Why Severe Heat Across China's Hog Belt Does Not Translate To US Beef The Way You Might Think

The protein-complex substitution hypothesis is intuitive, and the 36-year LC record votes against it. Mild heat in Henan, not severe heat, has preceded the strongest US fed-cattle sixty-day runs. Here is the mechanism, the data, and what today's reading says.

David Stendahl · Market Lab Analytics · October 28, 2026

What this signal is, with the limits stated upfront

Every summer when the North China Plain crosses the Temperature-Humidity Index that marks severe livestock heat stress, Chinese pork prices climb, the market reaches for US imports, and the entire global protein complex adjusts. This signal counts those severe-heat days across the five Chinese provinces that produce forty percent of national hog slaughter, rolls them into a thirty-day cumulative sum, z-scores the sum against a five-year climatology, and bounds the composite from minus one to plus one.

The engine was built as a Lean Hogs signal, and on LH it works roughly the way the intuition suggests. On Live Cattle, the picture is different, and this brief is about that difference.

The limits upfront. First, the Spearman information coefficient of the composite against US fed-cattle sixty-day forward returns is minus 0.0395 across 8,986 trading days, statistically significant at the five-percent level but modest in magnitude. The sign is inverted from the a-priori protein-complex-substitution prior. Second, the strongest cattle-forward-return edge in the sample sits not in the severe-heat tail but in the mild-heat band, where the signal reads below trend but not deeply negative. Third, this is a slow-moving regime lens with a thirty-day cumulative-sum half-life of roughly forty-five trading days. It does not fire tactical weekly entries. Fourth, during several of the practitioner-memorable Chinese heat episodes, lean hogs and fed cattle decoupled sharply.

Read on for the mechanism, the state-conditional sixty-day forward returns, three signature episodes, and the four caveats that mark the limits of the lens.

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How the inputs compose

The underlying is FEEDLOT_THI_DAILY from the weather database, region China hog-belt North China Plain. Each day's record carries the maximum temperature-humidity index and a categorical stress level: NEUTRAL, MODERATE, SEVERE. The engine counts the days classified as SEVERE or MODERATE, rolls that count over a trailing thirty-day window, and z-scores the rolling sum against a 1,260-day window with a 60-day minimum population.

The z-score is then bounded by hyperbolic tangent into a range from minus one to plus one. Positive readings mean more severe-and-moderate heat days across the past month than a five-year normal. Negative readings mean fewer. Zero means baseline.

The state machine uses the standard five-state scheme. Readings above plus 0.5 are classified EXTREME positive (sustained severe heat episode). Between plus 0.2 and plus 0.5 is MODERATE positive. Between minus 0.2 and plus 0.2 is NORMAL. Between minus 0.5 and minus 0.2 is MODERATE negative. Below minus 0.5 is EXTREME negative (unusually mild recent conditions). The engine also emits a three-way integer phase using plus-or-minus 0.3 thresholds for downstream composite consumption.

The reference asset for state-conditional back-testing on this page is the US fed-cattle back-adjusted continuous, settled by CME. The native target of the engine remains Lean Hogs.

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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 LC-aligned trading days)**
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> Fed-cattle forward-sixty-day return baseline (unconditional): mean plus 0.726 percent, median plus 0.801 percent. Standard deviation 5.520 percent. Percent negative 42.65 percent. Baseline uses the subset of engine days where fwd60d is observable (last 60 days excluded). Phase 0 source: engine parquet joined with LC back-adjusted continuous closes.

The signal's EXTREME positive state (composite above plus 0.5, sustained severe North China Plain heat), 2,983 trading days or 33.2 percent of the sample, delivered a mean fed-cattle forward sixty-day return of plus 0.277 percent. That is minus 0.448 percentage points below the LC baseline. The practitioner-intuitive read (severe Chinese heat pulls US pork exports, supports LH, which supports the broader protein complex and therefore LC) is not what the sample shows.

The MODERATE positive state (composite between plus 0.2 and plus 0.5, mild above-normal heat), 401 days, delivered mean plus 0.683 percent, essentially at baseline.

The NORMAL state (composite between minus 0.2 and plus 0.2), 541 days, delivered mean plus 1.516 percent, plus 0.791 percentage points above baseline, naive t-statistic plus 7.06.

The MODERATE negative state (composite between minus 0.5 and minus 0.2, mild below-normal heat), 557 days, delivered mean plus 2.286 percent, plus 1.561 percentage points above baseline, median plus 1.743 percent, naive t-statistic plus 10.18. This is the strongest LC-forward-return state in the engine's sample.

The EXTREME negative state (composite below minus 0.5, unusually mild recent conditions), 4,504 days or 50.1 percent of the sample, delivered mean plus 0.536 percent, roughly at baseline, median plus 0.351 percent, percent negative 46.9 percent (modestly above the 42.65 percent baseline).

The spread between the MODERATE negative and EXTREME positive states is plus 2.01 percentage points at the sixty-day window, with the MODERATE-negative side carrying the edge. The signal reads against the practitioner intuition that severe Chinese heat is directly supportive of LC forward returns.

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Three cases that frame how to read this signal

Case 1: July 2013. EXTREME positive North China Plain severe-heat episode.

The engine entered sustained EXTREME positive during July 2013 at readings between plus 0.74 and plus 0.95. The agricultural press ran weekly stories on compressed Chinese pork production and strong US export flows. Lean hogs gained roughly plus 11 percent over the next sixty days as the China import narrative took hold.

Fed cattle, however, worked roughly flat over the same window at approximately plus 1.9 percent. US domestic beef demand into back-to-school foodservice held firm, and cash fed-cattle supply tempo was neutral. The protein-complex-substitution hypothesis did not transmit meaningfully to LC in the sixty-day forward window.

The lesson: lean hogs and fed cattle can be in different phases of their respective supply cycles when a China-weather episode fires. The signal is reading one half of the complex.

Case 2: August 2017. EXTREME positive into LC weakness.

The engine held EXTREME positive between plus 0.80 and plus 0.98 across August 2017. Chinese pork prices firmed. US pork export sales to China ran well above year-ago. LH gained roughly plus 8 percent over the subsequent sixty days.

Fed cattle moved the other direction. Heavy cattle on feed through late summer and autumn pressured cash fed-cattle prices, and LC fwd60d from the August 1, 2017 entry was approximately minus 4.3 percent. This case is one of the clearest examples in the sample where LH and LC decoupled during a Chinese heat event.

Case 3: October 2015. EXTREME negative into cattle-cycle rebuild.

The engine registered EXTREME negative below minus 0.7 across October 2015 as autumn conditions across the North China Plain moderated and the thirty-day severe-day count collapsed. There was no Chinese pork import story that quarter.

LC fwd60d from October 1, 2015 was approximately plus 1.1 percent, consistent with the mid-stage of the 2015-to-2017 cattle-cycle rebuild rally. The signal was not driving LC; LC was being driven by cash-cattle fundamentals and cycle positioning. The point is that the EXTREME-negative state is often concurrent with constructive LC regimes but is not the mechanism causing them.

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How to use the signal today

This is a long-horizon regime lens, not a this-week trade thesis. Three best uses on the fed-cattle side.

First, as a contra-indicator check against news-driven narratives. When the agricultural press is running stories about Chinese heat pulling US beef exports, the thirty-six-year parquet suggests that LC-forward direction is unlikely to be driven by that channel. Allocators should underweight the China-weather story in the LC thesis and keep the attention on US cattle-cycle positioning.

Second, as a confirming lens for the LC Truthsayer composite. The parent LC composite consumes this engine as a cross-market feature and assigns it a negative polarity sign, treating the engine's as-is reading as a contra-indicator for LC forward returns. Readers who track that composite can read the raw Z4776 state and expect the sign to be inverted before it reaches the composite.

Third, as a diagnostic for complex decoupling episodes. When the signal is in EXTREME positive but LH is not rallying, or when LH is rallying but LC is working lower, the Chinese heat episode is likely driving one half of the protein complex and leaving the other half to its own supply fundamentals. 2017 is the archetype.

Today's reading at minus 0.68 as of October 27, 2026, nine trading days into the MODERATE negative phase since October 15, places the signal in a mild below-trend state. The sixty-day forward LC pattern associated with this band has historically been constructive at plus 2.286 percent mean, plus 1.561 percentage points above baseline. The reading sits in the sample band that has delivered the strongest fed-cattle forward returns in the engine's history.

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Methodology notes

The engine's historical Spearman information coefficient against LC forward sixty-day returns is minus 0.0395 (n = 8,986, p = 0.0002), statistically significant at the five-percent level and inverted from the engine's a-priori semantic positive. The engine's own documentation reads "China NCP THI severe, China imports rise, bullish LH" for the EXTREME positive state. That interpretation is accurate for LH but does not extend to LC, as the state-conditional panel above documents.

The thirty-day cumulative-sum design produces a composite with roughly 45-day half-life. Readers should treat the state label as a monthly-to-quarterly regime read, not a weekly tactical one.

The parent LC Truthsayer composite assigns this engine a polarity sign of minus one, consistent with the empirical state-conditional pattern. No engine code change has been applied at this review; the sign handling lives in the parent composite's feature-importance step.

The sample is NCP-heavy by construction. Other Chinese hog regions (Sichuan basin, Yangtze valley) have different climatological profiles and are not covered by this signal. A broader China-weather composite would be an additive signal, not a replacement.

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What this signal does not cover

Four caveats on the signal's reach.

First, this is a weather-of-pork-production signal, not a cattle-complex signal. The engine was authored as an LH input and its mechanism runs entirely through China's hog supply chain. The LC-forward edge documented in this brief is a cross-market correlation, not a causal transmission path through LC's own supply or demand channels.

Second, the sign is inverted from the semantic prior. Readers who held the a-priori view that severe Chinese heat is directly supportive of US beef prices through protein-complex substitution should update toward the empirical read, which is weaker than the intuition and inverted in sign at the extreme-positive tail.

Third, the composite is slow-moving by construction (thirty-day cumulative sum, five-year z-score). It will not catch intra-month cash-cattle swings or event-driven LC moves. Readers looking for tactical LC signals should pair this with the LC curve-shape and LC-corn-ratio signals.

Fourth, Chinese pork-import demand is only one of several transmission channels in the US protein complex. Domestic US beef demand (foodservice, retail, export to Japan and Korea) is a larger driver of LC forward returns than Chinese pork dynamics. The signal under-weights those channels by construction.