

From Pair-Based FX to *Global State Resolution*

The core challenge in enabling direct foreign currency exchange between individuals and businesses — without relying on banks, market makers, or payment intermediaries — is the difficulty of efficiently matching opposing currency demands at global scale.

Today, financial intermediaries solve this problem by matching buyers and sellers of currencies and charging fees for doing so. These costs are applied either directly through transaction fees or indirectly through spreads embedded within foreign exchange rates.

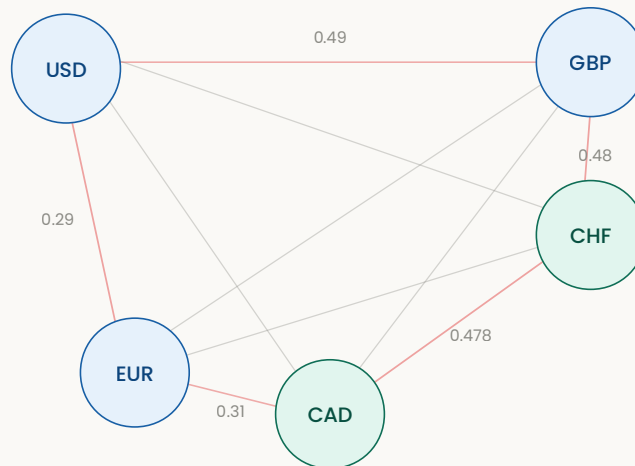
In a simple two-region system, such as between the United States and Europe, peer-to-peer currency matching would be relatively straightforward. Users seeking to exchange U.S. dollars for euros could be paired directly with users seeking the opposite exchange, with transactions executed at the prevailing market mid-rate using a first-in-first-out (FIFO) matching process. In effect, this creates a currency bridge between two regions.

However, scaling this approach globally introduces a far more complex problem. While thousands of bilateral currency bridges could theoretically be created, most currency demands — particularly within less liquid "long-tail" currency pairs — would rarely align perfectly in both size and timing. As a result, traditional one-to-one matching systems inevitably depend on intermediaries to absorb liquidity imbalances.

Today's market makers partially address this challenge through triangular arbitrage algorithms, which optimize pricing relationships across three connected currency pairs. While effective for institutional trading, these systems remain structurally limited because they only evaluate a small subset of potential currency paths at any given time. Additional overlapping paths

can improve matching possibilities, but the problem rapidly becomes computationally incomplete and inefficient as the network grows in dimensionality.

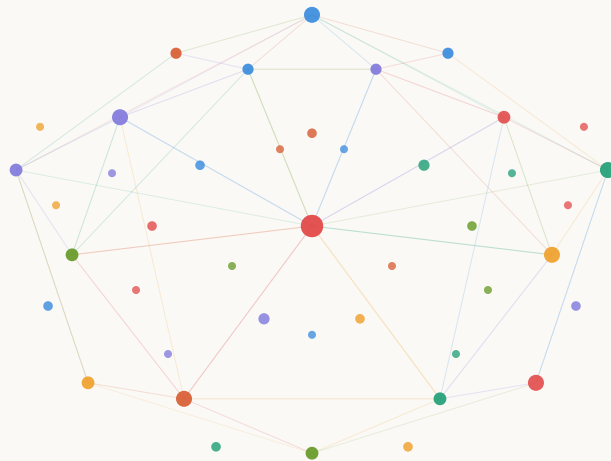
FIGURE 1 — OVERLAPPING TRIANGULAR PATHS: STILL INCOMPLETE



A true global payments system therefore requires something fundamentally different: an algorithm capable of evaluating and optimizing all currency demands simultaneously across every currency bridge in real time.

Traditional FX markets resolve currencies pair-by-pair. Market consistency is maintained afterward through arbitrage across independent currency relationships. While this model functions effectively within conventional financial infrastructure, it becomes increasingly inefficient as the number of currencies, participants, and transaction paths expands globally — as the network below begins to illustrate.

FIGURE 2 — GLOBAL DIMENSIONALITY: SIMULTANEOUS MULTI-CURRENCY STATE



Every node is a currency demand. Every edge is a potential resolution path. All must resolve simultaneously.

At global scale, foreign exchange ceases to behave as a collection of independent bilateral markets and instead becomes a system-resolution problem. Rather than resolving currencies sequentially pair-by-pair, a true global solution must evaluate all currency relationships simultaneously as part of a unified liquidity state. Under this model, currency conversion ceases to behave as a sequence of isolated bilateral trades and instead becomes a deterministic state transition across a globally connected liquidity network.

derien's implied-N resolution architecture enables simultaneous multi-currency matching beyond traditional pair-based and triangular market structures. In more than four decades of electronic and algorithmic market infrastructure, this generalized multi-currency resolution problem has never been fully solved or deployed at global scale. That resolution capability now resides at the core of derien – a next-generation global payment solution.