The Chinese Hog-Belt Rain Signal Through The ASF-Era Feed-Cost Lens

Why daily North China Plain precipitation, framed as a feed-cost stress gauge for the restructured post-ASF Chinese hog industry, has shown the same empirically-inverted polarity as its demand-pulse sibling and what the overlap teaches about weather signals in modern integrated production.

David Stendahl · Market Lab Analytics · October 28, 2026

What this signal is

China's hog industry has restructured dramatically since the African Swine Fever outbreak of 2018. Top-10 integrators now account for approximately 25 percent of Chinese hog production, up from roughly 10 percent pre-ASF. Modern biosecurity-compliant farms are concentrated in northeast China. Smallholder producers largely exited; the surviving independents cluster in specific North China Plain sub-regions.

This signal reads daily CHIRPS satellite precipitation across the North China Plain hog belt, takes a 30-day trailing mean, z-scores on a trailing five-year window, sign-flips so dry prints positive, and bounds the result from minus one to plus one. The engine's a-priori framing: NCP drought should stress feed-corn supply within China, lift hog input costs, squeeze margins for the modern integrated-production operators who dominate the post-ASF industry, accelerate the hog cycle, and transmit knock-on effects to US LH futures via the global protein trade.

On December 18, 2020, during the ASF-COVID compound shock, the composite at plus 0.64 preceded LH plus 44.9 percent fwd60d. On December 24, 2013, during a pre-ASF Chinese pork cycle expansion phase, the composite at plus 0.68 preceded LH plus 32.6 percent, the archetype of what the engine's a-priori expected. On November 6, 2019, during the acute ASF phase, the composite at plus 0.52 preceded LH minus 25.7 percent as near-term demand response had already passed.

Today the composite reads plus 0.68 as of October 27, 2026. The deep-dry state has been running for 5 trading days as the North China Plain has been running dry through fall 2026.

Here is the honest finding, which is the same finding this signal's byte-identical sibling (same input, different framing) reports. The engine's a-priori called positive composite bullish LH on the feed-cost-to-margin-squeeze mechanism. The thirty-four-year back-test shows the EXTREME_POS state has delivered mean fwd60d LH of minus 0.35 percent, 0.61 percentage points BELOW baseline. The EXTREME_NEG state has delivered plus 1.60 percent, 1.34 percentage points ABOVE baseline. The

empirical polarity is INVERTED versus the engine's prior at both extremes. The feed-cost framing is a plausible modern-era mechanism, but the aggregated NCP-wide precipitation signal does not isolate the transmission channel cleanly: Chinese corn-feed supply is substantially sourced from the Northeast (not the NCP), Chinese government strategic reserves (COFCO + Sinograin) buffer short-term volatility, and the ASF era distorted the normal relationship. Read on for three cases that frame the pattern, the state-conditional evidence, and the four caveats.

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How the inputs compose

The CHIRPS satellite dataset provides daily global precipitation from 1981 at approximately 5-kilometer resolution. The engine queries CHIRPS_REGIONAL_DAILY for the region CHINA_HOG_BELT_NCP (North China Plain hog belt, spanning Henan, Shandong, Hebei, Jiangsu, and Anhui).

The engine takes the daily precipitation series, computes a 30-day trailing mean, z-scores on a trailing 1,260-trading-day window with a 252-day minimum sample population, SIGN-FLIPS so a dry reading prints positive, and bounds by tanh.

The regime state machine maps the composite to five bands at the plus-or-minus 0.5 and plus-or-minus 0.2 thresholds. Distribution: 38.3 percent EXTREME_POS, 22.3 percent MODERATE_POS, 11.4 percent NORMAL, 6.6 percent MODERATE_NEG, 21.4 percent EXTREME_NEG.

Byte-identical construction with Z4245. The two engines query the same region with the same transforms and produce byte-identical parquets. The library includes both because the editorial framings (demand-pulse vs feed-cost) are mechanistically distinct even though the input is the same. Parent LH composites must not double-wire; the two are the same information.

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Three cases that frame how to read this signal

Case 1: December 2013. Pre-ASF cycle expansion. The archetypal case.

Firing date: December 24, 2013 at composite plus 0.68. Forward 60-day LH return from entry: plus 32.6 percent.

Context: late 2013 was mid-Chinese-pork cycle expansion. Chinese producer margins were strong; the cycle was approaching peak. The NCP was running dry on seasonal cool-winter patterns. US pork exports to China through early 2014 were elevated. LH February and April 2014 contracts rallied through Q1 2014 on the combination of Chinese export pull and US-side cold-weather demand.

Interpreted through the feed-cost framing: dry NCP in late 2013 would stress smallholder feed sourcing (the industry structure that dominated pre-ASF), compressing margins and accelerating sow slaughter. The forward hog cycle acceleration pulled Chinese imports from the US and benefited LH futures. This is one of the cleaner sample windows where the engine's a-priori direction matched the outcome via the feed-cost pathway as it was theoretically supposed to.

Case 2: November 2019. Acute ASF phase. The counter-case.

Firing date: November 6, 2019 at composite plus 0.52. Forward 60-day LH return from entry: minus 25.7 percent.

Context: late 2019 was the acute ASF phase. Chinese hog inventory was down approximately 40 percent from 2018 peaks; spot wholesale pork prices in Chinese markets were at record highs. The NCP was running dry on seasonal cool-fall patterns.

Interpreted through the feed-cost framing: dry NCP during ASF should have further stressed the surviving hog producers who were already operating at ASF-reduced capacity. Instead, the LH forward return was deeply negative because the demand response had already fully exhausted: China had front-loaded US pork imports through Q3 2019; by November the near-term pulse had passed and LH entered a correction phase.

The 2019 case teaches that when a demand/supply shock has already fully priced into the forward market, additional stress signals from the same region cannot drive further rallies. The feed-cost framing requires residual demand elasticity to work; in late 2019 that elasticity was gone.

Case 3: December 2020. ASF-COVID compound shock. The outlier.

Firing date: December 18, 2020 at composite plus 0.64. Forward 60-day LH return from entry: plus 44.9 percent.

Context: late 2020 was the ASF-COVID compound shock era. Chinese hog recovery was underway but still limited; US pork export pull to China was at record highs; US domestic LH was recovering from the Q2 COVID packing-plant collapse. The NCP was running dry on seasonal cool-winter patterns.

Interpreted through the feed-cost framing: dry NCP would stress the restructuring integrator-dominated post-ASF production. In practice, the LH forward rally was driven by compound shock dynamics (US domestic rebalancing + ongoing Chinese import pull from pre-ASF inventory draw-down + general commodity reflation). The signal rode along rather than led.

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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)**
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> 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: Z4331 engine parquet joined with LH back-adjusted continuous closes. Note that Z4331 parquet is byte-identical to Z4245 parquet by construction.

The signal's EXTREME_POS state (composite above plus 0.5), 3,439 trading days, delivered a mean forward 60-day LH return of minus 0.35 percent. That is minus 0.61 percentage points below baseline. The engine's a-priori called this bullish via the feed-cost mechanism; the sample shows it mildly bearish.

The MODERATE_POS state (composite between plus 0.2 and plus 0.5), 2,004 days, delivered mean minus 0.21 percent, minus 0.47 pp below baseline.

The NORMAL state (composite between minus 0.2 and plus 0.2), 1,026 days, delivered mean plus 0.98 percent, plus 0.72 pp above baseline. The middle state outperforms the extremes, consistent with the signal lacking monotonic predictive content.

The MODERATE_NEG state (composite between minus 0.5 and minus 0.2), 596 days, delivered mean minus 0.18 percent, minus 0.44 pp below baseline.

The EXTREME_NEG state (composite below minus 0.5), 1,921 days, delivered mean plus 1.60 percent, plus 1.34 pp above baseline. The strongest state in the sample, opposite to the engine's prior.

Spearman information coefficient of the composite against LH forward returns: h=20 minus 0.0509 (WRONG SIGN, significant); h=60 minus 0.0093 (not significant); h=125 minus 0.0378 (WRONG SIGN, significant). The IC is near-noise at h=60 and weakly wrong-signed at shorter and longer horizons.

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How to use the signal today

Three readings.

First, with the empirical polarity reframed. The engine's a-priori feed-cost framing (positive = bullish LH via feed-cost margin squeeze) is empirically inverted at the extremes. Readers consuming the raw engine output should apply the sign flip for the EXTREME_POS and EXTREME_NEG tails.

Second, as a sibling to the demand-pulse Z4245 signal. The two engines compute the same number. Parent LH composites must not double-wire. In most practical use cases, consume one of the two (choose the framing that matches the current cycle context) and apply the empirical polarity.

Third, as a research-stage artifact. The feed-cost framing is directionally reasonable for the modern post-ASF era (integrator-dominated, feed-cost-sensitive) but the aggregated NCP-wide precipitation signal does not isolate the transmission channel cleanly. Future work may filter to specific sub-NCP drought-severity regimes with specific integrator-concentration overlays.

Today's reading at plus 0.68, 5 trading days in EXTREME_POS, places the signal in the deep-dry zone per the engine convention. With empirical polarity applied, mild downside bias for LH at 60-day forward.

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Methodology notes

The signal's historical Spearman information coefficient against LH forward 60-day returns is minus 0.0093 (n = 8,986, p = 0.380), near-noise. The sign is wrong versus the engine's a-priori at shorter and longer horizons.

The engine's polarity annotation reads: "Positive = bullish LH, Negative = bearish." The empirical direction is INVERTED at both extremes.

Byte-identical sibling: Z4331 and Z4245 both query CHIRPS_REGIONAL_DAILY for region = CHINA_HOG_BELT_NCP with identical transforms. The two engines were authored under different framings but produce byte-identical outputs. Parent composites must not double-wire.

The engine source carries data_starts = 2008-01-01 in the historical_context field, indicating the author considered the pre-2008 CHIRPS sample thin for Chinese observations; in practice CHIRPS runs back to 1981 and the full 36-year sample is used in this brief.

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What this signal does not cover

Four caveats.

First, the engine's a-priori feed-cost framing is empirically inverted at the extremes.

Second, the signal is byte-identical to the Z4245 demand-pulse-framed sibling. Parent composites must not double-wire.

Third, Chinese corn-feed supply is substantially sourced from northeast China (not NCP), limiting the transmission channel the feed-cost framing assumes.

Fourth, this is a slow-moving signal. Half-life approximately 60 to 90 trading days.

Not investment advice. The analysis in this brief is informational and educational. The engine's a-priori polarity is empirically inverted at the extremes; this brief documents the empirical direction. Signal readings, historical case figures, and empirical statistics are derived from publicly available data (CME CBOT Lean Hog settlement prices, USDA Foreign Agricultural Service Weekly Export Sales, CHIRPS satellite precipitation across the North China Plain hog belt) and are provided without warranty. The engine is byte-identical to Z4245 by construction; parent composites must not double-wire. Hypothetical performance results have inherent limitations. Readers should consult their own financial advisor before making any investment decision. (c) 2026 David Stendahl.