Minute High-Low Volatility (significant at the 5% level) during DCE Day Time Trading Hours

Note: the difference is set to be zero if Kolmogorov-Smirnov test fails to reject the null hypothesis at the 5% significance level. Differences are expressed in percentage using the non-release days as the baseline.

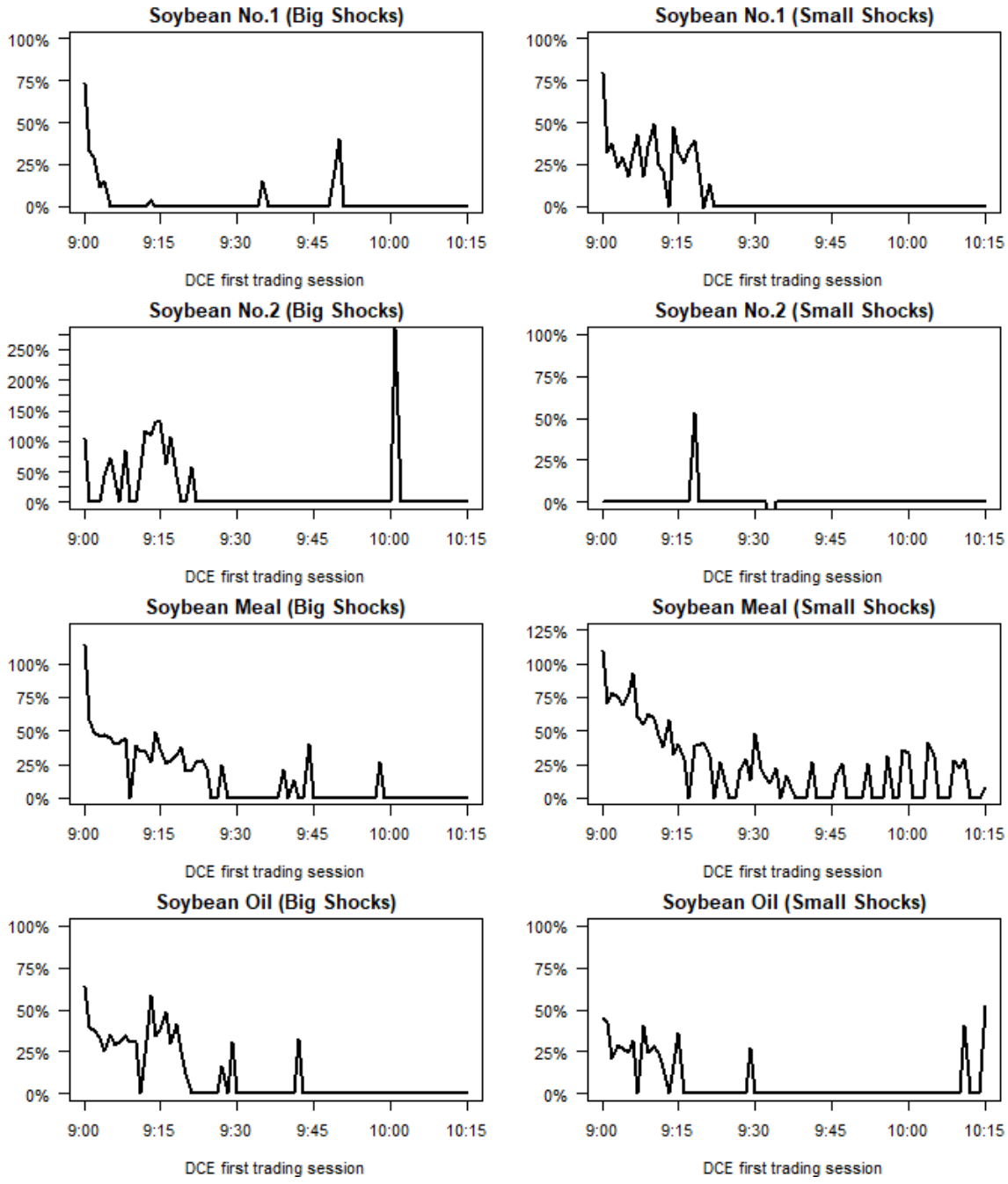

Figure 5: Difference of USDA Release vs Non-Release Minute-to-Minute Trading Volume (significant at the 5% level) during DCE Day Time Trading Hours by Shock Family

Note: the difference is set to be zero if Wilcoxon fails to reject the null hypothesis at the 5% significance level. Differences are expressed in percentage using the non-release days as the baseline.

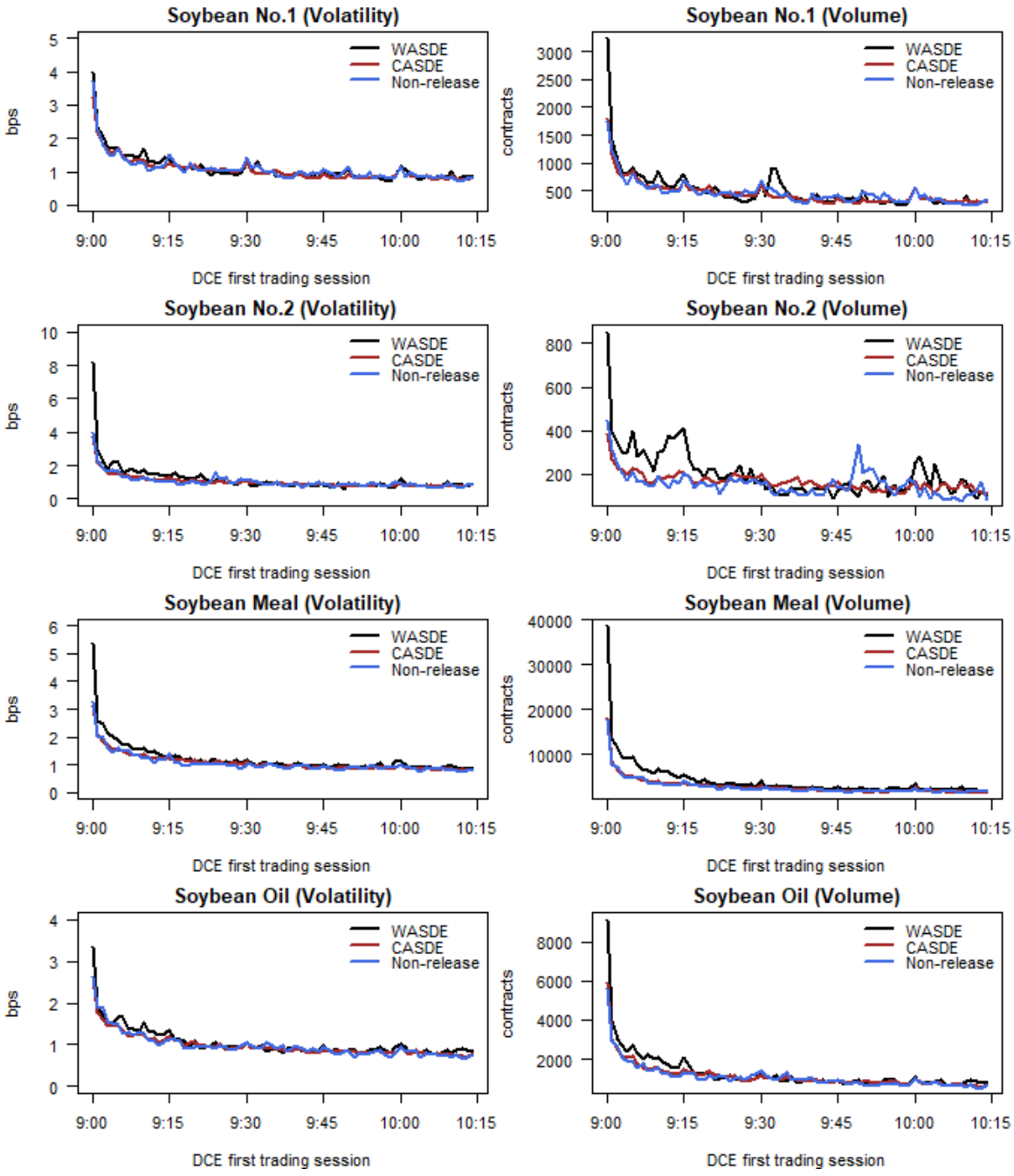

Figure 6: Average Minute-to-Minute Trading Volume and High-Low Volatility on WASDE , CASDE report days, and Non-release days

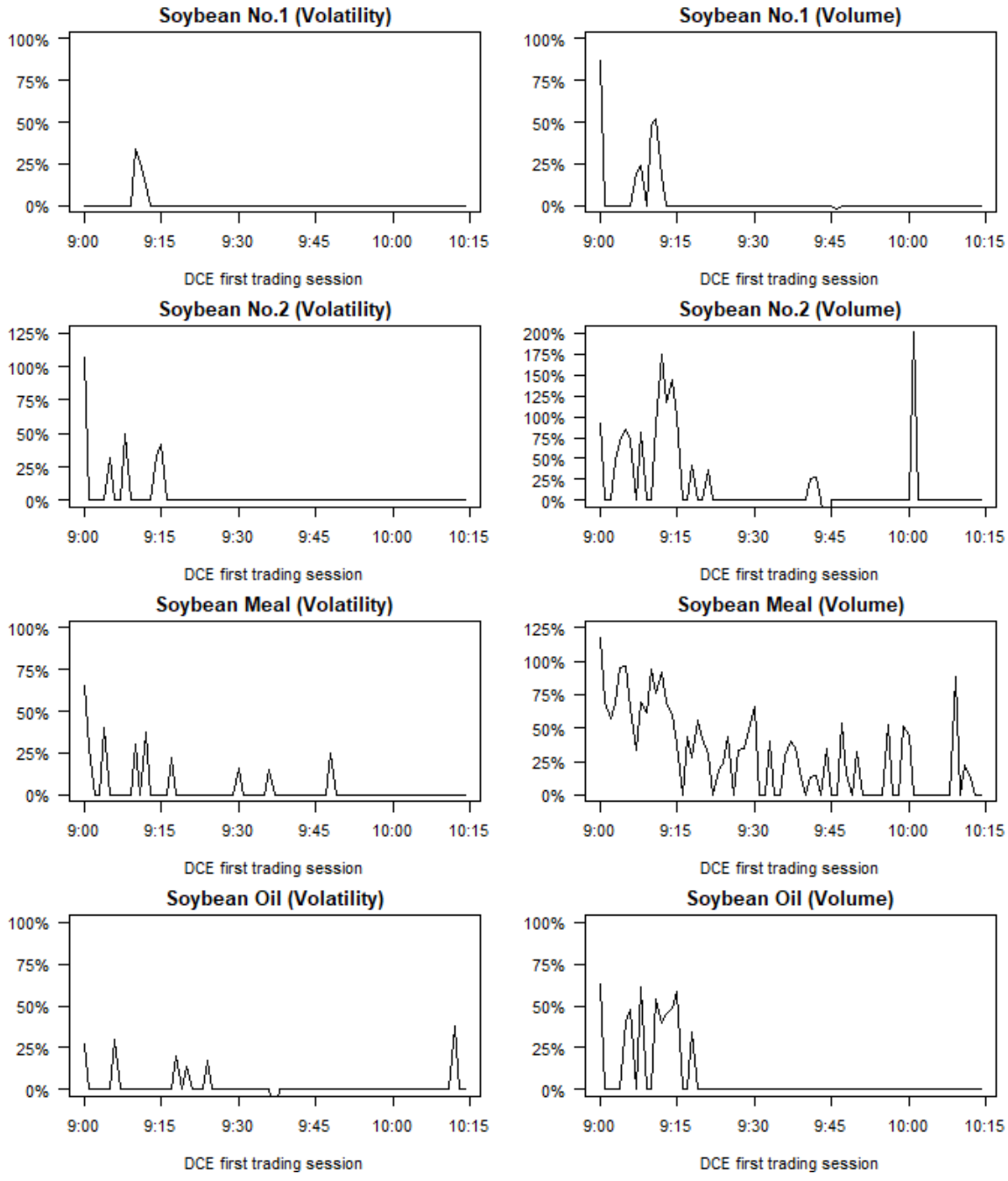

Figure 7: Difference between WASDE and CASDE Release Days Minute-to-Minute Trading Volume and High-Low Volatility

Note: differences are expressed in percentage using the CASDE as the baseline. Wilcoxon and Kolmogorov-Smirnov tests are used for testing the difference for trading volume and high-low volatility, separately with significance at the 5% level.

Table 1. Average Minute-Level Volatility and Trading Volume on USDA Release and Non-Release Days by Shock Sizes

	Soybean No.1			Soybean No.2			Soybean Meal			Soybean Oil		
	Total	Big Shocks	Small Shocks	Total	Big Shocks	Small Shocks	Total	Big Shocks	Small Shocks	Total	Big Shocks	Small Shocks
Release days												
High-low volatility (bps)	0.87	0.93	0.81	1.06	1.12	0.99	1.02	1.10	0.95	0.88	0.92	0.85
	(0.82)	(0.86)	(0.78)	(1.36)	(1.72)	(0.85)	(0.82)	(0.85)	(0.78)	(0.68)	(0.64)	(0.71)
Volume (contracts)	404.91	424.95	385.14	173.45	178.24	168.66	2982.30	3397.22	2573.35	1136.86	1246.52	1028.78
	(856.18)	(794.06)	(912.97)	(338.62)	(316.25)	(359.56)	(5096.61)	(5661.62)	(4432.73)	(1511.79)	(1609.82)	(1400.19)
Number of days	129	64	65	49	24	25	129	64	65	129	64	65
Non-release days												
High-low volatility (bps)	0.84	0.91	0.77	1.00	1.02	0.98	0.97	1.03	0.90	0.84	0.86	0.81
	(0.68)	(0.73)	(0.60)	(0.83)	(0.84)	(0.82)	(0.63)	(0.68)	(0.57)	(0.53)	(0.55)	(0.52)
Volume (contracts)	360.28	406.28	314.69	149.92	155.90	143.88	2554.15	2942.47	2159.38	1002.91	1075.65	930.61
	(631.47)	(698.82)	(552.97)	(308.63)	(323.78)	(292.45)	(3569.00)	(4001.22)	(3017.03)	(1231.11)	(1272.30)	(1184.34)
Number of days	754	375	379	288	143	145	754	380	374	754	376	378

Note: this table presents average minute-level high-low volatility and trading volume on release and non-release days based on minutes during the DCE daytime trading hours. Release days with a close-to-close return higher (lower) than the median close-to-close return of the entire sample period and the surrounding non-release days are classified as “big shock” (Small shock”) periods. Standard deviations are presented in parentheses.

Table 2. USDA Announcement Effects by Reports

Panel A. Soybean No.1				
	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
High-low volatility (bps)	0.82	0.88	1.04	0.87
	(0.77)	(0.93)	(1.06)	(1.19)
Trading volume (contracts)	395.48	395.93	575.41	299.61
	(900.17)	(644.65)	(849.17)	(583.40)
Number of days	99	36	9	9
Panel B. Soybean No.2				
	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
High-low volatility (bps)	0.92	1.03	1.44	0.77
	(1.40)	(1.09)	(1.51)	(0.74)
Trading volume (contracts)	164.35	192.74	228.90	196.27
	(297.49)	(432.91)	(472.17)	(643.12)
Number of days	37	13	4	3
Panel C. Soybean Meal				
	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
High-low volatility (bps)	0.98	1.04	1.12	1.05
	(0.78)	(0.93)	(0.82)	(1.36)
Trading volume (contracts)	2847.76	3249.58	3923.46	3913.33
	(1475.52)	(1577.83)	(1994.05)	(1411.40)
Number of days	99	36	9	9
Panel D. Soybean Oil				
	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
High-low volatility (bps)	0.87	0.90	0.99	0.91
	(0.64)	(0.75)	(0.82)	(0.94)
Trading volume (contracts)	1125.29	1139.05	1405.58	1004.32
	(1482.88)	(1558.54)	(1969.81)	(1411.40)
Number of days	99	36	9	9

Note: this table presents average minute-level high-low volatility and trading volume on different USDA report days based on minutes during the DCE daytime trading hours. Standard deviations are presented in parentheses.

Table 3. Occurrence of Price Limit Moves on USDA Release Days

Panel A. Soybean No.1				
Limit Move Days	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
total	1	0	0	0
limit moves/ number of reports	1/99	0/43	0/9	0/9
limit moves/ total limit move days	1/6	0/6	0/6	0/6
Panel B. Soybean No.2				
Limit Move Days	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
total	0	0	0	0
limit moves/ number of reports	0/99	0/43	0/9	0/9
limit moves/ total limit move days	0/4	0/4	0/4	0/4
Panel C. Soybean Meal				
Limit Move Days	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
total	2	3	1	3
limit moves/ number of reports	2/99	3/43	1/9	3/9
limit moves/ total limit move days	2/12	3/12	1/12	3/12
Panel D. Soybean Oil				
Limit Move Days	WASDE & Corp Production	Grain Stocks	Perspective Plantings	Acreage
total	0	0	0	0
limit moves/ number of reports	0/99	0/43	0/9	0/9
limit moves/ total limit move days	0/9	0/9	0/9	0/9

Note: this table presents number of price limit moves on USDA announcement days (limit moves) by reports compared with total number of reports used in the analysis (number of reports) and total number of price limit move days (total limit move days). Only price limit moves in the most active contracts are considered.

Table 4 Change in the Informational Value of the WASDE Report after the Introduction of the CASDE Report

	Volatility (bps)			Volume (contracts)		
	pre	*post*	Change (%)	*pre*	*post*	Change (%)
Soybean No.1						
9:00:00	1.99	0.73	-173.08%	909.10	1379.74	51.77%
9:01:00	0.13	0.12	-9.00%	252.90	254.50	0.63%
9:02:00	0.01	0.21	94.76%	229.03	179.44	-21.65%
9:03:00	0.19	-0.02	936.69%	122.19	28.49	-76.68%
9:04:00	0.11	0.18	38.49%	114.02	65.05	-42.95%
9:05:00	0.03	-0.02	266.90%	106.10	63.05	-40.57%
Soybean Meal						
9:00:00	2.10	2.11	0.48%**	14861.86	19465.88	30.98%
9:01:00	0.95	0.41	-56.47%	5937.06	4564.47	-23.12%
9:02:00	0.38	0.65	70.24%	2951.31	4443.13	50.55%
9:03:00	-0.12	0.43	-458.33%	1426.61	3245.84	127.52%
9:04:00	0.22	0.41	89.76%	1405.86	3300.12	134.74%
9:05:00	0.03	0.27	800.00%	1160.27	3868.00	233.37%**
Soybean Oil						
9:00:00	1.56	0.72	-53.85%	2725.47	3124.94	14.66%
9:01:00	0.41	0.09	-78.41%	1473.48	852.68	-42.13%
9:02:00	0.29	-0.06	-121.61%	1097.85	338.09	-69.20%
9:03:00	0.07	0.13	85.71%	744.23	439.18	-40.99%
9:04:00	0.11	0.09	-23.05%	646.72	339.97	-47.43%
9:05:00	0.04	0.25	525.00%	518.20	635.00	22.54%

Note: this table compares the informational value of the WASDE report represented by minute-level average excess high-low volatility and trading volume on selected trading minutes at the market opening for periods before and after the first release of the CASDE report. Changes in the informational value are expressed in percentage. ** represent statistical significance at the 5% level. Wilcoxon test and Kolmogorov-Smirnov test are used for volume and volatility, respectively. DCE's Soybean No.2 contract is not included as we only use the period after 2018 for that contract.

Appendix A

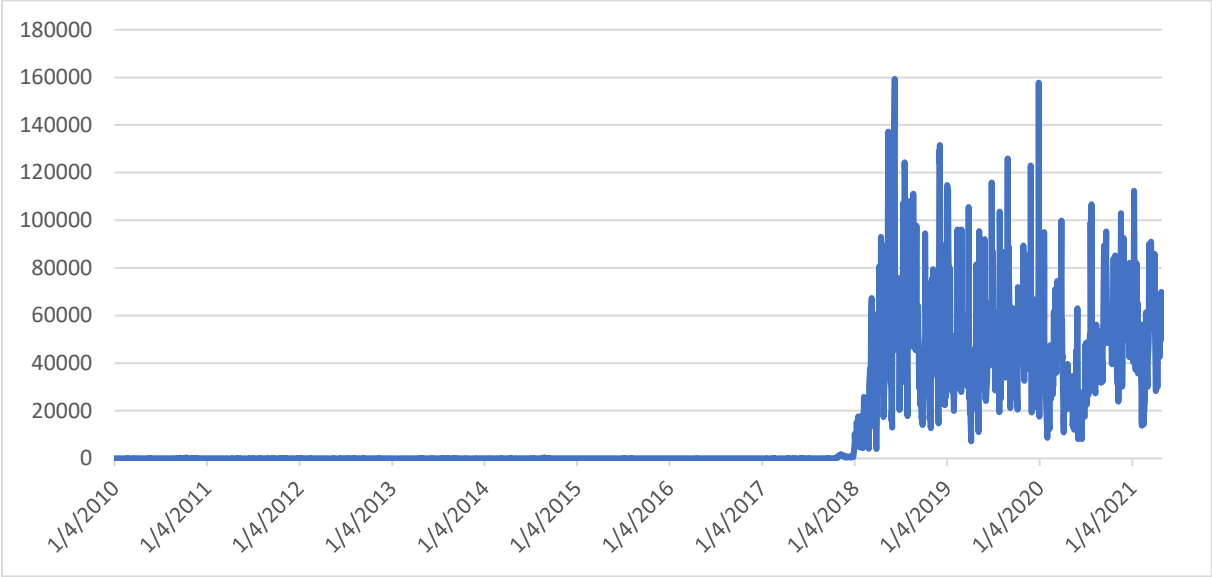

Figure A: Daily trading volume for the DCE most active soybean No.2 futures, January 2010- April 2021