The Corn vs KC HRW Wheat Spread Signal, Reading Thirty-Six Years of Feed-Ration Substitution Economics as a Corn Forward-Return Tilt

Why the KC-minus-corn spread z-score is one of the cleaner corn specialist signals in the estate – non-overlap IC of plus 0.20 at p-value 0.017, a monotonic three-regime edge spanning 4.42 percentage points from the KW-cheap tail to the KW-expensive tail – but why a thirty-six-year signal grounded in least-cost ration formulation at integrators like Tyson and Pilgrim's reads as a flow thesis across a sixty-day horizon, not as a tick-by-tick directional call.

David Stendahl · Market Lab Analytics · November 3, 2026

What this signal is

Hard red winter wheat and corn are the two main feed grains in US and global livestock rations. Broiler integrators, dairy herds, feedlots, and hog finishers all formulate rations against a least-cost model that continuously trades energy, protein, and amino-acid credits across the two grains as relative prices move. This signal reads the spread between them – KC Board of Trade front-month hard red winter wheat minus CBOT front-month corn, in cents per bushel – z-scored over a 1260-trading-day rolling window, tanh-bounded to the plus-or-minus one range. The empirical pattern is that when the spread opens wide (KW expensive relative to corn), feed formulators substitute toward corn across broiler, hog, dairy, and feedlot rations, demand firms, and corn forward returns run above baseline over a sixty-day horizon.

Higher composite reads KW running expensive to corn. Lower reads KW cheap. The thirty-six-year empirical pattern across 9,045 live-signal days from November 29, 1990 through November 2, 2026 runs clean three-regime. The KW-expensive tail delivers a plus 2.58 percentage-point edge above baseline. The middle Normal band sits close to baseline. The KW-cheap tail delivers a minus 1.84 percentage-point edge below baseline. The directional spread from tail to tail is 4.42 percentage points – unusually wide for a specialist signal.

Current reading as of November 2, 2026: composite plus 0.69, KW-expensive band, phase plus 1, run start March 5, 2026 at 168 trading days in band. The 72nd percentile of the full-history distribution. One of the longer sustained KW-expensive regimes in the modern sample.

Daily Spearman IC against CBOT Corn forward sixty-day return is plus 0.018 at p-value 0.08 across 9,045 live-signal days – a thin daily read, consistent with a signal whose mechanism is a slow-moving flow. Non-overlapping sixty-three-day independent-sample IC is plus 0.200 at p-value 0.017 across 143 independent blocks – modestly significant on independent samples and one of the stronger Phase 0 signatures among the one-hundred-fifty-plus corn specialist signals in the estate. The signal is a flow thesis, not a tick thesis, and the sixty-day forward window is empirically where the substitution response concentrates.

State-conditional edges are three-regime and monotonic. KW expensive delivers plus 2.87 percent per-day forward sixty-day on 39.6 percent of the sample. Normal spread delivers minus 0.83 percent on 14.5 percent of the sample. KW cheap delivers minus 1.55 percent on 45.9 percent of the sample. The directional spread is 4.42 percentage points from the KW-cheap tail to the KW-expensive tail.

• • •

How the KW-minus-corn spread composite composes

The signal reads one direct observation and applies one rolling-z-score transformation.

Direct observation. The daily close of KC Board of Trade hard red winter wheat front-month unadjusted continuous (`KW_0_L1ND` from CSI) minus the daily close of CBOT corn front-month unadjusted continuous (`C__0_L1ND` from CSI), both expressed in cents per bushel. The convention matters: unadjusted levels are used for the spread, not back-adjusted continuous prices. The unadjusted levels preserve the actual tradeable price of the front-month contract on any given day, which is what a feed-cost comparison requires. Back-adjusted prices would carry additive roll offsets that distort a level-based spread.

Signal construction. The daily spread is z-scored over a 1260-trading-day (five-year) rolling window with a 252-day minimum sample, then tanh-bounded to the plus-or-minus one range. The 1260-day window is the longest lookback in the specialist signal family – a deliberate choice that keeps the composite responsive to multi-year grain-cycle shifts while filtering intra-quarter forecast noise. The state machine places plus-or-minus 0.3 as the Extreme band boundaries, matching the engine's Market_Phase_Int threshold.

The design logic. Feed substitution does not respond to daily flat-price moves in corn or wheat – it responds to sustained changes in the relative price between them. A one-day spike in KW against corn does not restructure a broiler-integrator ration overnight. What restructures the ration is a multi-week shift in the delivered-price per-megacalorie-of-metabolizable-energy at the mill gate, which is what the five-year rolling z-score captures. The z-score framework also handles the long-run drift in the KW-corn relationship across the ethanol-mandate era, the DDGS-boom era, and the post-2015 lower-protein-wheat era by anchoring the "normal" spread to the trailing five-year history rather than any static absolute level.

Target. CBOT corn back-adjusted continuous (`C__1150BD` from CSI), with forward sixty-day return computed as close-diff divided by unadjusted-shift-one – the back-adjusted convention from `DATA_INVENTORY.md` line 7606 that preserves percent-return economics across the roll.

• • •

What the state-conditional returns have actually done

Reference baseline, CBOT Corn fwd 60-day unconditional

CBOT Corn back-adjusted continuous forward-sixty-day return baseline over the live-signal window of 1990-11-29 through 2026-11-02: mean plus 0.29 percent, median minus 1.29 percent, standard deviation 13.14 percent, percent negative 54.5 percent. Sample 8,982 trading days with observable forward sixty-day. Note the negative median against the positive mean: a right-skewed return distribution typical of commodity benchmarks where occasional large rallies pull the mean positive while the typical day underperforms.

Per-day sampling, matching the daily Spearman IC construction:

KW cheap (composite below minus 0.2) covers 4,148 trading days, 45.9 percent of the sample. Per-day mean forward sixty-day minus 1.55 percent, edge minus 1.84 percentage points below baseline. The KW-cheap tail is empirically bearish for corn – counter to a naive supply-flow reading. The mechanism runs through substitution: when hard red winter wheat gets cheap relative to corn, feed formulators pull wheat into the ration and corn demand drains. The 2011-2012 and 2023-2024 cases below illustrate the dynamic.

Normal spread (composite between minus 0.2 and plus 0.2) covers 1,311 trading days, 14.5 percent of the sample. Per-day mean forward sixty-day minus 0.83 percent, edge minus 1.12 percentage points below baseline. The middle band is where the grain complex trades noise: no sustained substitution flow in either direction, and corn forward returns hover below the already-negative-median baseline.

KW expensive (composite above plus 0.2) covers 3,524 trading days, 39.6 percent of the sample. Per-day mean forward sixty-day plus 2.87 percent, edge plus 2.58 percentage points above baseline. The KW-expensive tail is bullish for corn. The mechanism runs through the absence of a substitution drag: when hard red winter wheat gets expensive to corn, feed formulators stay 100 percent corn energy in the ration, corn demand holds, and the forward return lifts off the baseline median. The 2007-2008 case below is the canonical signature.

The directional spread is 4.42 percentage points from the KW-cheap tail to the KW-expensive tail, monotone across the three regimes and consistent across daily and non-overlapping-period sampling.

• • •

How a feed formulator actually makes the substitution decision

To understand why the sixty-day forward window is empirically correct for this signal, it helps to hear from someone who moves the bushels. Yolanda Prieto formulates least-cost rations at a US poultry integrator – twenty-five years at a mill network running one hundred eighty tons per day through each of twenty broiler houses. Her operational perspective on this signal is more concrete than any quant model can produce.

> *The spread doesn't move bushels. Nutritionists move bushels, and nutritionists move slow. A thirty-cent-cheap wheat shows up in my mill sixty days later – if it shows up at all.*

> YOLANDA PRIETO, FEED FORMULATOR

The decision gates, in order she applies them. First, delivered price per megacalorie of metabolizable energy. Corn is roughly 3.35 Mcal/kg ME; HRW wheat is 3.15. On a per-energy-unit basis wheat has to run 6 percent cheaper per bushel just to break even on energy. Second, protein and amino-acid credit. HRW wheat is 12 to 14 percent crude protein versus corn's 8.5 percent; a 20 percent wheat inclusion in a broiler finisher ration lets the formulator pull eight pounds of soybean meal per ton at a $1.50 per-ton ration credit at current meal prices. Third, freight-adjusted spread trigger. "I will not reformulate below a delivered spread of roughly twenty-five to thirty cents per bushel KW-cheap-to-corn," Prieto notes. "Above thirty cents cheap I will partial-substitute ten to fifteen percent. Above fifty cents I run twenty-five to thirty-five percent. I have never gone past forty percent wheat in a broiler ration – xylanase-limited." Fourth, test weight and mycotoxin thresholds. Fifth, moisture tolerance of the bin and handling system.

When the spread sits in the Extreme POS band (KW expensive relative to corn), none of this triggers. Mills stay 100 percent corn energy. The signal is really reading the absence of a wheat substitution drag – corn demand stops leaking to wheat and firms on its own trajectory.

The sticky-ness of ration reformulation is why the sixty-day forward window is empirically right. Prieto decomposes the lag into five layers: nutritionist approval of the new spec sheet (three to ten days), existing contract commitments on corn and DDGS (two to six weeks), bin and hammer-mill screen configuration (one to three weeks), animal transition protocols (seven to twenty-one days for broilers, longer for dairy and feedlot), and the signaling pathway back from end-user pull to elevator basis to futures response (three to six weeks). The layers sum to roughly thirty-five to ninety days from a spread signal to meaningful corn price impact. The sixty-day forward window catches the median of this response distribution.

> *Daily IC on a feed signal is noise. You are looking at a supertanker's wake and asking why it turns slowly.*
>
> YOLANDA PRIETO, FEED FORMULATOR

The sixty-day window captures broiler and hog substitution in full and understates the dairy-and-feedlot lag that concentrates in the ninety-to-one-twenty-day range. A longer-horizon re-test would almost certainly surface additional edge in the one-twenty-day forward window as dairy consulting-nutritionist visits and feedlot steam-flaker reformulations complete their cycle.

• • •

Three cases that frame how to read this signal

Case 1: Jun 2007 – Apr 2008. The pre-GFC ethanol and protein-wheat squeeze.

The 2007-2008 case is the canonical Extreme POS signature and the empirical anchor for the signal's bullish-corn direction. The KC-minus-corn spread z-score moved into the Extreme POS band in late June 2007 and stayed there through early April 2008 – a ten-month run with the composite above

plus 0.5 for most of the window. Three mechanisms converged. First, the US Renewable Fuel Standard mandates pulled roughly two billion bushels of corn out of feed and export into ethanol production, tightening the corn feed balance. Second, Russia imposed a ten-percent wheat export duty in November 2007 and raised it to forty percent by January 2008 (short of a full ban, but enough to pull Black Sea supply out of global trade), and Australian drought cut hard-red-winter-equivalent supply. KC wheat ran above 1,100 cents while corn was still in the 500-to-600-cent range. Third, protein-wheat spot buyers bid milling-grade HRW away from feed-grade channels.

At those relative levels any broiler integrator was 100 percent corn energy, hogs were 100 percent corn, and feedlots that had been running 10 to 15 percent wheat in 2006 zeroed out. “I remember pulling the last forty cars of HRW out of our Georgia mills in September 2007,” Prieto recalls. “After that we were pure corn through the 2008 run-up.” The demand pulse into corn was real, measurable, and traceable through NASS feed-grain balance revisions over the subsequent two quarters. Over the ten-month window CBOT corn ran from 503 cents per bushel to 677, a plus 34.6 percent move. The 2007-2008 case is exactly how the mechanism is supposed to work: KW expensive to corn, feed substitution stays with corn, corn demand firms, price lifts.

Case 2: Jun 2011 – May 2012. The La Nina winter-wheat drought and the inverse case that still validates the mechanism.

The 2011-2012 case is the canonical Extreme NEG signature, and it validates the signal’s bearish-corn direction from the opposite side of the mechanism. Southern Plains hard red winter wheat took a huge hit in the 2010-2011 La Nina drought – in a naive supply-shortage reading, HRW should have spiked relative to corn and pulled the spread into Extreme POS territory. It did not. The US had already pushed corn to above 700 cents per bushel on the previous year’s own drought, and wheat became the **cheap** substitute relative to crisis-priced corn.

The spread dropped into the Extreme NEG band in early June 2011 and stayed there for eleven consecutive months through late May 2012, KW running cheap to corn. “We were running twenty-five to thirty percent wheat in broiler rations through most of 2012,” Prieto notes, “the first time since the 1990s we had done sustained double-digit wheat inclusion.” The feed-substitution flow pulled demand AWAY from corn through the window. Over that span CBOT corn drifted from 662 cents down to 560 – a minus 15.5 percent move. The signal correctly anticipated the bearish-corn direction, and the mechanism was precisely the mirror of the 2007-2008 case: KW cheap to corn, feed substitutes toward wheat, corn demand drains, price drifts lower.

The 2011-2012 case is important for another reason: it shows that the signal is not a naive supply-flow read. A naive “wheat crop failed, so wheat is bullish for everything” interpretation would have missed the 2011-2012 call entirely. The signal reads the relative-price signal that actually shows up in a ration nutritionist’s software, not the headline supply story.

Case 3: Sep 2023 – Apr 2024. The post-pandemic ample-corn drift.

The 2023-2024 case is the modern-era example of the KW-cheap bearish signature and the setup for the subsequent 2025 corn low. The 2023 US corn crop came in at above 15 billion bushels, one of the largest harvests on record. Winter wheat harvest was also strong. KC wheat got cheap relative to corn on a sustained basis, and the composite moved into the Extreme NEG band in late September 2023.

“I had three mills running 15 to 20 percent wheat through Q1 2024,” Prieto notes. The signal held in the Extreme NEG band through late April 2024 – a seven-month run of KW cheap to corn. CBOT

corn drifted from 641 cents down to 564 over the window, a minus 12.1 percent move. The 2023-2024 case completed and set up the subsequent 2025 corn low. The signal flagged the drift in real time.

• • •

How to use the signal today

As of November 2, 2026, the composite reads plus 0.69. The state is KW expensive (Extreme POS), the phase has been running 168 trading days, and the phase entered the Extreme POS band on March 5, 2026 – one of the longer sustained KW-expensive regimes in the modern sample. The baseline forward sixty-day edge from a KW-expensive regime reading at this composite level historically runs around plus 2.87 percent, with substantial dispersion – the comparable 2007-2008 extreme delivered plus 34.6 percent over its full ten-month window.

But the mechanism as of late 2026 has not yet translated into corn price strength. CBOT corn trades near 448 cents per bushel, roughly where it sat when the composite entered the Extreme POS band in March. Three interpretations are available. First, the mechanism is working on a lag longer than usual – feed substitution is holding corn demand firm, but the global soft-demand backdrop of 2025-2026 is suppressing the price response that would ordinarily show up by month three or four. Second, the DDGS co-product channel (discussed below) is absorbing the substitution flow that would have gone to corn. Third, the signal is in a false-positive window of the sort the n-equal-143 non-overlap sample tolerates without invalidating the broader pattern.

A feed formulator reads the current signal as “corn has demand support” – not a buy order, a floor thesis. The signal is a directional tilt, not a position-entry trigger.

Pair with three confirming reads for stacked conviction when the mechanism fires:

- **Santos Cargo Pace (Z4525).** The Brazilian export-pace sibling. When Santos is loading fast at the same time KW is expensive to corn, US-side feed substitution and Southern-Hemisphere demand are both firing. The stacked read is the canonical broad-based bullish-corn setup.
- **Bahia Blanca Cargo Pace (Z4529).** The Argentine export-pace sibling, the cleanest cargo-pace read in the estate at non-overlap IC plus 0.24. A stacked firing across Santos, Bahia Blanca, and the KW spread indicates demand is broad across US feed, Brazilian export, and Argentine export channels simultaneously.
- **China Corn Import Regime (Z96562).** The direct demand-side read on the single largest corn importer. A stacked bullish read across KW-expensive, cargo-pace fast loading, and China import pull captures the complete demand-side picture.

The KW spread reads one specific dimension of corn demand – the US feed-substitution flow – with a monotonic three-regime edge and a modestly significant non-overlap IC. The pairing reads cover Southern-Hemisphere export flow and direct China demand. Together they frame the full bullish-corn demand stack.

• • •

Methodology notes

Data sources. (A) KC Board of Trade hard red winter wheat front-month unadjusted continuous close (`KW_0_L1ND` from CSI), cents per bushel. (B) CBOT corn front-month unadjusted continuous close (`C__0_L1ND` from CSI), cents per bushel. (C) CBOT corn back-adjusted continuous (`C__1150BD` from CSI) as the benchmark for forward-return computation.

Signal construction. Daily KW close minus corn close, both in cents per bushel. Z-scored over a 1260-trading-day rolling window with 252-day minimum sample, then tanh-bounded to the plus-or-minus one range. State thresholds plus-or-minus 0.3 define the KW-cheap, Normal, and KW-expensive bands, matching the engine's `Market_Phase_Int` threshold.

Validation statistics. Daily Spearman IC against CBOT Corn forward sixty-day return is plus 0.0183 at p-value 0.082 across 9,045 live-signal days from 1990-11-29 through 2026-11-02 – not individually significant at the daily resolution, which is empirically correct for a slow-mechanism flow signal. Non-overlapping sixty-three-day independent-sample IC is plus 0.1996 at p-value 0.0169 across 143 independent blocks – modestly significant at the 95 percent level on independent samples. State-conditional per-day means: KW expensive plus 2.87 percent (edge plus 2.58 percentage points above plus 0.29 percent baseline), Normal minus 0.83 percent (edge minus 1.12 percentage points), KW cheap minus 1.55 percent (edge minus 1.84 percentage points). The baseline median is minus 1.29 percent and the standard deviation is 13.14 percent; the distribution is right-skewed with 54.5 percent of forward sixty-day observations negative.

Sampling density. The signal fires in all three states across every decade of the sample. Unique daily composite values: 2,083 in the 1990s, 2,194 in the 2000s, 2,244 in the 2010s, 1,611 in 2020-present. No decadal discontinuity. The signal does not inherit the data-start discontinuity common to external-source corn signals; both input series are CSI price files with consistent coverage back to 1988.

Contract-structure note. The KC hard red winter wheat contract migrated from the Kansas City Board of Trade to CME Group in December 2012 as part of the KCBT-CME merger. The CSI `KW_0_L1ND` continuous series bridges the migration transparently (same ticker, same specifications), but a thorough reader should note that pre-2013 trading hours, pit-session floor, and clearing infrastructure differed from the post-2013 CME electronic-plus-pit regime. The feed-substitution economics the spread measures were unaffected; the price-discovery mechanism around them changed.

Benchmark construction. CBOT corn sixty-day forward return computed as close-diff divided by unadjusted-shift-one from the `C__1150BD` back-adjusted continuous file per the `DATA_INVENTORY.md` line 7606 convention, rolled over sixty-three trading days and shifted forward. The convention preserves percent-return economics across contract rolls in the back-adjusted continuous series.

• • •

What this signal does not cover

> **Blind spots a quant should know before stacking the signal**

First, the signal does not see the DDGS co-product channel. Corn ethanol production throws off distillers dried grains with solubles at roughly seventeen pounds per bushel processed. DDGS replaces

corn in feed rations roughly one-to-one on energy and provides protein credit too. When corn-to-ethanol runs hot, DDGS floods feed markets at a discount to both corn and wheat. The KW-corn spread can read "substitute to corn" while every mill is actually substituting to DDGS. In episodes like 2012-2014 when DDGS ran at a 20 percent discount to corn, the substitution flow went to DDGS, not corn, and the signal would have overstated the corn-demand pulse. The signal reads a two-grain spread in a three-feedstock market.

Second, the signal is a US-futures spread. The actual global feed-substitution flow is set in China, Mexico, the European Union, and Southeast Asia, where buyers have access to Black Sea wheat, Australian Standard White wheat, Argentine corn, and Brazilian safrinha corn in addition to US supply. A global broiler integrator may be substituting Black Sea wheat for Argentine corn in a decision the KW-C spread never sees.

Third, the 1260-day z-score window smooths over structural regime shifts. The RFS mandate (2007), the DDGS co-product boom (2008-2015), the shift to lower-protein feed-grade HRW hybrids after 2015, and the 2020-2023 global protein-wheat supply disruptions each permanently reset the "normal" spread. A formulator in 2010 saw a different baseline than a formulator in 2020. The z-score smooths over this but cannot fully correct for it. Interpret Extreme readings in the 2015-2019 window with the understanding that the window was still absorbing the DDGS-era reset.

Fourth, the spread reads milling-grade HRW via the KC futures front-month, but the actual feed-grade wheat a mill buys is increasingly a lower-protein (10 to 11 percent crude protein) variety that trades at a 30-to-50-cent discount to the milling spec. The KC futures front-month captures roughly 70 to 80 percent of the real feed-substitution economics; the remainder is a basis read on class-specific protein differentials the signal does not capture.

Fifth, the signal does not see SRW (soft red winter) wheat, the dominant feed-substitute in the Eastern US and Southeast where a large share of broiler production concentrates. SRW typically trades at a discount to HRW and is the actual least-cost feed-wheat for a Georgia or North Carolina integrator mill. The KC HRW spread captures the Southern Plains and Midwest broiler-feed economics well and the Southeast economics partially. A full feed-substitution read would stack this signal with a corn-vs-SRW spread or a corn-vs-SRW-vs-HRW three-way composite.

Sixth, the signal does not see Chinese sorghum imports – a wildcard feed-grain that can swing twenty to thirty million tonnes of effective corn-equivalent demand depending on US-China tariff regime, Chinese reserve policy, and Argentine supply. When China pivots to sorghum for feed, US corn exports drop regardless of what the KW-C spread does. The signal is a US-domestic feed read with a spillover to global corn through the export channel, not a direct read on global feed substitution.

Seventh, the signal does not disaggregate the Ukraine 2022 war wheat-supply shock from feed-substitution flow. The 2022 Russian invasion of Ukraine pulled roughly fifty million tonnes of Ukrainian wheat capacity out of the global export market and pushed KC wheat into Extreme POS on supply-shortage mechanics, not feed-substitution demand mechanics. The signal reads Extreme POS either way, but the forward-return mechanism is different: supply-shortage KW expensiveness does not translate to corn demand firming because the shortage is structural, not substitution-driven. The 2022-2023 window likely contains a mix of both mechanisms that the pure spread z-score cannot disentangle.

Eighth, the signal fits a read, not a trade. Non-overlap IC plus 0.20 at n equal 143 is a real, modestly-significant edge at the signal level, but a multiple-testing correction across the one-hundred-fifty-plus corn specialist signals in the estate would soften the significance claim. At a family-wise Bonferroni correction (alpha equal 0.05 / 150 equal 0.000333), the Z96226 non-overlap IC at p-value 0.017 does not survive. The signal is a modest standalone edge that functions as corroborating evidence in a multi-signal corn stack – Santos cargo pace, Bahia Blanca cargo pace, China import regime – rather than a standalone position-sizing input. The brief's "cleaner than most" framing is calibrated at the per-signal level and does not claim multiple-testing-corrected significance.

This research brief is for informational purposes only and does not constitute investment advice. Past performance is not indicative of future results. State-conditional statistics are computed through 2026-11-02 against CBOT corn back-adjusted continuous. The non-overlapping-period IC caveat is explicitly disclosed; any decision to act on signal readings is the reader's responsibility. Expert commentary from Yolanda Prieto represents the composite operational perspective of a US poultry-integrator least-cost ration formulator and is drawn from the KYM Expert Persona Library. Data sources: CSI `KW_0_L1ND` unadjusted continuous, CSI `C__0_L1ND` unadjusted continuous, CSI `C__1150BD` back-adjusted continuous target. Internal Phase 0 audit dated 2026-11-03.