The Gold-Silver Ratio, Read As a Silver Mean-Reversion Lens

Why the GC over SI ratio, Z-scored on a 5 year trailing window and bounded by tanh, is one of the strongest-IC signals in the library at plus 0.333 against silver 252 day forward returns; the three complete episodes that frame how the signal fires; and the 2022-2026 central-bank-driven gold bull that has disrupted the classical mean-reversion mechanism.

David Stendahl · Market Lab Analytics · November 6, 2026

What this signal is

The ratio of the gold price to the silver price has been monitored by metals traders since antiquity. In the Roman era the ratio ran at 12 to one. In the US Mint Act of 1792 the ratio was set at 15 to one for bimetallic coinage. In the 20th century, after the demonetization of silver, the ratio became unstable and swung with industrial-demand cycles.

In the modern era the gold-silver ratio has ranged from 32 to one (at the April 2011 silver peak when silver reached 48 dollars per ounce) to 125 to one (at the March 2020 COVID extreme when silver crashed below 12 while gold held above 1,500). Today the ratio runs in the 80 to 95 range as gold has rallied to above 3,400 dollars per ounce on central-bank reserve-allocation flow while silver trades in the 38 to 42 range.

This signal reads the ratio as a 5 year trailing Z-score, scaled by a factor of 1.5 before tanh-bounding into the range minus one to plus one. The polarity is as-is positive. A positive composite means the ratio is above the trailing 5 year baseline (silver compressed relative to recent history), which historically precedes silver mean-reversion up on a 6 to 12 month horizon. A negative composite means the ratio is below the trailing baseline (silver outperforming relative to recent history).

In March 2020, as the COVID shock crashed silver below 12 dollars per ounce while gold held near 1,500, the composite peaked at plus 0.9994. Silver mean-reverted explosively over the subsequent 252 days to 30 dollars per ounce, a 100 percent rally. In February 1998, as Berkshire Hathaway disclosed its 129.7 million troy ounce silver accumulation (approximately 20 percent of estimated annual world production), silver surged and the composite hit the series minimum at minus 0.9993. Today the composite reads minus 0.3893, in Moderate Below-Baseline territory for 2 trading days, having moderated out of a 317 day run in extreme-negative Z territory.

Here is the twist. This signal has one of the strongest information coefficients in the library (plus 0.333 against silver 252 day forward returns, monotonic across 60 and 120 day horizons too), but the 2022-2026 central-bank-driven gold bull has disrupted the classical mean-reversion mechanism. The gold-silver ratio has sat in the 80 to 110 range for over 300 days without the historical mean-reversion kicking in to full extent. Read on for the three complete cases that frame how this signal fires, the state-conditional evidence, and the four caveats on reading a signal whose underlying mechanism may be regime-dependent.

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How the inputs compose

The engine divides GC (COMEX gold back-adjusted continuous, USD per troy ounce) by SI (COMEX silver back-adjusted continuous, USD per troy ounce) each day. The result is the gold-silver ratio, a number that ranges historically from the low twenties (silver outperforming) to 125 (silver compressed at COVID extreme).

The engine computes a 1,260 day (approximately 5 year) rolling Z-score with a 252 day minimum population. The Z-score is divided by 1.5 before being bounded by tanh. The 1.5 scaling gives the composite a slightly wider dynamic range than other signals in the library (tanh saturates at approximately plus one at raw z of plus 2.3 rather than at z of plus 1). The polarity is as-is positive: higher composite equals silver compressed equals bullish silver via mean-reversion.

The engine also computes four confirming features alongside the primary composite. First is 5 day velocity (change in composite). Second is the 20 day over 252 day volatility regime ratio. Third is the 63 day rolling correlation of the composite with silver returns. Fourth is 63 day lag 1 autocorrelation (regime persistence).

The engine's native Market_Phase_Int uses integer phases 0, +1, +2, +3 keyed to Z-score thresholds (0 covers negative Z, +1 covers z >= 0, +2 covers z >= 0.5, +3 covers z >= 1.0). The reader-facing page uses the standard 5 band framing (EXTREME_POS, MODERATE_POS, NORMAL, MODERATE_NEG, EXTREME_NEG) based on the tanh-bounded composite for consistency with other brief pages.

Discovery statistics per engine source: 60 day forward silver IC equals plus 0.217, 120 day equals plus 0.271, 252 day equals plus 0.333 (monotonic across horizons). Session-tier performer. The mechanism parallels the HG with GC-over-HG signal (Wave 50 sibling, delivered plus 34 percent Calmar in back-test).

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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 0.9994 on 2020-03-19. 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.

The 2020 window captured a textbook mean-reversion signal. The composite's peak reading preceded a 100 percent silver rally on the combination of post-COVID reflation industrial-demand recovery and the Reddit "Silver Short Squeeze" retail flow that briefly drove silver to 29 dollars per ounce 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 Z11479′s mean-reversion mechanism.

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

Case 2: July 2014 to July 2016. The shale-era silver compression.

Firing date: composite entered Extreme Positive on July 25, 2014 and ran 710 consecutive trading days through July 2016, the longest sustained silver-compression regime in the series. Forward 60 day SPY return from state entry (2014-07-25 at 197.72): minus 3.75 percent. SI forward 252 day: partial mean-reversion as silver eventually recovered to 18-20 dollars per ounce by late 2016.

The 2014-16 window captured a different mechanism from the 2020 COVID case. The 2014 oil-price collapse (WTI from 100 dollars per barrel to under 40) drove a shale-era industrial-production slowdown that affected silver demand indirectly (reduced oilfield equipment manufacturing, reduced electronics capex). Silver fell from approximately 21 dollars per ounce to 14 while gold held near 1,200. The GSR ran in the 70 to 85 range through this window. The composite stayed in Extreme Positive territory for nearly three calendar years as the industrial-demand headwind persisted.

The 2014-16 case is instructive because the mean-reversion was slow and incomplete. Silver did eventually recover from the 14 dollar trough to 18-20 by 2016, but the full mean-reversion took multiple years rather than the clean 252 day horizon the 2020 case delivered. The signal's historical IC of plus 0.333 at 252 days is an average; individual windows vary.

The lesson is that sustained industrial-demand headwinds can keep the composite in Extreme Positive territory for extended periods before mean-reversion delivers. The signal flags the setup; the actual return realization depends on the macro context that resolves the compression.

Case 3: December 2025 to October 2026. The extended negative-Z run.

Firing date: composite entered Extreme Negative on December 1, 2025 and ran 317 trading days through October 2026. Forward 60 day SPY return from state entry (2025-12-01 at 680.27): plus 0.84 percent.

The 2025-2026 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-dollar-ization-era buying by PBOC, Poland, Singapore, Turkey, and Qatar). The GSR normalized from the 2022-2024 peak compression range (90 to 110 to 1) back toward the historical median around 70 to 1.

The Z-score read this normalization as "below trailing baseline" because the trailing 5 year window still anchors partially on the 2022-2024 compression peaks. The adaptive baseline continues to

normalize as the compression-peak days drop out of the trailing window through 2027. The composite transitioned out of Extreme Negative into Moderate Below-Baseline on October 24, 2026.

The lesson is that the 2022-2026 central-bank-driven gold bull has disrupted the classical mean-reversion mechanism. 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 silver forward-60-day return baseline (unconditional) is mean plus 1.20 percent, median plus 0.50 percent. Standard deviation 10.50 percent. Percent negative 46 percent. State-conditional means below are expressed as edges relative to this baseline.

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> **Reference baseline (8,411 SPY aligned trading days from November 1992 through October 2026)**
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> silver forward 60 day return baseline (unconditional): mean plus 1.20 percent, median plus 0.50 percent. Standard deviation 10.50 percent. Percent negative 46 percent. The engine data covers 8,517 trading days total; the baseline uses the 8,411 day subset where fwd 60d is observable. The signal's silver-specific discovery statistics: 60 day forward IC plus 0.217, 120 day plus 0.271, 252 day plus 0.333 (monotonic). Phase 0 source: Z11479 engine parquet joined with SPY end of day closes (NYSE Arca).

The Extreme Positive state (composite above plus 0.5), 2,507 trading days (29.4 percent of the SPY-aligned sample), delivered mean fwd 60 day SPY return of plus 2.24 percent. Close to baseline on SPY. The silver forward returns are the primary performance target. The 2020 COVID peak delivered plus 100 percent SI at 252 days from the composite peak; the 2014-16 shale compression delivered slow partial mean-reversion; the 2008-09 GFC window delivered strong SI reflation returns through 2009-11.

The Moderate Positive state (composite between plus 0.2 and plus 0.5), 1,171 trading days, delivered mean plus 1.70 percent, modestly below baseline.

The Normal state (composite between minus 0.2 and plus 0.2), 1,162 trading days (13.7 percent of the sample), delivered mean plus 3.31 percent, plus 0.99 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), 1,229 trading days (the current state), delivered mean plus 1.84 percent. Percent negative 37.9 percent, materially above baseline.

The Extreme Negative state (composite below minus 0.5), 2,342 trading days (27.5 percent of the sample, including the recent 2025-2026 CB-gold-bull window and various other silver-outperforming episodes), delivered mean plus 2.47 percent, slightly above baseline.

The Spearman information coefficient of the composite against SPY 60 day forward returns is plus 0.0096 (nearly flat). The signal is a silver-specific lens, not a broad risk-asset signal. Silver-specific IC: 60d plus 0.217, 120d plus 0.271, 252d plus 0.333 (monotonic). The 252 day IC is session-tier.

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How to use the signal today

This is a long-horizon mean-reversion lens with strongest edge at 252 day horizons.

Three best uses.

First, as a silver mean-reversion identifier at historical extremes. When the composite is in Extreme Positive (silver compressed), classical mean-reversion mechanics suggest silver outperformance on a 6 to 12 month horizon. The 2020 COVID peak at plus 0.9994 preceded a 100 percent silver rally over 252 days.

Second, as a two-sided cross-metal regime read. When the composite is in Extreme Negative (silver outperforming), the signal flags silver may be overbought relative to the trailing 5 year baseline. The 1998 Buffett-corner window was the archetype case; silver mean-reverted modestly over 1999-2000.

Third, as a context lens for monetary-versus-industrial demand balance. When the ratio widens on safe-haven monetary flow (like 2020 COVID or 2022 Russia SDN), monetary demand is dominating. When it narrows on industrial-demand strength (2011 reflation, 2021 reflation), industrial demand is dominating. Readers interpreting silver fundamentals can anchor on the regime.

For allocators considering silver exposure today, the composite's moderating reading from the recent extended negative-Z run suggests the adaptive baseline is normalizing. A classical mean-reversion read would call for silver exposure as the baseline continues to adjust; a non-classical read (CB-flow continues to drive gold) would call for continued gold-over-silver positioning.

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Methodology notes

The composite is `tanh(z_1260d(GC / SI) / 1.5)`. The 1,260 day Z-score uses 252 day minimum population. The division by 1.5 before tanh gives the composite a slightly wider dynamic range than other signals in the library.

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The engine computes four confirming features: 5 day velocity, 20d over 252d volatility regime, 63 day correlation with silver returns, 63 day lag 1 autocorrelation. The polarity is AS_IS post-validation; higher ratio equals silver compressed equals bullish silver via mean-reversion.

Discovery statistics per engine source (Wave 53, 2026-07-16): 60 day forward silver IC equals plus 0.217, 120 day equals plus 0.271, 252 day equals plus 0.333 (monotonic across horizons). Session-tier performer. The mechanism parallels the HG with GC-over-HG signal (Wave 50 sibling, delivered plus 34 percent Calmar in back-test).

The 1992 to 2026 sample includes multiple complete silver cycles: the 1998 Buffett corner (series minimum at minus 0.9993 on 1998-02-06), the 2003-08 commodities supercycle, the 2008-11 reflation-to-silver-peak run (silver reached 48 dollars per ounce in April 2011 and the GSR troughed near 32 to 1), the 2014-16 shale-era compression (710 day Extreme Positive run), the 2020 COVID peak at 125 to 1 (series maximum at plus 0.9994), the 2021 reflation plus Reddit squeeze, and the 2022-2026 central-bank-driven gold-bull disruption. The 1988-1992 pre-sample period is covered by CSI GC and SI data but reads near zero mechanically before the 1,260 day Z-score populates.

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What this signal does not cover

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

First, the 2022-2026 central-bank-driven gold bull has disrupted the classical mean-reversion mechanism. The gold-silver ratio has sat in the 80 to 110 range for over 300 days without the historical mean-reversion kicking in to full extent. If central-bank flow continues at the 2022-2024 pace, the ratio may stay elevated for longer than the 1,260 day Z-score window can adapt to. Readers using the signal for silver exposure should know they are betting on classical mean-reversion in a non-classical macro environment.

Second, the 5 year Z-score baseline is adaptive. Current readings reflect the trailing baseline, which currently anchors partially on the 2022-2024 silver-compression peaks. The baseline is dynamic. For a definitive silver-regime read, pair this signal 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), electric vehicle adoption pace, Chinese decarbonization investment cycles, and global electronics-production dynamics all affect silver demand in ways the GC over SI ratio does not disentangle. During industrial-demand-shift episodes (like the 2010-11 LED-to-silver-paste technology shift), the ratio may read as "silver outperforming" when the mechanism is specifically industrial.

Fourth, the signal reads back-adjusted continuous prices only. Physical-market tightness (LBMA silver vault flow, COMEX silver registered inventory, platinum-group basket moves, physical-coin market premiums) is not captured. The 2020 Reddit "Silver Short Squeeze" window was partially a physical-coin-market event (iShares SLV creations surged, physical premiums spiked to double-digits over spot) that the price-ratio signal partially captured but not fully. 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 back-adjusted continuous 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.