The Gold-Silver Ratio, Read As an Unscaled 5 Year Z-Score

Why the GC over SI ratio, Z-scored against a 5 year baseline with no scaling factor, is the fast-reacting silver mean-reversion lens; the series minimum touched in January 2026 reflecting the central-bank-driven gold-bull disruption of classical mean-reversion; and why the signal spends 73 percent of its history saturated at the extreme bands.

David Stendahl · Market Lab Analytics · November 6, 2026

What this signal is

The gold-silver price ratio is the oldest cross-metal spread monitored in modern financial markets. In the US Mint Act of 1792 the ratio was set at 15 to one for bimetallic coinage. In the April 2011 silver peak at 48 dollars per ounce it bottomed at 32 to one. In the March 2020 COVID extreme it hit 125 to one as silver crashed below 12 while gold held above 1,500.

This signal reads the ratio as a trailing 5 year rolling Z-score, bounded by hyperbolic tangent with no scaling factor. The unscaled framing reaches the extreme bands sooner than smoothed companion signals: a raw Z of plus 1.0 produces a composite of plus 0.76 (already in Extreme Positive), while a raw Z of plus 2.3 produces a composite of plus 0.98 (near-saturation). The polarity is as-is positive. A positive composite means the ratio is above the trailing 5 year baseline (silver compressed), which historically precedes silver mean-reversion up on 6 to 12 month horizons.

On March 19, 2020, as the COVID shock drove the GSR to its all-time high of 125 to 1, the composite peaked at plus 1.0000, the series maximum. Silver mean-reverted explosively over the subsequent 252 days to 30 dollars per ounce, a plus 100 percent rally. On January 27, 2026, as silver partially caught up against gold through 2025-2026 but the trailing 5 year baseline still anchored on the 2022-2024 compression peaks, the composite reached minus 0.9998, the series minimum. Today the composite reads minus 0.5996, in Moderate Negative territory, 229 trading days in state.

Here is the twist. This signal has saturated at the extreme bands for 73 percent of its history, because the unscaled Z-score framing is highly sensitive to the ratio's position against the baseline. Reader interpretation should pair the composite reading with the raw Z-score and the longer-horizon 20 year percentile companion to distinguish near-saturation extremes (uncommon, strong directional implications) from modest extremes (common, context-dependent).

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How the inputs compose

The engine divides GC (COMEX gold first-nearby, USD per troy ounce) by SI (COMEX silver first-nearby, USD per troy ounce) each day. The result is the gold-silver ratio, which today runs in the 85 to 95 range.

The engine then computes a 1,260 day (approximately 5 year) rolling Z-score with a 252 day minimum population. The Z-score is bounded by tanh with no scaling factor. The polarity is as-is positive: higher composite equals silver compressed equals bullish silver via mean-reversion.

The unscaled Z-score framing is highly sensitive at the edges. Z = plus 1.0 produces tanh = plus 0.76 (clearly in Extreme Positive). Z = plus 2.0 produces tanh = plus 0.96 (near-saturation). Compared to the 1.5-scaled companion signal, this framing reaches the extreme bands sooner and spends more time saturated at the edges. The 73 percent extreme-state share documented across the sample reflects the saturation sensitivity.

The engine computes four confirming features: 5 day velocity, 20 day over 252 day volatility regime ratio, 63 day rolling correlation with silver returns, 63 day lag 1 autocorrelation. The polarity is as-is positive post-validation.

Spearman IC against SPY forward 60 day return equals plus 0.004 (p-value 0.71, n equals 8,407). The signal's primary target is silver forward returns; the SPY-aligned IC captures only silver's indirect industrial-cycle beta and is not statistically significant.

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Three cases that frame how to read this signal

Case 1: March 2020. The COVID peak at 125 to 1.

Firing date: composite peaked at plus 1.0000 on March 19, 2020 (series maximum). The gold-silver ratio hit 125 to 1, the all-time high in modern financial data, as the COVID shock crashed silver below 12 dollars per ounce while gold held near 1,500.

Silver mean-reverted explosively over the subsequent 252 days, reaching 30 dollars per ounce by Q1 2021 on the combination of post-COVID reflation industrial-demand recovery and the Reddit Silver Short Squeeze retail flow that briefly drove silver to 29 in February 2021. The underlying mechanism was both industrial (solar PV, electronics, EV battery demand resumed as the pandemic receded) and monetary (safe-haven inflation hedge demand continued as 2020-21 stimulus accelerated).

SI from the composite's peak reading on 2020-03-19: 60 day forward plus 60 percent, 252 day forward plus 100 percent. Among the strongest cases in the signal's sample. The 2020 window is the archetype case for the signal's mean-reversion mechanism.

The lesson is that extreme GSR peaks at near-saturation Z-score readings are historically the clearest contrarian silver signals the metals markets produce. The signal fires precisely at the compression extreme; the mean-reversion delivers on a 6 to 12 month horizon.

Case 2: August 1997 through February 2000. The 624 day Extreme Negative run.

Firing date: composite entered Extreme Negative on August 18, 1997 and stayed there continuously for 624 trading days through February 14, 2000. The longest sustained silver-outperformance regime in the series.

The window bracketed the Berkshire Hathaway silver-corner disclosure in February 1998. Berkshire had accumulated 129.7 million troy ounces of silver, approximately 20 percent of estimated annual world production. The disclosure drove silver from 5.50 dollars per ounce in late 1997 to a peak of 7.80 by February 1998. The ratio collapsed from above 80 to 1 toward 40 to 1 on the Buffett-driven silver rally.

The Z-score drove deep into negative territory as the composite captured the sustained silver outperformance through 1998 and the subsequent 1999 silver drift. The 624 day run demonstrates that the signal can hold in Extreme Negative for extended periods when a sustained physical-market squeeze pulls silver through the 5 year baseline.

The 1997-2000 case also illustrates the mean-reversion from Extreme Negative: silver eventually mean-reverted modestly through 2000 as the Buffett accumulation stopped being a marginal buyer, and the ratio drifted back toward 60 to 1 over the subsequent years.

The lesson is that Extreme Negative episodes are the mirror image of Extreme Positive episodes. Both resolve through mean-reversion toward the trailing baseline on 6 to 12 month horizons, though the mean-reversion mechanism differs (physical demand surge from the extreme compressed side; physical demand exhaustion from the extreme expanded side).

Case 3: November 2025 through October 2026. The series minimum extended run.

Firing date: composite entered Moderate Negative on November 26, 2025 and the state file reports 229 days in state as of October 26, 2026. The composite touched the series minimum at minus 0.9998 on January 27, 2026.

The window captured silver's partial catch-up against gold during the central-bank-driven gold bull. Silver recovered from 32 dollars per ounce to 42 while gold continued its rally from 2,600 to above 3,400 on sustained central-bank reserve-allocation flow (post-Russia-SDN de-dollarization-era buying by PBOC, Poland, Singapore, Turkey, and Qatar).

The 1,260 day baseline still anchors on the 2022-2024 compression peaks when the ratio ran persistently in the 90 to 110 range. The Z-score reads the 2025-2026 partial normalization toward the 85 to 95 range as deep below baseline. The longer 20 year percentile companion signal reads the same current ratio as moderately above baseline. The disagreement between the two framings is informative: the ratio has normalized against the recent window but remains elevated against the longer historical window.

The lesson is that the 2022-2026 central-bank-driven gold bull has disrupted the classical mean-reversion mechanism measured by this signal. The signal still works as a relative-baseline indicator, but the underlying regime (gold-dominant on CB flow, silver partially catching up on industrial demand) is non-classical and may continue to diverge from the historical pattern as long as CB-flow remains at the 2022-2024 pace.

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What the state-conditional returns have actually done

The SPY forward-60-day return baseline (unconditional) is mean plus 2.32 percent, median plus 3.14 percent. Standard deviation 7.25 percent. Percent negative 29.7 percent. State-conditional means below are expressed as edges relative to this baseline.

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The SPY forward 60 day return baseline (unconditional) is mean plus 2.31 percent, median plus 3.14 percent. Standard deviation 7.23 percent. Percent negative 29.57 percent across 8,494 trading days. State-conditional means below are expressed as edges relative to this baseline. The signal's primary target is silver forward returns.

> **Reference baseline (8,494 SPY aligned trading days)**
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> SPY forward 60 day return baseline (unconditional): mean plus 2.31 percent, median plus 3.14 percent. Standard deviation 7.23 percent. Percent negative 29.57 percent. The engine data covers 9,016 trading days total; the SPY-aligned baseline uses the 8,407 day subset where forward 60d is observable and the composite has populated. Phase 0 source: engine parquet joined with SPY end of day closes (NYSE Arca).

The Extreme Positive state (composite above plus 0.5), 2,943 trading days (35.0 percent of the SPY-aligned sample), delivered mean fwd 60 day SPY return of plus 2.17 percent. Close to baseline on SPY. The 2020 COVID peak, the 2017-19 trade-war 598 day run, and the 2008-09 GFC window all sit in this band.

The Moderate Positive state (composite between plus 0.2 and plus 0.5), 704 trading days, delivered mean plus 1.94 percent, modestly below baseline.

The Normal state (composite between minus 0.2 and plus 0.2), 773 trading days (only 9.2 percent of the sample, reflecting saturation sensitivity), delivered mean plus 2.90 percent, plus 0.59 percentage points above baseline, the strongest state-conditional SPY edge in the signal.

The Moderate Negative state (composite between minus 0.5 and minus 0.2), 832 trading days (the current state), delivered mean plus 2.82 percent.

The Extreme Negative state (composite below minus 0.5), 3,155 trading days (37.5 percent of the sample, dominated by the 1997-2000 Buffett window and the 2025-26 CB-gold-bull window), delivered mean plus 2.27 percent, slightly below baseline.

The Spearman information coefficient of the composite against SPY 60 day forward returns is plus 0.004 (p-value 0.71). Essentially flat. The signal is a silver-specific lens, not a broad risk-asset signal.

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How to use the signal today

Three best uses.

First, as a fast-reacting silver mean-reversion identifier. The unscaled Z-score framing reaches the extreme bands sooner than the 1.5-scaled companion. When the composite is in near-saturation Extreme Positive at raw Z above 2.0, classical mean-reversion mechanics suggest silver outperformance on a 6 to 12 month horizon with high conviction.

Second, as a cross-check against the 20 year percentile companion signal. When both views agree that silver is compressed or outperforming, conviction is higher. When they disagree (as currently, where this signal reads deep negative while the percentile reads moderately positive), the disagreement flags that the ratio has normalized against the recent 5 year window but remains elevated against the longer 20 year window.

Third, as a context lens for monetary-vs-industrial demand balance. When the ratio widens on safe-haven monetary flow, monetary demand dominates. When it narrows on industrial-demand strength, industrial demand dominates.

For allocators considering silver exposure today, the composite's extended deeply negative reading reflects the CB-gold-bull disruption of the classical mean-reversion mechanism. The adaptive 5 year baseline is normalizing as the 2022-2024 compression peak days drop out of the trailing window through 2027.

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Methodology notes

The composite is `tanh(z_1260d(GC over SI))` with no scaling factor. The 1,260 day Z-score uses 252 day minimum population. Pure unscaled Z saturates at approximately plus one at raw z of plus 2.3 and plus 0.76 at z of plus 1.0.

The engine uses first-nearby price series (SI first-nearby, GC first-nearby) rather than back-adjusted continuous. First-nearby prefixes carry small roll-related variance but represent the current-contract price more accurately. The data goes back to approximately 1990 for the compound engine output.

The engine computes four confirming features: 5 day velocity, 20 day over 252 day volatility regime ratio, 63 day rolling correlation with silver returns, 63 day lag 1 autocorrelation. The polarity is as-is positive post-validation.

The 1990 through 2026 sample window includes multiple complete silver cycles: the 1996-99 Buffett window, the 2003-08 commodities supercycle, the 2008-11 reflation-to-silver-peak run, the 2014-16 shale-era compression, the 2017-19 trade-war 598 day Extreme Positive run, the 2020 COVID peak at 125 to 1, the 2021 reflation plus Reddit squeeze, and the 2022-2026 central-bank-driven gold-bull disruption that drove the composite to its series minimum in January 2026.

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What this signal does not cover

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

First, the unscaled Z-score framing produces 73 percent extreme-state saturation. Readers unfamiliar with the saturation sensitivity may over-interpret an Extreme Positive or Negative reading as a rare extreme when it is in fact the most common state. Pair with the raw Z-score reading (not bounded) and the 20 year percentile companion.

Second, the 5 year Z-score baseline is adaptive. Current readings reflect the trailing baseline, which currently anchors on the 2022-2024 silver-compression peaks. The baseline is dynamic. For a definitive silver-regime read, pair with primary silver inputs (COMEX silver registered inventory, LBMA silver vault flow, GLD-SLV ratio).

Third, silver's industrial-demand profile is cyclical and policy-driven. Solar photovoltaic manufacturing capacity (approximately 20 percent of annual silver demand and growing), EV adoption pace, Chinese decarbonization investment, and global electronics-production cycles all affect silver demand in ways the GC over SI ratio does not disentangle.

Fourth, the signal reads futures prices only. Physical-market tightness (LBMA silver vault flow, COMEX silver registered inventory, platinum-group basket moves, physical-coin premium spikes) is not captured directly. The 2020 Reddit Silver Short Squeeze window was partially a physical-coin-market event that the price-ratio signal partially but not fully captured. Readers interested in physical-market confirmation should pair with the LBMA silver vault flow signal and the COMEX silver proxy signal.

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 (COMEX end-of-day gold and silver prices; NYSE Arca end-of-day SPY closes; London bullion market historical ratio references) and are provided without warranty. Hypothetical performance results have inherent limitations. Readers should consult their own financial advisor before making any investment decision. (c) 2026 David Stendahl.