Forecasting longer exchange-rate cycles

Compact report · Five forecast horizons on four- and five-currency graphs

Result. At the one-second target, all 22 graph-model fits improved on persistence on the original four-currency October test for both triangles and quadrilaterals. Every one of those fits fell behind persistence on CHF-containing triangles, quadrilaterals and pentagons. A linear ridge correction gave the lowest error on the longer CHF routes. The comparison tests numerical forecasts of recorded indicative quotes.

The source universe contains EUR, GBP, JPY and USD, augmented with CHF on the five-vertex graph. Models fit August K4 sessions and selected checkpoints on separate September dates. Both October evaluations use the same six session dates. Each graph uses direct bid and inverse-ask legs. Its target is the sum of log conversion rates at the future tenor, minus 0.1 assumed log basis point per leg.

What changes when CHF enters the graph?

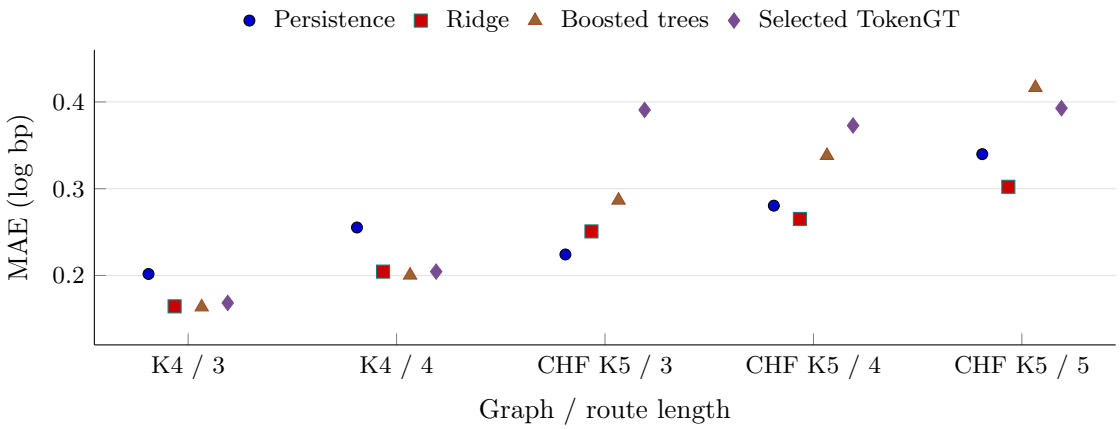


Figure 1. One-second target, one-second input cadence. Lower values indicate smaller mean absolute error. The displayed neural fit had the smallest September validation macro MAE among the 22 dense-history fits. It used classical route features and tropical TokenGT attention.

Graph	Legs	Labels	Persistence	Ridge	Boosted trees	TokenGT
K4	3	8,136	0.2017	0.1644	0.1636	0.1684
K4	4	4,830	0.2553	0.2045	0.2003	0.2045
CHF K5	3	9,880	0.2242	0.2508	0.2866	0.3908
CHF K5	4	13,584	0.2805	0.2652	0.3381	0.3728
CHF K5	5	9,810	0.3398	0.3022	0.4164	0.3928

Each label is a directed route, origin and tenor. A single origin can contribute several labels. The best two-seed neural mean on K4 quadrilaterals was 0.203728 for GAT with token attention. That same pair averaged 0.413984 on CHF pentagons. Boosted trees had the lowest one-second MAE across all 25 entries on both K4 lengths. The lowest K5 values shift to persistence on triangles and ridge on lengths four and five. The new graph changes currency, graph size and route support together. Five-leg routes were absent during training.

What the paired controls isolate

Same directed route, UTC origin and target horizon

The full history contains 16 one-second frames. The decimated history retains the four frames at $-15, -10, -5, 0$ seconds. Both end at the same origin and cover the same elapsed time. Holding the eligible keys fixed separately from the cadence change left 40,960 October K4 and 109,640 CHF K5 route–origin–tenor labels across the five target horizons. An additional sensitivity restricts origins to the five-second grid.

Circuit readout on the same message-passing backbone

The coherent arm evolves a four-qutrit, 81-amplitude state on a CUDA simulator. A phase depending on basis digits and adjacent-wire couplings precedes four local unitary mixers. Squared output amplitudes give probabilities for four expectation values. The dephased arm propagates probabilities using squared mixer entries. The max-plus arm accumulates maximum log-path scores and normalizes the terminal scores. The tropical attention control changes the TokenGT attention kernel separately. All measurements here come from software.

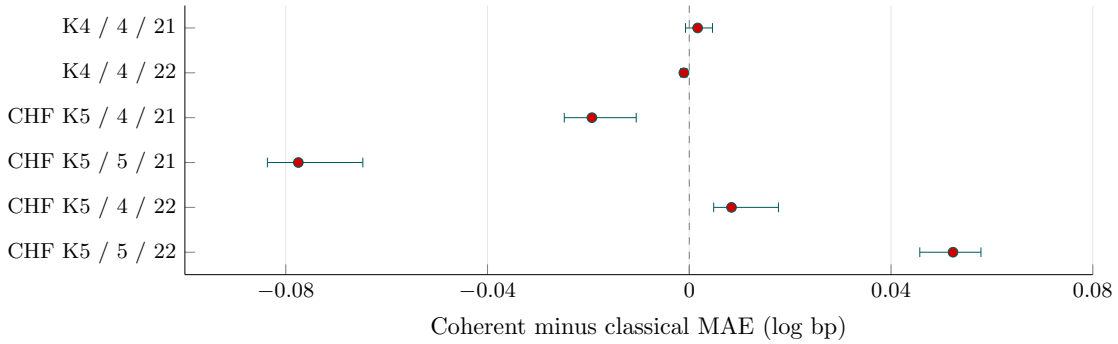


Figure 2. One-second cadence and target, common-mask labels. Rows identify graph, route length and the final two digits of the training seed. Each interval resamples six whole October dates 2,500 times. Negative differences favor coherent propagation.

The one-second CHF pentagon effect changes sign across seeds. The observation-weighted difference is -0.0775 log bp for seed 20261121 and $+0.0523$ for 20261122. For comparison, using five-second inputs gives differences of $+0.0166$ and $+0.0361$ on the same 6,944 pentagon labels. The fixed seed and cadence affect the relative result. On the native one-second CHF pentagon cohort both coherent fits still have higher error than persistence and ridge.

Interpretation

The target contains modeled quote availability and a fixed leg charge. The study has no observed executable size, queue priority, order arrivals or realized fills. Overlapping windows and routes share observations across all five horizons. The day intervals describe these six dates and the specified individual contrasts. The experiment does not establish a revenue estimate, a quantum hardware advantage or the mechanism of the transfer failure. Interactive results Archive specification. The companion extended report supplies every seed, comparator and reproduction option.