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WHY DO HEDGERS TRADE SO MUCH?

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ABSTRACT

Futures positions of commercial hedgers in wheat, corn, soybeans and cotton fluctuate much more than expected output. Hedgers' short positions are positively correlated with price changes. Together, these observations raise doubt about the common practice of categorically classifying trading by hedgers as hedging while trading by speculators as speculation, as hedgers frequently change their futures positions over time for reasons unrelated to output fluctuations, arguably a form of speculation.

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Financial innovations such as derivatives facilitate not only risk sharing and price discovery, but critics also argue that they lead to reckless speculation which amplifies price volatility and hinders efficient risk sharing (Posner and Weyl, 2013). This concern has led to a debate on the regulation of financial innovation and trading of financial derivatives, and warrants a benefit-cost analysis of financial regulation. In this debate, as well as in other broad contexts of analyzing risk sharing and trading in financial markets, it is common to categorically separate two groups of traders – one group of traders trading for hedging reasons, labeled hedgers, and another group of traders trading for speculative reasons, labeled speculators.

Perhaps due to this distinction, the debate heavily focuses on examining the behavior and impact of speculators, with little attention on how hedgers trade in practice. Policy prescriptions often focus on the behavior of the speculator group while exempting the hedger group.¹ Is this categorical treatment justified? Do hedgers trade just to hedge risk in their commercial business? Or might there be other factors driving their trading? In this paper, we systematically examine how hedgers trade in the futures markets of a set of agricultural commodities: wheat, corn, soybeans and cotton.

Commodity futures markets offer a nice setting to examine the distinction between hedgers and speculators. Futures contracts on agricultural commodities were early financial innovations that have a long history of serving farmers and commodity producers to hedge the commodity price risk they face. The long-standing hedging pressure theory of Keynes (1923) emphasizes the imbalance between the need of commodity producers to short sell commodity futures contracts and the lack of interest from speculators to take the long side as a key determinant of commodity futures prices. Through the so-called financialization of commodity futures markets in the last decade, commodity futures became a popular asset class for portfolio investors and have attracted large inflows of investment capital in the magnitude of hundreds of billions dollars to the long side. The large capital inflows have led to a heated debate on the role of speculation in commodity futures markets, particularly concerned with financial traders destabilizing commodity prices.² While this debate focuses on financial traders, more attention on how hedgers trade is also warranted.

¹ For example, the Commodity Futures Trading Commission (CFTC) has considered position limits in futures markets, from which so-called “bona fide hedgers” may obtain exemptions.

² See Cheng and Xiong (2013) for a review of this debate.

Our analysis employs the position data released by the U.S. Commodity Futures Trading Commission (CFTC) in its Commitments of Traders (COT) reports. By regulation, clearing houses of commodity futures markets report the end-of-day positions of traders with positions larger than certain reporting thresholds to the CFTC, which classifies each reportable trader into several categories such as commercial hedgers and managed money, and reports aggregated weekly positions at the group level to the public.

Our analysis examines whether commercial hedgers' trading patterns are consistent with a simple benchmark notion of hedging in which risk-averse commercial hedgers take short positions in futures to mitigate their endowed commodity price and output risk. We proceed in two steps.

First, we compare the intensity of hedgers' trading with the uncertainty in the aggregate output of each commodity. Intuitively, in the absence of output uncertainty, a fixed hedging position equal to the size of the output would perfectly hedge the price risk faced by hedgers. In the presence of output uncertainty, Rolfo (1980) and Hirshleifer (1991) develop theoretical models to show that hedgers tend to under-hedge as output is negatively correlated with price and that their hedging position would fluctuate with expected output. Interestingly, our empirical analysis shows that although hedgers' futures positions are much smaller than output, the volatility of their positions is much higher than the output volatility measured by either the year-to-year output fluctuation or month-to-month fluctuation of professional output forecasts. Furthermore, even though output uncertainty declines over the harvest season, hedgers' trading volatility remains stable throughout the year.

In the second step of our analysis, we examine what else might explain the volatility of hedgers' futures positions. We find that hedgers respond strongly to price changes. They short more futures contracts when the futures price rises, and reduce their short position as the futures price falls.³ It is difficult to reconcile such trading behavior purely based on hedging strategies of risk-averse hedgers seeking to hedge price and output uncertainty. For example, if prices rise in response to a demand shock, all else equal, there is no change in the quantity of expected output, yet our data suggest that hedgers' short positions increase in response to the price increase.

³ In a related paper, Kang, Rouwenhorst, and Tang (2013) discuss how hedgers trade frequently and in a contrarian fashion and find that they provide liquidity to speculators. Our paper explicitly relates their trading to output forecasts.

Taken together, the high intensity of hedgers' trading and the sensitivity of their futures positions to prices are difficult to reconcile with the simple traditional view of hedging by risk-averse producers, which emphasizes that hedging trades mitigate cash flow volatility by reducing exposures. Our evidence suggests that, while the overall short positions of hedgers in commodity futures markets offset their commodity price risk, hedgers frequently change their positions over time for reasons unrelated to output fluctuations. Although more elaborate models of hedging may explain a portion of this behavior (Rampini, Sufi, and Viswanathan, 2012), an interesting question for these models is whether they can also simultaneously generate the significant trading we observe in the data.

Overall, the distinction between hedgers and speculators is less informative than previously thought for benefit-cost analyses of financial regulation, both in determining how trading contributes to price discovery and for notions of reckless speculation. A trader labeled as a hedger may be engaged in both types of activity. That is, commercial hedgers appear to engage both in production as well as complex trading activities traditionally viewed as the province of financial firms with specialized trading operations.

The paper is organized as follows. Section 1 provides some institutional background and describes the data used in our analysis. Section 2 compares the volatility of hedgers' position changes with the uncertainty in aggregate commodity output. Section 3 examines the responses of hedgers' futures positions to price changes. We conclude in Section 4 with a discussion.

1. Background and Data on Trader Positions

Centralized futures markets for agricultural commodities are some of the earliest markets for derivatives in the US, dating back to the mid-1800s and the formation of the Chicago Board of Trade. The futures markets for wheat, corn, soybeans and cotton (the sample of our analysis) continue to thrive, with total open interest averaging \$79 billion dollars in 2010.

Data on positions in these futures markets are collected and published by the Commodity Futures Trading Commission (CFTC). Every day, trader positions in excess of a specified reporting threshold, which varies by commodity, are reported to the CFTC by exchange clearing members, futures commission merchants, and foreign brokers. Positions are reported at the contract level (e.g., December 2001 Corn). This data is aggregated by the CFTC into the public Commitment of

Traders (COT) reports, and has been published weekly on Tuesdays since 2000 and at a lower but regular frequency before then. Aggregate positions in the COT account for 70%-90% of open interest in any given market.

This report categorizes positions into “Commercial” and “Non-Commercial” positions based on trader classifications self-reported to the CFTC. Traders who exceed the reporting threshold are required to file CFTC Form 40, which requires the trader to disclose information regarding the nature of their business and whether they are using futures to hedge business risk. Based on these forms and conversations with the trader, the CFTC decides how to classify the trader. Since 2009, the CFTC has published a Disaggregated COT (DCOT) report which breaks down positions into those of “Producers,” “Swap Dealers,” “Managed Money,” and “Other Reportable” traders. This data was made available back to 2006 based on existing 2009 classifications cast back to 2006. The CFTC also has published a Supplemental COT (SCOT) report that breaks down positions into those of Commodity Index Investors (CITs), Commercial traders, and Non-Commercial traders. Broadly, Commercial (COT, SCOT) and Producer (DCOT) positions are meant to capture traders who trade futures to hedge their business risk.⁴

Figure 1 plots the aggregated net (long minus short) notional position value (computed using front-month contract prices, downloaded from Bloomberg) of producers, swap dealers, managed money, and other reportables in the four agricultural commodities from the DCOT. It shows that hedgers occupy the short side of the futures markets with swap dealers and managed money on the long side. The open interest in the market has grown significantly since 2000, as well as the net short positions of commercial hedgers and net long positions of financial traders such as index traders and hedge funds (Cheng, Kirilenko and Xiong, 2013).

The US Department of Agriculture (USDA) keeps close track of crop production in the US and around the world. Between the 9th and 12th of every month, it publishes the World Agricultural Supply and Demand Estimates (WASDE) report, which tracks estimated production, demand, and stocks for a large number of agricultural and livestock products, including wheat, soybean, corn, and cotton. The latter three are spring-planted crops, while wheat is planted in both the winter and

⁴ For a discussion of other trader classes, see Cheng, Kirilenko and Xiong (2013). For a detailed discussion of the explanatory notes of the Disaggregated COT report, see CFTC (2013).

spring. Beginning in May, the USDA will begin forecasting crop production based on trend yields and estimates of intended and planted acreage.⁵ In June, the USDA surveys a large representative sample of farms (in 1999, over 125,000) to gather information on planted acreage, which inform subsequent production estimates. Estimates are revised each following month based on updated surveys about farmers' expected yield, through the beginning and end of fall harvest, after which they are surveyed about actual yields until the end of April of the following calendar year. Estimates from the WASDE report thus represent both the best real-time estimates of aggregate crop production in the US for a coming or in-progress harvest, but also the best historical estimates of total crop production for previous harvests as well.⁶

2. Output Uncertainty and Hedging Position

A hedging strategy is often referred to buying or selling of securities intended to offset price fluctuations of one's existing positions. As a farmer is naturally exposed to price fluctuations of crops in the field, a hedging strategy entails shorting commodity futures contracts to offset any price drop at the harvest time. If there is no output uncertainty, a fixed short position in commodity futures with a size equal to the output would perfectly hedge the price uncertainty faced by the farmer. In the presence of output uncertainty, the optimal hedging strategy is more subtle. Rolfo (1980) argues that output uncertainty leads hedgers to under-hedge because output is negatively correlated with price. Indeed, by studying price and output uncertainty faced by Cocoa producers in several countries, Rolfo shows that this insight helps explain the widely observed under-hedging by farmers. Hirshleifer (1991) derives a theoretical model to systematically examine the optimal hedging strategy with both output and price uncertainty. It is intuitive that the optimal hedging position fluctuates with the expected output.

We first compare the volatility of hedgers' position with the uncertainty in the output. We measure the output uncertainty in two ways, one through the year-to-year fluctuations in output and the other through the fluctuations in the monthly output forecasts provided by the USDA in the WASDE reports.

⁵ For wheat, estimates of winter wheat are posted in May, with spring wheat added in July.

⁶ For a detailed discussion, see USDA (1999).

Note that the aggregate output of a commodity, say wheat, is determined by the acres planted at the beginning of the season and the yield per acre. As the planting area is determined by people, the output uncertainty faced by farmers is mostly from the yield. Figure 2 plots both aggregate output and yield from 1960 to 2012 for wheat, corn, soybeans and cotton. Indeed, the yield of each commodity is either the same or less volatile than the aggregate output, indicating that part of the annual output fluctuations is due to changes in planting acreage.

Figure 3 plots the commodity producers' short positions in commodity futures (in output equivalent units) in each of these four commodities together with the aggregate annual output.⁷ The plot shows that the producers' position changes are much more volatile than the annual output changes, and that, consistent with Rolfo (1980), hedge ratios are far less than one. The figure plots both Commercial positions from the COT as well as Producer positions from the DCOT. The COT has a longer history than the DCOT. Interestingly, while the DCOT data consistently show short positions, the COT data show Commercials with near-net zero (sometimes even long) positions, highlighting the data issues underlying the original COT report (Cheng, Kirilenko and Xiong, 2013). From the rest of the analysis, we therefore rely on the DCOT data from 2006 onwards and focus on producers as commercial hedgers.

Table 1 describes means and standard deviations of this data in terms of hedge ratios, defined as the short position of producers in commodity futures divided by expected output. The average hedge ratio was roughly 28% in wheat, 32% in soybeans, 17% in corn, and 57% in cotton over this period. Notably, hedge ratios fluctuated significantly over these years, as the standard deviations of hedge ratios over these years was roughly 30% of the mean in the four commodities.⁸

Figure 4 formalizes this notion by computing the volatility of annual percentage changes in producers' futures position, output, and yield for each of the commodities over the five years from 2007-2011, from the first year we can compute such changes using DCOT data through the last year

⁷ To convert the output-equivalent futures position, we use the size of the contract (5000 bushels per contract for wheat, corn, soybeans, and 50000 lbs per contract for cotton) as well as the metric conversions reported at the end of each WASDE report (0.027216 bushels per metric ton for wheat and soybeans, 0.025401 bushels per metric ton for corn; cotton output is reported in millions of 480 lb. bales).

⁸ To compute average hedge ratios across harvests, we first average hedge ratios across 52 weeks within each year, then compute averages and standard deviations of these averages over the harvests.

in which we have finalized ex post output.⁹ If hedgers were maintaining fixed hedge ratios, these volatilities should be equal. However, the volatility of producers' futures position ranges from 0.5 to 0.7 across the commodities, while the volatility of the annual yield changes stays in a narrow range around 0.07. This difference is rather striking.

Next, we examine patterns of monthly futures positions changes and expected output changes, by month of the harvest. Although the USDA begins issuing forecasts in May based on trends, the harvest for spring crops begins in August for wheat and cotton, and September for corn and soybeans.¹⁰ As discussed in the previous section, each month's report contains more information about aggregate supply for the year than the last. These forecasts tend to be very informative of the coming year's crops. Figure 5 plots the root mean-squared error (RMSE) of the forecast for twenty years by month from harvest, scaled by the unconditional average of the actual harvest for each commodity. The plot shows that the uncertainty declines monotonically as the harvest season comes closer, as these forecasts converge to the actual harvest. Even in the noisiest first forecast, the average RMSE is between 6 and 13 percent of the harvest.

Figure 6 plots the volatility of percentage changes in producers' futures position together with the volatility of percentage changes in the monthly forecast, again by month from harvest. Two salient observations are common across the commodities. First, the volatility of the producers' futures position changes is several times larger than the volatility of the forecast changes. Second, the volatility of the producers' futures position changes is large throughout the year. The volatility of futures position changes does appear to increase during the planting season (the two months furthest from the harvest, just prior to the first issuance of forecasts for the next harvest, represented by the right-most two points on those graphs), as uncertainty rises presumably with the next planting. Nonetheless, it is remarkably high before then, even as output uncertainty is declining.

Figure 7 re-phrases these results again in hedge ratios. The left-hand panel shows that the average hedge ratio across harvests is remarkably stable throughout the harvest year. On the other

⁹ The figure computes the volatility of annual futures position changes by first computing the average 52-week percent change in futures position across each of the 52 weeks within each year, and then computing the volatility of this average across harvest years. Flipping the order of operations and computing the 52 separate volatilities of 52-week futures changes (one for each week) and then averaging these volatilities yields even more striking results.

¹⁰ Beginning-of-harvest dates can vary by region in the US (USDA, 2010), but these months are the standardized months used by the USDA in their WASDE reports to determine the so-called marketing year.

hand, the right-hand panel shows that there can be large percentage changes in hedge ratios from month to month, as the volatility of these percentage changes across harvests is quite high – between 10 and 50%.

In summary, producers' futures positions in the four commodities are several times more volatile than the output uncertainty. This leads to our next question: what cause hedgers to trade?

3. Price Changes and Hedging Position

We next focus on analyzing the correlation between producers' futures position changes and price changes. Figure 8 plots the producers' short position in each of the four commodity futures together with the futures price from January 2006 to December 2012. There is a salient pattern---producers' short positions move in sync with the price. That is, as the price rises, producers increase their short position, while as the price falls, they reduce their short position. Indeed, in contrast to the annual volatility of output changes, the volatility of price changes is on the same order of magnitude as the volatility of position changes, as shown in Figure 2.

Table 2 provides results from a regression of monthly percentage changes in producers' short positions on the 12-month and 1-month percentage changes in output forecasts, and the monthly futures price percentage change. We include a turn-of-harvest effect to control for how output forecasts roll over to the next harvest in May, and fully interact this effect with the main effects of interest. We use the Newey-West (1987) construction of the covariance matrix in computing our standard errors to allow for serial correlation. Coefficients are reported in standardized units of standard deviations of percentage changes in positions per one-standard deviation of the right-hand side variable.

From the table, we observe that, first, there is hardly any consistent correlation between the monthly change of producers' short position and the 12-month or 1-month change in forecasted output. Second, the monthly position change is positively and significantly correlated with the monthly futures price change across all commodities. Third, the bulk of the variation in position changes is explained by price changes, as adding the price change term to the forecast output terms increases the R-squared for each commodity significantly (nine-fold for wheat, three-fold for corn, twenty-fold for soybeans, and ten-fold for cotton).

Can we explain the positive correlation between producers' change in short positions and price changes based on a pure hedging strategy? It is difficult to reconcile such trading behavior purely based on hedging strategies of risk-averse hedgers seeking to hedge price and output uncertainty. To fix intuition, consider a representative hedger who faces uncertainty in both price and output. Consider an increase in the price, which may arise due to a negative aggregate supply shock or positive aggregate demand shock. In the former case, all else equal, less output needs to be hedged, yet our data suggests hedgers increase their short positions in response to a higher price. In the latter case, all else equal, there is no change in the quantity of expected output, yet our data suggest that hedgers' short positions increase with the price increase.

Certain aspects of different hedging models may explain away a portion of this behavior. Negative aggregate supply shocks may put commercial hedgers closer to financial distress (despite higher prices) so that they need to actively increase their hedge ratio more than that implied by the natural passive increase following the negative quantity shock, as might be suggested by models of hedging such as Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993). Whether this explains the average relationship between price and hedging could be tested in principle by examining whether the price reaction of trading is related to the supply or demand component of price movements, through a careful instrumental variables analysis. Notably, however, Rampini, Sufi and Viswanathan (2012) provide evidence that airline fuel hedging decreases, rather than increases, with financial distress, as hedging requires costly collateral.

This costly collateral mechanism may induce a positive correlation between position changes and prices. For example, commercial hedgers may increase hedges in response to positive demand shocks that raise the price, and thus their net worth. An interesting question for these models is whether they can simultaneously generate the high degree of trading that we observe.

4. Conclusion and Discussion

Overall, it is problematic to categorically classify trading by hedgers as hedging and trading by speculators as speculation. Although hedgers tend to take short positions that hedge risk in their commercial business, on the margin, they engage in significant non-output related trading.

One possibility is that hedgers take a view on prices just as speculators do. As noted in Stulz (1996), commercial hedgers may attempt to exploit informational advantages by trading against

speculators. For example, agricultural firms may have better knowledge of local physical market conditions across the country, as the opacity of physical markets may induce significant informational frictions. A second possibility is that by hedging away some of their risk, hedgers are able to speculate more heavily based on their disagreements against speculators regarding future price movements, as in Simsek (2013).¹¹ A third possibility is that participants in futures markets are not producers themselves, but are market-makers who trade in futures markets to hedge forward contracts written with the ultimate commodity producers such as farmers, although our analysis would imply these producers are themselves speculating on the price.

Any of the above possibilities raises complex questions, as market-making, speculation based on heterogeneous beliefs, and active trading based on informational advantages require specialized trading operations that are not typically associated with the canonical notion of hedgers whose primary business is the production of commodities.

Our analysis offers implications for benefit-cost analysis of financial regulation in two ways. First, our finding cautions against the categorical treatment of trading by hedgers as hedging and trading by speculators as speculation. This caution echoes the concern raised by Cochrane (2013) and Duffie (2013) that policy distinctions based on trading motives may be more challenging to construct than ever. Second, from a conceptual point of view, our finding also suggests the need to expand the scope of the benefit-cost analysis from the usual emphasis on costs brought by any reckless speculation of speculators to cover that by speculation of all market participants, including hedgers.

¹¹ The presence of heterogeneous beliefs raises challenges to welfare analysis of futures market trading. See Brunnermeier, Simsek, and Xiong (2012) and Gilboa, Samuelson, and Schmeidler (2012) for recently proposed welfare criteria to analyze welfare in economic models with heterogeneous beliefs.

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Figure 1: Trader Positions in Commodity Futures Markets

This figure plots the notional value of net positions (the net position times the front-month contract price) aggregated over wheat, corn, soybeans, and cotton for trader categories defined in the DCOT report.

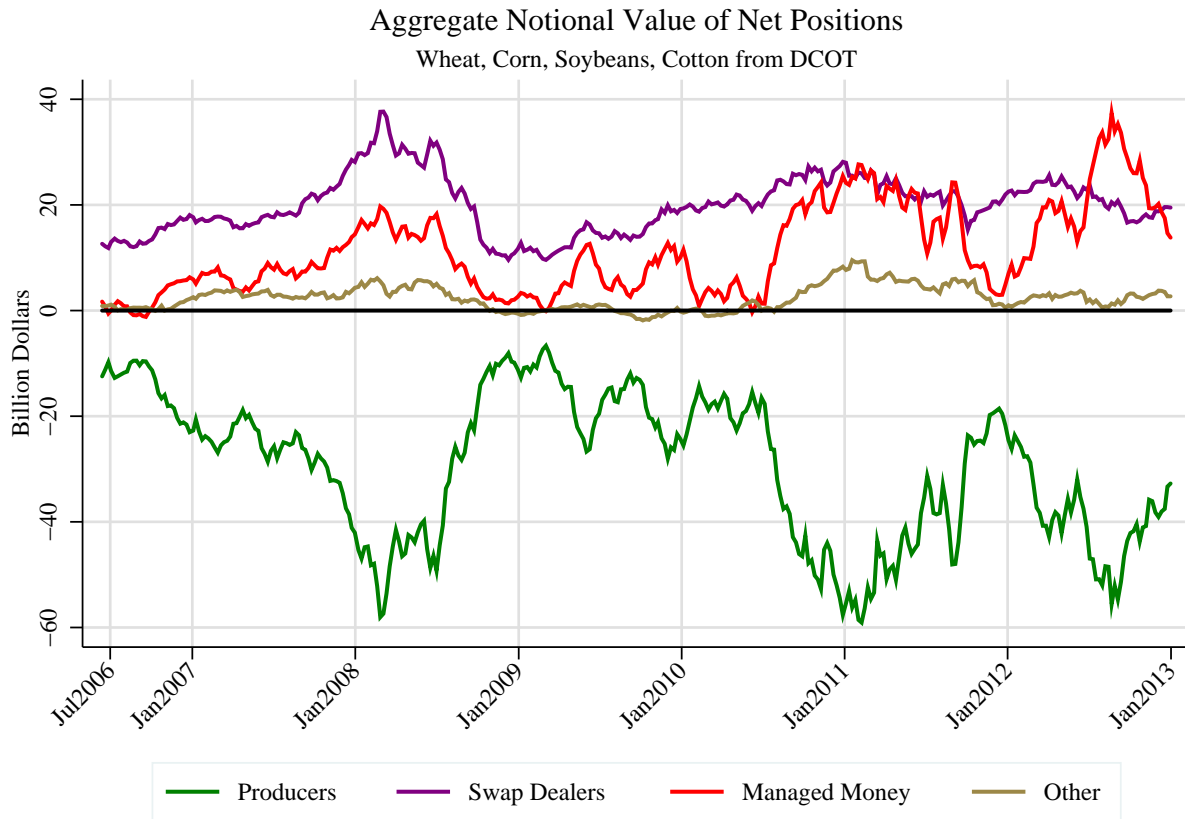


Figure 2: Commodity Production and Yields

This figure plots US production quantities and yields for wheat, corn, soybeans, and cotton as reported in the WASDE reports.

US Production and Yields

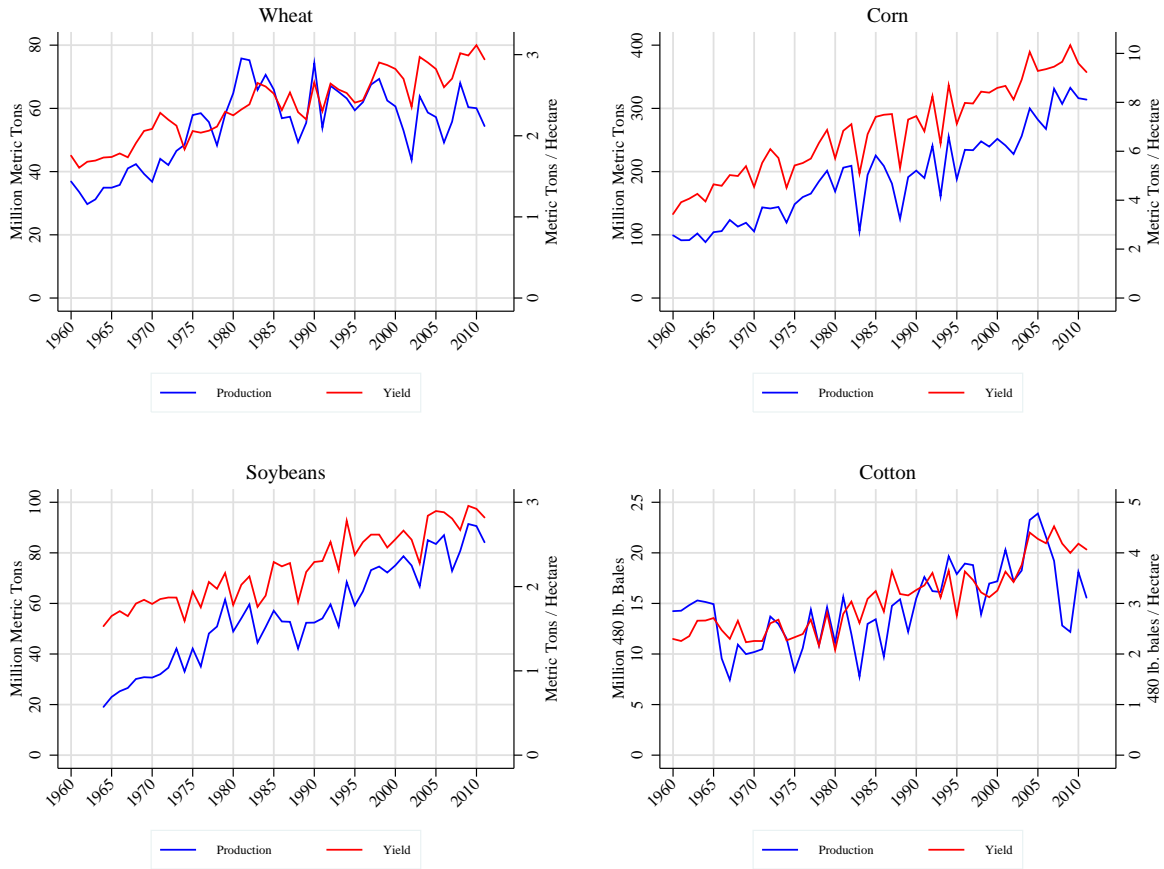


Figure 3: Commodity Output and Hedgers' Futures Positions

This figure plots the annual realized harvest output reported in the WASDE reports along with weekly positions of futures contracts in output-equivalent units from the COT and DCOT reports.

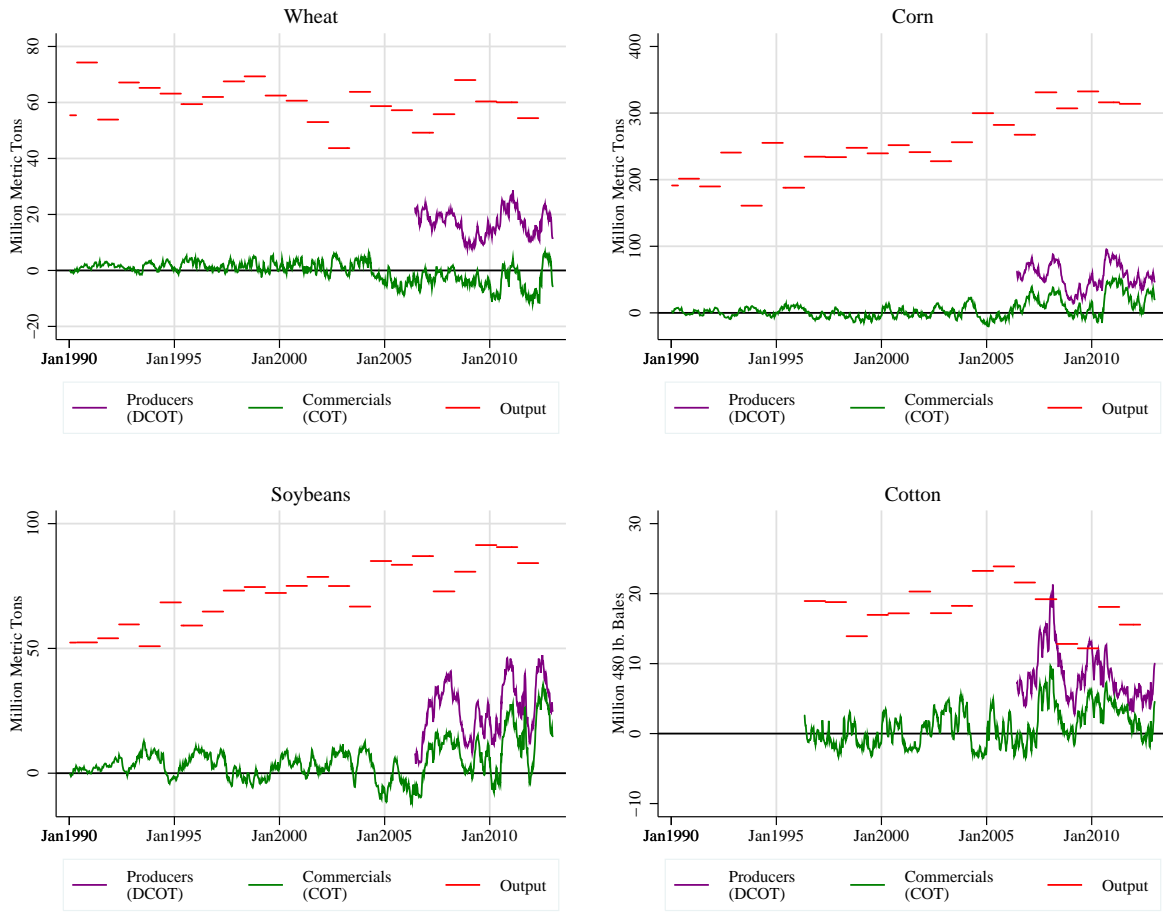
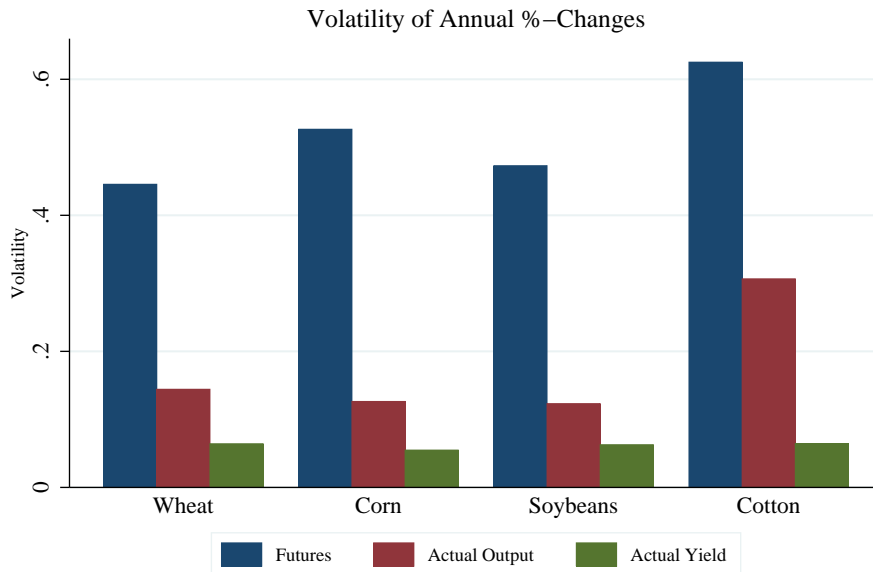


Figure 4: Volatility of Hedgers' Futures Position, Actual Output and Yield

This figure plots the cross-harvest volatility of annual percentage changes in futures positions, realized output, and realized yield.



Data from 2007–2011.
For prices and positions, the volatility of %–change in 52–week average is plotted.

Figure 5: Uncertainty in Output Forecasts

This figure plots the root mean squared error of USDA output forecasts for each commodity by month from the harvest, scaled by the unconditional average harvest size.

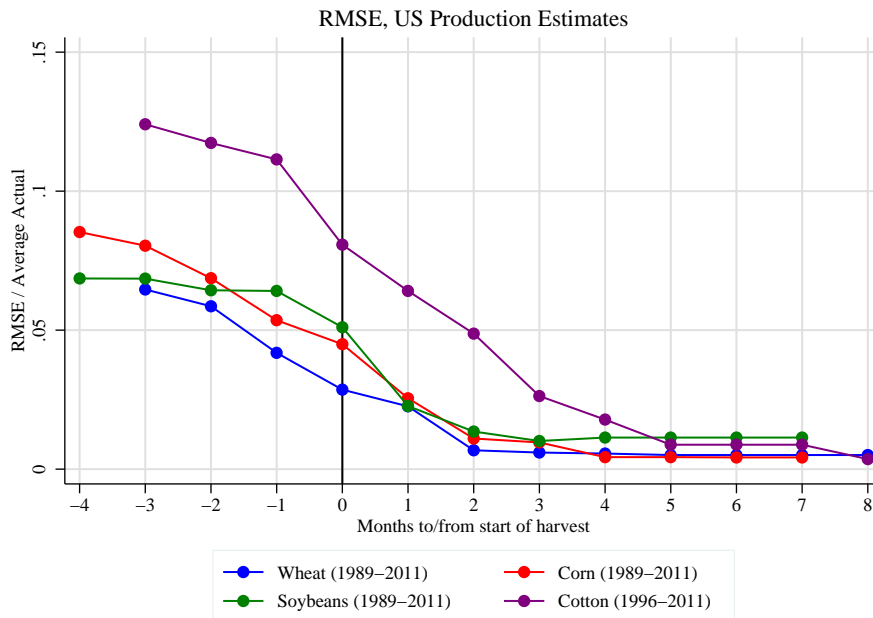


Figure 6: Volatility of Hedgers' Position and Output Forecast

This figure plots the cross-harvest volatility of monthly percentage changes in USDA output forecasts and producer short positions, by harvest month.

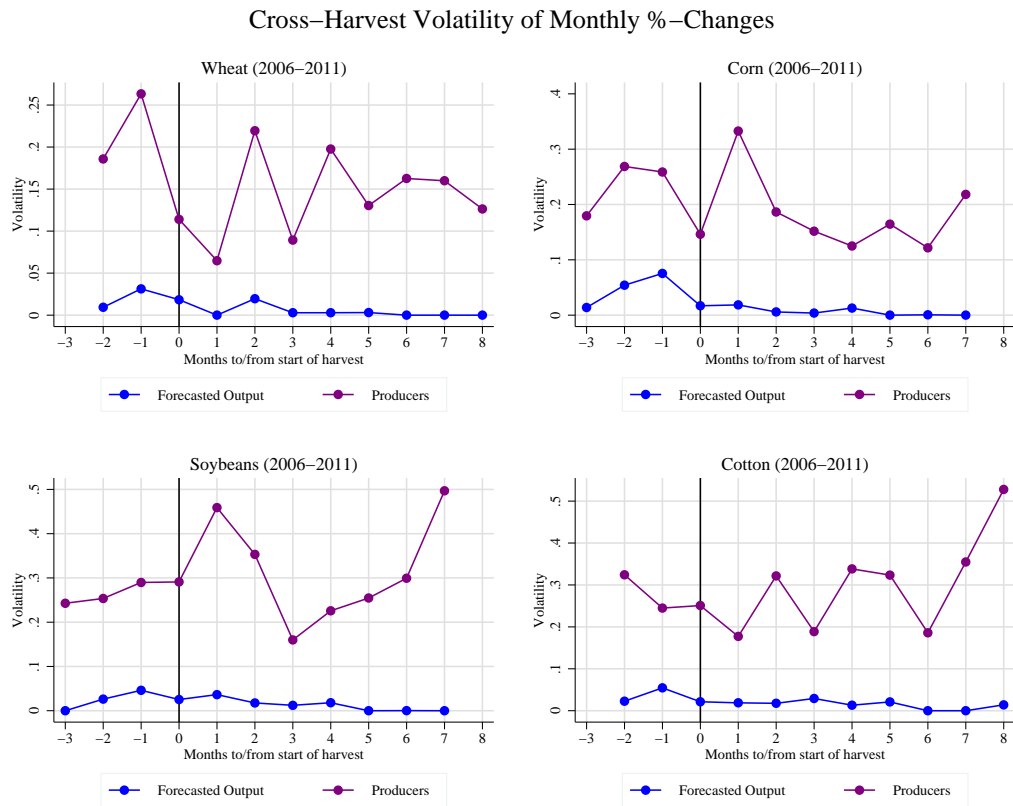


Figure 7: Hedge Ratios

This figure plots the average hedge ratio and cross-harvest volatility of monthly percentage changes in the hedge ratio, by harvest month.

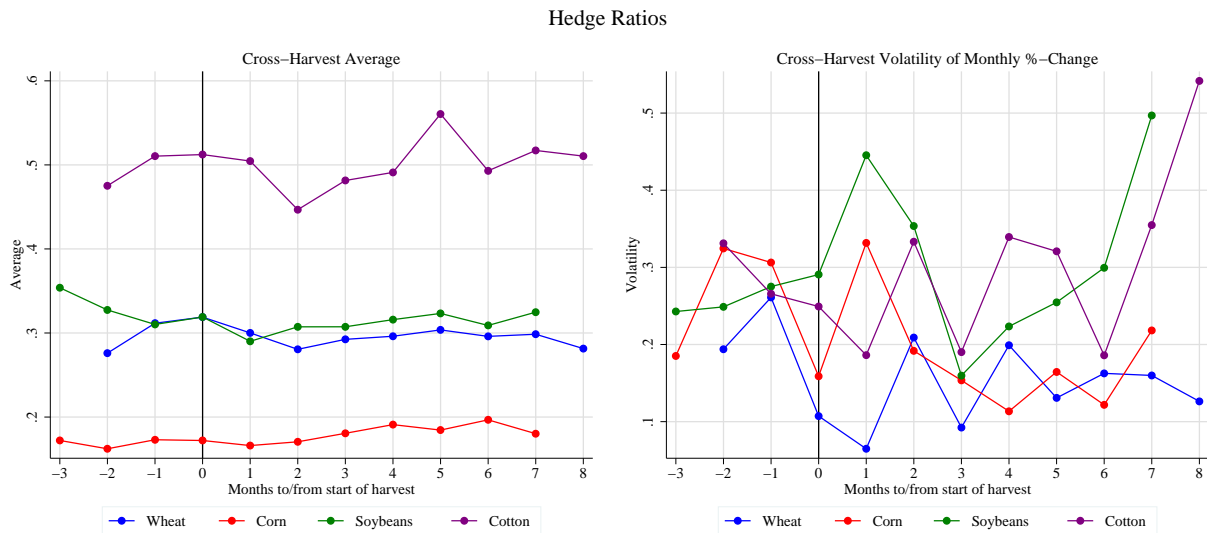


Figure 8: Hedgers' Position and Commodity Futures Price

This figure plots weekly producer futures positions as well as the front-month futures contract price.

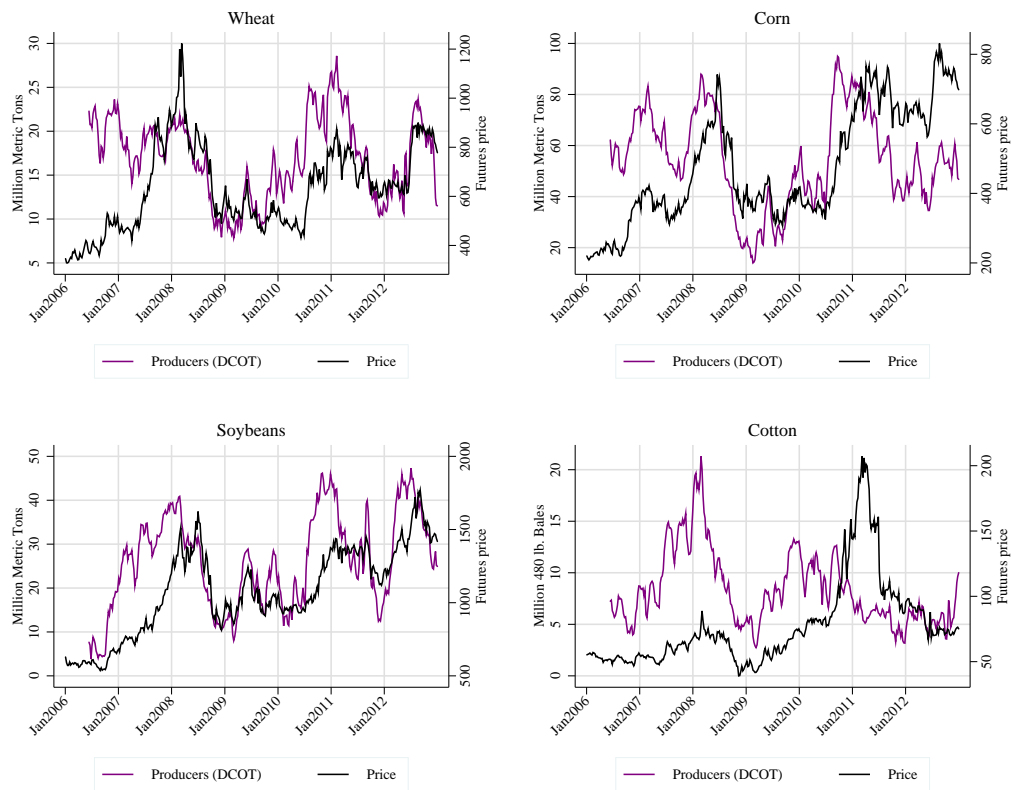


Table 1: Hedge Ratios, 2007-2011 Annual

This table reports summary statistics for hedge ratios from the 2007-2011 harvests.

	Mean	SD	SD / Mean
Wheat	0.28	0.08	0.29
Corn	0.17	0.04	0.27
Soybeans	0.32	0.10	0.32
Cotton	0.57	0.19	0.34

Table 2: Hedgers' Futures Position Changes and Futures Price Changes

This table reports results from a time-series regression at the monthly frequency of the 1-month percentage change in futures position as the dependent variable on percentage changes in output forecasts and percentage changes in futures positions. We include a turn-of-harvest effect for the month in which output forecasts for the new harvest year are first issued and fully interact this with all other terms; these coefficients are omitted for brevity. Standard errors reported in brackets are computed using the Newey-West (1987) construction of the covariance matrix with three lags. */**/** denote statistically significant at the 10%, 5%, and 1% levels, respectively.

Dependent variable:		Wheat				Corn	
1-month % change in futures position	(1)	(2)	(3)	(4)	(5)	(6)	
12-month % change in output forecast	0.014 [0.13]		-0.022 [-0.29]	0.156 [1.61]		0.015 [0.20]	
1-month % change in output forecast	0.312 [0.54]		0.262 [0.78]	-0.502 [-5.23]***		-0.011 [-0.06]	
1-month % change in futures price		0.530 [4.39]***	0.529 [4.35]***		0.628 [6.49]***	0.624 [4.55]***	
Constant	0.005 [0.05]	-0.055 [-0.70]	-0.066 [-0.77]	-0.005 [-0.04]	-0.049 [-0.63]	-0.052 [-0.58]	
Fully interacted turn-of-harvest effect	Y	Y	Y	Y	Y	Y	
T	78	78	78	78	78	78	
R-squared	0.041	0.370	0.379	0.144	0.418	0.423	
Dependent variable:		Soybeans				Cotton	
1-month % change in futures position	(7)	(8)	(9)	(10)	(11)	(12)	
12-month % change in output forecast	0.009 [0.08]		0.122 [1.31]	-0.054 [-0.53]		-0.243 [-2.05]**	
1-month % change in output forecast	0.205 [1.22]		0.384 [3.19]***	-0.271 [-1.17]		-0.056 [-0.26]	
1-month % change in futures price		0.632 [5.22]***	0.701 [5.30]***		0.461 [2.53]**	0.549 [3.21]***	
Constant	0.184 [1.46]	0.062 [0.70]	0.066 [0.81]	0.114 [1.19]	0.070 [0.84]	0.028 [0.33]	
Fully interacted turn-of-harvest effect	Y	Y	Y	Y	Y	Y	
T	78	78	78	78	78	78	
R-squared	0.023	0.412	0.491	0.019	0.185	0.241	