Historical FX replication

Circuit phase across training seeds

A two-seed experiment suggested that a nearest-neighbor entangling phase improved a two-level clock-circuit feature for forecasting one-second FX triangle margins. We repeated the six matched circuit settings with twelve new initializations while preserving the model and training regime. The estimated two-level phase effect changed sign on both previously scored panels. Paired seed-by-day intervals spanned zero. At three levels per wire the phase increased mean error on both panels, with pointwise crossed intervals above zero. At five levels the crossed intervals included zero.

Design and estimand

Each width-200 TokenGT adds four circuit clock observables to the spatial representation. The wires have $q = 2, 3, 5$ levels. The phase arm adds the diagonal nearest-neighbor phase. Both arms retain the local phases and condition local mixers on neighboring input angles. All 72 models use 1,537,657 trainable parameters, the same 8,192 training windows, batch size 64, and 384 updates. Within each seed all six arms share initial parameters and training batches. All selected epoch three by validation MAE on the same 2,048 windows. This is a classical CUDA simulation.

For each seed and eligible row, we subtract the product-arm absolute error from the phase-arm error, averaging the two route orientations. We give equal weight to rows and to seeds. For the crossed interval, resample paired seeds and entire UTC-day groups independently, repeating all rows of a repeated day. The intervals use the 2.5th and 97.5th percentiles from 10,000 draws, with no multiplicity adjustment. Owen (2007)

Panel	q	Mean	Day only 95%	Crossed 95%	Improved
October	2	+0.001232	[+0.000774, +0.001681]	[−0.002798, +0.005052]	5
October	3	+0.005782	[+0.005074, +0.006473]	[+0.001683, +0.010024]	4
October	5	+0.004059	[+0.003472, +0.004628]	[−0.000027, +0.008025]	4
November	2	+0.002647	[+0.002272, +0.003043]	[−0.002673, +0.008116]	4
November	3	+0.006811	[+0.006165, +0.007434]	[+0.000039, +0.013951]	4
November	5	−0.000536	[−0.001637, +0.000541]	[−0.004940, +0.004231]	6

Values are log basis points. Negative effects favor the bond phase. Improved counts the seeds whose paired mean favors the phase, out of twelve.

Coverage. October has 2,048 windows on 26 UTC days. November has 2,042 eligible windows from 5,120 forecasts on 10 UTC days. Neither panel is a new set of market observations for the project. The forecast files were sealed before this evaluation opened the archived outcomes.

Interpretation. Day-only intervals are substantially narrower. The $q = 2$ effect is sensitive to the training initialization, even with identical architecture and data. All 72 new fits beat persistence in October, and 65 did so in November. The three-level result is specific to this matched control, graph, panels, and forecast horizon. The experiment evaluates prediction error on indicative quotes. Interactive results