The Iowa and Minnesota Hog-Belt Rain Signal, And Why The Intuitive Mechanism Does Not Survive The Parquet

Why daily CHIRPS satellite precipitation across the Iowa and Minnesota hog belt, inverted and tanh-bounded, has been flagged by the engine author as not working at practical horizons, and what the thirty-six-year sample actually says.

David Stendahl · Market Lab Analytics · October 30, 2026

What this signal is

Iowa and Minnesota are the number-one and number-two US hog-producing states, accounting together for approximately forty percent of US hog inventory. They are also the number-one and number-two US corn-producing states. On the intuitive mechanism, dry weather in the hog belt should drive local corn basis up, lift hog feed costs, squeeze producer margins, force herd liquidation into a short-term supply glut (bearish lean hog futures), followed by a six-to-twelve-month supply contraction (bullish).

This signal reads daily CHIRPS satellite precipitation across the Iowa and Minnesota hog belt, takes a 30-day trailing mean, z-scores on a trailing five-year window, sign-flips so a dry read prints positive, and bounds by tanh into a scale from minus one to plus one. When the composite climbs, Iowa and Minnesota are running dry on the engine's a-priori reading of feed-cost stress. When it falls, abundant precipitation is weighing on the signal.

Three signature firings from the sample. On July 2, 2020, during the COVID-19 packing-plant disruption environment, the composite entered deep abundant-rain at minus 0.52 and LH rose 108.9 percent over the next sixty trading days, driven by the post-COVID rebalancing rather than by the drought mechanism. On November 5, 2019, as sustained dryness drove the composite to plus 0.73, LH fell 28.1 percent over the next sixty trading days on broader supply-demand dynamics unrelated to the feed-cost signal. On April 2, 2024, with the composite at minus 0.59 on abundant Iowa and Minnesota precipitation, LH fell 20.5 percent as US-side supply dynamics dominated.

Today the composite reads plus 0.68 as of October 27, 2026. The dry-side state has been running for 6 trading days as the Iowa and Minnesota hog belt has moved into dry conditions through fall. The thirty-day composite average sits at minus 0.01, meaning the recent jump into the deep-dry zone is a short-term spike rather than a sustained pattern.

Here is the honest finding. The engine author ran a thirty-six-year back-test and the sixty-day forward Spearman information coefficient is minus 0.045, which is both small in magnitude AND wrong-signed versus the engine's a-priori. The engine source itself carries the classification `polarity_validated: False` and `recommended_role: DO_NOT_WIRE_pending_reregionalization`. The mechanism that intuition promises is not transmitting to LH futures at the sixty-day horizon the signal was designed for. The reason, per the LH-E1 practitioner critique: modern integrator-dominated hog production largely hedges feed-cost risk via corn futures and forward grower contracts. Direct precipitation signal reaches only the thirty-percent independent-producer channel, and even for independents, the placement-to-kill lag is roughly ten months, so a 2012 drought spike should show up in 2013 hog prices, not in sixty-day rolling forward returns. Read on for a transparent accounting of what the signal does and does not say, the state-conditional evidence that documents the dead-signal finding, and the four caveats that frame how to use this as a research-stage artifact rather than a live edge.

• • •

How the inputs compose

The CHIRPS satellite precipitation dataset provides daily global precipitation estimates from 1981 to the present at approximately 5-kilometer resolution. The engine queries CHIRPS_REGIONAL_DAILY for the region US_HOG_BELT_IA_MN, which aggregates daily precipitation across the Iowa and Minnesota hog belt.

The engine takes the daily precipitation series, computes a 30-day trailing mean, z-scores on a trailing 1,260-trading-day window (approximately five years) with a 252-day minimum sample population, SIGN-FLIPS so a dry reading prints positive, and bounds by tanh. No summer mask (unlike the Texas Panhandle sibling signal); the Iowa and Minnesota corn-and-hog belt has summer-dominant stress but the signal takes year-round observations.

The engine's a-priori reads the positive side as bullish LH on the drought-to-feed-cost-to-herd-liquidation mechanism. The thirty-six-year parquet does not support that prior.

The regime state machine maps the composite to five bands at the plus-or-minus 0.5 and plus-or-minus 0.2 thresholds. EXTREME_POS above plus 0.5 (39.2 percent of the sample). MODERATE_POS between plus 0.2 and plus 0.5 (11.7 percent). NORMAL between minus 0.2 and plus 0.2 (12.4 percent). MODERATE_NEG between minus 0.5 and minus 0.2 (9.3 percent). EXTREME_NEG below minus 0.5 (27.4 percent).

• • •

Three cases that frame how to read this signal

Case 1: July 2020. Abundant rain into COVID-era rally. The compound-shock case.

Firing date: July 2, 2020 at composite minus 0.5156. Forward 60-day LH return from entry: plus 108.9 percent, a saturated outlier.

Context: July 2020 was deep in the COVID-19 packing-plant disruption environment. US packing plants had operated under distancing protocols through Q2; the fed-hog pipeline was backing up; cash

hog prices had collapsed in April-May and were only beginning to recover. Iowa and Minnesota were running wet in summer 2020 as regular Midwest precipitation patterns held. The signal registered the abundant rain and the engine's a-priori read that as bearish LH on comfortable feed-cost conditions.

The forward 60-day LH return was plus 108.9 percent, not because the drought mechanism worked, but because the COVID-era supply disruption rebalanced through summer 2020 and the futures rallied back from the April-May collapse. The signal's call direction matched the outcome by coincidence, not by mechanism.

Case 2: November 2019. Dry conditions into LH decline. The core counter-case.

Firing date: November 5, 2019 at composite plus 0.7271. Forward 60-day LH return from entry: minus 28.1 percent.

Context: fall 2019 saw sustained dry conditions in Iowa and Minnesota. The engine's a-priori called this bullish LH on building feed-cost stress. LH actually declined 28.1 percent through December 2019 and January 2020 as broader US hog supply-demand dynamics dominated. Pork cutout was weak; export demand pulse from China (which had been strong through 2019 on ASF recovery) was tapering. The feed-cost mechanism the signal reads was theoretical rather than operative; the actual LH price action was driven by variables the signal cannot see.

The 2019 case is the clearest sample case documenting the signal's failure at practical horizons.

Case 3: April 2024. Wet conditions into LH decline. The engine-opposite case.

Firing date: April 2, 2024 at composite minus 0.5928. Forward 60-day LH return from entry: minus 20.5 percent.

Context: spring 2024 Iowa and Minnesota were running wet. The engine's a-priori read this as bearish LH on comfortable feed conditions. LH did decline, but not because the feed-cost signal worked. The 2024 LH decline was driven by US-side supply dynamics (sow slaughter running elevated, breeding herd contracting, packer margin compression) that had nothing to do with Iowa / Minnesota precipitation.

The 2024 case teaches that even when the signal's call direction appears to match the outcome, the underlying mechanism is often unrelated. This is the fingerprint of a signal that is not causally wired to the market it tries to predict.

• • •

What the state-conditional returns have actually done

The SPY forward-60-day return baseline (unconditional) is mean plus 2.31 percent, median plus 3.13 percent. Standard deviation 7.23 percent. Percent negative 29.8 percent. State-conditional means below are expressed as edges relative to this baseline.

> **Reference baseline (8,986 LH-aligned trading days from November 1990 through roughly July 2026)**
>
> LH forward-60-day return baseline (unconditional): mean plus 0.26 percent, median minus 0.24 percent. Standard deviation 10.9 percent. Percent negative 51.7 percent. Phase 0 source: Z4231 engine parquet joined with LH back-adjusted continuous closes.

The signal's EXTREME_POS state (composite above plus 0.5), 3,522 trading days, delivered a mean forward 60-day LH return of minus 0.12 percent. That is minus 0.38 percentage points below baseline. The engine's a-priori called this bullish; the sample shows it mildly bearish.

The MODERATE_POS state (composite between plus 0.2 and plus 0.5), 1,052 days, delivered mean minus 0.43 percent, minus 0.69 pp below baseline. Mildly bearish, consistent with wrong-sign IC.

The NORMAL state (composite between minus 0.2 and plus 0.2), 1,113 days, delivered mean plus 0.88 percent, plus 0.62 pp above baseline. The middle state outperforms the extremes, consistent with the signal having no monotonic predictive content.

The MODERATE_NEG state (composite between minus 0.5 and minus 0.2), 839 days, delivered mean plus 1.43 percent, plus 1.17 pp above baseline. Strongest state in the sample, but the mechanism (wet Iowa / Minnesota implies bullish LH) is not credible.

The EXTREME_NEG state (composite below minus 0.5), 2,460 days, delivered mean plus 0.42 percent, plus 0.16 pp above baseline. Mild upward bias.

Spearman information coefficient of the composite against LH forward returns:

- h=20: minus 0.0148 (p = 0.161, n = 9,026), not statistically significant.
- h=60: minus 0.0451 (p < 0.0001, n = 8,986), WRONG SIGN, significant.
- h=125: minus 0.0876 (p < 0.0001, n = 8,921), WRONG SIGN, strongly significant.

The IC is negative across all practical horizons and increasing in magnitude with horizon. The engine's prior does not hold. The signal is not usable in its current construction at these horizons.

• • •

How to use the signal today

The honest answer: do not use it as a live edge in its current construction.

The engine author's own classification (`DO_NOT_WIRE_pending_reregionalization`) is correct per the thirty-six-year back-test. The parent LH composites should not wire this engine as currently constructed. The brief and the page document the signal's limitations rather than endorsing it.

Three readings a careful user might take.

First, as a research-stage artifact. The engine's construction is clean (CHIRPS, 30-day rolling, 1,260-day z, tanh). The mechanism it tries to capture (drought-to-feed-cost-to-herd) is intuitive. The failure mode (integrator hedging, 10-month placement-to-kill lag, 30-percent independent-producer transmission) is also instructive. Future work could re-filter to specific USDM D3+ Iowa drought-severity regimes with 6-12 month forward targets, which may surface a usable edge the current construction does not.

Second, as a reminder that intuitive mechanisms require empirical validation. The signal's a-priori reading sounds correct to any trader familiar with hog production economics. The thirty-six-year parquet says it is not operative at 60-day horizons. The lesson: build the engine, run the back-test, publish the result. The engines that work and the engines that do not both inform the library.

Third, as a comparison baseline for OTHER weather signals in the LH complex. The LH China Hog Belt THI signal delivers Spearman IC of plus 0.078 against LH forwards, the opposite extreme from

this signal's minus 0.045. The China heat signal works at practical horizons; the Iowa / Minnesota precipitation signal does not. The contrast is informative: the demand-side China signal reaches into US LH through the export-pull channel more reliably than the supply-side feed-cost signal reaches through the integrator-hedged production channel.

Today's reading at plus 0.68, 6 trading days in EXTREME_POS, is a reading on dry Iowa / Minnesota. The historical pattern for EXTREME_POS entries has been mild downside bias (-0.38 pp below baseline), but readers should not weight this strongly given the signal's documented dead-signal classification.

• • •

Methodology notes

The signal's historical Spearman information coefficient against LH forward 60-day returns is minus 0.0451 (n = 8,986, p < 0.0001). The sign is WRONG versus the engine's a-priori and the magnitude is small. At h=20 IC is minus 0.0148 (not significant). At h=125 IC is minus 0.0876 (strongly significant, wrong-signed).

The engine's polarity annotation reads: `polarity_validated: False`. The engine author (Terminal C, 2026-09-01) classifies the signal as DEAD or NEAR-DEAD at practical horizons. The reader-facing page and this brief carry that classification plainly.

The regime state machine uses the plus-or-minus 0.5 and plus-or-minus 0.2 composite thresholds. The sample distribution is bimodal: 39.2 percent in EXTREME_POS, 27.4 percent in EXTREME_NEG, 11.7 percent in MODERATE_POS, 12.4 percent in NORMAL, 9.3 percent in MODERATE_NEG.

The failure mechanism per LH-E1 Prasse critique: integrator top-4 systems hedge feed costs via corn futures and forward-priced grower contracts. Drought signal propagates only through the approximately 30 percent independent-producer channel, which is too thin to move CME LH price at 60 days. For independents, the placement-to-kill lag of approximately 10 months means a 2012 drought spike would show up in 2013 hog prices, not in 60-day rolling forward returns.

• • •

What this signal does not cover

Four caveats on the signal's reach, each stated plainly.

First, the signal is self-classified as dead at practical horizons by the engine author. The thirty-six-year parquet shows wrong-sign IC at h=60 and h=125. Readers should not treat the signal as a live edge in its current construction.

Second, the mechanism assumes direct transmission from local precipitation to LH futures. Modern integrator-dominated hog production hedges feed costs; the direct transmission channel is thin. The signal's a-priori is theoretically clean but operationally broken.

Third, the placement-to-kill lag of approximately 10 months exceeds the signal's 60-day forward horizon by an order of magnitude. A drought that genuinely drives producer margin stress would show up in LH prices roughly 300 trading days later, not 60.

Fourth, this is a slow-moving signal. Half-life of the composite is approximately 60 to 90 trading days given the 30-day rolling input and 1,260-day z-window.

A future re-worked version of the signal might filter to specific USDM D3+ Iowa drought-severity regimes with 6-12 month forward return targets. That work is not yet in production.

Not investment advice. The analysis in this brief is informational and educational. Signal readings, historical case figures, and empirical statistics are derived from publicly available data (CME Lean Hog settlement prices for 1990 to 2026; USDA National Agricultural Statistics Service livestock inventory; CHIRPS satellite precipitation 1981 to 2026 across the Iowa and Minnesota hog belt) and are provided without warranty. The signal is self-classified by the engine author as not currently usable at practical horizons; readers should treat this brief as a research-stage artifact rather than a live edge endorsement. Hypothetical performance results have inherent limitations. Readers should consult their own financial advisor before making any investment decision. (c) 2026 David Stendahl.