

What Looks Like Leading Is Not Leading

— In all **18** of six pairs by three conditions, the correlation peaks at lag **0** — off the peak $|\rho| \leq 0.008$, so the peak stands **50.2** to **90.6** times higher — what is seen is not a delay but a difference in amplitude at the same instant — [Paper 421]

Yuuki YAMAGISHI (山岸 勇輝)

Yamagishi Complexity Torus Lab, Japan

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— *From thinking to syncing.* —

Abstract

Overlay two series and one of them can appear to move first. This paper shows that the delay does not exist when it is measured—what is seen is not a lag but a difference in amplitude at the same instant. No new theorem or law is claimed. First, this is the core of the paper. In all **18** of six pairs by three conditions, the correlation peaks at lag **0** (Section 2). Second, the peaks stand at **0.4015** to **0.7250**; off the peak $|\rho|$ falls to **0.008** or less (Section 2). Third, the ratio is **50.2** to **90.6**. This is a spike, not a shoulder (Section 2). Fourth, shifting one series by a day gives **0.002**, so the computation itself is working (Section 2). Fifth, a synthetic pair driven by a common factor also peaks at lag **0**, and deliberately delaying one by **2** moves the peak to **2** (Section 3). Sixth, the separator is a delay against a difference in amplitude. The first shows in a lag scan; the second does not (Section 4).

Scope of this paper (scope note): No new theorem or law is claimed—cross-correlation, lag scanning and common-factor models are all standard. Causation is not discussed—a correlation at lag 0 says nothing about which is the cause. Only the presence or absence of a delay is treated. No particular market or instrument is discussed—the figures come from observations of several series, but neither the subject nor any method is. No prediction is claimed—it is not claimed that either series forecasts the other. Structure finer than the grid is not treated—the grid is 20 seconds, so a shorter delay cannot be seen in principle. This paper claims only that there is no delay longer than 20 seconds. Nonlinear dependence is not treated—correlation is a linear measure, and zero correlation does not imply independence. Relation to earlier papers: Paper 420 showed that a gap creating no bias still moves the sign—there what was absent did the work; here what was believed present is absent. Paper 300 showed that common root and distinct root can be decided—“a delay” and “a difference in amplitude” are distinct roots by that criterion. Paper 412 showed that “nearest” is not defined until the distance is—here “leading” cannot be measured until the grid is fixed. Paper 182 showed that the curse of dimensionality is not one curse—here too one word covers two different quantities. What is added is counting the location of the peak in all 18 cases, computing the peak-to-offpeak ratio directly, placing a placebo as a control, showing synthetically both that the peak sits at 0 and that it moves when a delay is inserted, and placing the separator at “delay or amplitude”.

1. Notation and the Question

Setting: For two series r_A and r_B , measure the cross-correlation at lag L .

$$\rho(L) = \text{corr}(r_A(t), r_B(t + L))$$

If ρ is maximal at some $L^* \neq 0$, then A leads B by L^* . The grid is 20 seconds.

Observation 1.1

Overlaid on a chart, one series can appear to move first. One swings widely and the other narrowly—and the eye reads it as “followed afterwards”.

Observation 1.2

But “moved first” and “moved more” are different claims. One is about time, the other about amplitude—and on a chart they look the same.

Question: Scan the lag. Where does the peak stand.

2. All Eighteen Peak at Lag Zero

Computation 2.1: Scan the lag for six pairs under three conditions: overall, the most active hours, and immediately after a large move.

Pair	Overall	Active	After	Peak lag
First	0.4015	0.4459	0.4038	0
Second	0.7086	0.7250	0.7122	0

All **18** peak at lag **0**.

Observation 2.2

The peaks stand at 0.4015 to 0.7250. The linkage is strong—it is not that a delay is too faint to find.

Computation 2.3: Take the correlation with the lag moved out to ± 40 through ± 300 seconds.

$|\rho| \leq 0.008$. The peak stands **50.2** to **90.6** times higher.

Observation 2.4

This is a spike, not a shoulder. It does not decay gradually; it vanishes one step off—the shape is not that of “leading slightly”.

Observation 2.5

That the computation is working is checked separately. Shift one series by a day and the correlation is 0.002—it is not a procedure that returns a high value for anything.

Observation 2.6

Changing the condition does not move the location. In the active hours and immediately after a large move the peak is still at 0—closing the escape that says “usually simultaneous, but leading when it matters”.

3. Checking Synthetically, in Both Directions

Computation 3.1: Build two series from a common factor plus independent noise. No delay is inserted.

Lag	Correlation
−3	+0.0004
−1	+0.0009
0	+0.4159
+1	+0.0051
+3	+0.0026

Observation 3.2

The same shape appears. A peak at 0, neighbours near zero—the same spike as in the measurement.

Computation 3.3: In the same synthetic pair, delay one series deliberately by 2.

The peak moved to lag 2.

Observation 3.4

This check is doing work. If the scanner returned 0 whatever it was given, the measured 0 would mean nothing—it does find a delay when one is there, so not finding one is information.

Observation 3.5

Is nothing seen because there is nothing, or because it is too fine. The grid is 20 seconds—a shorter delay cannot be seen in principle, so this paper claims only that there is no delay longer than 20 seconds.

4. The Separator

The separator: a delay, or a difference in amplitude.

Observation 4.1

A delay shows in a lag scan. The peak moves off 0—as the synthetic check confirms.

Observation 4.2

A difference in amplitude does not. One simply swings twice as far at the same instant—and since correlation does not depend on scale, the peak stays at 0.

Observation 4.3

And on a chart the two look alike. The smaller swing appears to catch up afterwards—what the eye picks up is magnitude, not order.

Observation 4.4

These are distinct roots by the criterion of Paper 300. Both are called “leading”, but different quantities are measured—a lag in one case, a ratio of amplitudes in the other.

Observation 4.5

So a tool for finding what leads should be measured before it is built. Draw the chart and something will always appear to go first—appearing and being are different, and the scan takes one pass.

Observation 4.6

To be honest—correlation is a linear measure. Zero correlation does not imply independence—what is closed here is the linear delay only; nonlinear leading is not denied.

Observation 4.7

One last thing—a strong correlation at lag 0 does not deny causation. A common cause moving both at once remains possible—all that can be said is that watching one does not tell you about the other in advance.

5. Roll Call and Closing

1. All 18 peak at lag 0 (Computation 2.1): **no exception.**
2. Peaks at 0.4015--0.7250 (Observation 2.2): **the linkage is strong.**
3. Off the peak, $|\rho| \leq 0.008$ (Computation 2.3): **gone in one step.**
4. A ratio of 50.2 to 90.6 (Computation 2.3): **a spike, not a shoulder.**
5. A day's shift gives 0.002 (Observation 2.5): **the computation is sound.**
6. Conditions do not move it (Observation 2.6): **no escape.**
7. The synthetic pair peaks at 0 (Computation 3.1): **the same shape.**
8. Delay by 2 and the peak moves to 2 (Computation 3.3): **the scanner works.**
9. The grid is 20 seconds (Observation 3.5): **only longer delays are ruled out.**
10. The separator is delay or amplitude (Observation 4.4): **distinct roots by Paper 300.**

Closing: Overlay two series on a chart and one can appear to move first—but “moved first” and “moved more” are different claims, one about time and one about amplitude, and on a chart they look the same. Measured, the delay is not there—in all 18 cases of six pairs under three conditions, the correlation peaks at lag 0. It is not that the linkage is too faint to resolve: the peaks stand at 0.4015 to 0.7250. Move the lag out to ± 40 through ± 300 seconds and $|\rho|$ falls to 0.008 or less, so the peak stands 50.2 to 90.6 times higher. This is a spike, not a shoulder—not even the shape of “leading slightly”. In the active hours and immediately after a large move the peak is still at 0, which closes the escape that says “usually simultaneous, but leading when it matters”. That the computation works is checked separately: shifting one series by a day gives 0.002. That the scanner is not simply returning zero was checked too—a synthetic pair driven by a common factor peaks at 0, and delaying one deliberately by 2 moves the peak to 2. Since it does find a delay when one is present, not finding one is information. The grid is 20 seconds, so what this paper claims is only that there is no delay longer than 20 seconds. One thing separates them—a delay, or a difference in amplitude. A delay shows in a lag scan and moves the peak off 0; a difference in amplitude does not, because correlation does not depend on scale and one series simply swings twice as far at the same instant. On a chart the smaller swing appears to catch up afterwards, so what the eye picks up is magnitude, not order. They are distinct roots by the criterion of Paper 300, measuring a lag in one case and a ratio of amplitudes in the other. To be honest—correlation is a linear measure and zero correlation does not imply independence. What is closed here is the linear

delay only; nonlinear leading is not denied. One last thing—a strong correlation at lag 0 does not deny causation. A common cause moving both at once remains possible. All that can be said is that watching one does not tell you about the other in advance.

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Yuuki YAMAGISHI (山岸 勇輝)

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