The Nat Gas Real-Rate Overlay. Twenty-Four Years of US 10Y TIPS Yields Against Natural Gas Forward Returns.

Why real yields tax gas inventory carry through underground storage leasing, pipeline capacity fees, and seasonal-storage financing. Why the signal delivers monotonic state edges (plus 0.96pp Low-real-rates, minus 1.05pp High-real-rates) across 5,931 trading days. Why the 2022-2023 Fed hiking cycle crashed NG 54 percent over 442 trading sessions and the current 123-session regime matches that pattern.

David Stendahl · Market Lab Analytics · November 4, 2026

What this signal is

Gas carries a real-rate tax that bites harder than most commodities. Underground storage leasing runs 10-20 cents per MMBtu per month. Pipeline capacity fees are structural. Seasonal-storage financing dominates mid-stream balance sheets. At a three-dollar MMBtu gas price, carry costs are 10-20 percent of value per year on TOP of whatever opportunity cost TIPS 10Y imposes. When DFII10 rises, gas speculators face compounding drag faster than equivalent speculators in most other commodities.

The signal reads a simple construction: the 252-day rolling z-score of DFII10, with a 63-day minimum sample, tanh-bounded. Polarity is flipped so that RISING real yields (bearish gas) produce a NEGATIVE composite reading and FALLING real yields (bullish gas) produce a POSITIVE composite reading.

Current reading as of November 3, 2026: composite minus 0.897, Moderate NEG, 123 trading days in band since May 11, 2026. US 10Y TIPS real yields are deeply elevated at roughly 1.5 standard deviations above their 252-day trailing average. Six-month sustained real-rate drag on gas.

State-conditional edges are monotonic. Low real yields (composite above plus 0.3) covers 48.3 percent of the sample, delivering a plus 0.96 percentage point forward 60-day edge above the baseline. Neutral (composite between minus 0.3 and plus 0.3) covers 8.6 percent, delivering a minus 0.27pp edge. High real yields (composite below minus 0.3) covers 43.1 percent, delivering a minus 1.05pp edge.

Non-overlap 63-day IC plus 0.187 at p-value 0.07 is marginally significant. Daily IC not significant due to composite autocorrelation. The signal is a state-conditional backdrop that captures the macro cost of inventory carry.

How the composite composes

The construction is intentionally simple. One input series (DFII10), one transformation stack, one state machine.

First, load the Federal Reserve Economic Data DFII10 series. DFII10 is the market-traded yield on the 10-year TIPS instrument, equal to the 10-year nominal yield minus the market's 10-year breakeven inflation expectation. Economically, DFII10 is what the market demands as a real return for holding duration risk.

Second, compute the 252-day rolling z-score with a 63-day minimum sample. The 252-day window captures a full year of real-rate history. The z-score normalizes for the fact that real yields vary by regime.

Third, tanh-bound the z-score 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. The tanh compression concentrates the signal near zero and treats all extremes similarly.

Fourth, negate the result. The negation is a POLARITY FLIP. Without it, rising real yields (bearish gas) would produce a positive composite, which would invert the signal direction. The inline engine comment reads "Rising real yields bearish commodities." The negation aligns composite direction with forward-return direction.

The state machine uses plus-or-minus 0.3 as the Low-real-rates / Neutral / High-real-rates band boundaries. State plus one fires when composite is above plus 0.3 (low real yields, bullish gas carry). State zero fires when composite is between minus 0.3 and plus 0.3 (neutral real-rate backdrop). State minus one fires when composite is below minus 0.3 (high real yields, bearish gas).

What the state-conditional returns have actually done

> **Reference baseline, NG fwd 60-day unconditional over live window**
>
> Natural gas ratio-adjusted continuous forward-sixty-day return baseline over the live-signal window of 2003-07-03 through 2026-11-03: mean minus 1.73 percent, median minus 2.04 percent, standard deviation 10.94 percent. Sample 5,931 trading days with observable forward sixty-day. NG is extremely volatile (standard deviation of forward 60-day returns is significantly higher than crude or grain). The per-day distribution is heavy-tailed with occasional large drawdowns during real-rate hiking cycles.

Low real yields (composite above plus 0.3). 2,865 trading days, 48.3 percent of the sample. Per-day forward sixty-day edge plus 0.96 percentage points above baseline. The low-real-rate tail is the cleanest bullish signature in the gas macro channel. When TIPS 10Y falls, the real-rate drag on gas carry disappears. Storage operators face lower financing costs. Pipeline capacity holders see cheaper capital. Speculator flow rotates back into gas inventory.

Neutral real-rate backdrop. 508 trading days, 8.6 percent of the sample. Per-day forward sixty-day edge minus 0.27 percentage points below baseline. The middle state is the smallest. Gas real-rate

regimes spend most of their time pushed to one side or the other because real-yield distributions are themselves bimodal (zero-rate era vs normalized era).

High real yields (composite below minus 0.3). 2,558 trading days, 43.1 percent of the sample. Per-day forward sixty-day edge minus 1.05 percentage points below baseline. The high-real-rate tail is the price-side readout of a restrictive monetary stance. When the real-rate bar on commodity capital exceeds the structural gas carry, speculator flow rotates out even when supply-demand fundamentals are tight.

The spread is 2.01 percentage points from the High-real-rate tail to the Low-real-rate tail. Tight but monotonic and consistent across the 24-year sample.

• • •

Three cases that frame how to read this signal

Case 1: Mar 2022 to Dec 2023. The post-Ukraine real-rate drag and nat gas 54 percent crash.

The composite moved into state Moderate NEG on March 14, 2022 as the Fed began aggressive rate hikes to fight post-Ukraine inflation. TIPS 10Y real yields rose from deeply negative to firmly positive within months. The real-rate drag on gas inventory carry became severe. Seasonal-storage operators faced elevated financing costs. Speculator flow left gas. Over the 442-trading-session window NG ratio-adjusted continuous fell from 8.64 to 3.98, a minus 54 percent move.

Important context. Through most of this window gas fundamentals were SUPPORTIVE. Ukraine LNG-redirect demand pressure. European pipeline alternatives. Asian winter demand. A pure fundamentals read would have said “size long.” The signal said “size smaller, the macro bar is high.” The macro bar won. The 2022-2023 case is the canonical real-rate drag on gas carry and the most powerful validation in the signal history.

Case 2: Oct 2007 to Jun 2008. The pre-GFC low-real-rate nat gas rally.

The composite moved into state Moderate POS on October 15, 2007 as TIPS 10Y real yields fell during the pre-GFC Fed cutting cycle. The low-real-rate backdrop removed the drag on gas inventory carry. Over the 167-trading-session window NG ratio-adjusted continuous ran from 23.76 to 27.69, a plus 16.6 percent move. Nominal front-month NG ran from roughly seven to twelve-plus dollars per MMBtu over the window. The 2007-2008 case is the canonical low-real-rate gas rally with all four channels aligned bullish (growth, calm markets, weak USD, tight credit).

Case 3: Jul 2021 to Sep 2021. The 2021 post-COVID low-real-rate gas rally.

The composite moved into state Moderate POS on July 6, 2021 as TIPS 10Y real yields reached deeply negative territory on continued Fed emergency accommodation. The combination removed the real-rate drag on gas inventory carry just as European LNG-demand was building. Over the 56-trading-session window NG ratio-adjusted continuous ran from 7.60 to 8.79, a plus 15.6 percent move. The 2021 case illustrates how fast the signal can fire when the macro and physical channels align.

• • •

How to use the signal today

As of November 3, 2026, the composite reads minus 0.897 in the Moderate NEG band, 123 trading days into the regime since May 11, 2026. The state-conditional forward sixty-day edge is minus 1.05 percentage points below baseline. Six months of sustained real-rate drag on gas. NG has fallen from 3.65 at regime entry to 2.90 currently, a minus 20 percent in-regime move.

The closest historical analog is the 2022-March to 2023-December Fed hiking-cycle window, which ran 442 trading sessions in Moderate NEG and delivered NG minus 54 percent. The current cycle at 123 sessions is at month 6 of what could become a similar long real-rate drag on gas. If TIPS 10Y stays elevated through Q1 2027, the signal argues for continued macro pressure on gas independent of supply-demand fundamentals.

The practical rule. Any bullish gas thesis today has to beat the macro headwind BEFORE the supply-demand channel can transmit to price. Run the long thesis smaller than fundamentals alone would suggest. Hedge the macro overlay with a long-TIPS or short-nominal position. Or wait for the first confirmation that real yields are rolling over. A sustained 50 basis point decline in DFII10 over three months typically moves the composite back toward Normal.

Two triggers would re-engage the signal bullishly. First, a composite cross above plus 0.3 (low real yields return). That requires TIPS 10Y to fall meaningfully relative to its 252-day trailing average, which historically requires a Fed pivot toward easier policy or a deflationary shock. Second, a composite drift back toward Normal. Less aggressive but would remove the current real-rate dissent from a bullish gas fundamentals thesis.

• • •

Methodology notes

Data source. Federal Reserve Economic Data (FRED) DFII10 series, 10-Year Treasury Inflation-Indexed Security, Constant Maturity, loaded from the DFII10 table in the symbol_data estate. Refreshed daily. Target benchmark NYMEX natural gas ratio-adjusted continuous from CSI.

Signal construction. Single-leg composite. 252-day rolling z-score of the DFII10 level with 63-day minimum sample. Final composite computed as tanh of the negated z-score. The negation flips polarity so rising real yields (bearish gas) produce a negative composite reading.

Validation statistics. Daily Spearman IC against NG forward sixty-day return not significant on dense sampling due to composite autocorrelation. Non-overlapping sixty-three-day independent-sample IC plus 0.187 at p-value 0.07 (marginally significant) across 94 independent blocks. State-conditional per-day edges: Low real yields plus 0.96 percentage points, Neutral minus 0.27 percentage points, High real yields minus 1.05 percentage points.

Polarity history. Engine applies a single explicit negation. The inline comment reads “Rising real yields bearish commodities.” The negation is a POLARITY FLIP aligning composite direction with forward-return direction. State-conditional edges prove the sign is correct.

Benchmark construction. Natural gas 60-day forward return computed as close.pct_change() from the NYMEX NG ratio-adjusted continuous CSI file, rolled over 63 trading days and shifted forward.

What this signal does not cover

Blind spots a PM cares about before sizing

First, the DFII10 series begins January 2003. Pre-2003 history uses placeholder zeros, so the signal's effective track record is 24 years, not the full 36-year NG futures history. A PM evaluating signal robustness should budget for the possibility that the 2003-2026 window is unrepresentative of the full historical real-rate regime.

Second, gas supply shocks can override the macro channel completely. Polar vortex deep cold snaps, hurricane disruptions to Gulf production, pipeline explosions, and LNG terminal outages can force gas rallies even in high-real-rate regimes. The signal reads macro; it does not read weather or pipeline integrity. Pair with a dedicated gas supply signal for the full picture.

Third, Asian LNG demand and European pipeline politics can override the US-centric macro read. Gas is increasingly a global LNG market, and demand shocks from Japan, Korea, and continental Europe can move NYMEX NG independent of US real yields. The signal reads the US macro channel.

Fourth, the non-overlap 63-day IC of plus 0.187 is marginally significant at p=0.07. Not individually strong enough to size on alone. Treat as corroborating evidence in a gas macro-plus-supply 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 natural gas ratio-adjusted continuous. The post-2003 effective sample, weather and LNG-market override risks, and marginal IC are explicitly disclosed. Data sources: FRED DFII10 10-Year TIPS Constant Maturity, CSI ratio-adjusted continuous NG target. Internal Phase 0 audit dated 2026-11-04.