Searching for Risk Premia in Agricultural Commodity Markets

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Abstract

Commodity futures markets facilitate price discovery and risk management, and consequently attract traders with disparate motives, including commercial hedging demand, speculation, and commodity index exposure. We use end-of-day position data in five agricultural futures markets to better understand the relationship between trader groups' position taking and market returns. We analyze how each group's net positions relate to contemporaneous and lagged returns, and model how position changes affect price returns across trader types, aiming to isolate whether any particular trader group systematically predicts price changes. Specifically, we explore whether trader behavior aligns more with either of two general frameworks, (1) the "rational expectations storage model" where traders agree that prices reflect all available information or (2) the "differences-of-opinion model" where traders hold different beliefs and trade accordingly. After establishing that traders do hold disparate views, we exploit a natural experiment—the brief periods following USDA announcements where traders' beliefs about the futures price align. We demonstrate that, during those time periods, commercials pay an economically significant risk premium, while non-commercials pay a similar significant liquidity premium.

*This research was produced in each author's official capacity. Adjemian and Robe are academic consultants with, and Burns and Prager are full-time employees of the CFTC. The analyses and conclusions expressed in this paper are those of the authors and do not necessarily reflect the views of other Commission staff, the Commission's Economic Research Section, or the Commission.

1 Introduction

Commodity futures markets are the primary venue for the discovery of price and storage signals for the world's most critical and highly traded natural resources, and underpin the risk management activities of some of its largest firms. But precisely how is it that trader behavior shapes observed prices? Standard commodity pricing models (see, e.g.,Deaton and Laroque [1996]) assume that rational expectations lead market participants to form a single unbiased forecast of the future spot market price for a storable product. While these models can be used to accurately portray stylized facts about prices in these markets, such as persistent autocorrelation, to nonlinearities, and volatility bursts, they also embed several unrealistic assumptions. Among them, that market participants share expectations, and that trading is motivated solely by a demand for insurance among hedgers— traders with a commercial interest in the commodity that wish to insulate themselves from price risk by taking (typically short) futures positions. For this, commercial firms pay non-commercials a fee in the form of a risk premium, immediately biasing the futures price downward so that it generates a return to long speculators through gradual price appreciation. Futures prices, in this view, are normally backwardated (Keynes [1923],Hicks [1939]), and hedging pressure as represented by the net short positions of commercial firms should explain observed price changes. More pressure should force futures price down relative to the shared expectation over future spot prices, causing them to rise more over time.

Yet, this traditional conception of markets misses a significant (and perhaps the dominant) source of their round-the-clock trading: differing views about the expected future spot price of the commodity. Profit-seeking commercial firms that trade less or more than might be predicted, non-commercials with momentum- or frequency-based trading strategies, and long-only, diversified institutional investors who trade and periodically re-balance to maintain a weighted index of exposure to commodity prices—all of them challenge the basic conception of a single risk-averse hedger and a profit-seeking speculator.

Following the difference-of-opinion (DO) framework of Fishe et al. [2014], we contend that futures price changes are perhaps better explained by an iterative process where competitive traders

bring private information to the markets. In this framework, non-commercial firms might pay an observable premium to attract commercial firms into the market as counterparties. This, in turn, raises prices and works in the opposite direction as hedging pressure. In a recent paper, Kang et al. [2020] argue that measuring the commodity futures risk premium, rarely observed as significant in the empirical literature, is only possible after controlling for short-term liquidity demands.[1]

We make a further claim: that trader disagreement confounds the ability of the econometrician to reliably measure either premium. We show formally that when futures markets are comprised of traders that take different views about the expected future spot price—the true fundamental value of the commodity—that disagreement affects the evolution of futures prices over time. Because it is just this evolution that researchers use to estimate the premia, without controlling for trader disagreement, those estimates will be biased. Our identification approach relies on a set of natural experiments that exploit periods of trader agreement about market fundamentals; at these times the disagreement effect temporarily resolves and premia can be estimated accurately. For key agricultural commodities, USDA publishes periodic crop and inventory reports that offer detailed information about their current and expected market-specific supply and demand information. A rich literature has shown that these reports impact market prices significantly, and also resolve trader disagreement by reducing option-implied volatility (Cao and Robe [2022]). We rely on this resolution effect to measure risk and liquidity premia in a short interval (the trading week) immediately following report publication. We benefit from the use of daily, confidential, disaggregated regulatory data to isolate contract-level trader positions, which we carefully match to futures prices. Up to now, nearly all related work uses aggregated Commitments of Traders reports available only once each week—meaning that researchers only observe commercial or non-commercial positions across the entire term structure of contracts. By using daily data, we can accurately link trading and subsequent returns with report publication dates. And contact-level analysis permits us to observe trader effects not only in nearest-to-expire deliveries, but also in those contacts that

[1]Throughout, we refer to the premium non-commercials pay to commercials for trading immediacy as the *liquidity premium*.

are most heavily used to hedge the upcoming commodity harvest.[2]

Our objective in this paper is to improve understanding of the impact different types of traders have on commodity futures prices, in terms of both statistical and economic significance. We find that commercials pay an economically significant risk premium, while non-commercials pay a similar significant liquidity premium.[3] But together, their trading behavior explains a small fraction of the variation in futures price variation after their trades. Beyond offering a more accurate view of the markets themselves, from a practical standpoint our work informs policy makers about the relatively small degree to which trader position changes and the compensation that they pay for those services (either hedging or liquidity provision) systematically move market prices. While our work confirms that price appreciation over the next day tends to systematically compensate the counterparty, the vast majority of subsequent price variation is explained by outside factors (like macroeconomic or commodity market-specific fundamental shocks account). Indeed, since these premia effects are short-lived and work against one another, without carefully accounting for trader disagreement the futures price effectively functions as an unbiased expectation of the future spot price.[4]

We make several contributions to the literature. First, we show theoretically that—all else equal—the evolution of futures prices is affected by when traders receive different types of trading signals about market fundamentals. Second, we exploit that fact to isolate periods of time where trader disagreement is minimized or made relatively-less important, and use it to cleanly estimate the size and significance of risk and liquidity premia. Third, our use of frequent, regulatory data permits us to match trading decisions and returns at the contract level, and search for the risk premium where we expect it to be most pronounced (and not swamped by the short-term demands of financial traders).

[2]Harvest-time contracts, like December delivery corn and November delivery soybeans, are thought to be the most important for hedging needs.

[3]Using USDA report releases as natural experiments, for a net long (net short level) increase scaled to equal 0.1% of the previous day's market-wide open interest, we estimate that commercial (non-commercial) firms pay an annualized risk (liquidity) premium around 10%-20% (5%-10%) in most markets. The payment occurs through rapid price appreciation towards the counterparty. It is most evident the following day; by two weeks out, it is nearly unobservable.

[4]Our pooled sample results offer scant evidence supporting the existence of either premium, empirically.

2 Conceptual Framework: Understanding Futures Price Dynamics

To understand the empirical relationship between trader position taking and commodity price dynamics, we present three related theoretical models—built incrementally—to examine how specific assumptions about expectations and information affect the degree of influence trader positions have over futures prices. Following the two-period framework of Fishe et al. [2014], we model hedgers and speculators as different trader types with distinct motivations, adopting their two-trader model with one hedger and one speculator. Our objective is to understand the sort of empirical regularities each model predicts in terms of (i) the relationship between trader position changes and futures price changes, and (ii) how futures prices evolve over time in response to trader behavior. Later, we introduce a liquidity premium and explore how it would affect these predictions. For brevity we focus on the most relevant parts of the model in the text. More detailed derivations are provided in the Appendix A.

2.1 A Two-Period Model of Hedgers and Speculators

Consider a two-period economy. Traders enter period 1 with the same expectation about the period 2 futures price, $F_0 = E_0[F_2]$, and take positions in futures contracts for delivery in period 2, where the spot price S_2 is realized. The futures price converges to the spot price so that contracts settle at $F_2 = S_2$. A single hedger holds a spot market position of $Z > 0$ units, which he sells at $P_2 = S_2 + u$, where $u \sim N(0, \sigma_u^2)$ represents basis risk uncorrelated with S_2. The speculator in the model has no spot position. Both traders maximize their own expected utility with constant absolute risk aversion (CARA) $U(W) = -\exp(-\gamma W)$, where γ is the shared risk aversion coefficient for both hedger and speculator, following Fishe et al. [2014]. The hedger's wealth is $W_H = Q_H(S_2 - F_1) + ZP_2$, where Q_H is the futures position and F_1 is the period 1 futures price. Substituting

$P_2 = S_2 + u$, we have:

$$W_H = Q_H(S_2 - F_1) + Z(S_2 + u) = (Q_H + Z)S_2 + Zu - Q_H F_1 \tag{1}$$

The speculator's wealth is:

$$W_S = Q_S(S_2 - F_1) \tag{2}$$

where Q_S is their futures position. The market clears when the total futures positions balance, since hedgers tend to be net short while speculators are net long, their sum is zero:

$$Q_H + Q_S = 0 \tag{3}$$

Following Fishe et al. [2014], we assume $F_2 = F_0 + e_1 + e_2$, where $e_i \sim N(0, \sigma_F^2)$, $i = 1, 2$, are independent, so that $E[F_2] = F_0$, and their Var$[F_2] = 2\sigma_F^2$. Traders choose their positions to optimize their utility based on their expectations and risk preferences.

2.2 Rational Expectations With Common Beliefs

We begin by assuming that both traders share the same beliefs about the expected futures price, receiving identical signals $\mu_H = \mu_S = F_0$, with common variance $\text{Var}_H[F_2] = \text{Var}_S[F_2] = 2\sigma_F^2$, but that a premium compensates the speculator for taking on risk from the hedger. This generates the familiar normal backwardation result of Keynes [1923], where prices drift upwards over time to compensate the long speculator for risk-transfer service (see Appendix A.1 for derivation details). In this simple model the equilibrium futures price is a function of the spot price expectation and the risk premium, which depends on the size of the hedged position, emerges:

$$F_1 = F_0 - \gamma Z \sigma_F^2 \tag{4}$$

Both traders share the same information, and the hedger's spot position Z depresses F_1 below F_0. The equilibrium futures positions balance, and the risk premium defines the drift in the futures price over time:

$$Q_S = \frac{Z}{2}, \quad Q_H = -\frac{Z}{2} \tag{5}$$

$$E[F_2 - F_1] = F_0 - (F_0 - \gamma Z \sigma_F^2) = \gamma Z \sigma_F^2 \tag{6}$$

2.2.1 Contemporaneous Correlation

Equilibrium conditions in the RE model imply that the contemporaneous correlation between changes in trader positions and changes in futures prices is weak. This is because price movements are primarily driven by updates to both traders' shared expectation about the future spot price $F_0 = E[S_2]$, which do not induce changes in trader positions. When new information—perhaps from the demand side or international markets—updates the expected future spot price, the futures price adjusts accordingly; but since both traders share this updated expectation, their positions remain unchanged. In contrast, changes in the hedger's spot market position Z lead to both price and position adjustments. To illustrate this point mathematically, consider two scenarios: Case 1, where position changes (ΔQ_H, ΔQ_S) and price changes (ΔF_1) are uncorrelated, and Case 2, where they are correlated.

Case 1. If F_0 updates to $F_{0,b} = F_{0,a} + \Delta F_0$ due to an exogenous shock (e.g., demand-side news), then futures prices shift:

$$F_{1,a} = F_{0,a} - \gamma Z \sigma_F^2, \quad F_{1,b} = F_{0,b} - \gamma Z \sigma_F^2 \tag{7}$$

$$\Delta F_1 = F_{1,b} - F_{1,a} = \Delta F_0 \tag{8}$$

On the other hand, period 1 positions remain unchanged:

$$Q_{S,a} = Q_{S,b} = \frac{Z}{2}, \quad Q_{H,a} = Q_{H,b} = -\frac{Z}{2} \tag{9}$$

So, in this case $\Delta Q_S = 0$, $\Delta Q_H = 0$, implying no correlation between ΔF_1 and ΔQ.

Case 2. If hedging pressure increases from Z_c to $Z_d = Z_c + \Delta Z$ (e.g., due to a news shock about the size of an upcoming harvest), then:

$$F_{1,c} = F_0 - \gamma Z_c \sigma_F^2, \quad F_{1,d} = F_0 - \gamma(Z_c + \Delta Z)\sigma_F^2 \tag{10}$$

$$\Delta F_1 = -\gamma \Delta Z \sigma_F^2 \tag{11}$$

Positions adjust:

$$Q_{S,c} = \frac{Z_c}{2}, \quad Q_{S,d} = \frac{Z_c + \Delta Z}{2}, \quad \Delta Q_S = \frac{\Delta Z}{2} \tag{12}$$

$$Q_{H,c} = -\frac{Z_c}{2}, \quad Q_{H,d} = -\frac{Z_c + \Delta Z}{2}, \quad \Delta Q_H = -\frac{\Delta Z}{2} \tag{13}$$

When $\Delta Z > 0$, $\Delta F_1 < 0$, hedgers get shorter to cover their larger spot position $\Delta Q_H < 0$, drawing more speculators into the market $\Delta Q_S > 0$, yielding a positive correlation between ΔF_1 and ΔQ_H, and a negative correlation between ΔF_1 and ΔQ_S. Because hedging demands don't change as frequently as spot price expectations, the overall contemporaneous correlation under RE is weak.

2.2.2 Price Drift

For RE, the drift expression $E[F_2 - F_1] = \gamma Z \sigma_F^2 > 0$ implies that the futures prices rises over time in order to compensate the speculator to taking a long position, and reducing the hedger's

risk exposure, supporting Keynes' conception of normal backwardation. This drift increases with hedging pressure (Z), risk aversion (γ), and price uncertainty (σ_F^2).

2.3 Rational Expectations With Distinct, Noisy Signals

Fishe et al. [2014] extend the basic RE framework by introducing private signals that aggregate through the futures price. Both traders share $F_0 = E_0[F_2]$ as the common prior expectation of the period 2 futures price, but now they receive additional information: the hedger observes a signal $s_H = \varepsilon_1 + v_H$, with noise $v_H \sim N(0, \sigma_H^2)$, and the speculator observes $s_S = \varepsilon_1 + v_S$, with $v_S \sim N(0, \sigma_S^2)$, where ε_1 is the period 1 shock to the futures price $F_2 = F_0 + \varepsilon_1 + \varepsilon_2$. The futures price F_1 incorporates these signals, allowing traders to update their beliefs (Appendix A.2). The equilibrium futures price is a weighted function of the signals received by each trader group, adjusted for the risk premium:

$$F_1 = F_0 + w_H s_H + w_S s_S - \frac{\gamma Z}{2} \cdot \frac{4}{3}\sigma_F^2 \tag{14}$$

where $w_H = \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}}$, $w_S = \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}}$. In equilibrium, trader positions match those of the base RE model, while the expected drift represents the risk premium; it is smaller than the base RE risk premium because both traders use the signals to refine their expectations, and speculators require less compensation in return for taking on risk from hedgers:

$$Q_S = \frac{Z}{2}, \quad Q_H = -\frac{Z}{2} \tag{15}$$

$$E[F_2 - F_1] = \frac{2}{3}\gamma Z \sigma_F^2 \tag{16}$$

2.3.1 Contemporaneous Correlation

We use Case 1 and Case 2 to illustrate that the contemporaneous correlation between position taking and futures price changes remains weak when trader groups receive distinct signals, but revise their information set based on the futures price.

Case 1. If signals update (Δs_H, Δs_S), then the futures price shifts:

$$\Delta F_1 = w_H \Delta s_H + w_S \Delta s_S \tag{17}$$

But, as in the case of base RE, equilibrium positions remain unaffected:

$$Q_S = \frac{Z}{2}, \quad Q_H = -\frac{Z}{2} \tag{18}$$

Because $\Delta Q_S = 0$, $\Delta Q_H = 0$, and $\Delta F_1 \neq 0$, position changes and price changes are uncorrelated in Case 1.

Case 2. Change in Z: If Z changes to $Z + \Delta Z$:

$$\Delta F_1 = -\frac{\gamma \Delta Z}{2} \cdot \frac{4}{3}\sigma_F^2 \tag{19}$$

$$\Delta Q_S = \frac{\Delta Z}{2}, \quad \Delta Q_H = -\frac{\Delta Z}{2} \tag{20}$$

This mirrors RE's Case 2, with a positive correlation between ΔF_1 and ΔQ_H, and negative with ΔQ_S. The dominance of signal updates (Case 1) keeps the overall correlation weak, consistent with Fishe et al.'s findings (page 546).

2.3.2 Price Drift

Now the drift term, or equivalently the risk premium, is affected by signal aggregation and trader updating $E[F_2 - F_1] = \frac{2}{3}\gamma Z \sigma_F^2$. This is smaller than the risk premium in the base RE model due to

signal aggregation reducing uncertainty. Higher signal precision (lower σ_H^2, σ_S^2) increases w_H and w_S, further reducing the size of the drift. However, even in the case of signal aggregation under rational expectations, the drift is still present and fully dependent on a weighted version of the risk premium; futures prices naturally rise over time to compensate speculators.

2.4 Difference of Opinion (DO)

In the DO model, after sharing a common initial expectation about the future price $F_0 = E_0[F_2]$, the two traders develop heterogeneous beliefs. They receive private signals in period 1 and place no weight on the signals received by the other trader. The hedger receives a private signal μ_H and the speculator receives μ_S, where $\mu_i = \varepsilon_1 + v_i$ and $v_i \sim N(0, \sigma_{v_i}^2)$ for $i = H, S$. Each trader believes their signal is correct, leading to subjective expectations:

$$E_H[F_2] = F_0 + \mu_H, \quad E_S[F_2] = F_0 + \mu_S \tag{21}$$

Their perceived variances are $\text{Var}_H[F_2] = \sigma_H^2$ and $\text{Var}_S[F_2] = \sigma_S^2$, with $\sigma_H^2 \neq \sigma_S^2$ in the general case, reflecting differing confidence levels.

2.4.1 Distinct Signal Precisions

The equilibrium futures price F_1 is determined by the market clearing condition $Q_H + Q_S = 0$, while optimal positions account for risk aversion γ and the hedger's spot market endowment Z:[5]

$$Q_H = \frac{E_H[F_2] - F_1}{\gamma \sigma_H^2} - Z, \quad Q_S = \frac{E_S[F_2] - F_1}{\gamma \sigma_S^2} \tag{22}$$

$$Q_H = \frac{F_0 + \mu_H - F_1}{\gamma \sigma_H^2} - Z, \quad Q_S = \frac{F_0 + \mu_S - F_1}{\gamma \sigma_S^2} \tag{23}$$

[5]Matching Fishe et al.'s equation (4).

In equilibrium the market clears:

$$\frac{F_0 + \mu_H - F_1}{\gamma \sigma_H^2} - Z + \frac{F_0 + \mu_S - F_1}{\gamma \sigma_S^2} = 0 \tag{24}$$

Solving for the period 1 futures price F_1:

$$\left(\frac{1}{\gamma \sigma_H^2} + \frac{1}{\gamma \sigma_S^2} \right) F_1 = \frac{F_0 + \mu_H}{\gamma \sigma_H^2} + \frac{F_0 + \mu_S}{\gamma \sigma_S^2} - Z \tag{25}$$

$$F_1 = \frac{\frac{F_0 + \mu_H}{\sigma_H^2} + \frac{F_0 + \mu_S}{\sigma_S^2} - \gamma Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} \tag{26}$$

The expected drift is then:

$$E[F_2 - F_1] = F_0 - \frac{\frac{F_0 + \mu_H}{\sigma_H^2} + \frac{F_0 + \mu_S}{\sigma_S^2} - \gamma Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} \tag{27}$$

2.4.2 Simplified Model: Identical Signal Precision

Assuming $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$, the futures price expression simplifies to:[6]

$$F_1 = \frac{\frac{F_0 + \mu_H}{\sigma_F^2} + \frac{F_0 + \mu_S}{\sigma_F^2} - \gamma Z}{\frac{2}{\sigma_F^2}} = \frac{2F_0 + \mu_H + \mu_S - \gamma Z \sigma_F^2}{2} = F_0 + \frac{\mu_H + \mu_S}{2} - \frac{\gamma Z \sigma_F^2}{2} \tag{28}$$

And trader positions can be represented by:

$$Q_S = \frac{F_0 + \mu_S - \left(F_0 + \frac{\mu_H + \mu_S}{2} - \frac{\gamma Z \sigma_F^2}{2} \right)}{\gamma \sigma_F^2} = \frac{\frac{\mu_S - \mu_H}{2} + \frac{\gamma Z \sigma_F^2}{2}}{\gamma \sigma_F^2} = \frac{\mu_S - \mu_H}{2\gamma \sigma_F^2} + \frac{Z}{2} \tag{29}$$

[6] Equivalent to Fishe et al.'s equations (12) and (15).

$$Q_H = \frac{F_0 + \mu_H - \left(F_0 + \frac{\mu_H + \mu_S}{2} - \frac{\gamma Z \sigma_F^2}{2}\right)}{\gamma \sigma_F^2} - Z = \frac{\frac{\mu_H - \mu_S}{2} + \frac{\gamma Z \sigma_F^2}{2}}{\gamma \sigma_F^2} - Z = \frac{\mu_H - \mu_S}{2\gamma \sigma_F^2} - \frac{Z}{2} \tag{30}$$

The drift becomes:

$$E[F_2 - F_1] = F_0 - \left(F_0 + \frac{\mu_H + \mu_S}{2} - \frac{\gamma Z \sigma_F^2}{2}\right) = \frac{\mu_S - \mu_H}{2} + \frac{\gamma Z \sigma_F^2}{2} \tag{31}$$

2.4.3 Contemporaneous Correlation

Case 1 and Case 2 illustrate that under the DO model—unlike the RE models—both signal and hedging pressure changes result in correlated position and futures price changes.

Case 1: Updates to Beliefs. If the speculator's signal updates by $\Delta\mu_S$, with no change in μ_H:

$$\Delta F_1 = \frac{\frac{\Delta \mu_S}{\sigma_S^2}}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} = \frac{\sigma_H^2 \Delta \mu_S}{\sigma_H^2 + \sigma_S^2} \quad \text{(general DO)} \tag{32}$$

The futures price change is proportional to the speculator's signal $\Delta\mu_S$, weighted by its precision. A lower σ_S^2 (higher precision) amplifies the futures price change ΔF_1, as the market assigns greater weight to the speculator's updated belief, while a higher σ_S^2 dampens the response, shifting more influence to the hedger's belief. Unlike RE, when signals change under DO traders change positions:

$$\Delta Q_S = \frac{\Delta \mu_S - \Delta F_1}{\gamma \sigma_S^2} = \frac{\Delta \mu_S - \frac{\sigma_H^2 \Delta \mu_S}{\sigma_H^2 + \sigma_S^2}}{\gamma \sigma_S^2} = \frac{\sigma_S^2 \Delta \mu_S}{\gamma \sigma_S^2 (\sigma_H^2 + \sigma_S^2)} = \frac{\Delta \mu_S}{\gamma (\sigma_H^2 + \sigma_S^2)} \tag{33}$$

$$\Delta Q_H = -\frac{\Delta F_1}{\gamma \sigma_H^2} = -\frac{\sigma_H^2 \Delta \mu_S}{\gamma \sigma_H^2 (\sigma_H^2 + \sigma_S^2)} = -\frac{\Delta \mu_S}{\gamma (\sigma_H^2 + \sigma_S^2)} \tag{34}$$

When speculators anticipate a higher spot price $\Delta\mu_S > 0$, they bid up the futures price $\Delta F_1 > 0$ by going longer $\Delta Q_S > 0$, yielding a positive correlation between ΔF_1 and ΔQ_S; the same process

leads to a negative correlation between ΔF_1 and ΔQ_H.[7] Better speculative signal precision, i.e., smaller σ_S^2, increases ΔF_1 and induces a larger speculative trade ΔQ_S.

In the simplified model, with $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$:

$$\Delta F_1 = \frac{\Delta \mu_S}{2}, \quad \Delta Q_S = \frac{\Delta \mu_S}{2\gamma\sigma_F^2}, \quad \Delta Q_H = -\frac{\Delta \mu_S}{2\gamma\sigma_F^2} \tag{35}$$

Equal precisions balance the signals' impact, while predicted correlations still obtain since the change in speculator beliefs revises both the equilibrium futures price and positions.

Case 2: Change in Hedging Pressure. If Z increases by ΔZ:

$$\Delta F_1 = -\frac{\gamma \Delta Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} = -\frac{\gamma \sigma_H^2 \sigma_S^2 \Delta Z}{\sigma_H^2 + \sigma_S^2} \quad \text{(general DO)} \tag{36}$$

The price must decrease to induce speculators to soak up the larger hedge, but the size of the reduction depends on the magnitude of the signal variances. Higher precision, or lower σ_H^2 or σ_S^2, amplifies ΔF_1 all else equal, as traders with precise beliefs are more responsive to hedging needs, requiring a larger price adjustment to clear the market. Positions adjust as follows:

$$\Delta Q_S = -\frac{\Delta F_1}{\gamma \sigma_S^2} = \frac{\sigma_H^2 \Delta Z}{\sigma_H^2 + \sigma_S^2}, \quad \Delta Q_H = -\frac{\Delta F_1}{\gamma \sigma_H^2} - \Delta Z = \frac{\sigma_S^2 \Delta Z}{\sigma_H^2 + \sigma_S^2} - \Delta Z = -\frac{\sigma_H^2 \Delta Z}{\sigma_H^2 + \sigma_S^2} \tag{37}$$

When hedging demand rises $\Delta Z > 0$, hedgers go shorter $\Delta Q_H < 0$ and bid down the price $\Delta F_1 < 0$, requiring speculators to lengthen $\Delta Q_S > 0$; together this yields a negative correlation between ΔF_1 and ΔQ_S, scaled by signal precision.

With equal signal precision $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$, the weighting simplifies, but the correlation structure remains:

$$\Delta F_1 = -\frac{\gamma \sigma_F^2 \Delta Z}{2}, \quad \Delta Q_S = \frac{\Delta Z}{2}, \quad \Delta Q_H = -\frac{\Delta Z}{2} \tag{38}$$

[7] On the other hand, if hedgers anticipate a higher spot price they bid up the futures price by reducing their short position, leading to a positive correlation between ΔF_1 and ΔQ_H

2.4.4 Price Drift

Under DO, the drift reflects two influences. In the general model:

$$E[F_2 - F_1] = F_0 - \frac{\frac{F_0+\mu_H}{\sigma_H^2} + \frac{F_0+\mu_S}{\sigma_S^2} - \gamma Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} \tag{39}$$

Under RE, the drift was fully explained by the risk premium. With DO the risk premium component remains important, but the drift is also affected by trader beliefs, weighted by their precisions. Signals affect the drift, but are modified by precision weights $\frac{1}{\sigma_i^2}$ that determine each trader's impact on the market price, thus shaping the drift's magnitude and direction.

In the simplified model, the expression becomes:

$$E[F_2 - F_1] = \frac{\mu_S - \mu_H}{2} + \frac{\gamma Z \sigma_F^2}{2} \tag{40}$$

The risk premium $\frac{\gamma Z \sigma_F^2}{2}$ compensates the speculator for absorbing the hedger's risk, just as in RE. The difference between trader signals $\frac{\mu_S - \mu_H}{2}$ also factors in if $\mu_H \neq \mu_S$. For instance, if $\mu_S > \mu_H$, speculators anticipate a higher period 2 spot price, accelerating upward drift; if $\mu_H > \mu_S$, the hedger's higher expectation dampens it.

2.5 Incorporating a Liquidity Premium

Speculators diversify investments across asset classes, and face exogenous shocks—uncorrelated to spot market dynamics—that require them to re-balance their portfolios. Consequently, their demand for liquidity requires speculators to pay a premium Λ to hedgers for the immediacy of speculative trading needs in the market. Although it increases the equilibrium futures price, because it is exogenous the liquidity premium does not alter position dynamics. Under the general model the modified period 1 futures price is *higher* than it otherwise would be:

$$F_1^* = F_1 + \Lambda \tag{41}$$

This modifies the drift, shrinking it:

$$E[F_2 - F_1^*] = E[F_2 - F_1] - \Lambda \tag{42}$$

Indeed, a large enough liquidity premium complicate observation of the drift, since it would just balance against the (belief-adjusted, in the case of DO) risk premium or even occur downwards, as speculators compensate hedgers for liquidity service through futures price depreciation. In the latter case, the market will be in *normal contango* rather than *normal backwardation*. Yet, all our predictions about the strength of the contemporaneous correlations between trader position changes and futures price changes maintain, because the liquidity premium is exogenous and does not affect equilibrium position taking.

2.5.1 Model-by-model consideration

Rational Expectations with Common Beliefs. The exogenous liquidity premium raises the equilibrium futures price:

$$F_1^* = F_0 - \gamma Z \sigma_F^2 + \Lambda \tag{43}$$

This generates a smaller drift:

$$E[F_2 - F_1^*] = \gamma Z \sigma_F^2 - \Lambda \tag{44}$$

Since this model assumes common beliefs without signal precision differences, Λ's impact is purely additive. Position dynamics and therefore predicted correlations do not change.

Rational Expectations with Noisy Signal Aggregation. Again, the modified futures price is higher, and the ordinary drift is adjusted downwards by the size of the liquidity premium:

$$F_1^* = F_0 + w_H s_H + w_S s_S - \frac{\gamma Z}{2} \cdot \frac{4}{3} \sigma_F^2 + \Lambda \tag{45}$$

$$E[F_2 - F_1^*] = \frac{2}{3}\gamma Z \sigma_F^2 - \Lambda \tag{46}$$

Correlations remain weak and same-signed, as Λ does not affect signal-driven position changes.

Difference of Opinion. Similarly, the liquidity premium shifts the futures price higher than it otherwise would be, and reduces the drift, all else equal. Strong correlations persist, as Λ does not affect belief-driven position changes:

$$F_1^* = \frac{\frac{F_0+\mu_H}{\sigma_H^2} + \frac{F_0+\mu_S}{\sigma_S^2} - \gamma Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} + \Lambda \tag{47}$$

$$E[F_2 - F_1^*] = F_0 - \frac{\frac{F_0+\mu_H}{\sigma_H^2} + \frac{F_0+\mu_S}{\sigma_S^2} - \gamma Z}{\frac{1}{\sigma_H^2} + \frac{1}{\sigma_S^2}} - \Lambda \tag{48}$$

In the simplified case:

$$F_1^* = F_0 + \frac{\mu_H + \mu_S}{2} - \frac{\gamma Z \sigma_F^2}{2} + \Lambda \tag{49}$$

$$E[F_2 - F_1^*] = \frac{\mu_S - \mu_H}{2} + \frac{\gamma Z \sigma_F^2}{2} - \Lambda \tag{50}$$

High signal precision amplifies belief effects, reducing Λ's relative impact on the drift; still correlations remain as predicted since the liquidity premium is exogenous.

3 Empirical Approach: Using Natural Experiments to Estimate Market Premia

Under all of the models above, futures price changes over time $E[F_2 - F_1]$ are explained by the risk and liquidity premium; the DO model adds to that a weighted function of trader beliefs. Kang

et al. [2020] attempt to identify separate risk and liquidity premium values using slow-moving commercial position levels and position changes, respectively. They do not consider the effect of trader beliefs, which is significant, would confound our ability to measure the premia. We therefore suggest that the premia can be more accurately measured by focusing on periods where traders share homogeneous expectations.

3.1 Empirical Specification

Our empirical strategy centers on two related steps: (i) searching for contemporaneous correlation between trader position changes and futures returns, and (ii) regressing cumulative post-trade returns on changes in trader positions and hedging pressure. Each of these steps incorporates methodological approaches from Fishe et al. [2014] and Kang et al. [2020]; together they offer evidence for which of the theoretical models best characterizes agricultural commodity markets and also permit the measurement of premia. For each commodity i at time t, we define hedging pressure ($HP_{i,t}$) as the one-year moving average of the net short position of commercial traders (hedgers, $j = H$) relative to total open interest, following Kang et al. [2020]:

$$HP_{i,t} = \frac{CS_{i,H,t} - CL_{i,H,t}}{OI_{i,t}} \tag{51}$$

where $CS_{i,H,t}$ and $CL_{i,H,t}$ represent the short and long contracts held by commercials, respectively, and $OI_{i,t}$ denotes the total open interest. This variable serves as a proxy for the slow-moving component of hedging demand. Position changes ($\Delta Q_{i,j,t}$) for trader type j (commercials, $j = H$, or non-commercials, $j = S$) are defined as the change in net long positions from day $t-1$ to t, normalized by the prior day's open interest:

$$\Delta Q_{i,j,t} = \frac{\text{net long position}_{i,j,t} - \text{net long position}_{i,j,t-1}}{OI_{i,t-1}} \tag{52}$$

This measure, analogous to Fishe et al.'s (2014) and Kang et al.'s (2020) net trading variable, captures short-term trading activity. Daily returns represent the one-day change in futures prices

from $t-1$ to t and are denoted by ($R_{i,t}$) while cumulative post-trade returns ($R_{i,t,\tau}$) from t to T are calculated as the excess return over a fixed window, following the trade:

$$R_{i,t,\tau} = \frac{F_i(\tau, T) - F_i(t, T)}{F_i(t, T)} \tag{53}$$

where $F_i(t, T)$ is the futures price at time t for maturity T.

3.1.1 Contemporaneous Correlation

The degree of correlation between daily trader position changes and futures price changes offers evidence for (and against) the theoretical models we describe in the previous section. We estimate it using the regression model:

$$\Delta Q_{i,j,t} = \alpha_1 + \theta_{i,j} R_{i,t} + \upsilon_{i,t} \tag{54}$$

Statistically significant values for $\theta_{i,j}$ are consistent with the DO model predictions. Weak or insignificant values would favor RE predictions.

3.1.2 General Drift Analysis

To study the general futures drift we specify a regression model that includes both positions changes ($\Delta Q_{i,j,t}$) in order to capture short-term liquidity dynamics, and also hedging pressure ($HP_{i,t}$) to represent a long-run risk premium:

$$R_{i,t,\tau} = \alpha_2 + \beta_{i,j} \Delta Q_{i,j,t} + \beta_{i,HP} HP_{i,t} + \gamma X_{i,t} + \epsilon_{i,t} \tag{55}$$

where $X_{i,t}$ represents control variables, including lagged returns, exogenous economic indicators, and volatility proxies. This specification tests the extent to which position changes by commercials or non-commercials, alongside hedging pressure, predict post-trade returns. To examine trader-specific impacts, we estimate separate regressions for commercials ($j = H$), non-commercials

($j = S$), and Commodity Index Traders ($j = C$), allowing us to differentiate their contribution to futures returns. Coefficient $\beta_{i,j}$ is expected to vary by trader type. For non-commercials ($j = S$), a negative $\beta_{i,j}$ suggests that increases in their net long positions ($\Delta Q_{i,S,t} > 0$) are associated with lower subsequent returns, reflecting the liquidity premium paid for trading immediacy. Likewise, for commercials ($j = H$), a positive $\beta_{i,j}$ implies that increases in net short positions ($\Delta Q_{i,H,t} < 0$) are linked to lower returns (so prices shift in the direction of their net long), confirming that commercials earn a premium for providing liquidity to non-commercials. A positive coefficient $\beta_{i,HP}$ indicates that more hedging pressure, reflecting greater net short positions by commercials, predicts higher futures returns, which aligns with the risk premium component in each of the models above.

3.1.3 Natural Experiments Offer Trader Agreement that Isolates the Premia

According to our theoretical models, trader beliefs can confound our ability to measure actual premium effects in the general drift analysis. From time to time, however, market-wide information events align trader expectations, effectively eliminating heterogeneity in beliefs that emerge from the DO model. Fortunately, a robust subset of these occur at *a priori* known dates: USDA crop and inventory reports. The latter are widely recognized as authoritative sources of news about market fundamentals, effectively providing traders identical signals ($\mu_H = \mu_S$) and precision ($\sigma_H^2 = \sigma_S^2 = \sigma_F^2$), reflecting both aligned expectations and shared uncertainty about the future spot price. Another candidate period for a similar type of analysis is the short trading window following spikes in the VIX, which represents financial market uncertainty. At these times, any trader disagreement about fundamentals regarding the underlying commodity is likely to be overwhelmed by competing trading needs. By exploiting these natural experiments, we provide a robust framework to evaluate price dynamics under different expectation frameworks.

In the RE model with common beliefs, traders share identical expectations ($\mu_H = \mu_S = F_0$) at all times, with no signal variance, yielding a drift driven solely by the risk premium and liquidity

premium:

$$E[F_2 - F_1] = \gamma Z \sigma_F^2 - \Lambda \tag{56}$$

Here, $\gamma Z \sigma_F^2$ represents the risk premium arising from commercials' net short positions (Z), and $-\Lambda$ is the liquidity premium. Trader agreement ($\mu_H = \mu_S$) has no impact on the drift, so our results would likely match those from the general drift specification, since trading in the period *following* USDA reports would not likely represent changes in hedging or liquidity demand.

Similarly, in the RE model with noisy signals, traders receive distinct information ($s_H = \varepsilon_1 + v_H$, $s_S = \varepsilon_1 + v_S$, $v_i \sim N(0, \sigma_F^2)$), but update through the futures price. Once again, trader agreement has no impact on the drift. It is defined by the risk premium:

$$E[F_2 - F_1] = \frac{2}{3}\gamma Z \sigma_F^2 - \Lambda \tag{57}$$

During periods when $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$ the same drift prevails, so the results of a natural experiment would likely match those from the general drift specification.

In the DO model, with $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$, the general drift accounts for belief divergence:

$$E[F_2 - F_1] = \frac{\mu_S - \mu_H}{2} + \frac{\gamma Z \sigma_F^2}{2} - \Lambda \tag{58}$$

The term $\frac{\mu_S - \mu_H}{2}$ captures the impact of differing expectations, $\frac{\gamma Z \sigma_F^2}{2}$ is the risk premium, and $-\Lambda$ is the liquidity premium. Note that when traders agree ($\mu_H = \mu_S$), and the effects of trader disagreement are eliminated:

$$\frac{\mu_S - \mu_H}{2} = 0 \tag{59}$$

$$E[F_2 - F_1] = \frac{\gamma Z \sigma_F^2}{2} - \Lambda \tag{60}$$

Shared expectations eliminate belief-driven effects. Unlike the RE models, DO would predict that these natural experiments permit us to measure the true risk and liquidity premia.

To isolate the risk and liquidity premia during periods of trader agreement, we specify a fixed effects panel regression estimated over the five trading days following USDA crop and inventory report releases. This approach leverages the *a priori* known timing of these reports to ensure trader expectations are aligned ($\mu_H = \mu_S$), minimizing belief divergence and isolating the premia as predicted by the DO model. The panel is defined by the number of report releases, with trading day ($t = 1, 2, \ldots, 5$) as the time variable, and includes fixed effects to control for report-specific heterogeneity.[8] The specification borrows from the general drift model:

$$R_{i,k,t,\tau} = \delta_{i,j}\Delta Q_{i,j,k,t} + \delta_{i,HP}HP_{i,k,t} + \eta X_{i,k,t} + \phi_k + \eta_{i,k,t} \tag{61}$$

where $R_{i,k,t,\tau}$ is the cumulative return for commodity i, report release k, and trading day t over a five-day window ($\tau = t + 5$); $\Delta Q_{i,j,k,t}$ and $HP_{i,k,t}$ are the position changes and hedging pressure, respectively; $X_{i,k,t}$ includes the same control variables as the general drift model (lagged returns, economic indicators, volatility proxies); ϕ_k represents report-specific fixed effects; and $\eta_{i,k,t}$ is the error term. Separate regressions are estimated for commercials ($j = H$), non-commercials ($j = S$), and Commodity Index Traders ($j = C$). A negative $\delta_{i,j}$ for non-commercials indicates a liquidity premium paid for immediacy, while a positive $\delta_{i,j}$ for commercials confirms their premium earned for providing liquidity, consistent with Kang et al.'s (2020) findings. A positive $\delta_{i,HP}$ reflects the risk premium. This specification complements the general drift analysis, but by focusing on controlled periods of trader agreement (which avoid confounding problems predicted by DO), enhances the precision of premia estimates.

It may be that commercials focus hedging behavior in those contracts most naturally tied to the harvest period: December delivery for corn, soybeans, wheat and cotton, and November for soybeans. We therefore estimate equation (61) for both nearby and harvest contracts, carefully

[8]Fixed effects also naturally control time-invariant information, like the size of the surprise generated by USDA news, or the information known in the immediate pre-event period.

matching trading positions to returns—a benefit offered by the CFTC's confidential, regulatory data over its public COT reports, which aggregate trading across contracts. If long-run hedging in fact weighs more heavily, we would expect to see stronger $\delta_{i,HP}$ coefficients for harvest contracts; in addition, hedging needs may shift the normal day-to-day relationship between position changes and subsequent returns, watering down the expected negative (positive) $\delta_{i,j}$ for non-commercials (commercials),

We likewise apply model equation (61) to a different set of shocks, these designed to represent the five-trading day window immediately following a sharp spike in the VIX. When market-wide uncertainty rises, any disagreement over commodity market fundamentals is likely to be made less important than other market-wide phenomena. Also, at these times large non-commercials may be more willing to pay an price for immediacy in order to rebalance their portfolios. Although not as clean an identification strategy as the USDA window, since traders in a VIX-shock window may still disagree about the expected future spot price of the commodity, liquidity and risk premium effects may be more easily measured than during normal trading periods.

3.2 Data

Our analysis uses daily, contract-level trader positions from the Commodity Futures Trading Commission's (CFTC) Large Trader Reporting System (LTRS) and confidential Commitments of Traders (COT) reports. These data cover end-of-day positions across five agricultural futures markets: corn, soybeans, hard red winter wheat, soft red winter wheat, and cotton, spanning January 2007 to March 2025 (4,594 trading days per market). Clearing members, Futures Commission Merchants (FCMs), and Foreign Brokers report holdings for large traders exceeding specific thresholds in each contract market. Reporting firms submit documentation categorizing accounts by the trader's primary occupation, hedging status (cash or swap market exposure), and Commodity Index Trading activity. Positions are classified as commercial or non-commercial, with some traders holding both types across different markets. The data capture an average of 91% of open interest, ranging from 88% in corn and hard red winter wheat to 95% in cotton (see Table 1).

We segment the data to study the interplay between trader positions and prices, focusing on three trader groups, consistent with the CFTC's Supplemental Commitments of Traders:

- *Commodity Index Traders (CIT)*: Commercial and non-commercial traders seeking exposure to commodity price movements, often for portfolio diversification, via broad commodity indices, sub-indices, or single-commodity indices.

- *Commercial traders*: Traders using futures for hedging ($j = H$), as defined by the CFTC, including dealer/merchants (producers, processors, end-users), non-CIT swap dealers, and other commercials (e.g., banks, non-bank financial institutions, trading platforms).

- *Non-commercial traders*: Managed money (e.g., hedge funds) and other reportables (e.g., pension funds, insurance companies), denoted as non-commercials ($j = S$).

Unlike public COT reports, we use daily data with position breakouts by contract expiry. For each group, we aggregate long and short positions across all contract months, computing net positions as long minus short. We segment positions two ways: (1) *Front-month positions*, summing long and short positions for the front and first-deferred contracts, rolling to the next contract month one day before the last trading day, excluding calendar spreads to focus on outright positions (see Figure 1); these show seasonality, especially around harvest months, and align with front-month price dynamics. (2) *Harvest-month positions*, tracking the November contract for CBOT Soybeans and December for others, including only positions in that contract month within the calendar year, resetting to zero on January 1 (see Figure 2).

Futures price series are constructed to match net positions: an open-interest weighted average of the front two contract months for front-month prices, a weighted average of the first four contract months for total net positions, and the harvest-month contract price alone, all using end-of-day settlement prices. Cumulative returns ($R_{i,t,\tau}$) are measured over 1-, 5-, and 10-trading-day windows following USDA report publications to capture drift effects.

Additional variables include the credit spread (*baa10y*), global economic activity index (*igrea*), VIX (*vixcls*), federal funds rate (*fedfunds*), and the monthly Economic Policy Uncertainty Index

(based on newspaper coverage, expiring tax provisions, and forecaster dispersion). We also include the 30-day implied volatility of at-the-money call options from Bloomberg. These controls, used in our panel regression model, isolate risk and liquidity premia effects, consistent with our general drift analysis.

Table 1: Percent of Open Interest Captured by LTRS

Commodity	N	Mean	p25	p50	p75
Corn	4,595	0.88	0.87	0.88	0.89
Cotton No. 2	4,594	0.95	0.94	0.95	0.95
Soybeans	4,595	0.91	0.90	0.91	0.92
Wheat-HRW	4,594	0.88	0.86	0.89	0.92
Wheat-SRW	4,595	0.92	0.91	0.92	0.92
Total	22,973	0.91	0.89	0.91	0.93

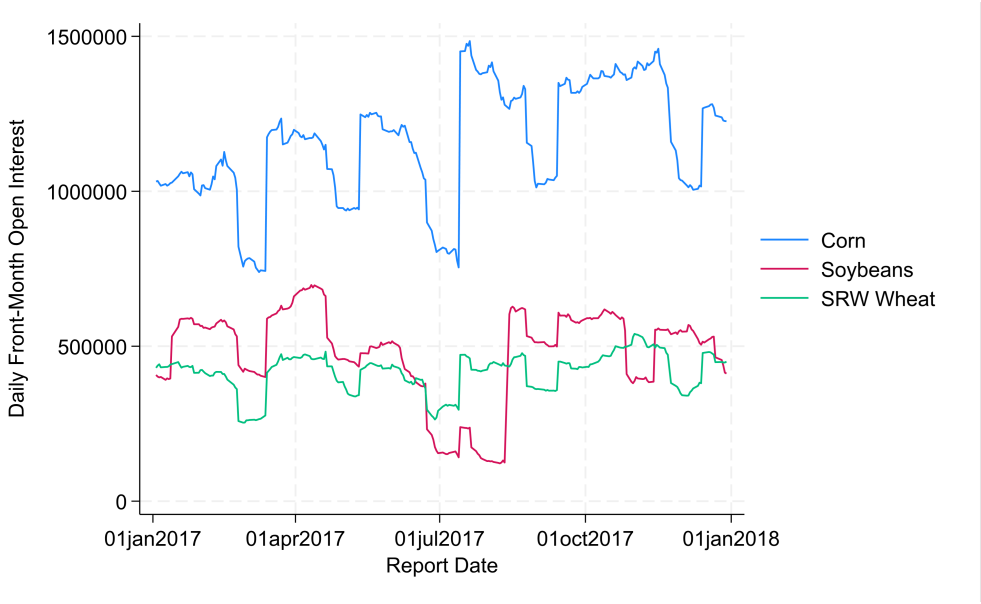


Figure 1: Front-month open interest in 2017 for selected commodities

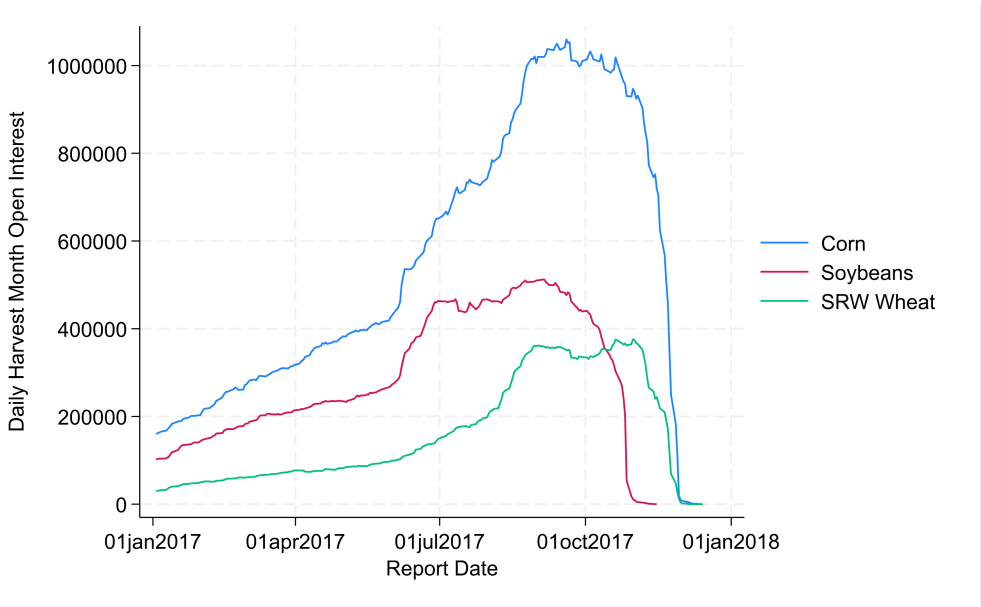


Figure 2: Harvest-month open interest in 2017 for selected commodities

3.3 Results

3.3.1 Contemporaneous Correlation

We first examine the contemporaneous effects of changes in futures prices on positions held by distinct trader groups. Under the rational expectations (RE) model, changes in price do not significantly affect contemporaneous positions, as trader groups receive the same price signal and update their expectations in concert. Conversely, in the difference-of-opinion (DO) model, traders hold distinct beliefs about price expectations; new signals received by one trader group induce a change in positions based on updated (differing) price expectations. Accordingly, a significant coefficient estimate for ΔP_t conflicts with the assumptions of the RE model and lends strong support to the DO model.

Our empirical specification detects whether, across all trading days, traders change their positions due to changes in returns (equation (54)). We estimate distinct regressions for each trader group (commercial, non-commercial, and CIT) and each of the five commodities, using OLS with Newey-West standard errors, including 5 lags. The results are shown in appendix tables 2a and 2b . We find that changes in trader positions are significantly positively related to position changes of

non-commercials and negatively related to position changes of commercials. Notably, we observe strong contemporaneous correlations in both nearby and harvest contracts, across all commodities for commercials and non-commercials. These findings are consistent with the results for Managed Money and Producer groups in Fishe et al. [2014]. Commodity Index Traders do not respond strongly or consistently to price changes, with insignificant results in most cases. This indicates that they typically receive weak signals about the price, or alternatively that they set positions primarily based on hedging their index portfolio and do not change their positions in response to those signals.

The price signals appear stronger for both non-commercials and commercials in the nearby contract market, indicating that their positions move more sharply as a result of signals, compared with the harvest contract. This could be due to a larger size of the price signal or less uncertainty about the signal. Given that the harvest contract expiration is typically several months behind the nearby, there tends to be more price uncertainty.

3.3.2 General Drift Analysis

Next, we estimate our general drift model (equation (55)) using 1-day, 1-week, and 2-week cumulative returns, separating our results by nearby and harvest contracts. Similar to the contemporaneous correlation model, we estimate separate regressions for each trader group and each of the five agricultural commodities, using OLS with Newey-West standard errors.

Results for the general drift model are shown in Appendix tables 2 and 3, and also figures 2a-2d; returns in the latter are annualized to make them comparable across the measurement window, and scaled to represent a net long (or hedging pressure) increase equivalent to 0.1% of the previous day's open interest. In the figures, point estimates significantly different from zero at the 5% significance level are filled, while those that are not significantly different remain unfilled. Recall that the drift captures both short-term liquidity dynamics, reflecting demand for immediacy (i.e., liquidity) by non-commercials, and also hedging pressure by commercials, in addition to any effects due to different trading signals (almost assuredly, given the results of the previous section). Because the

difference-of-opinion effects are not controlled, however, we cannot interpret with certainty that any systematic post-trade drift associated with position changes are premium-related. Rather they may simply indicate the systematic accuracy of trading signals received by different trader groups.

Although the single-day and one-week cumulative returns do not offer any useful evidence for liquidity premia—none of their point estimates are significantly different from zero—all five commodity markets appear to offer evidence of statistically significant price drift effects in the 2-week cumulative return, both in the nearby and harvest contracts. In each case, non-commercial trades correlate to price drifts in the opposite direction, while for commercial firms the price tend to drift in the direction of their position changes. For HRW, the effect is about a half a percent return in the nearby contract, annualized; for corn and soybeans it approaches a full percent, while for cotton and soybeans it's smaller. In the harvest contract, for each commodity the correlation is around two percent, annualized. Again, while this relationship—recovered from pooled analysis across the entire period of observation—may represent a premium paid for trading immediacy paid through subsequent futures price appreciation, it's interpretation is confounded by disagreement effects. According to the figures CITs do not consistently pay a liquidity premium, though they depct significant effects in HRW wheat for the nearby contract and soybeans for the harvest contract. These results are consistent with previous research showing that the price impact of CITs on commodity futures markets is minimal (Li et al. [2022]).

For the hedging pressure effects, we define one similar to Kang et al. [2020]; it represents the 52-week trailing moving average of the net short position of commercials in the market. It is designed to capture longer-run changes in hedging demand and thus any associated risk premium paid by commercials to non-commercials. Although, we include the term in each bivariate regression (equation 55) since it helps to explain the post-trade drift; notice it's similarity across trader equations for all five commodity markets. Using the pooled results for the entire data set, we find almost no evidence supporting a persistent or economically-meaningful risk premium. Only two figures show statistically-significant effects: the 2-week cumulative nearby contract return for SRW wheat and HRW wheat. However, even if this effect can be interpreted as a risk premium,

something we cannot be assured of since it may be confounded by belief effects, it is only on the order of about 0.15%, annualized.

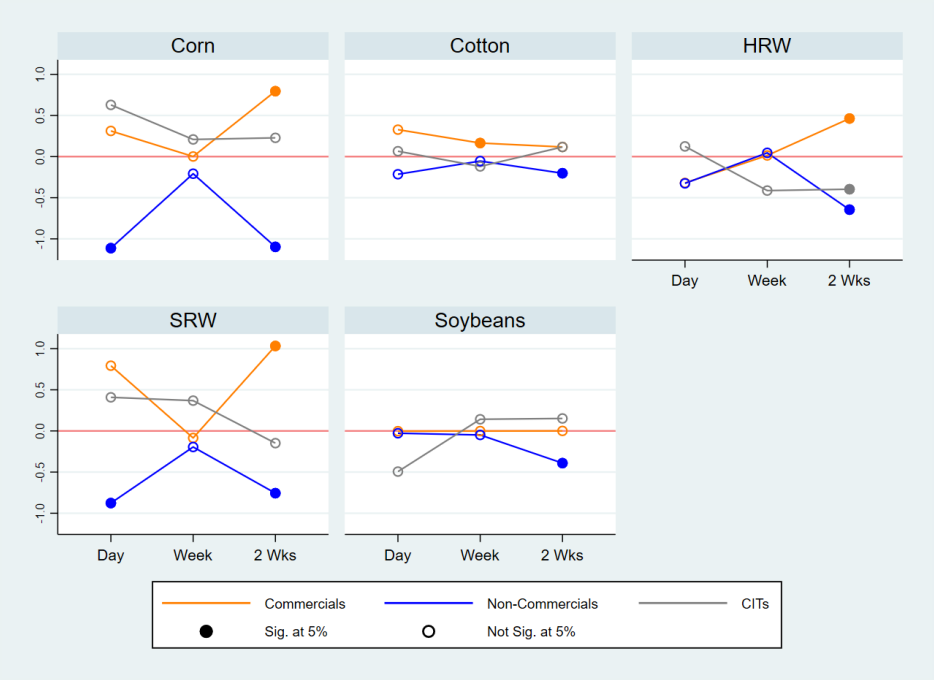


Figure 2a: Annualized Nearby Contract Return Over the Identified Period Following Net Long Increases Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type

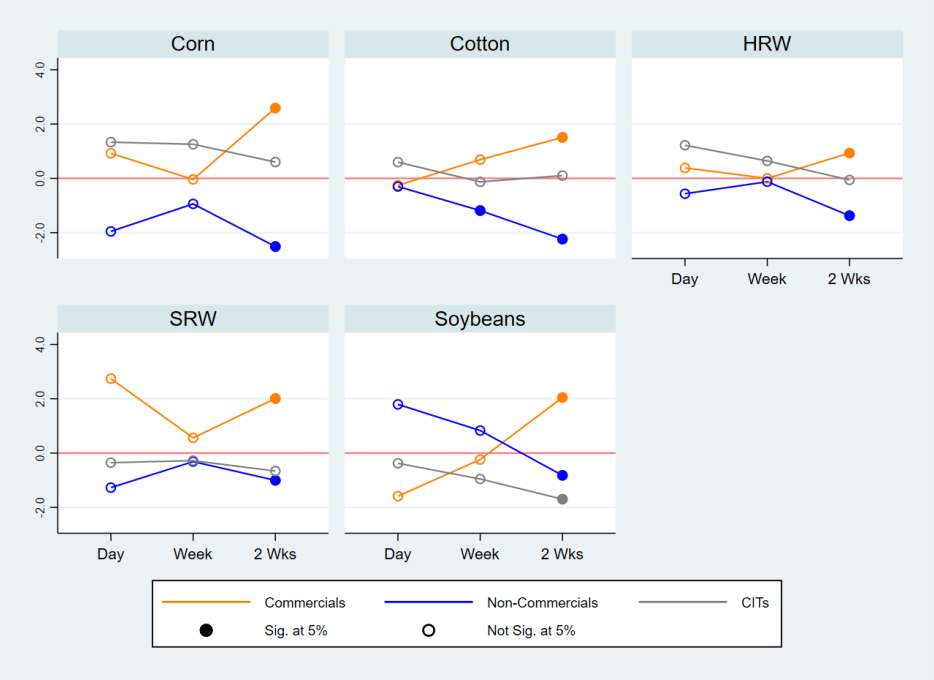


Figure 2b: Annualized Harvest Contract Return Over the Identified Period Following Net Long Increases Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type

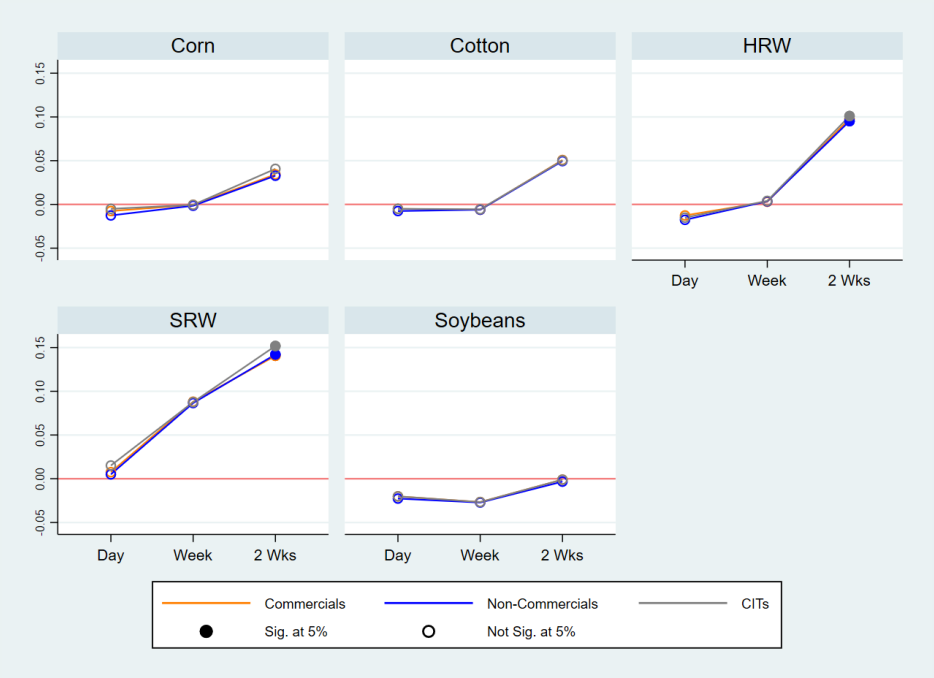


Figure 2c: Annualized Nearby Contract Return Over the Identified Period Following a Hedging Pressure Increase Equivalent to 0.1% of the Previous Day's Market-wide Open Interest

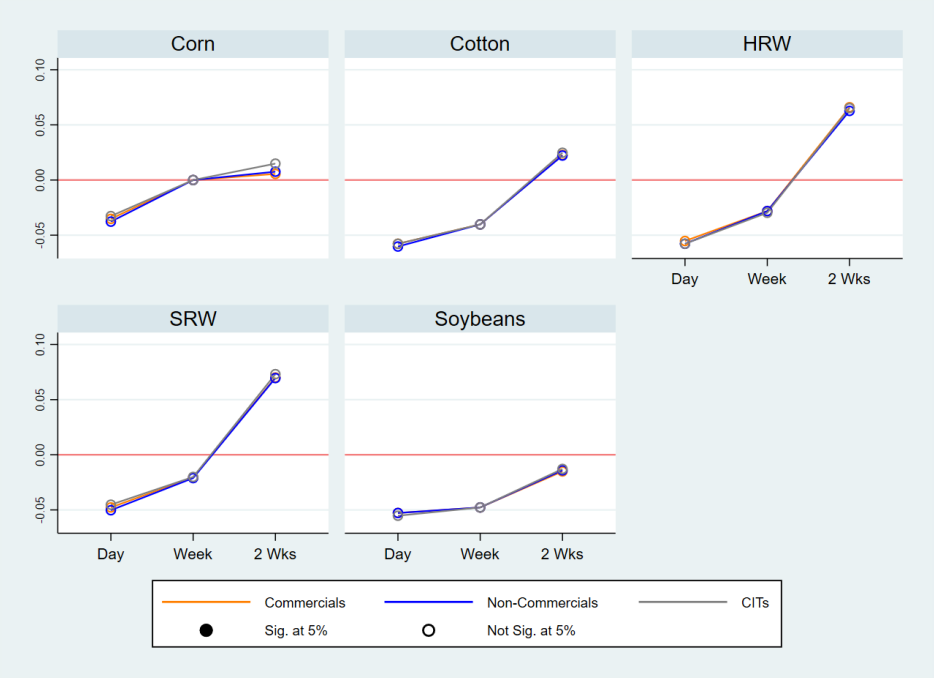


Figure 2d: Annualized Harvest Contract Return Over the Identified Period Following a Hedging Pressure Increase Equivalent to 0.1% of the Previous Day's Market-wide Open Interest

3.3.3 Panel Analysis of Natural Experiments: USDA Reports Resolve Trader Disagreement

Because trader disagreements prevent the econometrician from identifying the risk and liquidity premium using pooled data, we now exploit natural experiments and estimate our panel drift model (equation (61)) for the five-day period following each USDA report publication, with the assumption that these reports resolve differences of belief among traders. The timing of these reports is know well ahead of time and their information is shielded from markets until they are published. As before, we generate estimates for all five commodity markets using the 1-day, 1-week, and 2-week cumulative post-trade returns, and conduct separate models by trader type and also nearby and harvest contracts. All standard errors are Newey-West corrected.

Regression results for all models are shown in Appendix tables 6 and 7, and also figures 3a-3d; returns in the latter are annualized to make them comparable across the measurement windows, and scaled to represent a net long (or hedging pressure) increase equivalent to 0.1% of the previous day's open interest. In the figures, point estimates significantly different from zero at the 5% significance level are filled, while those that are not significantly different remain unfilled.

Unlike the general results above, by exploiting natural experiments figures 3a-3b demonstrate consistent evidence that non-commercials consistently pay commercials a liquidity premium in return for trading immediacy. Virtually every commodity and contract in the charts shows statistically-significant returns in the direction of commercials' position changes, and against those of non-commercials; often the effects are something like a mirror image. As before CITs are not as easily classified, although the charts make clear that their contribution is far less important than the other traders. By annualizing the cumulative returns, it is obvious that a large share of the premium is earned in the day following the trade. And the premium is economically meaningful: for the nearby contract the one-day annualized liquidity premium works out to around 4 percent in corn, soybeans, and cotton. In the harvest contract the one-day return is even larger—over twenty percent for both corn and SRW, but under ten percent for the other commodities. In all cases, non-commercials pay the liquidity premium through rapid price appreciation in the direction of the commercial trader. Without controlling for belief differences or using daily data, this premium

is much more difficult to observe.

Likewise hedging pressure effects in figures 3c-3d, are far more easily observed than in the pooled, general model. Recall that we include the HP variable in each bivariate regression (equation 55); again it is robust across trader models for all five commodity markets. In the five-trading-day period following USDA announcements we find substantial evidence of a risk premium paid by commercial firms to other traders—it occurs through price appreciation against the commercials. And it is economically meaningful in both the nearby and harvest contracts: for a rise in the trailing one-year moving average of the commercial net short position equivalent to 0.1% of the previous day's market-wide (across all contracts) open interest, the corn market's one-day annualized risk premium approaches one-hundred percent in the nearby contract and forty percent in the harvest contract. For other commodities, the annualized risk premium is between 10-30%. It remains positive when measured with one-week and two-week windows too, but is far smaller, indicating the importance of using the confidential regulatory data when trying to measure it with accuracy. We note, however, that these liquidity and risk premia effects explain a very small fraction of subsequent future price changes over time, especially at ore distant horizons.

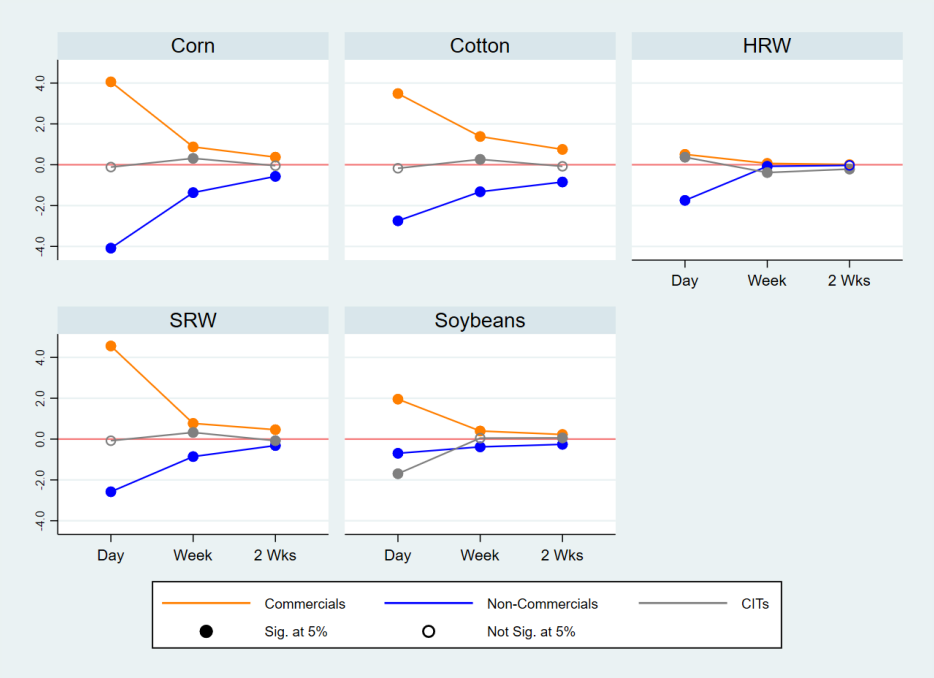


Figure 3a: Annualized Nearby Contract Return Over the Identified Period Following Net Long Increases During the 5-day USDA Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type

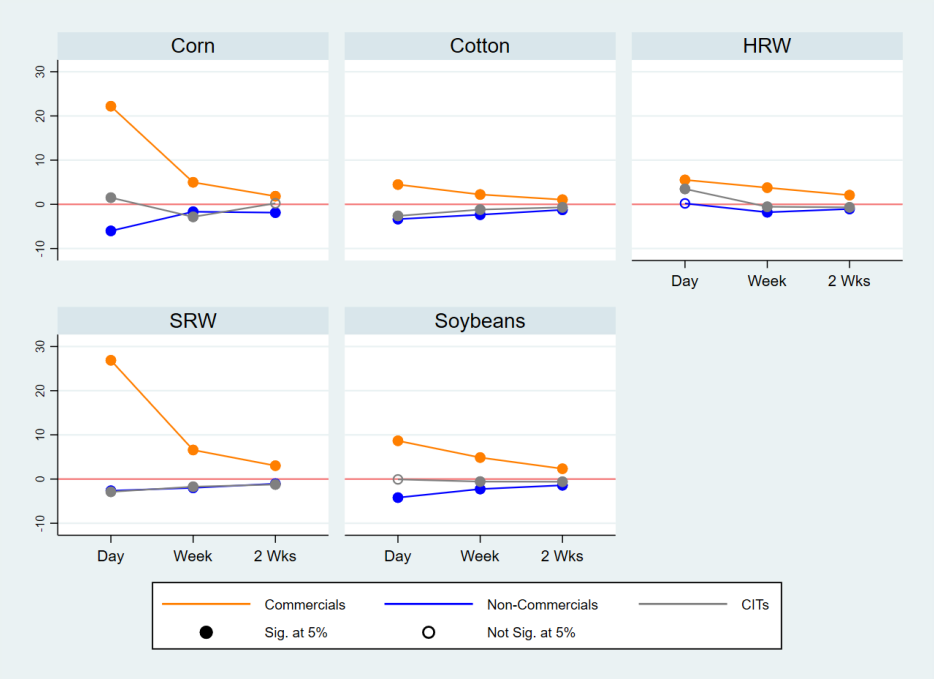


Figure 3b: Annualized Harvest Contract Return Over the Identified Period Following Net Long Increases During the 5-day USDA Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type

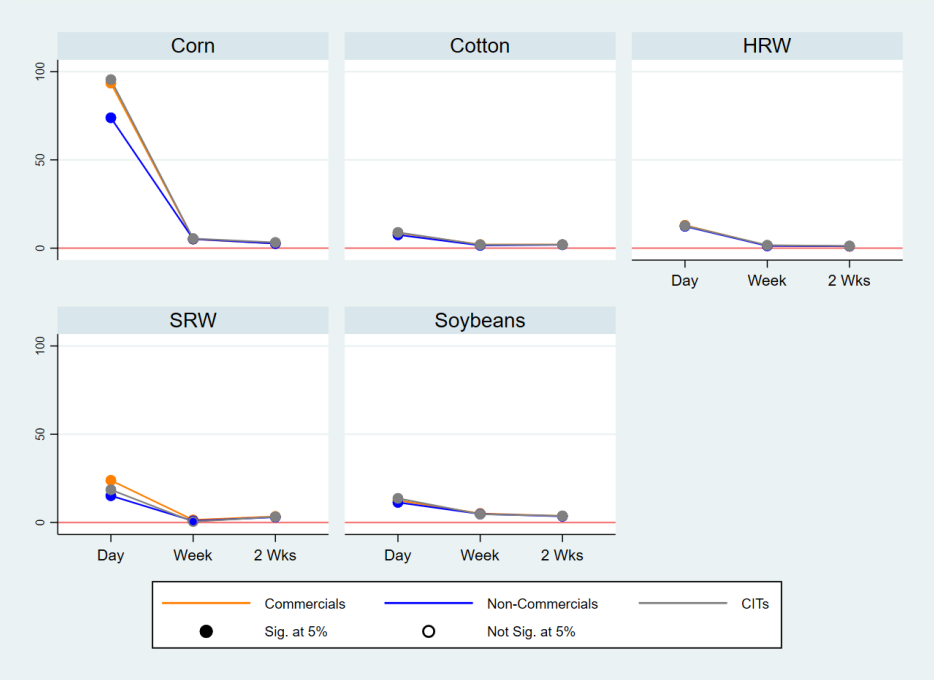


Figure 3c: Annualized Nearby Contract Return Over the Identified Period Following a Hedging Pressure Increase During the 5-day USDA Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest

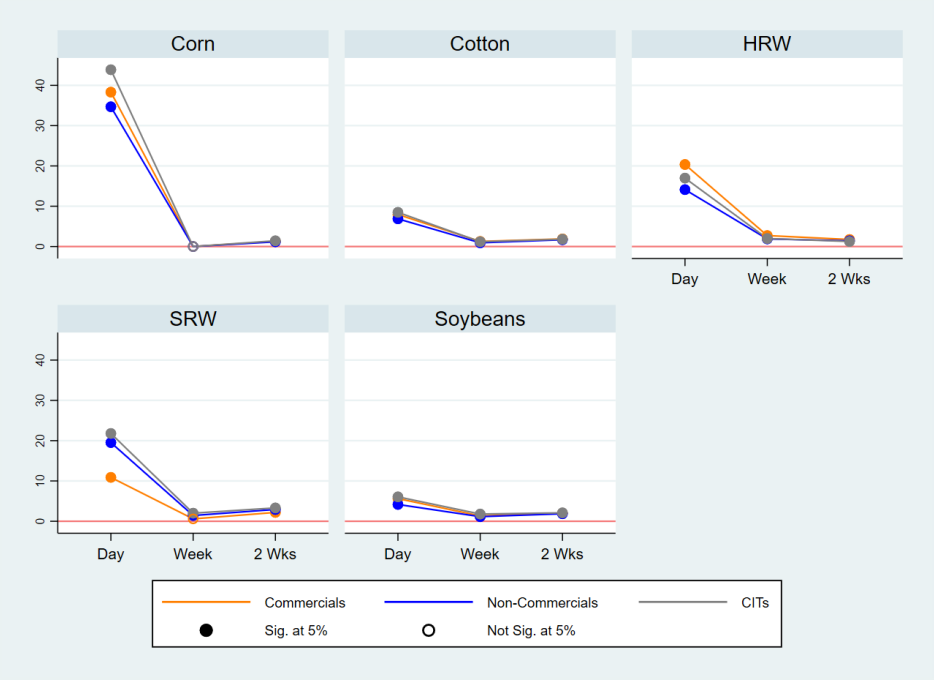


Figure 3d: Annualized Harvest Contract Return Over the Identified Period Following a Hedging Pressure Increase During the 5-day USDA Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest

3.3.4 Panel Analysis of Natural Experiments: VIX Spikes May Overwhelm Trader Disagreement

Like USDA reports, spikes in financial market uncertainty may lead to trading periods where disagreement about the future spot price of a commodity is less important than on normal trading days. While spikes in the VIX may not serve as reliably as resolution instruments compared to USDA reports (since they do not directly reveal the fundamental price of the underlying commodity), we assume that they can be viewed as times where trader beliefs are relatively more aligned—since prices are potentially determined by exogenous dynamics. It may also be that certain traders choose to re-balance their portfolios as these times and so shift out the demand for trading immediacy. As in the previous section, we estimate our panel drift model (equation (61)) for the five-day period following each VIX spike (in the top 5 percentile throughout the data) for all five commodity markets using the 1-day, 1-week, and 2-week cumulative post-trade returns; we conduct separate models by trader type and also for nearby and harvest contracts. All standard errors are clustered by VIX shock.

Regression results for all models are shown in Appendix tables 6 and 7, and also figures 4a-4d; returns in the figures are annualized to make them comparable across measurement windows, and scaled to represent a net long (or hedging pressure) increase equivalent to 0.1% of the previous day's open interest. In the figures, point estimates significantly different from zero at the 5% significance level are filled, while those that are not significantly different remain unfilled.

As in the case of USDA reports, by exploiting the natural experiments offered by VIX shocks we demonstrate in figures 4a-4b yet more evidence that non-commercial firms consistently pay commercials a liquidity premium in return for trading immediacy. Perhaps unsurprisingly, the liquidity premium following VIX shocks across markets is a bit larger for the nearby contract than in the USDA windows of 3a (although for harvest contracts the effect is about the same save for corn). This could be due to the rebalancing effect as economic uncertainty drives certain non-commercial traders to enter or exit the market. Once again, the liquidity premia are paid through futures price appreciation in the direction of commercial traders, and the payment is concentrated

soon after the trade. By one-to-two weeks out, it is nearly impossible to observe.

Hedging pressure effects in figures 4c-4d are generally similar to those from the USDA windows (except for nearby contract corn). They further support the notion that the risk premium is paid rapidly following commercial net long increases, and once again robust across trader models for all five commodity markets. It remains positive when measured with one-week and two-week windows, but is far smaller.

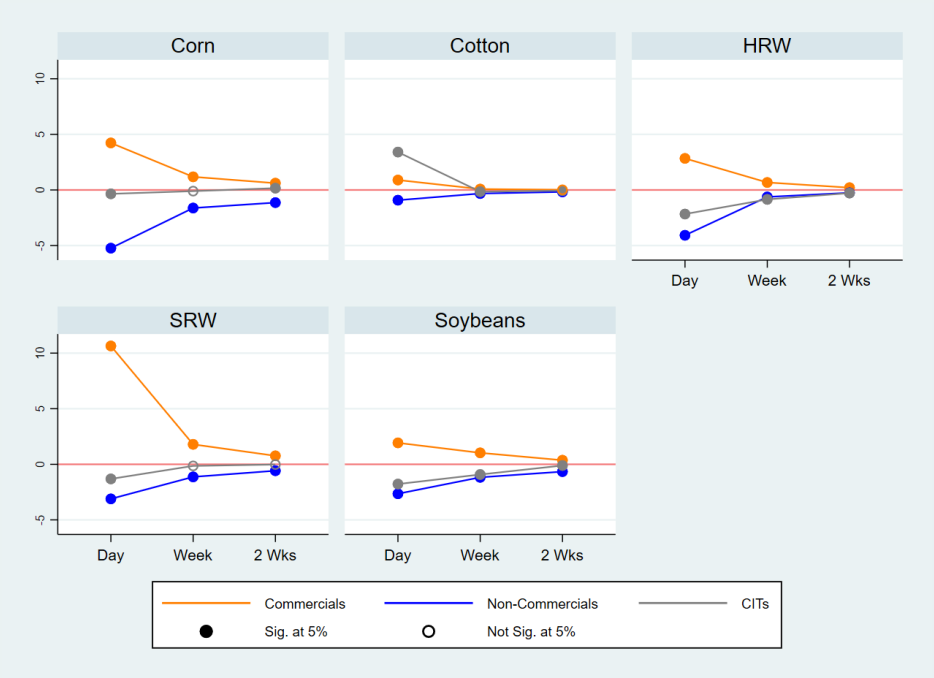


Figure 4a: Annualized Nearby Contract Return Over the Identified Period Following Net Long Increases During the 5-day VIX Shock Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type

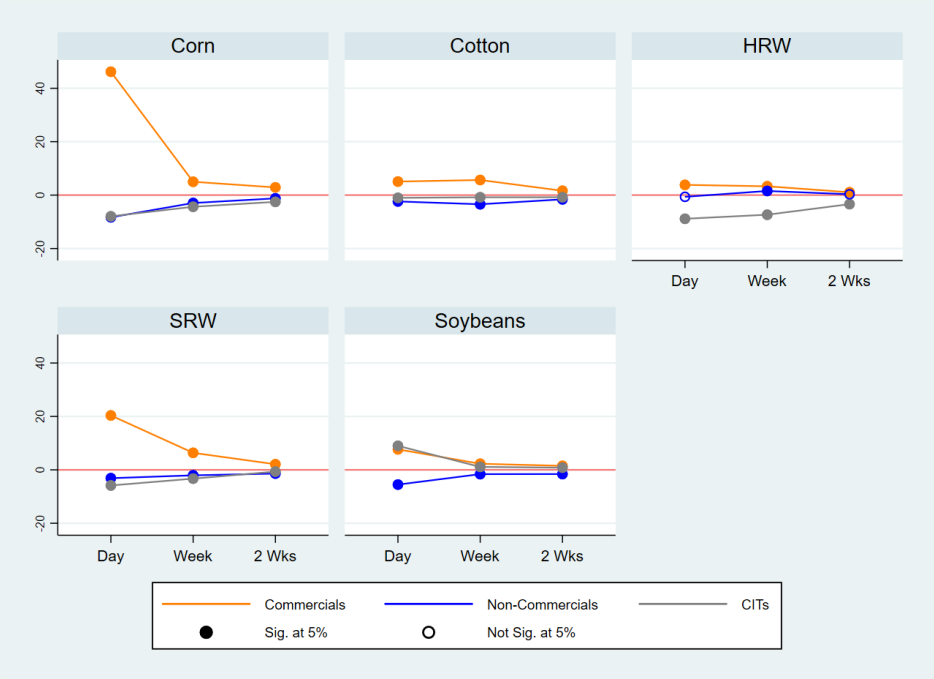


Figure 4b: Annualized Harvest Contract Return Over the Identified Period Following Net Long Increases During the 5-day VIX Shock Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest, by Trader Type



Figure 4c: Annualized Nearby Contract Return Over the Identified Period Following a Hedging Pressure Increase During the 5-day VIX Shock Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest



Figure 4d: Annualized Harvest Contract Return Over the Identified Period Following a Hedging Pressure Increase During the 5-day VIX Shock Window Equivalent to 0.1% of the Previous Day's Market-wide Open Interest

4 Conclusions

For over a century, economists have wondered why traders use futures markets, and how their trading choices might affect them. In this article, we show formally that a systematic post-trade price drift in the futures price can represent the combined effects of the risk premium, a liquidity premium, and disagreement about the expected spot price at contract maturity. We then suggest an identification strategy that controls for trader disagreement, in order to measure the premia accurately.

We show that without doing so, neither is particularly significant, statistically or economically. However, once trader disagreement effects are partialed out, we demonstrate that commercials pay an economically significant risk premium, while non-commercials pay a similar significant liquidity premium. We show that compensation effects occur through the rapid price appreciation in the direction of the relevant counterparty; our regulatory data show that most of the effect is concentrated by the next day, and that by the second week after a trade, almost no effect can be measured. Moreover, position changes and hedging pressure by traders explains only a small fraction of the subsequent variation in futures prices. In the end, we arrive at the finding that—because at most times these premia work against one another—the futures price can be conceived of as a noisy forecast of the expected future spot price.

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A Derivations and Comparisons to Fishe et al.

A.1 RE Model Derivation

In the Rational Expectations (RE) model, both traders share a common signal $\mu_H = \mu_S = F_0$ and perceive $\text{Var}_H[F_2] = \text{Var}_S[F_2] = 2\sigma_F^2$. The futures price is $F_2 = F_0 + e_1 + e_2$, where $e_i \sim N(0, \sigma_F^2)$, $i = 1, 2$, are independent, so $E[F_2] = F_0$, $\text{Var}[F_2] = 2\sigma_F^2$. The spot price is $S_2 = F_2$, and the hedger's selling price is $P_2 = S_2 + u$, with $u \sim N(0, \sigma_u^2)$, $\text{cov}[F_2, u] = 0$.

The hedger's wealth is:

$$W_H = Q_H(F_2 - F_1) + Z(F_2 + u) = (Q_H + Z)F_2 + Zu - Q_H F_1 \tag{62}$$

The speculator's wealth is:

$$W_S = Q_S(F_2 - F_1) \tag{63}$$

With CARA utility $U(W) = -\exp(-\gamma W)$, the speculator maximizes:

$$E_S[-\exp(-\gamma Q_S(F_2 - F_1))] = -\exp\left(-\gamma Q_S(F_0 - F_1) + \frac{1}{2}\gamma^2 Q_S^2(2\sigma_F^2)\right) \tag{64}$$

Maximizing the certainty equivalent $Q_S(F_0 - F_1) - \frac{\gamma}{2}Q_S^2(2\sigma_F^2)$ by choosing quantity yields:

$$Q_S = \frac{F_0 - F_1}{\gamma(2\sigma_F^2)} \tag{65}$$

Similarly, the hedger maximizes:

$$E_H[-\exp(-\gamma((Q_H + Z)F_2 + Zu - Q_H F_1))] \tag{66}$$

Given expected wealth $(Q_H + Z)F_0 - Q_H F_1$ and variance $(Q_H + Z)^2(2\sigma_F^2) + Z^2\sigma_u^2$, the certainty

equivalent is $(Q_H + Z)F_0 - Q_H F_1 - \frac{\gamma}{2}\left[(Q_H + Z)^2(2\sigma_F^2) + Z^2\sigma_u^2\right]$, yielding:

$$Q_H = \frac{F_0 - F_1}{\gamma(2\sigma_F^2)} - Z \tag{67}$$

Imposing market clearing ($Q_H + Q_S = 0$) solves for the equilibrium conditions:

$$\frac{2(F_0 - F_1)}{\gamma(2\sigma_F^2)} - Z = 0 \implies F_1 = F_0 - \gamma Z \sigma_F^2 \tag{68}$$

$$Q_S = \frac{Z}{2}, \quad Q_H = -\frac{Z}{2} \tag{69}$$

The drift is:

$$E[F_2 - F_1] = \gamma Z \sigma_F^2 \tag{70}$$

A.2 NRE Model Derivation

Traders receive signals $s_H = \varepsilon_1 + v_H$, $s_S = \varepsilon_1 + v_S$, with $v_H \sim N(0, \sigma_H^2)$, $v_S \sim N(0, \sigma_S^2)$. Therefore, the signal vector is:

$$\mathbf{s} = [s_H, s_S]' \tag{71}$$

with independent realizations so that the noise covariance is given by:

$$\Omega = \begin{bmatrix} \sigma_H^2 & 0 \\ 0 & \sigma_S^2 \end{bmatrix} \tag{72}$$

The futures price is determined by the conditional expectation and variance of F_2:

$$F_1 = E[F_2|s_H, s_S] - \frac{\gamma Z}{2}\text{Var}[F_2|s_H, s_S] \tag{73}$$

where $F_2 = F_0 + \varepsilon_1 + \varepsilon_2$, $\varepsilon_1, \varepsilon_2 \sim N(0, \sigma_F^2)$, and $E[F_2|s_H, s_S] = F_0 + A'(AA' + \sigma_F^{-2}\Omega)^{-1}\mathbf{s}$, with $A = [1, 1]'$. Translating the expression to scalar notation:

$$AA' = 2, \quad \sigma_F^{-2}\Omega = \begin{bmatrix} \frac{\sigma_H^2}{\sigma_F^2} & 0 \\ 0 & \frac{\sigma_S^2}{\sigma_F^2} \end{bmatrix} \tag{74}$$

$$AA' + \sigma_F^{-2}\Omega = \begin{bmatrix} 2 + \frac{\sigma_H^2}{\sigma_F^2} & 0 \\ 0 & 2 + \frac{\sigma_S^2}{\sigma_F^2} \end{bmatrix} \tag{75}$$

$$(AA' + \sigma_F^{-2}\Omega)^{-1} = \begin{bmatrix} \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}} & 0 \\ 0 & \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}} \end{bmatrix} \tag{76}$$

Therefore we define the signal weights as:

$$w_H = \frac{1}{2 + \frac{\sigma_H^2}{\sigma_F^2}}, \quad w_S = \frac{1}{2 + \frac{\sigma_S^2}{\sigma_F^2}} \tag{77}$$

As a result:

$$A'(AA' + \sigma_F^{-2}\Omega)^{-1} = [w_H, w_S] \tag{78}$$

$$E[F_2|s_H, s_S] = F_0 + w_H s_H + w_S s_S \tag{79}$$

For the conditional variance:

$$\text{Var}[F_2|s_H, s_S] = 2\sigma_F^2 - \sigma_F^2 A'(AA' + \sigma_F^{-2}\Omega)^{-1}A \tag{80}$$

$$A'(AA' + \sigma_F^{-2}\Omega)^{-1}A = w_H + w_S \tag{81}$$

$$\text{Var}[F_2|s_H, s_S] = 2\sigma_F^2 - \sigma_F^2(w_H + w_S) \tag{82}$$

When $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$:

$$w_H = w_S = \frac{1}{2 + \frac{\sigma_F^2}{\sigma_F^2}} = \frac{1}{2+1} = \frac{1}{3}, \quad w_H + w_S = \frac{2}{3} \tag{83}$$

$$\text{Var}[F_2|s_H, s_S] = 2\sigma_F^2 - \sigma_F^2 \cdot \frac{2}{3} = 2\sigma_F^2 - \frac{2}{3}\sigma_F^2 = \frac{4}{3}\sigma_F^2 \tag{84}$$

The futures price reduces to:

$$F_1 = F_0 + w_H s_H + w_S s_S - \frac{\gamma Z}{2} \cdot \frac{4}{3}\sigma_F^2 \tag{85}$$

$$F_1 = F_0 + \frac{1}{3}s_H + \frac{1}{3}s_S - \frac{2}{3}\gamma Z \sigma_F^2 \tag{86}$$

$$F_1 = F_0 + \frac{1}{3}(s_H + s_S) - \frac{2}{3}\gamma Z \sigma_F^2 \tag{87}$$

Optimal positions are:

$$Q_H = \frac{E[F_2|s_H, s_S] - F_1}{\gamma \cdot \frac{4}{3}\sigma_F^2} - Z, \quad Q_S = \frac{E[F_2|s_H, s_S] - F_1}{\gamma \cdot \frac{4}{3}\sigma_F^2} \tag{88}$$

Imposing market clearing ($Q_H + Q_S = 0$) yields:

$$Q_S = \frac{Z}{2}, \quad Q_H = -\frac{Z}{2} \tag{89}$$

The drift is:

$$E[F_2 - F_1] = \frac{2}{3}\gamma Z \sigma_F^2 \tag{90}$$

A.3 Proof of Equivalence Between Our Noisy RE Model and that of Fishe et al.

We express the equilibrium futures price F_1 in scalar notation, while Fishe et al. [2014] use a matrix form. Here we prove that they are equivalent when the variances of the signals are equal, i.e., $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$.

Step 1: Define the Two Futures Price Expressions

Two expressions represent the futures price F_1:

- **Our Scalar Form:**

$$F_1 = E[F_2|s_H, s_S] - \frac{\gamma Z}{2}\text{Var}[F_2|s_H, s_S] \tag{91}$$

  Here, $E[F_2|s_H, s_S]$ is the expected value of the terminal futures price F_2 given two signals, s_H (from hedgers) and s_S (from speculators). The term $-\frac{\gamma Z}{2}\text{Var}[F_2|s_H, s_S]$ is the risk premium, where γ is risk aversion, Z is the spot position, and $\text{Var}[F_2|s_H, s_S]$ is the variance of F_2 conditional on the signals received by the hedger and speculator.

- **Fishe et al.'s Matrix Form:**

$$F_1 = F_0 + A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1}\mu - \frac{\gamma Z \sigma_F^2}{2}\left(2 - A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1}A\right) \tag{92}$$

  Note that F_0 is the original expected futures price, $A = [1, 1]'$ is a column vector stating that both signals contribute equally in the model, $\mu = [s_H, s_S]'$ is a vector of the signals, and

$\Omega = \begin{bmatrix} \sigma_H^2 & 0 \\ 0 & \sigma_S^2 \end{bmatrix}$ is a diagonal matrix of signal variances (the covariance is zero since signals are independent). The term σ_F^2 is the variance of F_2.

Step 2: Convert Fishe et al.'s Matrix Form to Scalar Form

To keep things consistent, since we use scalars we first re-write Fishe et al.'s futures price to scalars, as well.

$A = [1, 1]'$ implies that:

$$AA' = 1 \cdot 1 + 1 \cdot 1 = 2 \tag{93}$$

$\sigma_F^{-2} = \frac{1}{\sigma_F^2}$ is the precision (inverse variance) of F_2. Multiply it by the variance matrix:

$$\sigma_F^{-2}\Omega = \frac{1}{\sigma_F^2}\begin{bmatrix} \sigma_H^2 & 0 \\ 0 & \sigma_S^2 \end{bmatrix} = \begin{bmatrix} \frac{\sigma_H^2}{\sigma_F^2} & 0 \\ 0 & \frac{\sigma_S^2}{\sigma_F^2} \end{bmatrix} \tag{94}$$

Since Ω is 2×2 and diagonal, this scales each signal's variance by the precision of F_2. Then:

$$AA' + \sigma_F^{-2}\Omega = \begin{bmatrix} 2 + \frac{\sigma_H^2}{\sigma_F^2} & 0 \\ 0 & 2 + \frac{\sigma_S^2}{\sigma_F^2} \end{bmatrix} \tag{95}$$

Implying that:

$$\left(AA' + \sigma_F^{-2}\Omega\right)^{-1} = \begin{bmatrix} \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}} & 0 \\ 0 & \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}} \end{bmatrix} \tag{96}$$

Pre-multiplying by $A' = [1, 1]$ generates a 1×2 vector of signal weights:

$$A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1} = [1,1]\begin{bmatrix} \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}} & 0 \\ 0 & \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}} \end{bmatrix} = \begin{bmatrix} \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}}, & \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}} \end{bmatrix} \tag{97}$$

Define these as weights: $w_H = \frac{1}{2+\frac{\sigma_H^2}{\sigma_F^2}}$ and $w_S = \frac{1}{2+\frac{\sigma_S^2}{\sigma_F^2}}$.

Now, post-multiply by the signal vector transpose $\mu = [s_H, s_S]'$ to generate a scalar representing the weighted average of the signals:

$$A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1}\mu = [w_H, w_S]\begin{bmatrix} s_H \\ s_S \end{bmatrix} = w_H s_H + w_S s_S \tag{98}$$

To convert their risk premium term to a scalar, post-multiply by $A = [1, 1]'$:

$$A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1}A = [w_H, w_S]\begin{bmatrix} 1 \\ 1 \end{bmatrix} = w_H \cdot 1 + w_S \cdot 1 = w_H + w_S \tag{99}$$

So:

$$2 - A'\left(AA' + \sigma_F^{-2}\Omega\right)^{-1}A = 2 - (w_H + w_S) \tag{100}$$

And the risk premium scalar becomes:

$$-\frac{\gamma Z \sigma_F^2}{2}(2 - w_H - w_S) \tag{101}$$

Combining the above, the scalar form of Fishe et al.'s futures price is:

$$F_1 = F_0 + (w_H s_H + w_S s_S) - \frac{\gamma Z \sigma_F^2}{2}(2 - w_H - w_S) \tag{102}$$

Step 3: Apply the Condition $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$

Assume $\sigma_H^2 = \sigma_F^2$ and $\sigma_S^2 = \sigma_F^2$. Substitute into the weights:

$$w_H = \frac{1}{2 + \frac{\sigma_F^2}{\sigma_F^2}} = \frac{1}{2+1} = \frac{1}{3} \tag{103}$$

$$w_S = \frac{1}{3} \tag{104}$$

Now plug these into Fishe et al.'s scalar form:

$$F_1 = F_0 + \left(\frac{1}{3}s_H + \frac{1}{3}s_S\right) - \frac{\gamma Z \sigma_F^2}{2}\left(2 - \frac{1}{3} - \frac{1}{3}\right) \tag{105}$$

Simplify the risk term:

$$2 - \frac{1}{3} - \frac{1}{3} = 2 - \frac{2}{3} = \frac{4}{3} \tag{106}$$

$$-\frac{\gamma Z \sigma_F^2}{2} \cdot \frac{4}{3} = -\frac{2}{3}\gamma Z \sigma_F^2 \tag{107}$$

So their futures price expression becomes:

$$F_1 = F_0 + \frac{1}{3}(s_H + s_S) - \frac{2}{3}\gamma Z \sigma_F^2 \tag{108}$$

Step 4: Expand Our Scalar Form To Demonstrate Equivalence

From Appendix A.2, the futures price in our rational expectations model with noisy signals is:

$$F_1 = F_0 + w_H s_H + w_S s_S - \frac{\gamma Z}{2}\text{Var}[F_2 | s_H, s_S] \tag{109}$$

When $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$, we have $w_H = w_S = \frac{1}{3}$ and Var$[F_2|s_H, s_S] = \frac{4}{3}\sigma_F^2$. Substitute:

$$F_1 = F_0 + \frac{1}{3}s_H + \frac{1}{3}s_S - \frac{\gamma Z}{2} \cdot \frac{4}{3}\sigma_F^2 \tag{110}$$

Simplifying:

$$F_1 = F_0 + \frac{1}{3}(s_H + s_S) - \frac{2}{3}\gamma Z \sigma_F^2 \tag{111}$$

This matches Fishe et al.'s form exactly:

$$F_1 = F_0 + \frac{1}{3}(s_H + s_S) - \frac{2}{3}\gamma Z \sigma_F^2 \tag{112}$$

Thus, the two models are equivalent under the condition $\sigma_H^2 = \sigma_S^2 = \sigma_F^2$.

B Appendix Tables

Table 2a: Contemporaneous Correlations, Nearby Contracts

	Hedgers	*Speculators*	*CITs*
SRW	-0.3757***	0.3516***	0.0221
HRW	-0.2964***	0.2189***	0.0290**
Corn	-0.4346***	0.4164***	0.0231
Soybeans	-0.6231***	0.5369***	0.0006
Cotton	-0.3487***	0.3253***	-0.0538**

Coefficients are estimated (as in equation 54 in the text) using a contemporaneous regression of daily net long position changes, as a share of open interest, on matched-contract futures contract returns. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 2b: Contemporaneous Correlations, Harvest Contracts

	Hedgers	*Speculators*	*CITs*
SRW	-0.0815***	0.0806***	0.0007
HRW	-0.0533***	0.0371***	0.0029
Corn	-0.1151***	0.1033***	0.0098***
Soybeans	-0.1781***	0.1571***	-0.0016
Cotton	-0.1815***	0.1267***	-0.0043

Coefficients are estimated (as in equation 54 in the text) using a contemporaneous regression of daily net long position changes, as a share of open interest, on matched-contract futures contract returns. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3a: General Drift Results for Cumulative One-Day Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0303	-0.0364**	0.0159
HRW	-0.0129	-0.0131	0.0049
Corn	0.0122	-0.0468**	0.0242
Soybeans	-0.0001	-0.0011	-0.0201
Cotton	0.0128**	-0.0086	0.0026

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3b: General Drift Results for Cumulative One-Week Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	-0.0169	-0.0390	0.0719
HRW	0.0028	0.0091	-0.0836
Corn	0.0003	-0.0416	0.0410
Soybeans	-0.0002	-0.0096	0.0280
Cotton	0.0325**	-0.0107	-0.0238

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3c: General Drift Results for Cumulative Two-Week Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.3909***	-0.3115***	-0.0593
HRW	0.1798***	-0.2641***	-0.1603**
Corn	0.3042***	-0.4601***	0.0896
Soybeans	0.0002	-0.1581***	0.0599
Cotton	0.0464*	-0.0809**	0.0462

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3d: General Drift Results for Cumulative One-Day Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0962*	-0.0539	-0.0142
HRW	0.0150	-0.0231	0.0457
Corn	0.0350	-0.0862	0.0497
Soybeans	-0.0684*	0.0655	-0.0152
Cotton	-0.0104	-0.0121	0.0230

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3e: General Drift Results for Cumulative One-Week Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.1085	-0.0633	-0.0559
HRW	-0.0001	-0.0246	0.1237
Corn	-0.0077	-0.1957	0.2350
Soybeans	-0.0476	0.1585	-0.1983
Cotton	0.1325*	-0.2502**	-0.0258

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 3f: General Drift Results for Cumulative Two-Week Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.7297***	-0.4184***	-0.2703
HRW	0.3544**	-0.5851***	-0.0233
Corn	0.9180***	-1.1402***	0.2321
Soybeans	0.7420***	-0.3387**	-0.7345***
Cotton	0.5592***	-0.9994***	0.0405

Trader coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4a: General Hedging Pressure Results for Cumulative One-Day Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0003	0.0002	0.0006
HRW	-0.0005	-0.0007	-0.0006
Corn	-0.0003	-0.0005	-0.0002
Soybeans	-0.0008	-0.0009	-0.0008
Cotton	-0.0002	-0.0003	-0.0002

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4b: General Hedging Pressure Results for Cumulative One-Week Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0174	0.0171	0.0173
HRW	0.0006	0.0007	0.0008
Corn	-0.0001	-0.0003	-0.0001
Soybeans	-0.0053	-0.0054	-0.0053
Cotton	-0.0012	-0.0012	-0.0011

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4c: General Hedging Pressure Results for Cumulative Two-Week Post-trade Return, Nearby Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0554**	0.0560**	0.0598***
HRW	0.0386**	0.0376**	0.0399**
Corn	0.0136	0.0130	0.0161
Soybeans	-0.0004	-0.0013	-0.0004
Cotton	0.0201	0.0196	0.0199

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4d: General Hedging Pressure Results for Cumulative One-Day Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	-0.0019	-0.0020	-0.0018
HRW	-0.0022	-0.0023	-0.0023
Corn	-0.0014	-0.0015	-0.0013
Soybeans	-0.0021	-0.0021	-0.0022
Cotton	-0.0023	-0.0024	-0.0023

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4e: General Hedging Pressure Results for Cumulative One-Week Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	-0.0041	-0.0042	-0.0040
HRW	-0.0056	-0.0056	-0.0059
Corn	-0.0042	-0.0046	-0.0039
Soybeans	-0.0095	-0.0095	-0.0095
Cotton	-0.0080	-0.0080	-0.0080

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4f: General Hedging Pressure Results for Cumulative Two-Week Post-trade Return, Harvest Contract

	Hedgers	*Speculators*	*CITs*
SRW	0.0277	0.0275	0.0289
HRW	0.0261	0.0248	0.0258
Corn	0.0022	0.0030	0.0059
Soybeans	-0.0060	-0.0056	-0.0051
Cotton	0.0090	0.0088	0.0098

Hedging Pressure coefficients are estimated (as in equation 55 in the text) by regressing the indicated, contract-matched, cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls. Newey-West standard errors are used, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5a: Cumulative One-Day Post-trade Return: SRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1492***	-0.1183***	-0.0032	0.2880***	-0.1477***	-0.0559
	(0.0383)	(0.0292)	(0.0470)	(0.0537)	(0.0513)	(0.0798)
Hedging Pressure	0.4854	0.3670	0.4172	0.5550*	0.2391	0.5848
	(0.2953)	(0.2990)	(0.2822)	(0.3322)	(0.3651)	(0.3787)
Relative Day	0.0004	0.0006	0.0007	-0.0003	0.0001	0.0000
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)
BAA Yield	-0.0312	-0.0239	-0.0340*	-0.0330	-0.0388	-0.0281
	(0.0198)	(0.0186)	(0.0192)	(0.0301)	(0.0339)	(0.0339)
Federal Funds Rate	-0.0837*	-0.0805**	-0.0798**	0.0667	0.0492	0.0465
	(0.0434)	(0.0390)	(0.0394)	(0.0475)	(0.0753)	(0.0711)
Economic Policy Uncertainty	-0.0002	-0.0003***	-0.0002**	-0.0003	-0.0002	-0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0003)
IGREA	-0.0003	-0.0003	-0.0002**	-0.0003	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0011**	-0.0012**	-0.0014***	-0.0015**	-0.0021**	-0.0019***
	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0010)	(0.0007)
Log Basis	17.3236	36.1038***	30.5921**	25.9500**	24.6519	27.7552
	(13.5835)	(13.4212)	(14.5397)	(11.6715)	(18.2789)	(17.0403)
Partial R2 (HP Coefficient)	0.0036	0.0020	0.0029	0.0064	0.0010	0.0055
Partial R2 (Trader Coefficient)	0.0198	0.0000	0.0000	0.0620	0.0000	0.0000
R-squared	0.0914	0.0949	0.0662	0.2395	0.1554	0.1561
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5b: Cumulative One-Day Post-trade Return: SRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.5192***	-0.1215	-0.1350	0.4419*	-0.1481	-0.3478
	(0.1170)	(0.1079)	(0.1912)	(0.2557)	(0.2405)	(0.2967)
Hedging Pressure	0.2928	0.4306	0.4600*	0.4730	0.3663	0.5815*
	(0.2709)	(0.2843)	(0.2724)	(0.2921)	(0.3244)	(0.3192)
Relative Day	0.0005	0.0005	0.0004	-0.0007	-0.0004	-0.0007
	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0006)
BAA Yield	-0.0348*	-0.0298	-0.0340*	-0.0492	-0.0374	-0.0249
	(0.0190)	(0.0188)	(0.0196)	(0.0367)	(0.0337)	(0.0339)
Federal Funds Rate	-0.0667**	-0.0580*	-0.0555*	0.0701	0.0388	0.0600
	(0.0330)	(0.0310)	(0.0321)	(0.0813)	(0.0878)	(0.0612)
Economic Policy Uncertainty	-0.0002**	-0.0002**	-0.0002**	-0.0002	-0.0002	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
IGREA	-0.0002**	-0.0002**	-0.0002**	-0.0002	-0.0001	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0012***	-0.0013***	-0.0013***	-0.0014***	-0.0012**	-0.0011***
	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0004)
Log Basis	9.5024	14.2800	15.5482	12.1356	14.7839	17.0246
	(9.7278)	(9.9270)	(10.2156)	(13.5858)	(12.2056)	(12.3347)
Partial R2 (HP Coefficient)	0.0016	0.0030	0.0038	0.0064	0.0031	0.0081
Partial R2 (Trader Coefficient)	0.0256	0.0000	0.0000	0.0073	0.0000	0.0000
R-squared	0.0874	0.0600	0.0586	0.0975	0.0761	0.0979
Observations	764	764	764	421	421	421

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5c: Cumulative One-Day Post-trade Return: HRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0197	-0.0761*	0.0144	0.0992*	-0.2076***	-0.0969
	(0.0269)	(0.0391)	(0.0500)	(0.0537)	(0.0691)	(0.0855)
Hedging Pressure	0.3307	0.3201	0.3260	0.3037	0.0954	0.2385
	(0.2312)	(0.2323)	(0.2376)	(0.2437)	(0.2137)	(0.2669)
Relative Day	0.0002	0.0002	0.0002	0.0000	0.0001	-0.0001
	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
BAA Yield	-0.0155	-0.0168	-0.0172	-0.0350	-0.0277	-0.0513*
	(0.0222)	(0.0222)	(0.0222)	(0.0289)	(0.0308)	(0.0300)
Federal Funds Rate	-0.0524	-0.0555	-0.0486	0.0799	0.0732	0.0869
	(0.0348)	(0.0358)	(0.0345)	(0.0695)	(0.0669)	(0.0842)
Economic Policy Uncertainty	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
IGREA	-0.0001	-0.0001	-0.0001	-0.0003	-0.0003	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0015**	-0.0014**	-0.0016***	-0.0016***	-0.0017***	-0.0019***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0007)
Log Basis	30.0910***	31.5632***	29.4715***	40.5977**	50.1705***	37.4234**
	(9.3559)	(9.4431)	(8.8564)	(16.5172)	(16.0591)	(18.4671)
Partial R2 (HP Coefficient)	0.0027	0.0025	0.0025	0.0036	0.0005	0.0018
Partial R2 (Trader Coefficient)	0.0007	0.0000	0.0001	0.0078	0.0000	0.0000
R-squared	0.0608	0.0715	0.0621	0.1586	0.1470	0.1226
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5d: Cumulative One-Day Post-trade Return: HRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1748	0.0083	0.1185	0.1288	-0.0260	-0.8593**
	(0.1181)	(0.1190)	(0.1585)	(0.2664)	(0.2384)	(0.4090)
Hedging Pressure	0.4416*	0.3501	0.3946*	-0.0183	-0.0444	-0.0503
	(0.2303)	(0.2297)	(0.2277)	(0.2032)	(0.2089)	(0.2066)
Relative Day	0.0003	0.0002	0.0002	0.0001	0.0001	0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)
BAA Yield	-0.0152	-0.0180	-0.0198	-0.0212	-0.0185	-0.0226
	(0.0222)	(0.0214)	(0.0199)	(0.0283)	(0.0287)	(0.0255)
Federal Funds Rate	-0.0445	-0.0426	-0.0435	0.0497	0.0502	0.0612
	(0.0288)	(0.0286)	(0.0282)	(0.0528)	(0.0584)	(0.0770)
Economic Policy Uncertainty	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
IGREA	-0.0001	-0.0001	-0.0002**	-0.0002	-0.0001	-0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0013**	-0.0014**	-0.0014**	-0.0015***	-0.0014***	-0.0016***
	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0006)
Log Basis	19.9663**	20.1625**	21.1079**	26.2592**	29.4576**	23.6527**
	(9.1158)	(9.1365)	(9.3216)	(11.2592)	(11.9056)	(10.9407)
Partial R2 (HP Coefficient)	0.0049	0.0031	0.0040	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0029	0.0000	0.0007	0.0006	0.0000	0.0000
R-squared	0.0633	0.0550	0.0603	0.0996	0.0886	0.0977
Observations	764	764	764	421	421	421

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5e: Cumulative One-Day Post-trade Return: Corn nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1353***	-0.2081***	-0.0045	0.1401**	-0.2937***	-0.0141
	(0.0320)	(0.0370)	(0.0475)	(0.0621)	(0.0812)	(0.0793)
Hedging Pressure	0.9317***	0.8474***	0.9393***	0.1325	0.0206	0.2319
	(0.2584)	(0.2604)	(0.2811)	(0.2332)	(0.2199)	(0.2169)
Relative Day	0.0000	0.0007	0.0002	-0.0004	-0.0001	-0.0006
	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
BAA Yield	0.0068	0.0084	0.0076	-0.0097	-0.0056	-0.0241
	(0.0370)	(0.0352)	(0.0379)	(0.0378)	(0.0359)	(0.0380)
Federal Funds Rate	0.0072	0.0100	0.0032	0.1300*	0.1279**	0.1481**
	(0.0397)	(0.0361)	(0.0416)	(0.0789)	(0.0502)	(0.0753)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	-0.0003	-0.0002	-0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0001	0.0001	0.0001	-0.0001	-0.0002**	0.0000
	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0001)	(0.0002)
Implied Volatility	-0.0010	-0.0008	-0.0012*	0.0010	0.0009	0.0007
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Log Basis	-7.0643***	0.8098	-5.8856*	-23.1412***	-19.5651*	-26.4998***
	(2.6485)	(3.0904)	(3.3066)	(8.3422)	(11.5208)	(8.3146)
Partial R2 (HP Coefficient)	0.0170	0.0139	0.0147	0.0007	0.0000	0.0026
Partial R2 (Trader Coefficient)	0.0233	0.0000	0.0000	0.0116	0.0000	0.0000
R-squared	0.0976	0.1181	0.0508	0.1159	0.1333	0.0831
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5f: Cumulative One-Day Post-trade Return: Corn harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.4651***	-0.3641**	0.0560	0.6874**	-0.7007**	-0.6259
	(0.1496)	(0.1439)	(0.2908)	(0.2965)	(0.3233)	(0.4228)
Hedging Pressure	0.6270**	0.5958**	0.6705***	-0.1392	-0.1806	-0.1340
	(0.2618)	(0.2592)	(0.2508)	(0.3315)	(0.3387)	(0.2612)
Relative Day	0.0001	0.0001	0.0000	-0.0010**	-0.0008	-0.0011**
	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)
BAA Yield	0.0080	0.0101	0.0145	-0.0246	-0.0331	-0.0364
	(0.0355)	(0.0356)	(0.0360)	(0.0363)	(0.0339)	(0.0372)
Federal Funds Rate	-0.0041	-0.0053	-0.0058	0.0994	0.0875	0.1518*
	(0.0258)	(0.0249)	(0.0267)	(0.0976)	(0.0891)	(0.0868)
Economic Policy Uncertainty	0.0001	0.0001	0.0001	-0.0003	-0.0002	-0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0000	0.0000	0.0000	-0.0001	-0.0001	0.0000
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0008	-0.0008	-0.0009	0.0008	0.0010	0.0005
	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0008)
Log Basis	-4.7573	-4.5937	-4.4216	-29.6403***	-27.6040***	-33.9754***
	(3.0222)	(2.8712)	(2.7921)	(8.5391)	(8.6069)	(7.6429)
Partial R2 (HP Coefficient)	0.0076	0.0070	0.0094	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0127	0.0000	0.0000	0.0130	0.0000	0.0000
R-squared	0.0848	0.0676	0.0412	0.1328	0.1365	0.0993
Observations	764	764	764	421	421	421

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5g: Cumulative One-Day Post-trade Return: Soybeans nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0709***	-0.0286	-0.0737***	0.0700***	-0.1221**	-0.0776*
	(0.0195)	(0.0201)	(0.0232)	(0.0229)	(0.0476)	(0.0464)
Hedging Pressure	0.3227**	0.3016*	0.3427**	0.2414*	0.1707	0.4196***
	(0.1613)	(0.1589)	(0.1690)	(0.1387)	(0.1204)	(0.1448)
Relative Day	0.0000	0.0001	0.0002	0.0002	-0.0001	0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0004)
BAA Yield	0.0190	0.0179	0.0204	-0.0036	0.0047	-0.0048
	(0.0309)	(0.0302)	(0.0290)	(0.0255)	(0.0242)	(0.0256)
Federal Funds Rate	-0.0207	-0.0188	-0.0179	-0.0336	-0.0316	-0.0483
	(0.0220)	(0.0217)	(0.0224)	(0.0536)	(0.0559)	(0.0430)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	0.0002**	0.0002**	0.0002**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
IGREA	-0.0002	-0.0002	-0.0001	-0.0003***	-0.0004***	-0.0003***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Implied Volatility	-0.0010*	-0.0011*	-0.0011*	-0.0011	-0.0008	-0.0012**
	(0.0006)	(0.0006)	(0.0006)	(0.0007)	(0.0007)	(0.0005)
Log Basis	1.4287	0.9109	3.6555**	-0.0048	-2.5867	4.2824
	(1.3720)	(1.4524)	(1.6616)	(5.9216)	(6.5830)	(7.0586)
Partial R2 (HP Coefficient)	0.0053	0.0048	0.0055	0.0069	0.0046	0.0189
Partial R2 (Trader Coefficient)	0.0173	0.0000	0.0000	0.0210	0.0000	0.0000
R-squared	0.0640	0.0398	0.0544	0.0873	0.1130	0.0915
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5h: Cumulative One-Day Post-trade Return: Soybeans harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.2479**	-0.2157*	-0.0031	0.2264	-0.3174*	0.2549
	(0.1124)	(0.1178)	(0.2051)	(0.1637)	(0.1653)	(0.2881)
Hedging Pressure	0.1773	0.1384	0.1882	0.2203	0.2198	0.2108
	(0.1871)	(0.1631)	(0.1500)	(0.2008)	(0.2020)	(0.1883)
Relative Day	-0.0001	-0.0004	0.0000	-0.0001	-0.0001	-0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0005)
BAA Yield	0.0135	0.0040	0.0164	0.0302	0.0304	0.0306
	(0.0369)	(0.0275)	(0.0269)	(0.0278)	(0.0294)	(0.0290)
Federal Funds Rate	0.0286	0.0325	0.0375*	-0.0403	-0.0198	-0.0170
	(0.0225)	(0.0219)	(0.0214)	(0.0570)	(0.0664)	(0.0665)
Economic Policy Uncertainty	0.0002**	0.0002**	0.0002**	0.0003***	0.0003***	0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
IGREA	-0.0003	-0.0003	-0.0003	-0.0003***	-0.0003***	-0.0003***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Implied Volatility	-0.0013*	-0.0012*	-0.0016***	-0.0006	-0.0004	-0.0006
	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Log Basis	0.4625	0.2631	0.1011	-0.2329	-1.5379	-1.3712
	(1.5279)	(1.6892)	(1.6140)	(9.2522)	(8.6292)	(9.3251)
Partial R2 (HP Coefficient)	0.0013	0.0010	0.0023	0.0032	0.0031	0.0033
Partial R2 (Trader Coefficient)	0.0070	0.0000	0.0000	0.0051	0.0000	0.0021
R-squared	0.0748	0.0750	0.0799	0.0558	0.0649	0.0620
Observations	701	701	701	389	389	389

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5i: Cumulative One-Day Post-trade Return: Cotton nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1188***	-0.1273***	-0.0069	0.0340	-0.0383	0.1164
	(0.0357)	(0.0432)	(0.0742)	(0.0212)	(0.0502)	(0.1024)
Hedging Pressure	0.2477***	0.2229***	0.2534***	-0.1180	-0.1651	-0.1720
	(0.0780)	(0.0810)	(0.0821)	(0.2707)	(0.2853)	(0.2944)
Relative Day	0.0001	0.0000	-0.0001	0.0006	0.0003	0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0006)
BAA Yield	-0.0206	-0.0216	-0.0113	-0.0374	-0.0304	-0.0309
	(0.0214)	(0.0235)	(0.0224)	(0.0452)	(0.0464)	(0.0454)
Federal Funds Rate	-0.0568	-0.0604	-0.0519	0.0084	-0.0096	-0.0113
	(0.0457)	(0.0462)	(0.0455)	(0.1150)	(0.1035)	(0.1059)
Economic Policy Uncertainty	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0000	0.0000	0.0000	-0.0003***	-0.0004***	-0.0004***
	(0.0003)	(0.0003)	(0.0003)	(0.0001)	(0.0001)	(0.0001)
Implied Volatility	0.0000	0.0001	0.0000	-0.0011	-0.0012	-0.0011
	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0008)
Log Basis	24.9002***	25.9374***	25.4826***	29.9604***	27.2557***	27.7976***
	(9.5401)	(9.8952)	(9.7754)	(9.1698)	(9.4711)	(8.4153)
Partial R2 (HP Coefficient)	0.0133	0.0100	0.0125	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0146	0.0000	0.0000	0.0059	0.0000	0.0030
R-squared	0.0793	0.0674	0.0590	0.1087	0.0941	0.1026
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5j: Cumulative One-Day Post-trade Return: Cotton harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1468**	-0.1617*	-0.1204	0.1628	-0.1074	-0.0424
	(0.0623)	(0.0971)	(0.1424)	(0.1057)	(0.1142)	(0.2516)
Hedging Pressure	0.2322***	0.2078***	0.2442***	0.0432	0.0078	0.0507
	(0.0763)	(0.0734)	(0.0878)	(0.0914)	(0.0826)	(0.0808)
Relative Day	0.0001	-0.0001	0.0001	-0.0001	-0.0001	0.0001
	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0005)
BAA Yield	-0.0312	-0.0216	-0.0235	-0.0014	0.0070	0.0086
	(0.0208)	(0.0219)	(0.0223)	(0.0278)	(0.0250)	(0.0234)
Federal Funds Rate	-0.0381	-0.0429	-0.0442	-0.0284	-0.0315	0.0059
	(0.0442)	(0.0455)	(0.0441)	(0.0383)	(0.0387)	(0.0438)
Economic Policy Uncertainty	0.0001	0.0001	0.0001	0.0000	0.0000	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0000	0.0000	0.0000	-0.0003***	-0.0002**	-0.0003***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
Implied Volatility	0.0001	0.0002	0.0002	-0.0008	-0.0008	-0.0007
	(0.0006)	(0.0007)	(0.0007)	(0.0005)	(0.0005)	(0.0005)
Log Basis	3.2632	3.5794	11.6604	0.0420	-0.4611	0.4214
	(9.5483)	(10.0808)	(10.7878)	(4.4542)	(4.2903)	(4.2495)
Partial R2 (HP Coefficient)	0.0122	0.0106	0.0102	0.0006	0.0000	0.0010
Partial R2 (Trader Coefficient)	0.0073	0.0000	0.0000	0.0059	0.0000	0.0000
R-squared	0.0681	0.0620	0.0457	0.0613	0.0739	0.0451
Observations	764	764	764	412	412	412

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6a: Cumulative One-Week Post-trade Return: SRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1470**	-0.1778***	0.0636	0.3278***	-0.2385***	-0.0286
	(0.0572)	(0.0436)	(0.0613)	(0.0886)	(0.0782)	(0.1046)
Hedging Pressure	0.2711	0.1695	0.0936	-0.0514	-0.4607	0.0178
	(0.5433)	(0.5240)	(0.5480)	(0.5330)	(0.5541)	(0.6075)
Relative Day	-0.0010	-0.0008	-0.0008	-0.0008	-0.0002	-0.0004
	(0.0010)	(0.0010)	(0.0011)	(0.0013)	(0.0012)	(0.0013)
BAA Yield	-0.0520	-0.0415	-0.0489	-0.0945	-0.0957	-0.0900
	(0.0451)	(0.0480)	(0.0472)	(0.0654)	(0.0683)	(0.0652)
Federal Funds Rate	-0.0139	-0.0057	-0.0038	0.1840*	0.1542**	0.1717**
	(0.0436)	(0.0389)	(0.0403)	(0.0943)	(0.0781)	(0.0839)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
IGREA	0.0000	0.0001	0.0001	0.0004	0.0005*	0.0005*
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	-0.0054***	-0.0054***	-0.0058***	-0.0039***	-0.0045***	-0.0043***
	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0010)	(0.0009)
Log Basis	48.6283**	75.8075***	72.7682***	60.7411***	58.1936***	62.7390***
	(20.6758)	(17.5355)	(20.0897)	(16.7339)	(21.1556)	(20.7170)
Partial R2 (HP Coefficient)	0.0003	0.0001	0.0000	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0087	0.0000	0.0014	0.0305	0.0000	0.0000
R-squared	0.2233	0.2566	0.2208	0.3324	0.3213	0.2980
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6b: Cumulative One-Week Post-trade Return: SRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	1.0084***	-0.4385**	-0.3765	0.9834***	-0.4546	-0.7892*
	(0.2078)	(0.1981)	(0.2541)	(0.2936)	(0.3324)	(0.4184)
Hedging Pressure	0.1135	0.2655	0.3636	0.1522	-0.0506	0.3887
	(0.4789)	(0.5487)	(0.5443)	(0.5860)	(0.6199)	(0.6009)
Relative Day	-0.0003	-0.0004	-0.0006	-0.0014	-0.0006	-0.0012
	(0.0009)	(0.0010)	(0.0009)	(0.0013)	(0.0013)	(0.0012)
BAA Yield	-0.0657	-0.0560	-0.0593	-0.1090*	-0.0983	-0.0829
	(0.0409)	(0.0465)	(0.0427)	(0.0612)	(0.0625)	(0.0625)
Federal Funds Rate	-0.0232	-0.0094	-0.0026	-0.0245	-0.0400	-0.0338
	(0.0423)	(0.0368)	(0.0363)	(0.1022)	(0.0803)	(0.1019)
Economic Policy Uncertainty	0.0000	0.0000	0.0001	0.0003	0.0003	0.0003
	(0.0002)	(0.0002)	(0.0001)	(0.0003)	(0.0003)	(0.0003)
IGREA	0.0001	0.0001	0.0001	0.0004	0.0006**	0.0005*
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	-0.0046***	-0.0048***	-0.0049***	-0.0029***	-0.0026***	-0.0024**
	(0.0007)	(0.0007)	(0.0007)	(0.0010)	(0.0010)	(0.0010)
Log Basis	36.5308**	43.6110***	45.7507***	9.1041	13.7353	13.5283
	(16.8157)	(16.7188)	(17.2168)	(16.5651)	(16.2938)	(16.7590)
Partial R2 (HP Coefficient)	0.0001	0.0003	0.0006	0.0002	0.0000	0.0010
Partial R2 (Trader Coefficient)	0.0305	0.0000	0.0000	0.0273	0.0000	0.0000
R-squared	0.2431	0.1952	0.1913	0.1674	0.1395	0.1649
Observations	764	764	764	414	414	414

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6c: Cumulative One-Week Post-trade Return: HRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0133	-0.0150	-0.0772	0.1294*	-0.1289	-0.1757**
	(0.0385)	(0.0472)	(0.0630)	(0.0668)	(0.0818)	(0.0860)
Hedging Pressure	0.2715	0.2404	0.3057	0.3635	0.2045	0.3027
	(0.4047)	(0.3982)	(0.4210)	(0.4467)	(0.4427)	(0.4395)
Relative Day	-0.0006	-0.0007	-0.0005	0.0004	0.0003	0.0004
	(0.0010)	(0.0010)	(0.0009)	(0.0012)	(0.0012)	(0.0012)
BAA Yield	-0.0514*	-0.0521*	-0.0511	-0.1004**	-0.0861*	-0.1032**
	(0.0310)	(0.0311)	(0.0313)	(0.0461)	(0.0479)	(0.0492)
Federal Funds Rate	0.0192	0.0113	0.0142	0.2647***	0.2606***	0.2744***
	(0.0563)	(0.0552)	(0.0564)	(0.0734)	(0.0749)	(0.0766)
Economic Policy Uncertainty	0.0003	0.0003	0.0003	0.0001	0.0002	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
IGREA	0.0005	0.0005	0.0004	0.0005**	0.0005**	0.0006***
	(0.0004)	(0.0004)	(0.0004)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0059***	-0.0058***	-0.0058***	-0.0033***	-0.0035***	-0.0035***
	(0.0009)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0009)
Log Basis	49.1247***	49.0964***	47.2999***	70.1371**	73.0042***	65.8084**
	(12.1507)	(11.7206)	(11.8950)	(27.6364)	(27.5621)	(27.3781)
Partial R2 (HP Coefficient)	0.0006	0.0005	0.0007	0.0015	0.0005	0.0011
Partial R2 (Trader Coefficient)	0.0002	0.0000	0.0000	0.0086	0.0000	0.0000
R-squared	0.1693	0.1659	0.1814	0.2121	0.2044	0.1984
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6d: Cumulative One-Week Post-trade Return: HRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.6372***	-0.3912**	-0.1118	0.5685	0.2870	-2.5948***
	(0.1764)	(0.1964)	(0.2640)	(0.3815)	(0.2681)	(0.5218)
Hedging Pressure	0.4778	0.3427	0.3592	0.2420	0.0993	0.2361
	(0.3994)	(0.3924)	(0.3849)	(0.3950)	(0.3832)	(0.3614)
Relative Day	-0.0003	-0.0004	-0.0006	-0.0003	0.0001	-0.0001
	(0.0009)	(0.0010)	(0.0009)	(0.0011)	(0.0011)	(0.0010)
BAA Yield	-0.0498*	-0.0548*	-0.0578*	-0.0788*	-0.0852*	-0.0755
	(0.0277)	(0.0307)	(0.0300)	(0.0468)	(0.0459)	(0.0466)
Federal Funds Rate	0.0220	0.0262	0.0235	-0.0057	0.0098	-0.0071
	(0.0482)	(0.0460)	(0.0491)	(0.0985)	(0.0719)	(0.0987)
Economic Policy Uncertainty	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0004	0.0004	0.0004	0.0005**	0.0006***	0.0004**
	(0.0004)	(0.0004)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0047***	-0.0049***	-0.0051***	-0.0030***	-0.0031***	-0.0033***
	(0.0008)	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0007)
Log Basis	36.6473***	36.2031***	39.3937***	31.2658	30.8816	27.1274
	(11.0550)	(11.2897)	(10.9493)	(23.9805)	(24.8416)	(21.6233)
Partial R2 (HP Coefficient)	0.0019	0.0010	0.0012	0.0009	0.0002	0.0011
Partial R2 (Trader Coefficient)	0.0171	0.0000	0.0000	0.0055	0.0029	0.0000
R-squared	0.1729	0.1588	0.1526	0.1683	0.1676	0.2441
Observations	764	764	764	414	414	414

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6e: Cumulative One-Week Post-trade Return: Corn nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1664***	-0.2905***	0.0612	0.2218*	-0.3512***	-0.0210
	(0.0571)	(0.0624)	(0.0462)	(0.1266)	(0.1310)	(0.1084)
Hedging Pressure	0.8190	0.8321	0.8648	1.6226***	1.5508***	1.6200***
	(0.6070)	(0.5893)	(0.6125)	(0.4809)	(0.4924)	(0.4709)
Relative Day	-0.0010	-0.0008	-0.0011	-0.0011	-0.0010	-0.0014
	(0.0009)	(0.0010)	(0.0011)	(0.0012)	(0.0012)	(0.0012)
BAA Yield	-0.0518	-0.0482	-0.0434	-0.0172	-0.0239	-0.0425
	(0.0446)	(0.0448)	(0.0461)	(0.0577)	(0.0546)	(0.0594)
Federal Funds Rate	0.0344	0.0411	0.0398	0.1446***	0.1604***	0.1773***
	(0.0517)	(0.0452)	(0.0532)	(0.0486)	(0.0444)	(0.0643)
Economic Policy Uncertainty	0.0000	0.0001	0.0001	-0.0003	-0.0002	-0.0004
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
IGREA	0.0001	0.0000	0.0000	0.0003	0.0002	0.0004
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0003)
Implied Volatility	-0.0018	-0.0014	-0.0020*	0.0011	0.0009	0.0006
	(0.0011)	(0.0011)	(0.0011)	(0.0012)	(0.0012)	(0.0012)
Log Basis	-7.6220	1.5872	-3.3336	3.7508	8.4827	-2.0744
	(4.7084)	(5.3487)	(6.3091)	(13.5172)	(15.7812)	(11.8886)
Partial R2 (HP Coefficient)	0.0024	0.0027	0.0027	0.0255	0.0223	0.0265
Partial R2 (Trader Coefficient)	0.0112	0.0000	0.0023	0.0070	0.0000	0.0000
R-squared	0.0938	0.1270	0.0672	0.1564	0.1537	0.0981
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6f: Cumulative One-Week Post-trade Return: Corn harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.8056***	-0.3619	-0.6605*	0.8074**	-0.6909	-1.1321*
	(0.2189)	(0.2475)	(0.3809)	(0.3890)	(0.4411)	(0.6590)
Hedging Pressure	0.5334	0.6039	0.6866	0.9454	0.8571	0.8876
	(0.4839)	(0.4944)	(0.4967)	(0.6855)	(0.6813)	(0.6448)
Relative Day	-0.0008	-0.0009	-0.0007	-0.0021*	-0.0017	-0.0022*
	(0.0008)	(0.0008)	(0.0008)	(0.0012)	(0.0012)	(0.0012)
BAA Yield	-0.0529	-0.0448	-0.0433	-0.0269	-0.0403	-0.0296
	(0.0431)	(0.0440)	(0.0423)	(0.0707)	(0.0682)	(0.0683)
Federal Funds Rate	0.0283	0.0292	0.0332	-0.0080	-0.0123	-0.0004
	(0.0271)	(0.0280)	(0.0292)	(0.0506)	(0.0523)	(0.0717)
Economic Policy Uncertainty	0.0001	0.0002**	0.0002**	0.0001	0.0001	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0003)
IGREA	0.0001	0.0000	0.0000	0.0004**	0.0004**	0.0004
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
Implied Volatility	-0.0011	-0.0012	-0.0014	-0.0017	-0.0016	-0.0020*
	(0.0009)	(0.0008)	(0.0009)	(0.0011)	(0.0012)	(0.0011)
Log Basis	-9.6917**	-8.6573**	-8.8440**	-25.6078	-25.8463*	-32.3410**
	(4.0715)	(3.9750)	(3.8050)	(16.0611)	(15.5417)	(15.2559)
Partial R2 (HP Coefficient)	0.0016	0.0020	0.0025	0.0047	0.0039	0.0047
Partial R2 (Trader Coefficient)	0.0177	0.0000	0.0000	0.0107	0.0000	0.0000
R-squared	0.0895	0.0603	0.0656	0.1268	0.1116	0.1130
Observations	764	764	764	414	414	414

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6g: Cumulative One-Week Post-trade Return: Soybeans nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0771**	-0.0770***	0.0095	0.1949***	-0.2469***	-0.1915***
	(0.0300)	(0.0287)	(0.0361)	(0.0473)	(0.0781)	(0.0673)
Hedging Pressure	0.8218***	0.7830***	0.7686***	0.7361***	0.5624**	0.9499***
	(0.2587)	(0.2597)	(0.2539)	(0.2673)	(0.2660)	(0.3445)
Relative Day	0.0010	0.0008	0.0012	-0.0004	-0.0007	-0.0003
	(0.0008)	(0.0007)	(0.0008)	(0.0012)	(0.0013)	(0.0012)
BAA Yield	-0.0121	-0.0159	-0.0100	-0.0006	0.0148	0.0027
	(0.0395)	(0.0383)	(0.0397)	(0.0564)	(0.0596)	(0.0529)
Federal Funds Rate	-0.0317	-0.0307	-0.0268	-0.0691	-0.0635	-0.0699
	(0.0330)	(0.0332)	(0.0343)	(0.0871)	(0.0863)	(0.0697)
Economic Policy Uncertainty	-0.0001	-0.0001	-0.0001	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
IGREA	0.0001	0.0000	0.0001	-0.0001	-0.0001	0.0000
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0001)	(0.0002)
Implied Volatility	-0.0016**	-0.0017**	-0.0018**	-0.0007	-0.0007	-0.0013
	(0.0008)	(0.0008)	(0.0009)	(0.0011)	(0.0011)	(0.0009)
Log Basis	5.8700	3.3139	4.7068	22.7753	18.9827	37.2334
	(7.6939)	(7.2514)	(7.3723)	(18.4001)	(21.0138)	(24.6083)
Partial R2 (HP Coefficient)	0.0133	0.0120	0.0121	0.0171	0.0102	0.0172
Partial R2 (Trader Coefficient)	0.0087	0.0000	0.0001	0.0377	0.0000	0.0000
R-squared	0.0964	0.0952	0.0839	0.1389	0.1072	0.1143
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6h: Cumulative One-Week Post-trade Return: Soybeans harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.7903***	-0.5060***	-0.1155	0.4096	-0.3466	0.2086
	(0.1780)	(0.1463)	(0.2448)	(0.3729)	(0.3437)	(0.5427)
Hedging Pressure	0.2466	0.2153	0.3273	0.5521*	0.5483*	0.4861*
	(0.1889)	(0.1971)	(0.2288)	(0.2952)	(0.2933)	(0.2725)
Relative Day	0.0000	-0.0004	0.0002	-0.0002	0.0000	-0.0003
	(0.0007)	(0.0007)	(0.0008)	(0.0011)	(0.0011)	(0.0011)
BAA Yield	0.0131	0.0052	0.0353	0.0645	0.0774	0.0628
	(0.0402)	(0.0535)	(0.0514)	(0.0613)	(0.0680)	(0.0598)
Federal Funds Rate	0.0287	0.0432	0.0512	-0.1005	-0.0849	-0.0801
	(0.0395)	(0.0361)	(0.0410)	(0.0943)	(0.0918)	(0.0789)
Economic Policy Uncertainty	0.0001	0.0002**	0.0002	0.0003***	0.0003***	0.0003***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
IGREA	-0.0002	0.0000	-0.0001	-0.0002**	-0.0002**	-0.0001
	(0.0004)	(0.0003)	(0.0004)	(0.0001)	(0.0001)	(0.0001)
Implied Volatility	-0.0012	-0.0013	-0.0017*	0.0003	0.0003	0.0003
	(0.0009)	(0.0009)	(0.0010)	(0.0007)	(0.0007)	(0.0007)
Log Basis	1.8517	1.3680	0.7825	13.5754	15.0651	11.7412
	(4.9209)	(5.4093)	(5.7685)	(17.9829)	(19.1365)	(17.5957)
Partial R2 (HP Coefficient)	0.0026	0.0018	0.0031	0.0092	0.0092	0.0083
Partial R2 (Trader Coefficient)	0.0295	0.0000	0.0000	0.0032	0.0000	0.0004
R-squared	0.1461	0.1080	0.0513	0.0704	0.0604	0.0659
Observations	662	662	662	392	392	392

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6i: Cumulative One-Week Post-trade Return: Cotton nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.2573***	-0.2809***	0.0518	0.0156	-0.0644	-0.0309
	(0.0681)	(0.0782)	(0.1117)	(0.0315)	(0.0447)	(0.0556)
Hedging Pressure	0.3648	0.2906	0.3538	-0.0007	-0.0043	0.0100
	(0.2270)	(0.2355)	(0.2382)	(0.3867)	(0.3954)	(0.4061)
Relative Day	-0.0013	-0.0015*	-0.0017*	0.0002	0.0003	0.0003
	(0.0009)	(0.0009)	(0.0010)	(0.0012)	(0.0011)	(0.0012)
BAA Yield	0.0041	-0.0015	0.0220	0.0433	0.0493	0.0442
	(0.0736)	(0.0785)	(0.0784)	(0.0590)	(0.0574)	(0.0584)
Federal Funds Rate	0.0256	0.0166	0.0344	0.2765***	0.2869***	0.2906***
	(0.0363)	(0.0342)	(0.0369)	(0.0911)	(0.1005)	(0.0987)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	0.0002	0.0002	0.0002
	(0.0002)	(0.0001)	(0.0002)	(0.0004)	(0.0004)	(0.0004)
IGREA	0.0006	0.0007*	0.0007*	-0.0004**	-0.0004**	-0.0004**
	(0.0004)	(0.0004)	(0.0004)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	0.0003	0.0006	0.0006	-0.0002	-0.0002	-0.0002
	(0.0009)	(0.0009)	(0.0010)	(0.0013)	(0.0013)	(0.0013)
Log Basis	137.8446***	140.5675***	140.1611***	84.9360***	84.4993***	84.5961***
	(22.1465)	(22.1343)	(23.9723)	(13.3082)	(13.9379)	(13.8673)
Partial R2 (HP Coefficient)	0.0034	0.0020	0.0029	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0187	0.0000	0.0003	0.0006	0.0000	0.0000
R-squared	0.2431	0.2295	0.1816	0.3021	0.3030	0.2954
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6j: Cumulative One-Week Post-trade Return: Cotton harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.3992***	-0.5289***	-0.2514	0.8941***	-0.8288***	-0.1694
	(0.1271)	(0.1673)	(0.2803)	(0.1820)	(0.2582)	(0.3852)
Hedging Pressure	0.2362	0.1760	0.2234	-0.0683	-0.1277	-0.0965
	(0.2305)	(0.2302)	(0.2577)	(0.3961)	(0.4602)	(0.4199)
Relative Day	-0.0007	-0.0011	-0.0008	-0.0012	-0.0007	-0.0022
	(0.0008)	(0.0009)	(0.0009)	(0.0013)	(0.0012)	(0.0014)
BAA Yield	-0.0154	0.0027	0.0039	-0.0725	-0.0531	-0.0849
	(0.0812)	(0.0864)	(0.0842)	(0.1079)	(0.1162)	(0.0997)
Federal Funds Rate	0.0313	0.0151	0.0155	0.0509	0.1717	0.2112***
	(0.0291)	(0.0301)	(0.0295)	(0.1250)	(0.1157)	(0.0799)
Economic Policy Uncertainty	0.0001	0.0001	0.0001	-0.0001	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0003)
IGREA	0.0003	0.0003	0.0003	-0.0002	-0.0004**	-0.0005**
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0003	0.0000	0.0000	-0.0004	-0.0001	0.0002
	(0.0009)	(0.0009)	(0.0009)	(0.0013)	(0.0013)	(0.0012)
Log Basis	59.4546**	61.4433**	81.3419**	17.3129*	17.9118*	25.1165***
	(26.6323)	(29.2257)	(32.0091)	(9.2870)	(10.2419)	(8.7848)
Partial R2 (HP Coefficient)	0.0014	0.0008	0.0010	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0130	0.0000	0.0000	0.0578	0.0000	0.0000
R-squared	0.1657	0.1263	0.0793	0.2121	0.0897	0.1475
Observations	764	764	764	407	407	407

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7a: Cumulative Two-Week Post-trade Return: SRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1790***	-0.1273***	-0.0308	0.2919***	-0.2375***	-0.0085
	(0.0594)	(0.0442)	(0.0546)	(0.1055)	(0.0850)	(0.0832)
Hedging Pressure	1.1759**	1.0527*	1.1171**	0.6804	0.2795	0.6778
	(0.5568)	(0.5626)	(0.5495)	(0.6111)	(0.6619)	(0.7281)
Relative Day	-0.0005	-0.0005	-0.0005	0.0008	0.0012	0.0011
	(0.0011)	(0.0011)	(0.0012)	(0.0013)	(0.0013)	(0.0013)
BAA Yield	-0.0029	0.0078	-0.0024	0.0337	0.0333	0.0410
	(0.0364)	(0.0368)	(0.0375)	(0.0587)	(0.0596)	(0.0623)
Federal Funds Rate	-0.0796*	-0.0715*	-0.0730*	0.0673	0.0261	0.0468
	(0.0412)	(0.0383)	(0.0390)	(0.2069)	(0.2101)	(0.2048)
Economic Policy Uncertainty	-0.0001	-0.0002**	-0.0001	-0.0001	0.0000	-0.0001
	(0.0002)	(0.0001)	(0.0002)	(0.0004)	(0.0004)	(0.0005)
IGREA	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003
	(0.0005)	(0.0005)	(0.0006)	(0.0004)	(0.0004)	(0.0004)
Implied Volatility	-0.0064***	-0.0064***	-0.0066***	-0.0030***	-0.0036***	-0.0035***
	(0.0009)	(0.0010)	(0.0010)	(0.0007)	(0.0008)	(0.0007)
Log Basis	42.8365**	65.0209***	52.4073***	73.4283***	70.3656***	73.0257***
	(17.5909)	(17.9803)	(19.1258)	(14.2955)	(22.0723)	(19.8279)
Partial R2 (HP Coefficient)	0.0059	0.0046	0.0055	0.0028	0.0004	0.0020
Partial R2 (Trader Coefficient)	0.0120	0.0000	0.0000	0.0173	0.0000	0.0000
R-squared	0.2612	0.2512	0.2380	0.2839	0.2718	0.2502
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7b: Cumulative Two-Week Post-trade Return: SRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	1.0553***	-0.4403**	-0.5184**	0.7593**	-0.5939*	-0.2683
	(0.2100)	(0.1916)	(0.2497)	(0.3220)	(0.3097)	(0.4144)
Hedging Pressure	0.7901	1.0219*	1.1428*	0.4647	0.3553	0.5891
	(0.5287)	(0.5673)	(0.5837)	(0.5496)	(0.6095)	(0.6398)
Relative Day	0.0001	0.0000	-0.0003	0.0003	0.0008	0.0004
	(0.0010)	(0.0011)	(0.0011)	(0.0014)	(0.0014)	(0.0013)
BAA Yield	-0.0072	-0.0014	-0.0051	0.0238	0.0224	0.0356
	(0.0359)	(0.0379)	(0.0364)	(0.0599)	(0.0633)	(0.0632)
Federal Funds Rate	-0.0722	-0.0560	-0.0484	0.0610	0.0049	0.0447
	(0.0443)	(0.0395)	(0.0384)	(0.3373)	(0.3260)	(0.2933)
Economic Policy Uncertainty	-0.0001	-0.0001	-0.0001	0.0001	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0001)	(0.0004)	(0.0004)	(0.0004)
IGREA	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003
	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
Implied Volatility	-0.0061***	-0.0063***	-0.0064***	-0.0023**	-0.0022**	-0.0020*
	(0.0010)	(0.0009)	(0.0009)	(0.0010)	(0.0010)	(0.0011)
Log Basis	28.9981	38.2999**	39.8578**	37.4831**	39.6892**	39.5635**
	(18.8750)	(18.4430)	(18.0511)	(17.6435)	(16.6813)	(18.5262)
Partial R2 (HP Coefficient)	0.0030	0.0043	0.0051	0.0018	0.0009	0.0022
Partial R2 (Trader Coefficient)	0.0326	0.0000	0.0000	0.0139	0.0000	0.0000
R-squared	0.2814	0.2385	0.2415	0.1426	0.1434	0.1396
Observations	764	764	764	407	407	407

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7c: Cumulative Two-Week Post-trade Return: HRW nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0059	-0.0118	-0.0848	0.0817	-0.1019	-0.1136
	(0.0404)	(0.0566)	(0.0694)	(0.0640)	(0.0998)	(0.1101)
Hedging Pressure	0.3932	0.4122	0.4658	0.0750	0.1692	0.0557
	(0.4714)	(0.4681)	(0.4914)	(0.5626)	(0.5185)	(0.5884)
Relative Day	-0.0001	-0.0003	-0.0002	0.0015	0.0013	0.0018
	(0.0011)	(0.0011)	(0.0011)	(0.0014)	(0.0014)	(0.0014)
BAA Yield	0.0277	0.0335	0.0314	0.0378	0.0434	0.0357
	(0.0437)	(0.0443)	(0.0445)	(0.0573)	(0.0589)	(0.0589)
Federal Funds Rate	-0.0717	-0.0725	-0.0721	0.0511	0.0584	0.0600
	(0.0584)	(0.0594)	(0.0591)	(0.2864)	(0.2856)	(0.2881)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	0.0000	-0.0001	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0004)	(0.0004)	(0.0004)
IGREA	0.0005	0.0005	0.0006	0.0003	0.0003	0.0003
	(0.0005)	(0.0005)	(0.0005)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	-0.0057***	-0.0056***	-0.0056***	-0.0031***	-0.0032***	-0.0032***
	(0.0010)	(0.0010)	(0.0010)	(0.0009)	(0.0009)	(0.0008)
Log Basis	71.7477***	70.4349***	65.8815***	93.0999***	97.6981***	92.1570***
	(12.1826)	(11.6943)	(12.4248)	(30.0553)	(28.2105)	(29.4068)
Partial R2 (HP Coefficient)	0.0009	0.0010	0.0012	0.0000	0.0002	0.0000
Partial R2 (Trader Coefficient)	0.0000	0.0000	0.0000	0.0037	0.0000	0.0000
R-squared	0.1458	0.1447	0.1533	0.1549	0.1462	0.1661
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7d: Cumulative Two-Week Post-trade Return: HRW harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.7521***	-0.4431**	-0.2770	0.4055	0.1264	-1.6234**
	(0.2075)	(0.2006)	(0.3220)	(0.4943)	(0.4078)	(0.6991)
Hedging Pressure	0.6399	0.5286	0.4681	0.0383	-0.0121	0.0199
	(0.4930)	(0.4886)	(0.4858)	(0.4670)	(0.4708)	(0.4798)
Relative Day	0.0002	0.0002	-0.0002	0.0015	0.0018	0.0014
	(0.0011)	(0.0011)	(0.0010)	(0.0013)	(0.0014)	(0.0013)
BAA Yield	0.0363	0.0315	0.0244	0.0781	0.0660	0.0622
	(0.0467)	(0.0449)	(0.0441)	(0.0599)	(0.0624)	(0.0589)
Federal Funds Rate	-0.0409	-0.0328	-0.0405	0.0516	0.0400	0.0616
	(0.0600)	(0.0583)	(0.0601)	(0.3356)	(0.3341)	(0.3589)
Economic Policy Uncertainty	0.0000	0.0001	0.0001	0.0000	0.0001	0.0000
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
IGREA	0.0005	0.0005	0.0005	0.0003	0.0004	0.0003
	(0.0005)	(0.0005)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	-0.0051***	-0.0052***	-0.0056***	-0.0025***	-0.0024***	-0.0027***
	(0.0010)	(0.0010)	(0.0010)	(0.0008)	(0.0008)	(0.0007)
Log Basis	60.9540***	59.8283***	62.9799***	55.9223**	53.7880**	51.6903**
	(11.7624)	(11.7850)	(12.1513)	(22.1405)	(21.6194)	(21.8403)
Partial R2 (HP Coefficient)	0.0022	0.0016	0.0012	0.0000	0.0000	0.0000
Partial R2 (Trader Coefficient)	0.0172	0.0000	0.0000	0.0017	0.0002	0.0000
R-squared	0.1750	0.1647	0.1464	0.1238	0.1242	0.1384
Observations	764	764	764	407	407	407

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7e: Cumulative Two-Week Post-trade Return: Corn nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.1454***	-0.2325***	-0.0177	0.2362	-0.4789***	0.0635
	(0.0539)	(0.0555)	(0.0599)	(0.1472)	(0.1213)	(0.0931)
Hedging Pressure	0.9307	0.9240	1.1165*	0.6450	0.5799	0.4177
	(0.6403)	(0.6169)	(0.6570)	(0.5689)	(0.5378)	(0.6443)
Relative Day	-0.0017	-0.0014	-0.0022**	-0.0008	-0.0008	-0.0008
	(0.0011)	(0.0011)	(0.0011)	(0.0012)	(0.0012)	(0.0012)
BAA Yield	0.0122	0.0116	0.0157	-0.0045	0.0011	-0.0301
	(0.0519)	(0.0514)	(0.0535)	(0.0661)	(0.0623)	(0.0598)
Federal Funds Rate	0.0301	0.0243	0.0284	0.0999	0.0933	0.1287
	(0.0399)	(0.0383)	(0.0412)	(0.0785)	(0.0735)	(0.0988)
Economic Policy Uncertainty	0.0001	0.0001	0.0002	-0.0005**	-0.0003	-0.0005*
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
IGREA	0.0005*	0.0006**	0.0005*	0.0005*	0.0004**	0.0006**
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0003)
Implied Volatility	-0.0024**	-0.0022**	-0.0026**	-0.0007	-0.0010	-0.0012
	(0.0011)	(0.0011)	(0.0011)	(0.0012)	(0.0011)	(0.0013)
Log Basis	-7.3446	-1.6907	-9.0283	-26.9330	-20.3958	-30.2761
	(8.4735)	(8.3508)	(9.9265)	(26.1876)	(28.8708)	(26.5677)
Partial R2 (HP Coefficient)	0.0028	0.0030	0.0038	0.0029	0.0027	0.0010
Partial R2 (Trader Coefficient)	0.0096	0.0000	0.0000	0.0059	0.0000	0.0011
R-squared	0.0932	0.1157	0.0861	0.1263	0.1752	0.1020
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7f: Cumulative Two-Week Post-trade Return: Corn harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.6715***	-0.8211***	0.0926	1.0141***	-0.5148	-1.1491**
	(0.2109)	(0.2219)	(0.3758)	(0.3266)	(0.3786)	(0.5634)
Hedging Pressure	0.4797	0.4400	0.5303	1.0249	0.9565	0.9937
	(0.6177)	(0.5872)	(0.6003)	(0.6697)	(0.6551)	(0.7519)
Relative Day	-0.0008	-0.0006	-0.0007	-0.0017	-0.0013	-0.0013
	(0.0011)	(0.0010)	(0.0011)	(0.0013)	(0.0013)	(0.0014)
BAA Yield	0.0189	0.0168	0.0279	0.0865	0.0702	0.0549
	(0.0496)	(0.0499)	(0.0501)	(0.0558)	(0.0532)	(0.0530)
Federal Funds Rate	0.0426*	0.0401*	0.0414*	0.0789	0.1020	0.1586
	(0.0228)	(0.0240)	(0.0234)	(0.1326)	(0.1389)	(0.1285)
Economic Policy Uncertainty	0.0003***	0.0003***	0.0003***	-0.0002	-0.0001	-0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0004)
IGREA	0.0003	0.0004**	0.0003***	0.0002	0.0003	0.0003
	(0.0002)	(0.0002)	(0.0001)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	-0.0016	-0.0014	-0.0018*	-0.0005	-0.0006	-0.0009
	(0.0010)	(0.0010)	(0.0010)	(0.0012)	(0.0012)	(0.0012)
Log Basis	-10.0106	-9.8071	-9.3851	-62.3239**	-62.9271**	-67.7217***
	(7.6321)	(7.6275)	(7.3711)	(25.9207)	(24.8855)	(25.0967)
Partial R2 (HP Coefficient)	0.0008	0.0007	0.0010	0.0059	0.0054	0.0044
Partial R2 (Trader Coefficient)	0.0133	0.0000	0.0001	0.0239	0.0000	0.0000
R-squared	0.0788	0.0881	0.0578	0.2165	0.2025	0.1893
Observations	764	764	764	407	407	407

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7g: Cumulative Two-Week Post-trade Return: Soybeans nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.0890***	-0.1034***	0.0230	0.1441***	-0.2705***	-0.0438
	(0.0214)	(0.0307)	(0.0344)	(0.0510)	(0.0655)	(0.0568)
Hedging Pressure	1.2587***	1.2040***	1.2678***	0.1621	-0.0176	0.3663
	(0.3002)	(0.3058)	(0.3148)	(0.2995)	(0.2812)	(0.3898)
Relative Day	0.0009	0.0009	0.0014	-0.0009	-0.0014	-0.0010
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)
BAA Yield	0.0085	0.0056	0.0098	0.0269	0.0401	0.0297
	(0.0440)	(0.0438)	(0.0429)	(0.0398)	(0.0374)	(0.0493)
Federal Funds Rate	0.0285	0.0295	0.0335	-0.0669	-0.0636	-0.0876
	(0.0709)	(0.0695)	(0.0713)	(0.1049)	(0.1097)	(0.0867)
Economic Policy Uncertainty	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0003	0.0002	0.0003	0.0001	0.0001	0.0001
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0012	-0.0013	-0.0013	0.0005	0.0008	0.0002
	(0.0010)	(0.0010)	(0.0010)	(0.0006)	(0.0006)	(0.0007)
Log Basis	1.6440	-1.5942	2.0189	9.1373	3.9641	14.4682
	(3.4512)	(3.7522)	(3.8928)	(15.9151)	(14.1198)	(18.1036)
Partial R2 (HP Coefficient)	0.0229	0.0203	0.0212	0.0007	0.0000	0.0020
Partial R2 (Trader Coefficient)	0.0224	0.0000	0.0006	0.0181	0.0000	0.0000
R-squared	0.1070	0.1154	0.0963	0.1034	0.1267	0.0608
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7h: Cumulative Two-Week Post-trade Return: Soybeans harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.8388***	-0.5993***	-0.2460	0.5563*	-0.6755***	0.3125
	(0.1903)	(0.2146)	(0.2640)	(0.3135)	(0.2445)	(0.4671)
Hedging Pressure	0.7232**	0.6802**	0.7563**	0.4163	0.3095	0.3784
	(0.3076)	(0.3011)	(0.3142)	(0.3173)	(0.2969)	(0.3205)
Relative Day	0.0006	0.0001	0.0008	0.0002	0.0003	-0.0002
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
BAA Yield	0.0505*	0.0437*	0.0710**	0.1303***	0.1374***	0.1222***
	(0.0299)	(0.0257)	(0.0315)	(0.0364)	(0.0386)	(0.0377)
Federal Funds Rate	0.0801	0.0909*	0.0974	-0.0569	-0.0335	-0.0511
	(0.0538)	(0.0549)	(0.0599)	(0.1218)	(0.1277)	(0.1300)
Economic Policy Uncertainty	0.0003	0.0003	0.0003	0.0002	0.0002	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
IGREA	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	-0.0018**	-0.0018**	-0.0023**	0.0012**	0.0012**	0.0011*
	(0.0008)	(0.0009)	(0.0009)	(0.0006)	(0.0006)	(0.0006)
Log Basis	0.7083	0.4793	0.0644	-11.3145	-12.4834	-14.9074
	(2.2050)	(2.5721)	(2.9292)	(11.5360)	(10.6651)	(10.1886)
Partial R2 (HP Coefficient)	0.0085	0.0078	0.0089	0.0046	0.0029	0.0037
Partial R2 (Trader Coefficient)	0.0291	0.0000	0.0000	0.0084	0.0000	0.0012
R-squared	0.1896	0.1658	0.1178	0.1425	0.1620	0.1220
Observations	662	662	662	387	387	387

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7i: Cumulative Two-Week Post-trade Return: Cotton nearby

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.2882***	-0.3495***	-0.0303	0.0064	-0.0690	-0.0237
	(0.0574)	(0.0715)	(0.1144)	(0.0237)	(0.0426)	(0.0583)
Hedging Pressure	0.7351***	0.6928***	0.7214***	0.0297	0.0281	0.0566
	(0.1876)	(0.2018)	(0.1921)	(0.2384)	(0.2512)	(0.2485)
Relative Day	0.0001	-0.0001	-0.0003	0.0016	0.0018	0.0020
	(0.0008)	(0.0009)	(0.0009)	(0.0012)	(0.0012)	(0.0013)
BAA Yield	-0.0228	-0.0285	-0.0052	0.0689	0.0696	0.0732
	(0.0544)	(0.0571)	(0.0594)	(0.0619)	(0.0627)	(0.0641)
Federal Funds Rate	0.0465	0.0354	0.0544	-0.1988	-0.1975	-0.1907
	(0.0426)	(0.0447)	(0.0438)	(0.2323)	(0.2370)	(0.2406)
Economic Policy Uncertainty	0.0003***	0.0002**	0.0002	0.0005	0.0005	0.0005
	(0.0001)	(0.0001)	(0.0002)	(0.0006)	(0.0006)	(0.0006)
IGREA	0.0004	0.0004	0.0004	-0.0006**	-0.0006**	-0.0006**
	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
Implied Volatility	0.0001	0.0004	0.0004	0.0009	0.0009	0.0008
	(0.0009)	(0.0009)	(0.0009)	(0.0011)	(0.0011)	(0.0010)
Log Basis	102.7323***	103.0027***	107.2065***	93.8819***	93.4683***	94.2093***
	(21.6337)	(21.3779)	(22.4102)	(10.6731)	(11.4226)	(10.1229)
Partial R2 (HP Coefficient)	0.0201	0.0155	0.0185	0.0000	0.0000	0.0001
Partial R2 (Trader Coefficient)	0.0325	0.0000	0.0000	0.0002	0.0000	0.0000
R-squared	0.2609	0.2365	0.1887	0.3603	0.3629	0.3665
Observations	764	764	764	449	449	449

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7j: Cumulative Two-Week Post-trade Return: Cotton harvest

	USDA Reports			*VIX Increases*		
	Hedgers	*Speculators*	*CITs*	*Hedgers*	*Speculators*	*CITs*
Net Long Increase	0.4003***	-0.5245***	-0.2830	0.5998***	-0.6819***	-0.3292
	(0.1382)	(0.1953)	(0.2221)	(0.1129)	(0.1770)	(0.2838)
Hedging Pressure	0.6883***	0.6173***	0.6596***	0.1605	0.1111	0.1398
	(0.2292)	(0.2329)	(0.2069)	(0.2524)	(0.2820)	(0.2687)
Relative Day	0.0004	0.0001	0.0006	0.0012	0.0016	0.0010
	(0.0009)	(0.0010)	(0.0009)	(0.0010)	(0.0010)	(0.0011)
BAA Yield	-0.0637	-0.0457	-0.0459	0.0676	0.0934*	0.0643
	(0.0581)	(0.0645)	(0.0635)	(0.0531)	(0.0541)	(0.0577)
Federal Funds Rate	0.0506	0.0394	0.0481	-0.2565	-0.2400	-0.1850
	(0.0354)	(0.0397)	(0.0386)	(0.2274)	(0.2471)	(0.2578)
Economic Policy Uncertainty	0.0003***	0.0003***	0.0003***	0.0002	0.0002	0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0003)
IGREA	0.0003	0.0003	0.0003	-0.0004**	-0.0004**	-0.0005**
	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Implied Volatility	0.0001	0.0003	0.0003	-0.0002	-0.0002	0.0001
	(0.0009)	(0.0009)	(0.0010)	(0.0009)	(0.0010)	(0.0009)
Log Basis	25.6978	31.9147	47.5347	26.6364***	25.4825***	29.4216***
	(23.9161)	(27.0555)	(29.2190)	(9.2772)	(9.0141)	(8.1964)
Partial R2 (HP Coefficient)	0.0119	0.0093	0.0134	0.0010	0.0004	0.0007
Partial R2 (Trader Coefficient)	0.0111	0.0000	0.0000	0.0681	0.0000	0.0000
R-squared	0.1751	0.1371	0.1217	0.2132	0.1707	0.1641
Observations	764	764	764	400	400	400

Coefficients are estimated (as in equation 61 in the text) via panel regression of the indicated, contract-matched cumulative post-trade return on the day t trader net long position changes, as a percentage of the daily open interest, and a vector of controls—using as a natural experiment the five-day trading window following the indicated exogenous market shock. Newey-West standard errors are shown in parentheses, corrected with five lags. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

C Outstanding Questions

C.1 Timing of Belief Updates in the NRE Model.

Current setup: *Period 1:* Traders observe only their private period 1 signal $s_i = F_2 + v_i$, then simultaneously choose positions Q_i. The market clears at price

$$F_1 = F_0 + A'(AA' + \sigma_F^{-2}\Omega)^{-1}(\mathbf{s} - F_0 A) \; - \; \tfrac{\gamma Z}{2}\,\mathrm{Var}[F_2 \mid \mathbf{s}]. \tag{113}$$

Period 2: Spot prices are realized and payoffs occur.

Problem?: Although F_1 embeds both signals, traders *cannot* condition their chosen Q_i on F_1 because Q_i emerges in equilibrium along with F_1, rather than using it to update their strategy. We might allow intra-period learning: traders choose an initial $\widetilde{Q}_i$ based on s_i, observe F_1, then choose a final Q_i, but that would lead to a more complicated two-round equilibrium via Bayesian update, and could get complicated.

C.2 Persistence and Dynamics of DO Signals.

In the DO model as presented, each trader's signal μ_i is drawn at the start of Period 1 and then believed perfectly until payoffs. If $\mu_H - \mu_S$ is nonzero but constant, then every trading round would produce identical ΔQ even though no new information arrives. A richer model might introduce, e.g., an AR(1) signal process, that woudl ensure that trading volume is driven by *new* disagreement, not stale information:

$$\mu_{i,t} = \rho\,\mu_{i,t-1} \; + \; \eta_{i,t}, \quad \eta_{i,t} \sim N(0, \sigma_\eta^2), \tag{114}$$

for $t = 1, 2, \ldots$. Then at each date t, traders act on the new innovation $\eta_{i,t}$, so

$$\Delta Q_{i,t} \; \propto \; \frac{\eta_{i,t} - \eta_{j,t}}{\gamma\,\sigma_F^2} \quad (i \neq j). \tag{115}$$

C.3 Endogenous Liquidity Premium and Spikes in Trading.

Up to now we assume a constant liquidity premium Λ and simply subtract it from F_1, leaving the speculator's position rule unchanged except for a constant shift. In the real world liquidity squeezes cause margin calls or forced sales, generating *transient* shocks to in ΔQ_S. We could instead model Λ_t as a function of current speculative positions, and permit it to evolve endogenously:

$$\Lambda_t = \kappa\, Q_{S,t-1}, \quad \kappa > 0. \tag{116}$$

Then

$$F_{1,t} = F^*_{1,t} - \Lambda_t, \quad Q_{S,t} = \frac{E[F_2] - F_{1,t}}{\gamma \operatorname{Var}[F_2 \mid s]} = Q^*_{S,t} + \frac{\Lambda_t}{\gamma \operatorname{Var}[F_2 \mid s]}. \tag{117}$$

Because Λ_t rises with a large prior $Q_{S,t-1}$, growing speculative open interest triggers affects prices and equilibrium position taking.