The Crude 20-Day Momentum Signal. Thirty-Seven Years of Trend-Regime Reads Against WTI Forward Returns.

Why recent price carries in crude through three force-aligned transmission channels (speculator chase, commercial inventory pull, refiner run build). Why the signal delivers monotonic state edges (plus 0.58pp Uptrend, minus 0.58pp Downtrend) across 9,208 live-signal days. Why daily IC plus 0.021 at p=0.046 clears conventional significance on dense sampling, and non-overlap IC plus 0.104 at p=0.21 is marginal on independent samples. How to use the price-technical read alongside the macro and positioning signals in a four-signal crude stack.

David Stendahl · Market Lab Analytics · November 4, 2026

What this signal is

The simplest signal in a crude PM playbook is that recent price carries. A 20-day uptrend tends to extend. A 20-day downtrend tends to persist. This happens because position-adders follow price. Speculators chase the entry. Physical commercials pull inventory forward. Refiners build stocks against expected product demand. Three forces all push the same way through the near-term window. The 37-year empirical pattern confirms the mechanic.

The signal reads the 20-day log-return of WTI ratio-adjusted continuous (CSI CL21160RD), z-scored against its 252-day rolling distribution with a 63-day minimum sample. The result is tanh-bounded to the plus-or-minus one range. Positive composite means recent momentum up (bullish uptrend regime). Negative composite means recent momentum down (bearish downtrend regime). The state machine uses plus-or-minus 0.2 as the band boundaries.

Current reading as of November 3, 2026: composite plus 0.245, Moderate POS, 8 trading days in band since October 23, 2026. The 20-day log-return of crude is roughly 0.25 standard deviations above its 252-day rolling average. Mild uptrend reading.

Daily Spearman IC against WTI forward sixty-day return is plus 0.021 at p-value 0.046 across 9,208 live-signal days. This CLEARS conventional significance on dense sampling, a result the macro and positioning signals in this family do not consistently achieve. Non-overlapping sixty-three-day independent-sample IC is plus 0.104 at p-value 0.21 across 147 independent blocks. Marginal on independent samples.

State-conditional edges are monotonic. Uptrend (state plus one, composite above plus 0.2) covers 44.0 percent of the sample, delivering plus 3.12 percent per-day forward sixty-day, an edge of plus 0.58 percentage points above the plus 2.53 percent baseline. Neutral (state zero, composite between minus 0.2 and plus 0.2) covers 15.2 percent, delivering plus 2.43 percent (edge minus 0.11pp, essentially baseline). Downtrend (state minus one, composite below minus 0.2) covers 40.8 percent, delivering plus 1.97 percent (edge minus 0.58pp). The spread is 1.15 percentage points from one tail to the other.

The modest spread is characteristic of a price-technical signal. Momentum does not predict EXTREME forward returns. It predicts a mild tilt in the direction the trend is already running.

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How the composite composes

The signal reads one input: the daily close of WTI ratio-adjusted continuous from CSI (CL21160RD). The transformation is a single step.

First, compute the 20-day log-return: `log(close[t] / close[t-20])`. Log-returns are symmetric (a 10 percent up and 10 percent down cancel in log space) and additive across windows, both properties that make them the natural choice for trend-detection z-scoring.

Second, z-score the 20-day log-return against its 252-day rolling distribution with a 63-day minimum sample. This normalizes for the fact that crude volatility varies by regime. A 10 percent 20-day move is extreme in a 20 percent annualized volatility regime but normal in a 60 percent regime. The 252-day rolling window adapts to the current volatility backdrop.

Third, tanh-bound the result to the plus-or-minus one range. This prevents extreme readings from dominating the state machine logic. A raw z of plus 4 reads as composite plus 0.9993 on the tanh scale. A raw z of plus 2 reads as plus 0.9640. The tanh compression concentrates the signal near zero and treats all extremes similarly.

The state machine uses plus-or-minus 0.2 as the band boundaries. State plus one fires when composite is above plus 0.2 (Uptrend, momentum carries up). State zero fires when composite is between minus 0.2 and plus 0.2 (Neutral). State minus one fires when composite is below minus 0.2 (Downtrend, momentum carries down).

The design is structurally the simplest in the four-signal crude stack. One input series. One rolling z. One tanh. One state machine. The simplicity reflects the signal's role as the price-technical anchor that captures what the market has ALREADY DONE while the other three signals read EXTERNAL DRIVERS.

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What the state-conditional returns have actually done

> **Reference baseline, WTI crude fwd 60-day unconditional over live window**
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> WTI crude ratio-adjusted continuous forward-sixty-day return baseline over the live-signal window of 1989 through 2026-11-03: mean plus 2.53 percent, median plus 3.13 percent, standard deviation 20.39 percent,

> percent negative 41.2 percent. Sample 9,208 trading days. The mean-minus-median gap of minus 0.60pp tells you crude forward returns are mildly left-tailed.

Uptrend (composite above plus 0.2). 4,043 trading days, 44.0 percent of the sample. Per-day mean forward sixty-day plus 3.12 percent, edge plus 0.58 percentage points above baseline. The uptrend state is the price-side bullish backdrop. Position-adders are chasing. Physical commercials are pulling forward. Refiners are building. The 1994 Kuwait-tension rally and the 1999 post-OPEC-cut rally are the archetypes of this state firing cleanly.

Neutral (composite between minus 0.2 and plus 0.2). 1,393 trading days, 15.2 percent of the sample. Per-day mean forward sixty-day plus 2.43 percent, edge minus 0.11 percentage points below baseline. The middle state is the smallest. Crude momentum spends most of its time pushed to one side or the other because the sample distribution has fat tails. When momentum is in the middle, forward returns are essentially at baseline.

Downtrend (composite below minus 0.2). 3,772 trading days, 40.8 percent of the sample. Per-day mean forward sixty-day plus 1.97 percent, edge minus 0.58 percentage points below baseline. The downtrend state is the price-side bearish backdrop. Speculators are cutting longs. Physical commercials are draining inventory. Refiners are cutting runs. The 2008 GFC trend-down and the 2014-2015 Saudi price-war trend-down are the archetypes.

The spread is 1.15 percentage points from the Downtrend tail to the Uptrend tail. Modest but monotonic and consistent across the 37-year sample.

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Three cases that frame how to read this signal

Case 1: Jul 2008 to Dec 2008. The GFC trend-down and the canonical crude crash.

The composite moved into state Downtrend on July 17, 2008 as the 20-day log-return of crude crashed from the parabolic run-up into deep negative territory. Demand destruction, financial stress, and forced selling by levered producers all pushed the same direction. Over the 117-trading-session window (167 calendar days) WTI ratio-adjusted continuous fell from 419.9 to 132.8, a minus 68.4 percent move. Nominal front-month crude peaked near 147 dollars per barrel in July 2008 and bottomed near 33 dollars in December 2008. The 2008 case is the canonical trend-down crude crash and the most powerful validation in the signal history. A PM running this signal in July 2008 would have been positioned short crude on the trend read alone, five weeks before the Lehman weekend.

Case 2: Apr 1994 to Jul 1994. The Kuwait tension uptrend.

The composite moved into state Uptrend on April 4, 1994 as the 20-day log-return of crude surged on rising Middle East tensions and Iraqi military movements near Kuwait. Momentum compounded as spec flow chased. Over the 72-trading-session window (102 calendar days) WTI ratio-adjusted continuous rallied from 27.6 to 37.6, a plus 36.5 percent move. The 1994 case is a clean uptrend example. The signal catches it inside 5 trading sessions of the first 20-day momentum crossover, and the trend extends for a full quarter. A PM running this signal in April 1994 would have been positioned long crude from the crossover through the Middle East tension window.

Case 3: Oct 2014 to Feb 2015. The Saudi price-war trend-down.

The composite moved into state Downtrend on October 8, 2014 as the 20-day log-return of crude turned sharply negative with Saudi Arabia breaking OPEC production discipline. Momentum extended as US shale producers hedged forward, amplifying the sell pressure. Over the 80-trading-session window (117 calendar days) WTI ratio-adjusted continuous fell from 123.7 to 69.8, a minus 43.6 percent move. Nominal front-month crude fell from the mid-80s to the mid-40s. The 2014-2015 case is the second-biggest trend-down crude move in the signal history after 2008 GFC.

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How to use the signal today

As of November 3, 2026, the composite reads plus 0.245 in the Moderate POS band and the phase has been running 8 trading days. The state-conditional forward sixty-day expectation for Moderate POS is plus 3.12 percent, a plus 0.58 percentage-point edge above the plus 2.53 percent baseline. The trend read is MILDLY bullish.

Important context. The signal lives alongside three other crude signals. The DFII10 real-rate overlay reads macro cost (currently Moderate NEG, 123 sessions in). The CFTC heating-oil positioning reads downstream demand (currently Moderate NEG, 2 sessions in). The macro demand composite reads the four-channel macro backdrop (currently Neutral drifting toward Stress). This signal reads recent price itself (currently Moderate POS, mild uptrend).

A MIXED stack. The three macro and positioning signals read bearish. This price-technical signal reads mild bullish. When fundamentals diverge from technicals, the technical can lead by days to weeks (price moves before macro catches up) or lag by months (macro dominates and drags price). A PM should wait for the signals to converge before sizing up either direction.

Two triggers. First, the composite crosses above plus 0.6 (Extreme POS, strong uptrend). That requires the 20-day log-return to accelerate to roughly two standard deviations above the rolling average. Rare. Second, the composite drops below minus 0.2 (Moderate NEG, downtrend). That would join the other three bearish crude signals in a four-signal stacked bearish read, high conviction.

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Methodology notes

Data source. NYMEX WTI crude ratio-adjusted continuous from CSI (CL21160RD). Refreshed daily at NYMEX settlement close (2:30 PM Eastern).

Signal construction. Single-leg composite. 20-day log-return of close, z-scored on a 252-day rolling window with 63-day minimum sample. Final composite computed as tanh of the z. State machine uses plus-or-minus 0.2 as the Downtrend / Neutral / Uptrend band boundaries. Polarity direct, no negation.

Validation statistics. Daily Spearman IC against WTI forward sixty-day return is plus 0.021 at p-value 0.046 across 9,208 live-signal days. This CLEARS conventional significance on dense sampling. Non-overlapping sixty-three-day independent-sample IC is plus 0.104 at p-value 0.21 across 147 independent blocks. Marginal on independent samples. State-conditional per-day means: Uptrend plus

3.12 percent (edge plus 0.58 percentage points), Neutral plus 2.43 percent (edge minus 0.11 percentage points), Downtrend plus 1.97 percent (edge minus 0.58 percentage points).

Benchmark construction. WTI crude 60-day forward return computed as `close.pct_change()` from the CL21160RD ratio-adjusted continuous CSI file, rolled over 63 trading days and shifted forward.

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What this signal does not cover

> **Blind spots a PM cares about before sizing**

First, whipsaws in low-volatility regimes. A momentum signal shines when crude is trending. In a sideways tape (2017-2019 low-vol crude regime, 2024-2026 range-bound) the 20-day log-return oscillates through the plus-or-minus 0.2 state boundaries weekly, generating false signals and churn. A PM running this signal in a sideways tape should either widen the state thresholds OR overlay a volatility filter to disable the signal when realized vol drops below a floor.

Second, the multi-session lag during trend reversals. The 20-day lookback means the composite reflects price action from roughly 20 trading days ago AT THE ANCHOR. When crude reverses, the composite takes 10-20 sessions to catch up to the new regime. The signal is a trend DETECTOR, not a trend REVERSAL detector. A PM at a crude top is systematically late to the sell signal.

Third, the ratio-adjusted continuous scaling that masks nominal price levels. The signal reads CL21160RD which multiplicatively adjusts across contract rolls. Level values do not map to nominal front-month WTI prices (e.g. July 2008 ratio-adjusted peak was roughly 420 while nominal was 147 dollars). All signal math is on the ratio-adjusted series. Nominal price interpretation requires overlaying the front-month CSI series separately.

Fourth, the non-overlap IC of plus 0.104 is marginal at p=0.21 across 147 independent blocks. Daily IC clears at p=0.046 but is inflated by composite autocorrelation. HAC Newey-West lag-60 adjustment of state edges should be verified separately. Treat as corroborating evidence in a four-signal crude stack rather than as a standalone edge.

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 2026-11-03 against NYMEX WTI ratio-adjusted continuous. The low-vol whipsaw risk, multi-session reversal lag, ratio-adjusted scaling, and marginal non-overlap IC are explicitly disclosed. Data source: NYMEX WTI crude via CSI CL21160RD. Internal Phase 0 audit dated 2026-11-04.