# The KC HS2101 Extracts RTD Substitution Signal: Structural Product-Mix Overlay for Arabica

*Why US HS 2101 extracts versus HS 0901 green coffee import growth delivers a 4.93 pp directional spread on Arabica forward 60-day returns across 36 years via the structural substitution channel.*

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## The signal with the limits stated upfront

Three things the reader must know before the rest of this brief lands.

First, the full-distribution daily Spearman information coefficient against Arabica forward 60-day returns is minus 0.027 at p-value 0.011 on a sample of 8,947 daily observations spanning 1990 through 2026. Statistically significant on the 36-year window but modest in magnitude.

Second, Phase +1 (Robusta Share Gain) delivers minus 3.05 percentage points below baseline across 1,092 trading days (12.2 percent of sample) and Phase −1 (Arabica Share Gain) delivers plus 1.88 percentage points above baseline across 659 days (7.4 percent). 4.93 pp directional spread with clean monotone phase pattern.

Third, the non-overlap independence test at 60-day sampling is sign-consistent but not independently significant. Across 150 independent samples the Spearman is minus 0.035 with p-value 0.67. The signal captures decadal-scale product-mix drift; extreme-bucket shares are small (12.2 and 7.4 percent) meaning the signal spends 68.5 percent of the sample in neutral territory.

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## The thesis: structural product-mix substitution

Ready-to-drink and instant coffee product categories use predominantly Robusta rather than Arabica. The reasons are two. First, the extraction process tolerates Robusta harsher flavor profile; in a cold-brew canned beverage the consumer tastes a flavored product where origin nuance is secondary. Second, the price advantage of Robusta over Arabica matters more in commoditized product where margin compression at the retail level cascades back to the ingredient bill.

Growth in US HS 2101 extracts imports outpacing HS 0901 green coffee imports is a signal that the US consumption mix is shifting structurally toward Robusta-based formats. This shift structurally

reduces Arabica demand pressure over 60-day horizons as roaster blends drift further toward Robusta and premium-format demand softens.

The signal takes US HS 2101 (coffee extracts, essences, and concentrates) imports YoY minus US HS 0901 (green coffee) imports YoY, computes a 504-day rolling z-score, inverts, and tanh-bounds. State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Coffee C first-nearby back-adjusted close.

Historical window: US Census FT900 bilateral trade series from 1990 for both HS codes; engine runs from 1990 onward with 504-bar warmup.

## What the firings have actually done

Computed over 8,947 daily observations post-warmup from 1990 onward. The baseline Arabica forward 60-day return is mean plus 2.32 percent and median minus 0.96 percent across the live-window sample.

> **Baseline Arabica forward 60-day return:** mean plus 2.32 percent / median minus 0.96 percent across the live-window sample.
>
> **Daily Spearman IC (fwd 60d):** minus 0.027, p-value 0.011, N equals 8,947. Statistically significant but modest.
>
> **Non-overlap IC (60-day step):** minus 0.035, p-value 0.67, N equals 150. Sign-consistent but not independently significant.
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> **Phase-conditional forward 60-day Arabica returns:** Phase +1 (Robusta Share Gain, 1,092 days / 12.2 pct): minus 0.73 percent, edge minus 3.05 pp. Phase 0 (On Trend, 6,127 days / 68.5 pct): plus 2.71 percent, edge plus 0.39 pp. Phase −1 (Arabica Share Gain, 659 days / 7.4 pct): plus 4.20 percent, edge plus 1.88 pp.
>
> 4.93 pp directional spread between Phase +1 and Phase −1 with clean monotone phase pattern.

Three findings. The daily IC is significant but modest; structural product-mix signals carry diffuse rather than concentrated directional information. The monotone phase pattern cleanly separates Robusta Share Gain from Arabica Share Gain with 4.93 pp spread. Phase 0 is the majority bucket at 68.5 percent sample share; the signal spends most of the sample in neutral territory with the extreme buckets providing the directional information.

## Three cases that frame how to read the signal

The canonical anchors are the 2018-2019 extracts share-gain regime, the 2013-2014 RTD acceleration, and the 2021-2022 specialty demand rotation.

### Case 1: The 2018-2019 extracts share gain

Robusta Share Gain firing through 2018-2019 as US HS 2101 extracts import growth outpaced HS 0901 green coffee imports by multiple z-score standard deviations. The structural shift toward ready-to-drink and instant format consumption pulled roaster blends further toward Robusta. Composite

held in Phase +1 territory through the cycle-low Arabica pricing regime consistent with sub-baseline forward returns and the textbook Phase +1 structural-weakness anchor.

### Case 2: The 2013-2014 RTD acceleration

Robusta Share Gain firing anchored the 2013-2014 period as US RTD coffee consumption accelerated materially. Cold-brew canned beverages and single-serve pods drove HS 2101 extracts import growth above HS 0901 green growth. Composite held in Phase +1 territory. Arabica pricing softened through the regime consistent with the Phase +1 edge.

### Case 3: The 2021-2022 specialty demand rotation

Arabica Share Gain firing through 2021-2022 as premium-specialty demand rotated back toward whole-bean and ground-arabica formats during the post-pandemic consumption recovery. Consumer reopening after the pandemic drove a flight-to-quality in coffee consumption that reversed the extracts share gain temporarily. HS 0901 green imports accelerated past HS 2101 extracts. Composite held in Phase −1 territory. Arabica rallied through the regime consistent with the Phase −1 edge.

## How to use this signal today

Composite is currently reading plus 0.081 in the On Trend band. The Neutral phase began August 2026, 75 trading days ago. US HS 2101 extracts imports have run near the 504-day z-score mean versus HS 0901 green coffee imports through 2026 consistent with neutral structural substitution regime.

Pair with the following for stacked conviction: the LRC US Vietnam demand-pull signal (short-lead Robusta demand flow), CFTC positioning, and the ICO ICIP global benchmark. This structural substitution signal gives the slow-moving product-mix context; pair with cyclical demand and positioning signals for the full read.

Reader rule: Robusta Share Gain firings flag bearish regimes where product-mix drift structurally reduces Arabica demand pressure over 60-day horizons. Arabica Share Gain firings flag bullish regimes where premium-format demand rotates back.

## Methodology

Data source: US Census Bureau FT900 monthly bilateral trade release, HS 2101 (coffee extracts, essences, and concentrates) and HS 0901 (green coffee) import values. Computation: HS 2101 YoY percent change minus HS 0901 YoY percent change, z-scored on a 504-day rolling window, inverted, tanh-bounded. State thresholds plus or minus 0.2 (moderate) and plus or minus 0.5 (extreme). Phase +1 at composite above +0.3, phase −1 below −0.3. Target: ICE US Coffee C first-nearby back-adjusted close.

Historical window: US Census FT900 bilateral trade series from 1990 for both HS codes; engine runs from 1990 onward with a 504-bar warmup for the rolling z-score.

Validation computed on 8,947 post-warmup daily observations. Daily Spearman IC minus 0.027 at p-value 0.011 across 8,947 observations, statistically significant but modest. Phase +1 per-day forward return minus 0.73 percent (minus 3.05 pp below plus 2.32 percent baseline). Phase −1 per-day forward return plus 4.20 percent (plus 1.88 pp above baseline). 4.93 pp directional spread. Non-overlap IC at 60-day sampling minus 0.035 at p-value 0.67 across 150 samples, sign-consistent but not independently significant.

## What this signal does not cover

The signal does not capture individual-product-line attribution (pods vs RTD vs instant). It does not capture non-US product-mix drift (EU specialty coffee market dynamics may differ). It does not capture Arabica-specific supply (see USDA PSD, ENSO, CHIRPS). US Census FT900 publishes with 45-day publication lag; the signal is a slow-moving structural overlay not a short-horizon trigger.

## Disclaimer

This brief and the signal it describes are for informational purposes only and do not constitute investment, legal, tax, or trading advice. Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading. Also, since the trades have not been executed, the results may have under- or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. The phase-conditional forward-return stats reported above are a full-sample unconditional measurement. Readers should consult a licensed financial professional before taking any trading action.

## References

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