Cross-Market Coupling Integrity

US Treasury vs Euro-Area AAA 10-Year Yields — A Reproducible Measurement Method

Delta Motion Analytics — Methods & Reproducibility Whitepaper
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1. What this measures

Do US and euro-area government-bond yields move as one, and on what timescale? When the US Treasury 10-year yield moves on a given day, does the euro-area AAA sovereign 10-year yield move with it the same day, the next day, or not in any measurable way?

The honest question is narrower than "does the US lead Europe." At daily close-to-close sampling the two markets close about four hours apart, and that gap alone can manufacture a one-day lag out of nothing but shared global news. So the question this study can actually answer is **how strongly the two are coupled** — and, just as importantly, which parts of any apparent lead we are and are not entitled to claim. The dominant answer, set out below, is same-day.

2. Data

Two first-party official sources, no scrapers or redistributors. The US leg is the **U.S. Treasury Daily Par Yield Curve** — the 10-year constant-maturity point, struck from roughly 3:30 PM ET New York Fed quotations. The euro leg is the **European Central Bank's euro-area AAA sovereign yield curve** — the 10-year Svensson spot point. Each is the primary publisher of its own series. The overlap runs from September 2004, when the ECB series begins, to August 2026 — about 5,400 aligned trading days after inner-joining the two holiday calendars. The euro series spends 2019–2022 below zero (to about −0.82%), handled by a synthetic-price rescaling, exp(Y/100), that leaves the correlation untouched rather than discarding the data.

One construction caveat belongs on the face of the study: the US leg is a par constant-maturity yield and the euro leg is a Svensson spot yield, so their *level* difference carries a construction wedge and is **not** a clean sovereign basis. This is why the spread test in §4.4 is framed as spread behaviour, not as a sovereign-basis result.

3. Method (pre-registered)

The statistic (the daily-change cross-correlation), both null models, the materiality floor ($|\rho| \geq 0.10$), every threshold, and the block boundaries were pre-registered and frozen **before any confirmatory data was fetched.** The pre-2007 overlap (2004–2006) was used only to calibrate and size the thresholds, and was held out of every confirmatory block and verdict; the three verdict blocks run 2007–2026. Two nulls carry the weight: an ordinary value-permutation, and a more conservative **circular-block permutation** that preserves volatility clustering; both sit near **0.06**, well below the measured coupling. The engine is the same domain-agnostic core used across the program, unchanged; only a thin adapter is new. An offline self-test injects a genuine lag, a shared-factor-plus-timing artifact, and a trailing-level reversion artifact, and confirms the code keeps the real signal and rejects both fakes before any real data is touched.

4. Findings

4.1 Same-day co-movement is the dominant relationship

The cross-correlation curve peaks at zero lag: the contemporaneous correlation of daily changes runs **roughly 0.44 to 0.57** across the three blocks. This is the primary finding — the two markets move predominantly on the same day. Because it is contemporaneous, it carries no ordering and no predictive precedence to misread.

4.2 Lag-1 coupling is real, replicated — and secondary

Across three independent seven-year blocks (**2007–2013, 2014–2020, 2020–2026**), the registered one-day-lag cross-correlation was **+0.27, +0.24 and +0.20** — material in every block (above the pre-registered 0.10 floor), clear of both null models, and present in all three. The one-day-lag figure is much smaller than the same-day one, and — this is the load-bearing caveat — **it cannot be separated from the mechanics of the close.** The euro curve is struck about four hours before the US close, so any shared global move that lands in those four hours enters the US change today and the euro change tomorrow, producing a one-day lag from timing alone, with no transmission content. From daily close-to-close data, that geometric artifact and any genuine next-day transmission are not distinguishable. We therefore report a **coupling measurement, not a claim that one market leads the other.** The gentle decline across the blocks (0.27 → 0.24 → 0.20) is *consistent with* stronger global coupling during the 2007–2013 crisis years — offered as a hypothesis, not asserted as a cause.

4.3 The coupling is not driven by a few extreme days

Removing the most volatile 5% of days per block (87, 80 and 76 days) lowered the lag-1 correlation only to **+0.22, +0.19 and +0.16**, each block still material and still clear of both nulls — a coupling that lives in ordinary days, not one manufactured by a handful of crisis sessions.

4.4 The spread: a clean null, and why it is not a sovereign basis

Three things belong in plain sight:

1. **The spread does not mean-revert faster than chance — a clean null.** The US-minus-euro yield spread's measured reversion rate (**0.293**) sat below the surrogate's 99th percentile (**0.344**); at the registered thresholds its day-to-day behaviour is indistinguishable from a random walk. The null is reported as an asset, not omitted.

2. **The spread is spread-behaviour, not a clean sovereign basis.** The par-vs-Svensson construction wedge (§2) is exactly why the reversion test is framed as spread behaviour rather than a sovereign-basis result — which is what keeps it from being misread as a tradable basis.

3. **Calibration.** The pre-2007 years were unusually quiet — the spread threw only 15 reversion events there, fewer than a random walk would. The 2007–2026 window, with 232 events, is what the settings were sized for.

5. Reproduction — two distinct senses

(a) Cross-block (temporal) replication. The coupling replicated across **all three** independent seven-year blocks spanning 2007–2026; the pre-registered bar was replication in **at least two of three**, and the result was **three of three**. This is replication across **time on a single pair** — US Treasury 10Y vs euro-area AAA 10Y — **not** across pairs, tenors, or regions.

(b) Different-family adversarial hardening. The result was additionally reproduced against a **genuinely different family of synthetic generators**, importing the fixed core and the published harness unchanged; the coupling survived. This adversarial-robustness

reproduction is distinct from, and additional to, the cross-block replication in (a).

6. What this is — and what it is not

- A measurement of a historical and ongoing statistical relationship. **Not** a forecast, **not** a view, and **not** a statement about where any yield will go.
- **Coupling, not leadership.** No lead-lag or precedence claim: the four-hour close gap is precisely why the one-day-lag component cannot be attributed to transmission.
- A **measurement, not an accusation** — no claim of coordination, manipulation, or mispricing.
- Replicated **across time on one pair** — not a claim of breadth across pairs, tenors, or regions.
- **Spread behaviour, not a clean sovereign basis** (the construction wedge).

7. Applicability

For teams that must document and defend how a sovereign-rate benchmark or curve relates to the underlying markets — methodology and benchmark-governance functions, and the assurance evidence behind them — an independent, pre-registered, reproduced measurement of cross-market coupling is a defensible input to a methodology file. It **complements** external assurance, which attests to controls and stated criteria; it does not replace it, and it issues no recommendation. You keep the judgement; this measures the relationship.

Reproducibility: the statistic, both null models, the 0.10 materiality floor, all thresholds and the block boundaries were pre-registered and frozen before any confirmatory data was fetched; the engine is the shared domain-agnostic core, unchanged, with only a thin new adapter. Every figure is reproducible from the two public first-party sources — the U.S. Treasury Daily Par Yield Curve and the ECB euro-area AAA sovereign yield curve.