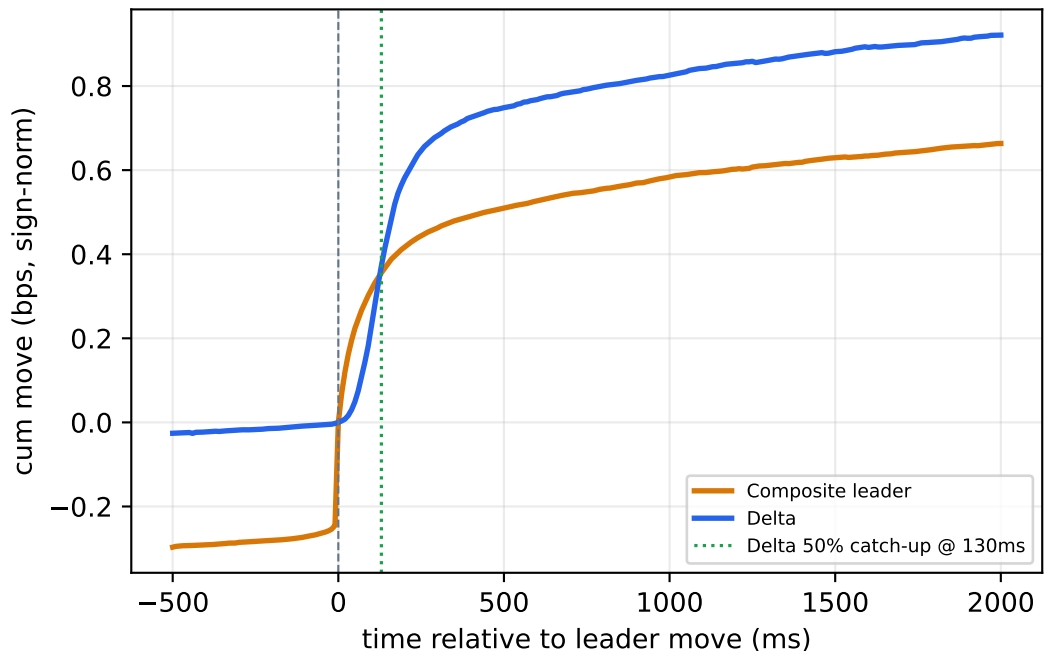
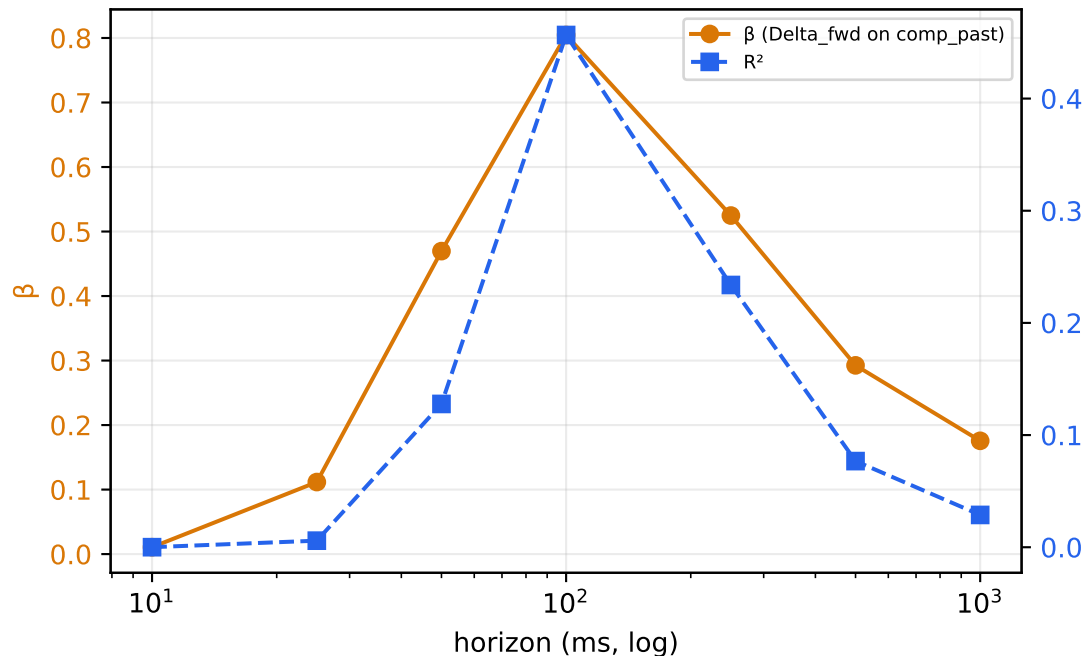


Lead-Lag Event Study — BTC | composite (BN70/OKX20/BYB10) leads Delta | grid=10ms

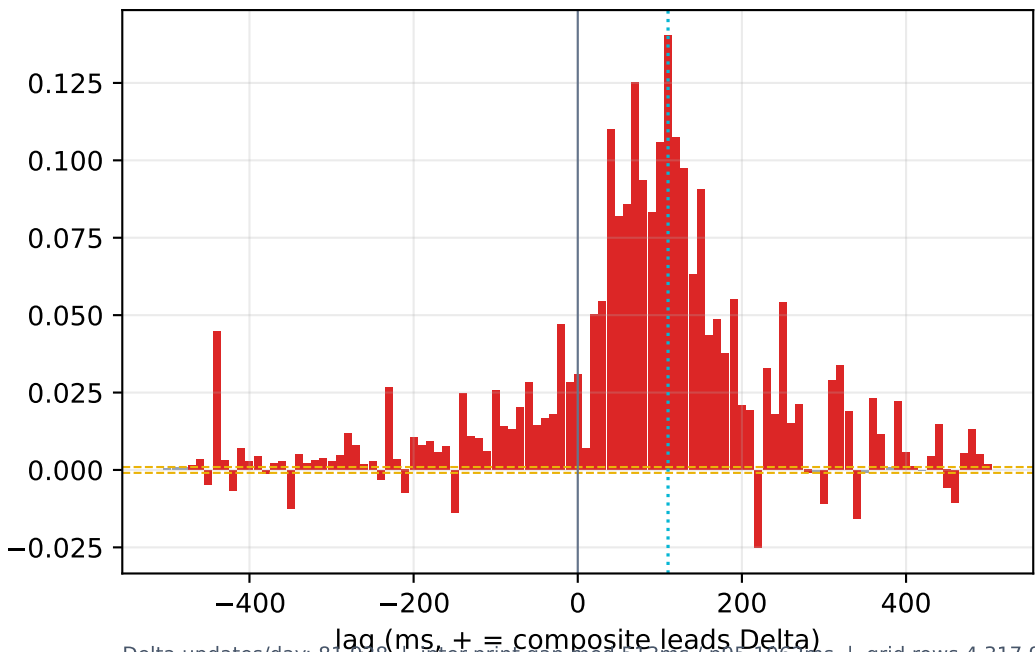
① Event-aligned impulse (>3.0σ, n=6658 events)



② Predictability decay: comp past-ret → Delta fwd-ret



③ Fine CCF (peak +110ms, ρ=0.140; + = comp leads)



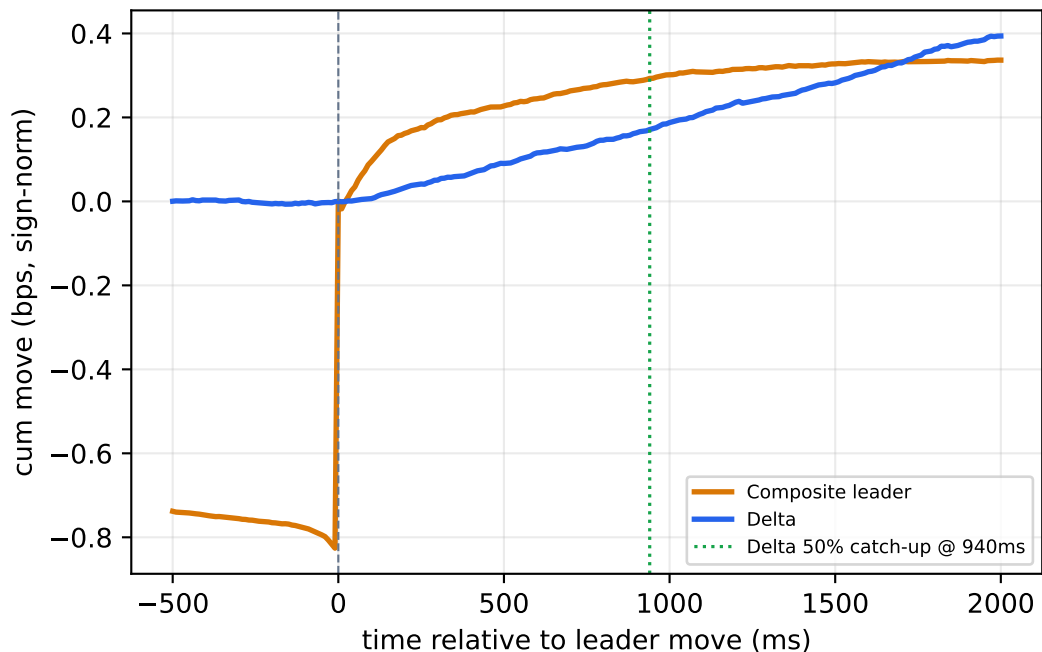
④ Delta catch-up after a ≥2bps leader move (cancellation budget)

Δ after move	Delta % of leader move realised
0 ms	0.0%
50 ms	41.3%
100 ms	77.7%
250 ms	106.3%
500 ms	105.0%
1000 ms	100.4%

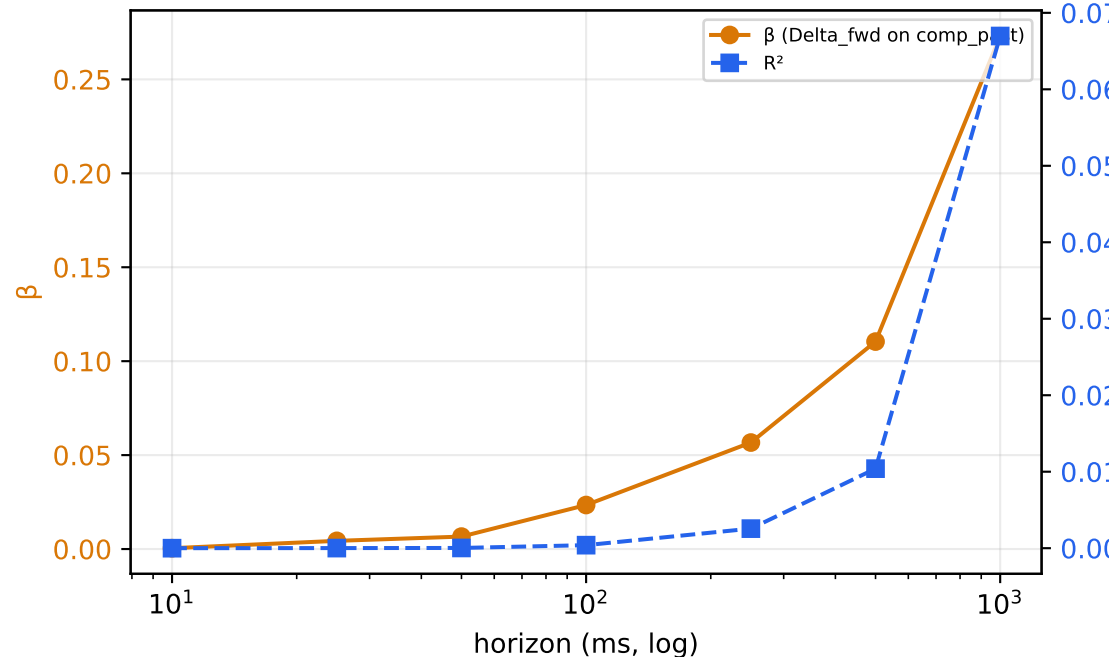
n=22 de-clustered ≥2bps events | the faster Delta catches up, the tighter your cancel must be

Lead-Lag Event Study — SOL | composite (BN70/OKX20/BYB10) leads Delta | grid=10ms

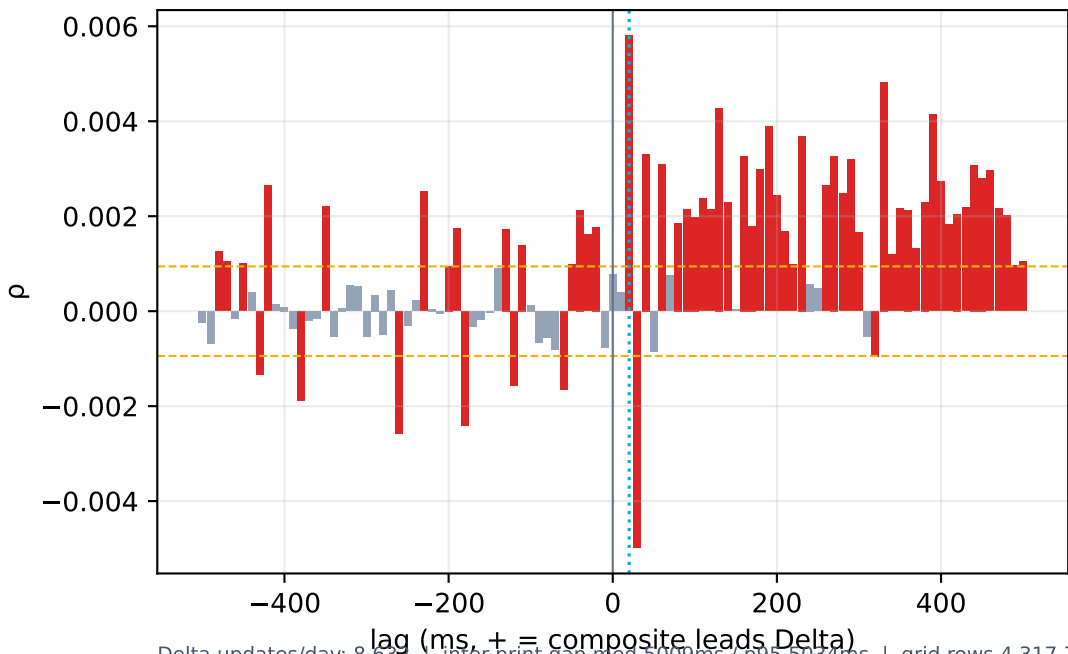
① Event-aligned impulse (>3.0σ, n=8163 events)



② Predictability decay: comp past-ret → Delta fwd-ret



③ Fine CCF (peak +20ms, ρ=0.006; + = comp leads)



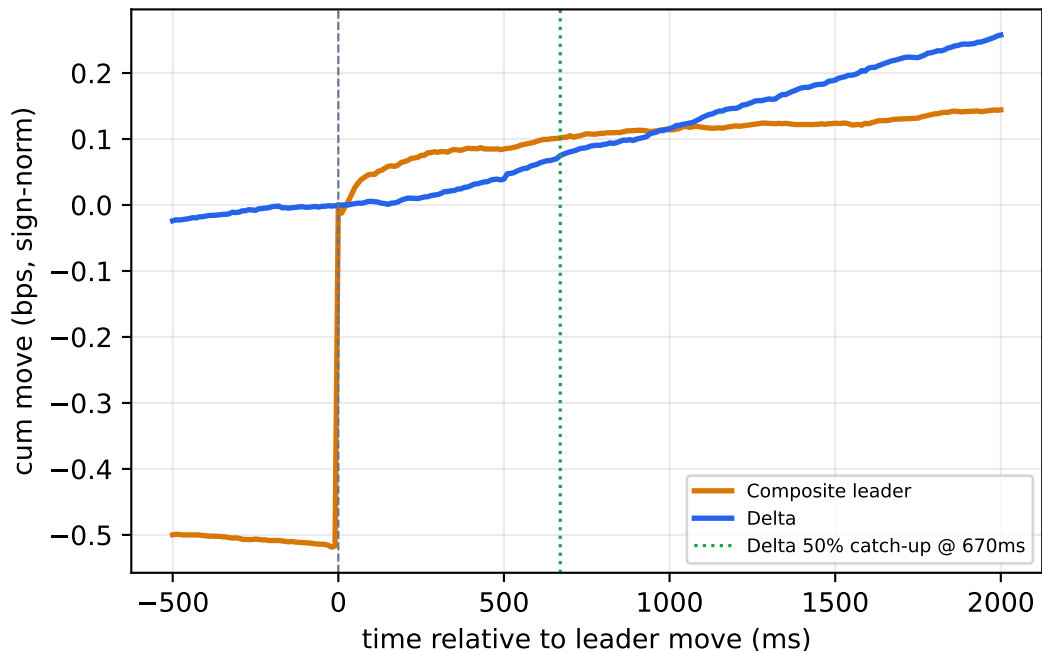
④ Delta catch-up after a ≥2bps leader move (cancellation budget)

Δ after move	Delta % of leader move realised
0 ms	0.0%
50 ms	0.4%
100 ms	0.6%
250 ms	4.2%
500 ms	10.0%
1000 ms	20.9%

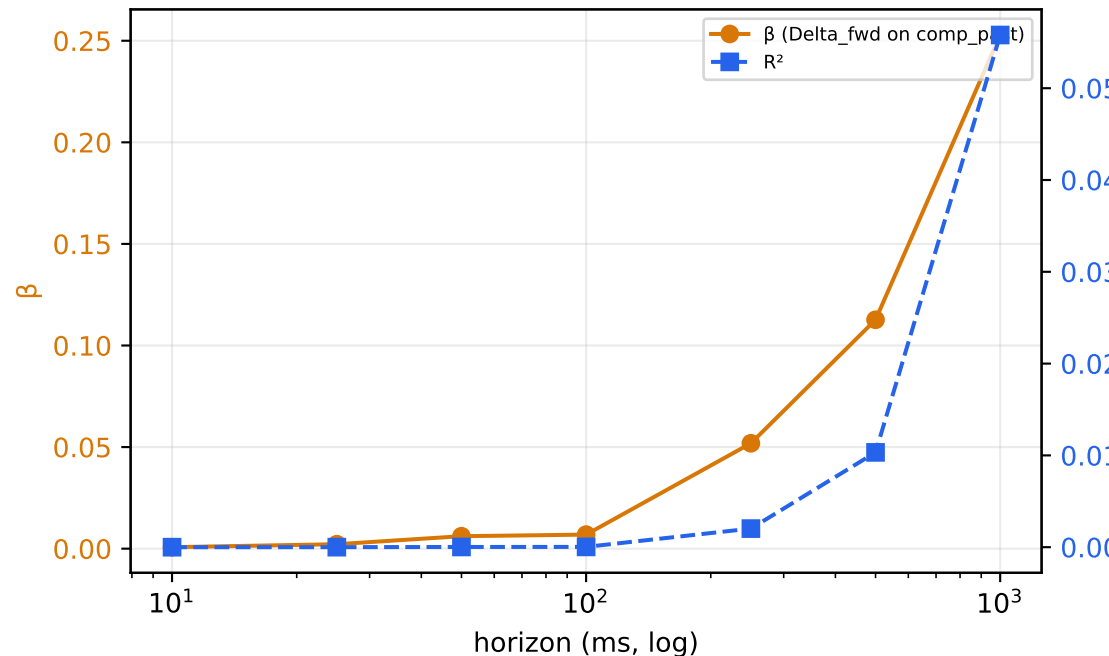
n=406 de-clustered ≥2bps events | the faster Delta catches up, the tighter your cancel must be

Lead-Lag Event Study — DOGE | composite (BN70/OKX20/BYB10) leads Delta | grid=10ms

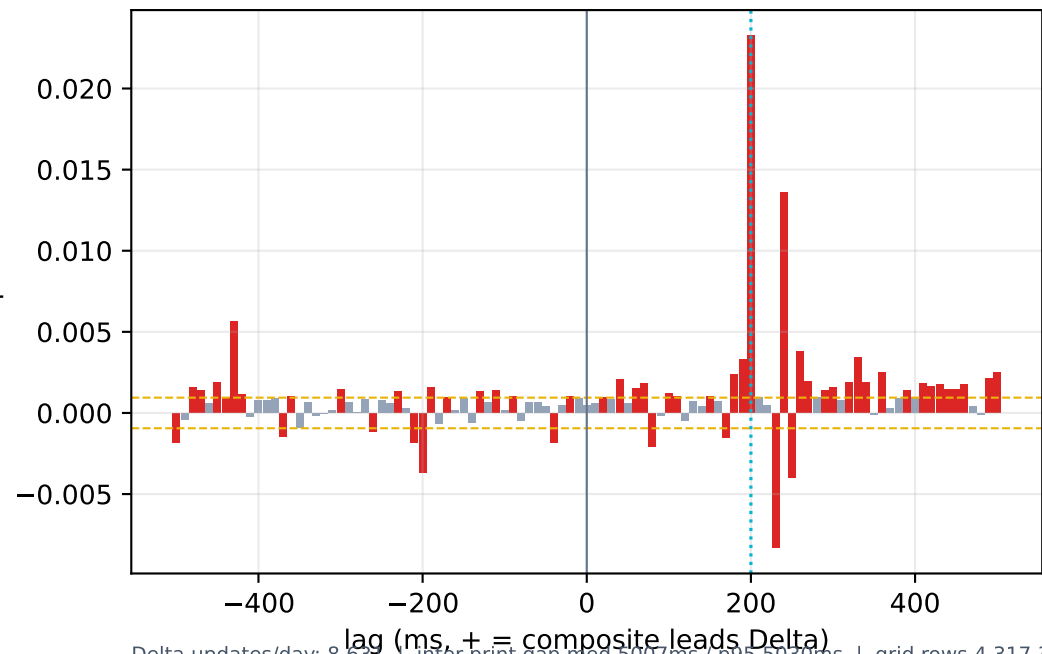
① Event-aligned impulse (>3.0σ, n=8375 events)



② Predictability decay: comp past-ret → Delta fwd-ret



③ Fine CCF (peak +200ms, $\rho=0.023$; + = comp leads)



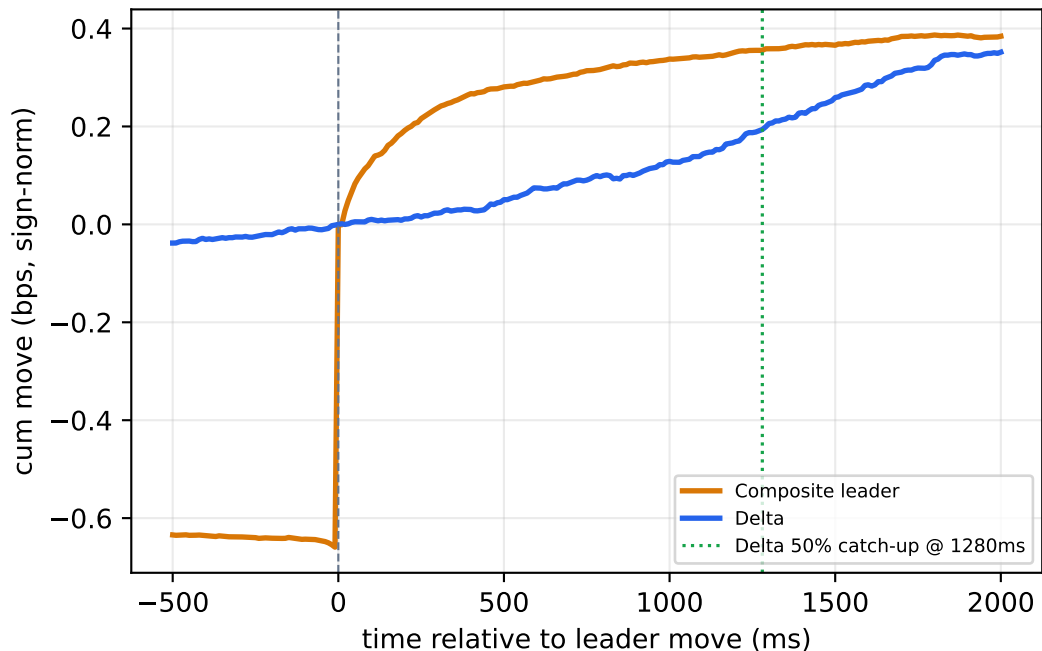
④ Delta catch-up after a ≥ 2 bps leader move (cancellation budget)

Δ after move	Delta % of leader move realised
0 ms	0.0%
50 ms	0.0%
100 ms	0.0%
250 ms	0.0%
500 ms	1.6%
1000 ms	10.7%

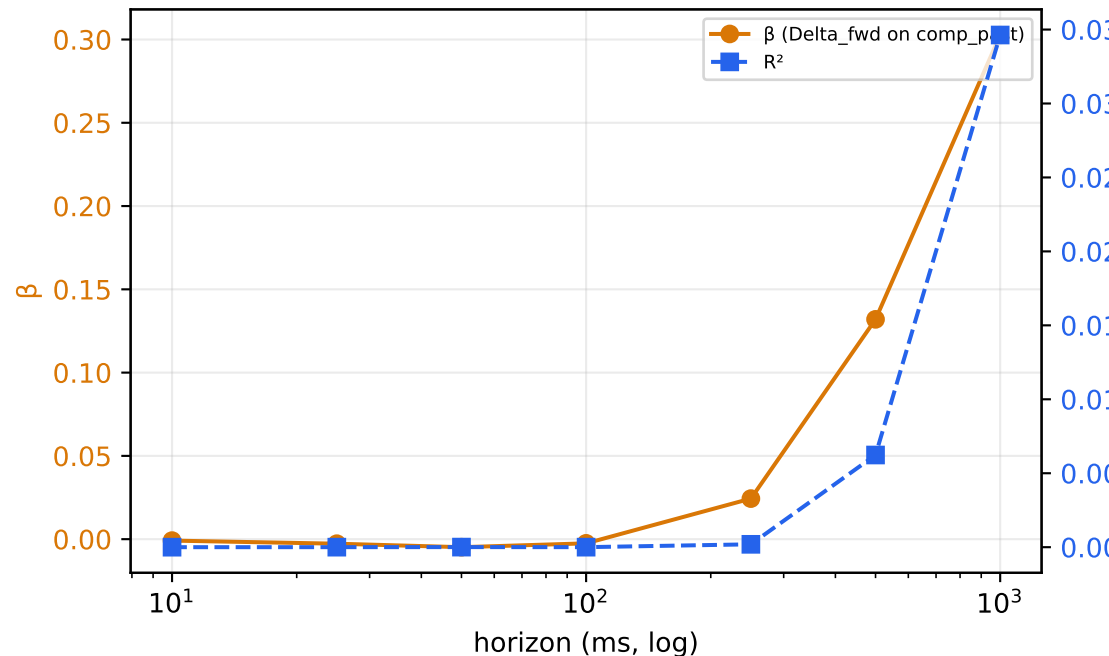
n=138 de-clustered ≥ 2 bps events | the faster Delta catches up, the tighter your cancel must be

Lead-Lag Event Study — XRP | composite (BN70/OKX20/BYB10) leads Delta | grid=10ms

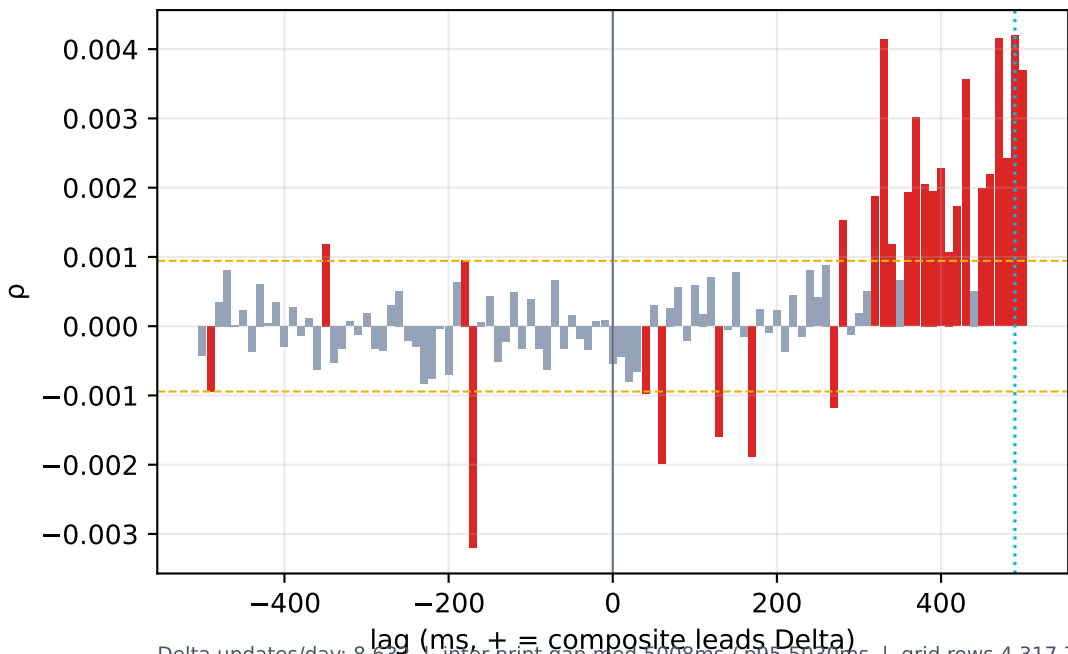
① Event-aligned impulse (>3.0σ, n=6968 events)



② Predictability decay: comp past-ret → Delta fwd-ret



③ Fine CCF (peak +490ms, ρ=0.004; + = comp leads)



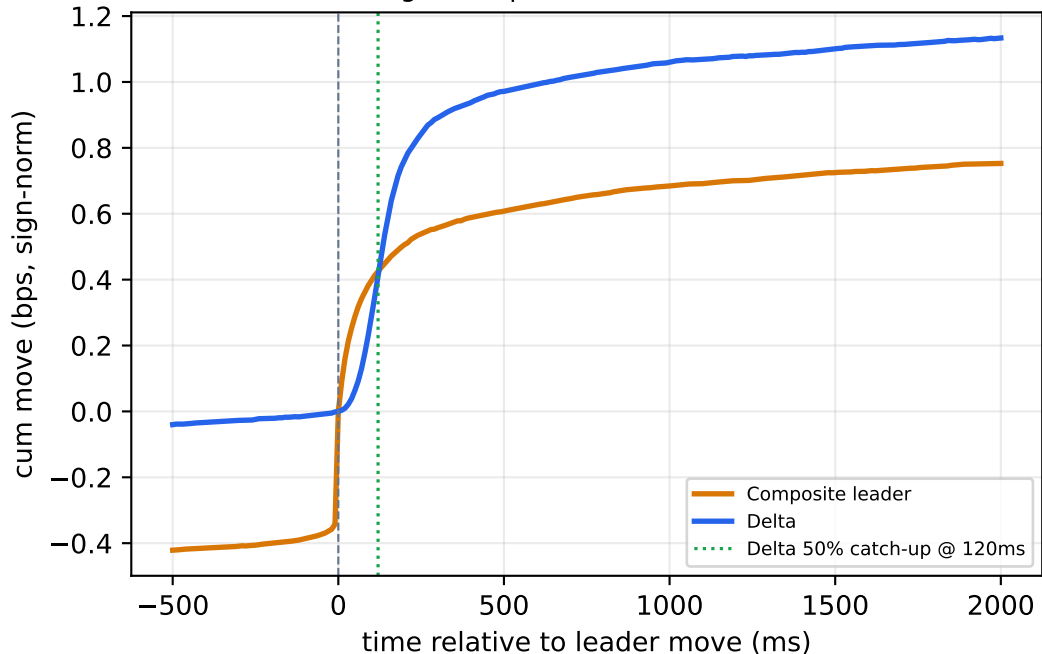
④ Delta catch-up after a ≥2bps leader move (cancellation budget)

Δ after move	Delta % of leader move realised
0 ms	-0.1%
50 ms	-0.1%
100 ms	-0.1%
250 ms	-0.7%
500 ms	6.4%
1000 ms	23.5%

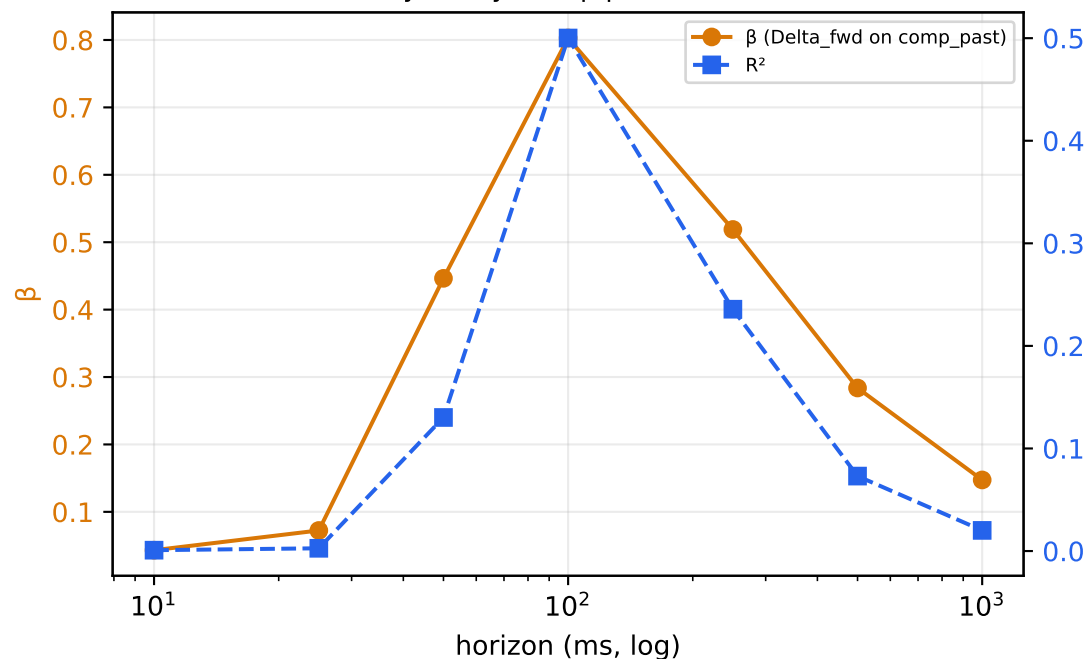
n=1151 de-clustered ≥2bps events | the faster Delta catches up, the tighter your cancel must be

Lead-Lag Event Study — ETH | composite (BN70/OKX20/BYB10) leads Delta | grid=10ms

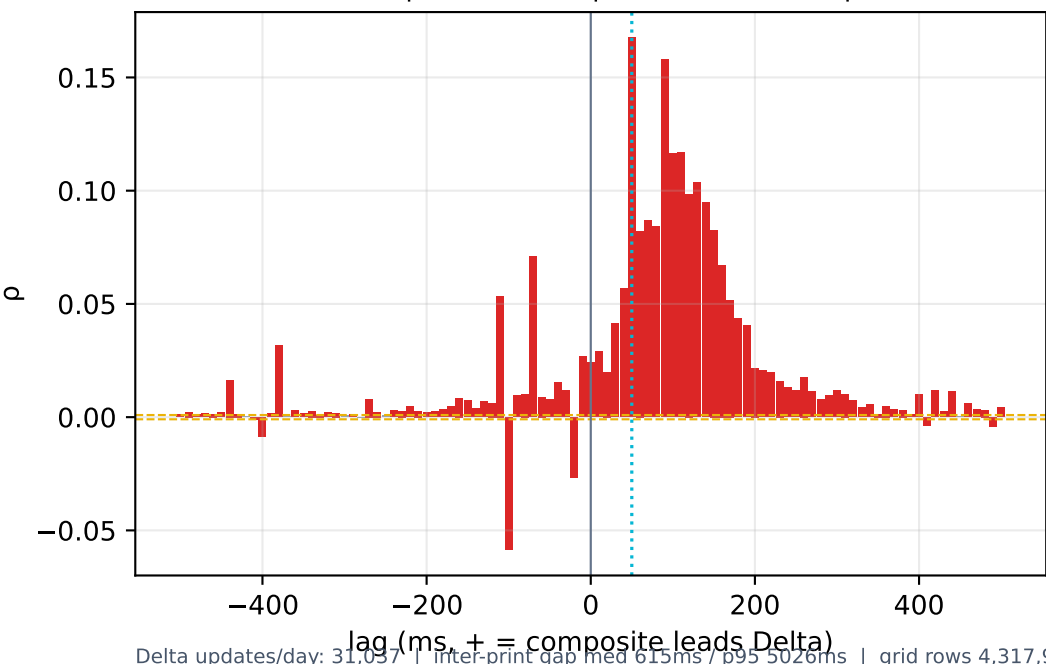
① Event-aligned impulse (>3.0σ, n=8396 events)



② Predictability decay: comp past-ret → Delta fwd-ret



③ Fine CCF (peak +50ms, ρ=0.168; + = comp leads)



④ Delta catch-up after a ≥2bps leader move (cancellation budget)

Δ after move	Delta % of leader move realised
0 ms	0.0%
50 ms	19.6%
100 ms	70.8%
250 ms	123.2%
500 ms	115.2%
1000 ms	106.3%

n=58 de-clustered ≥2bps events | the faster Delta catches up, the tighter your cancel must be

Lead-Lag Summary — BTC / SOL / DOGE / XRP / ETH

Sym	Δ upd/day	gap(ms)	CCFlag(ms)	CCFp	lead(ms)	catch@100	@250	@500
BTC	81,928	513	+110	0.140	130	78%	106%	105%
SOL	8,632	5009	+20	0.006	940	1%	4%	10%
DOGE	8,631	5007	+200	0.023	670	0%	0%	2%
XRP	8,632	5008	+490	0.004	1280	-0%	-1%	6%
ETH	31,037	615	+50	0.168	120	71%	123%	115%

Reading the table:

- CCF peak lag > 0 → composite leader leads Delta by that many ms (your reaction window).
- impulse lead = ms for Delta to realise 50% of a large leader move.
- Delta catch-up @ Δ = fraction of a ≥ 2 bps leader move already reflected in Delta after Δ ms;
high & fast catch-up ⇒ short toxic-flow window ⇒ you must cancel quotes within ~that horizon.

Interpretation for market-making on Delta:

- A measurable positive lead = there IS a window to re-quote ahead of Delta.
- But if Delta catches up within ~100–250ms, a 5s-poll or slow cancel will be adversely selected (you fill the stale side just before Delta moves). Cancellation latency must beat the catch-up curve.