NEXTFI ADVISORS · MARKET INTELLIGENCE

The Anatomy of Stablecoin Transactions

Beyond Transfers. Understanding On-Chain Complexity.

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POLICY BLOCKCHAIN STABLECOINS RESEARCH

EXECUTIVE SUMMARY

The prevailing view of stablecoins as digital payment instruments — analogous to cash or card transfers — materially mischaracterizes how they actually function on programmable blockchains. This BIS paper, analyzing 593 million event logs across 141 million Ethereum transactions involving three major U.S. dollar stablecoins (USDT, USDC, and PYUSD), establishes two ground-breaking findings.

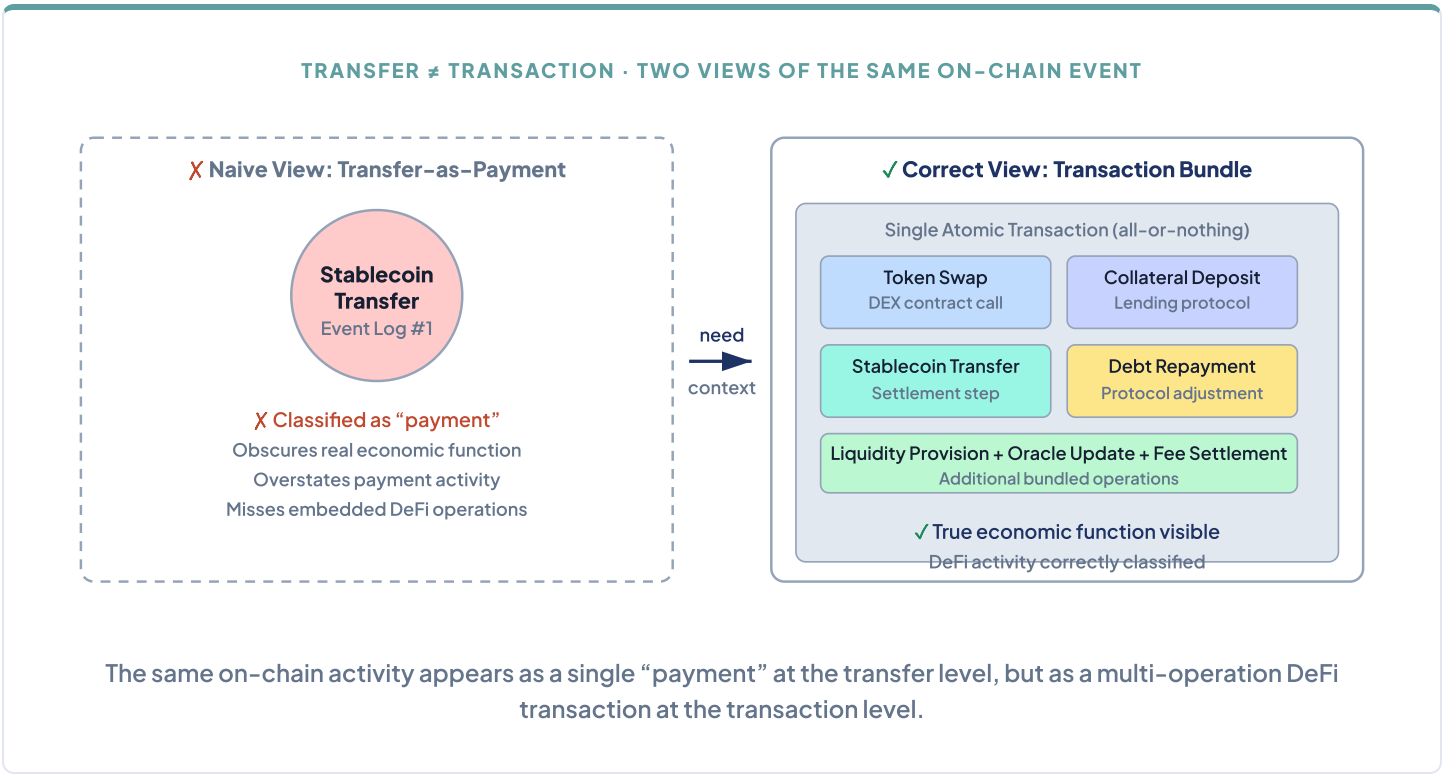
Finding 1: Complexity is a first-order feature. Nearly **60% of transfer events** occur within complex, atomically executed transaction bundles — not as standalone payments.

Finding 2: Stablecoins are not interchangeable. The three tokens studied (USDC, USDT, PYUSD) show systematically different usage patterns across transaction structure, urgency, and timing — reflecting distinct institutional designs and economic functions.

For policymakers, researchers, and institutions treating stablecoin activity as simple payment volume, these findings carry serious implications: empirical measurement is distorted, market monitoring is compromised, and regulatory frameworks built on transfer-level data are likely misdirected.

THE TRANSFER VS. TRANSACTION DISTINCTION

A **transfer** is a granular event log emitted by a stablecoin contract — a single change in token ownership. A **transaction** is the atomic bundle of operations specified by a smart contract — it may contain zero, one, or many transfers alongside swaps, collateral adjustments, lending operations, and settlement steps.

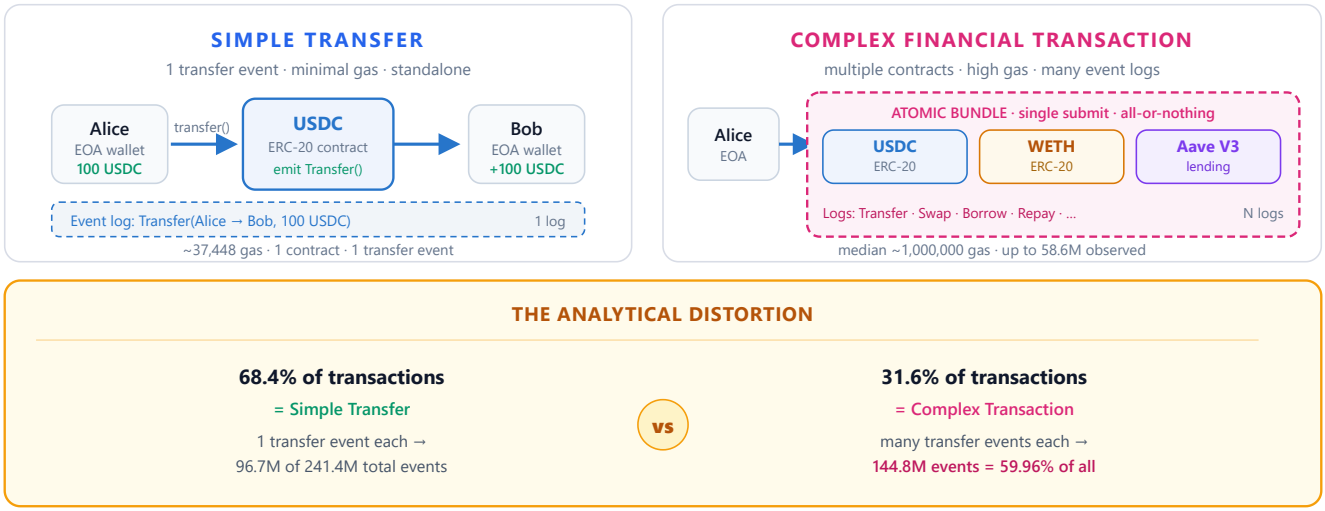


The same on-chain activity appears as a single "payment" at the transfer level, but as a multi-operation DeFi transaction at the transaction level.

The Misclassification Problem: 31.6% of transactions are complex. But because complex transactions emit many transfer events each, **59.96% of all transfer events occur within complex transactions**. Any study that treats each transfer as a standalone payment is misclassifying 6 in 10 observations. Transfer counts overstate activity; transfer volumes distort concentration; velocity metrics are systematically biased.

TRANSACTION ANATOMY — VISUAL FRAMEWORK

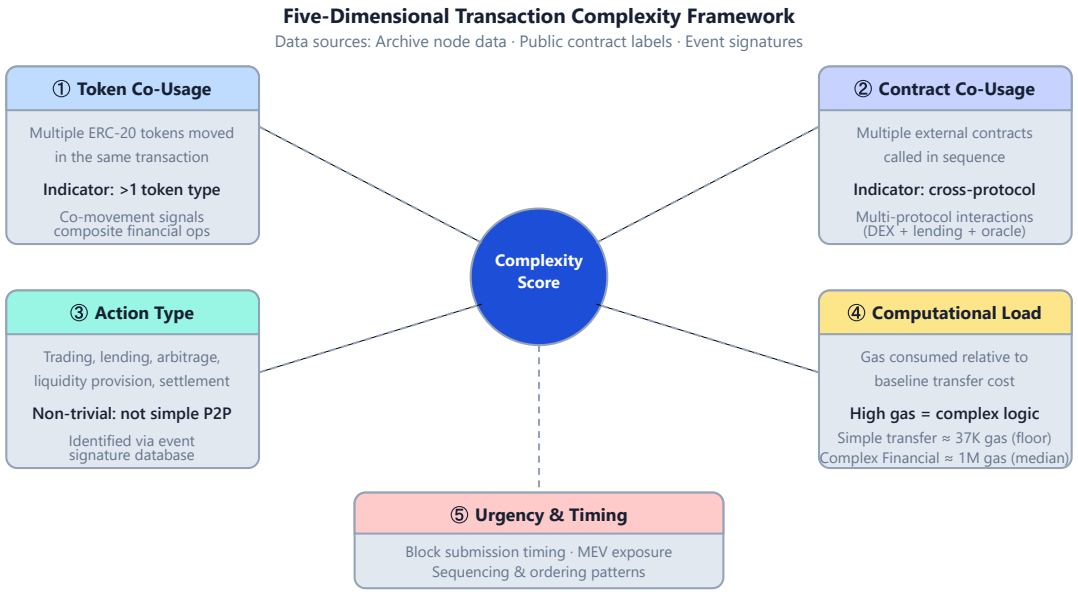
FIGURE 1: SIMPLE TRANSFER VS. COMPLEX TRANSACTION — STRUCTURAL COMPARISON



FIVE DIMENSIONS OF TRANSACTION COMPLEXITY

The authors develop a replicable, multi-dimensional framework to classify transaction complexity. Five signal dimensions are combined into a single complexity score:

THE COMPLEXITY MEASUREMENT FRAMEWORK · FIVE SIGNAL DIMENSIONS



The five signal dimensions used to classify a transaction as simple or complex. Each captures a distinct facet of on-chain activity beyond the raw transfer event.

1. Token Co-Usage

Which other tokens appear within the same transaction as each stablecoin?

- **USDC** Strong co-usage with **Wrapped Ether (WETH)** — ~20% of USDC transactions involve WETH. Second-most: USDT itself.
- **USDT** Similar pattern to USDC but weaker WETH co-occurrence. Coinbase Wrapped BTC is prominent.
- **PYUSD** Stands apart: USDC and USDT appear prominently within PYUSD transactions, but PYUSD barely registers in USDC/USDT networks. Low integration overall.

2. Smart Contract Co-Usage

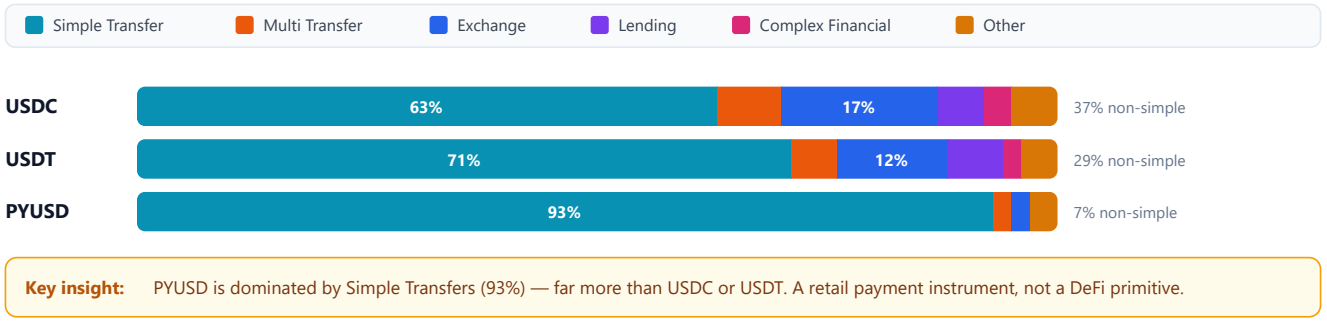
Which DeFi protocols do stablecoins co-appear with?

- **USDT** MayanSwift, Circle CCTP (bridging), Uniswap V3 pools, 1inch aggregator, Fluid DEX
- **USDC** AavePool V3, Binance Alpha router, LiFi Diamond, Uniswap V3, Circle CCTP
- **PYUSD** Curve (PYUSD-USDC/USDS pools), CoW Protocol, LayerZero Endpoint, Sky (MakerDAO MCD)

3. Action Category Breakdown

Classifying all 141M transactions into six mutually exclusive buckets:

FIGURE 2: TRANSACTION DISTRIBUTION BY ACTION CATEGORY AND STABLECOIN

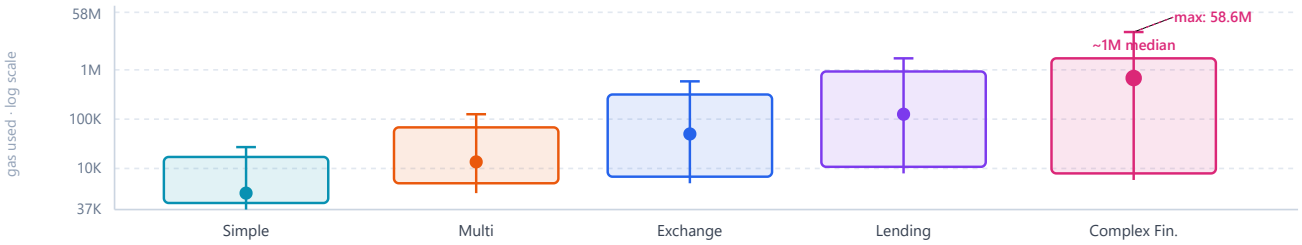


Key insight: PYUSD is dominated by Simple Transfers (93%) — far more than USDC or USDT. A retail payment instrument, not a DeFi primitive.

4. Computational Complexity (Gas Usage)

Gas is the protocol-determined cost of computation — identical across all contracts for equivalent operations. It is the standardized, implementation-agnostic measure of how much work a transaction performs.

FIGURE 3: GAS CONSUMPTION BY ACTION CATEGORY (HIGHER = MORE COMPLEX)



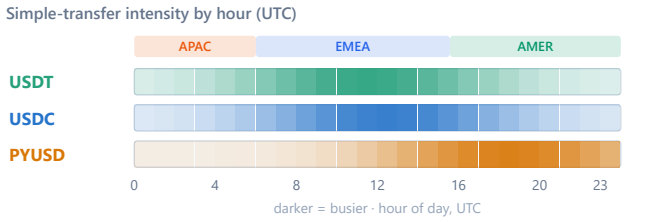
5. Urgency — Priority Fee Signals

The priority fee (per-gas tip to validators) measures *willingness to pay for faster block inclusion* — a proxy for time-sensitivity. Exchange transactions show the strongest urgency premium.

ACTION CATEGORY	PRIORITY FEE VS. SIMPLE TRANSFER	INTERPRETATION
Exchange	+253% PPML	Arbitrage, liquidation, time-critical DeFi ops
Complex Financial	+212% avg, but typical tx pays less	Small MEV tail lifts mean; most complex tx are patient
Lending	−28%	Non-urgent collateral management
Multi Transfer	−71%	Batch operations, non-time-critical
Other	−10%	Mixed, custom contract interactions

BUSINESS-HOUR ALIGNMENT — DISTINCT USER POPULATIONS

FIGURE 4: SIMPLE TRANSFER ACTIVITY HEATMAP BY STABLECOIN (UTC, WEEKDAYS)



Time-zone regression · Simple Transfers

change vs EMEA weekday baseline

	USDT	USDC	PYUSD
AMER hours	−12.5%	−3.8%	**+109.6% ★**
APAC hours	−26.8%	−33.5%	+29.3%
Weekend	−18.4%	−24.7%	−9.4%

Key finding: PYUSD is a payment instrument, not DeFi

PYUSD Simple Transfers are overwhelmingly AMER-based payment activity — **+109.6%** in AMER hours vs the EMEA weekday baseline.

That tilt collapses to +10–24% in non-payment action categories. PYUSD behaves like a payment instrument, not DeFi infrastructure.

★ Weekend effect is only −9.4% — far weaker than USDT (−18%) or USDC (−25%), consistent with consumer payments.

STABLECOIN PROFILES — NOT INTERCHANGEABLE

DIMENSION	USDT	USDC	PYUSD
Market Role	Largest by cap. Offshore-issued, oldest large-scale implementation. Dominant in cross-border and DeFi primitive use.	Regulated U.S.-based (Circle). Preferred institutional choice. Deeply integrated with Coinbase ecosystem and Aave.	PayPal's entry into blockchain settlement. Licensed U.S. money transmitter. Emergent; much smaller volume.
Transaction Complexity	~71% Simple Transfers; significant Exchange and multi-transfer activity	~63% Simple Transfers; more Exchange + DeFi integration than USDT	~93% Simple Transfers. Minimal DeFi integration. Overwhelmingly a retail payment token.
Top Protocols	Uniswap V3, MayanSwift (bridging), Circle CCTP, 1inch, Fluid	Aave V3, Coinbase ecosystem, Uniswap V3, Circle CCTP	Curve (PYUSD pools), CoW Protocol, Sky MCD, LayerZero
Business Hours	Strong EMEA concentration (−12.5% AMER vs EMEA)	Mild EMEA tilt (−3.8% AMER); most balanced of three	Strong AMER concentration (+109.6% AMER vs EMEA)
Weekend Effect	−18% on weekends	−25% on weekends	−9% on weekends (weakest — payment use is more continuous)
Urgency Profile	USDT ≈ USDC in typical priority fee; exchange transactions dominate high-urgency tail	Similar to USDT. Strong institutional/exchange-driven urgency profile.	Higher average priority fee than USDC, but driven by a few high-tip transactions; typical payment transaction is lower-urgency than USDC.
Co-Usage Pattern	WETH strong co-usage (DeFi primitive). USDC second. BTC wrapper third.	WETH strongest (~20% of all USDC transactions). USDC/USDT co-appear frequently.	USDC/USDT appear within PYUSD tx more than reverse. Low integration in broader token network. PYUSD is a peripheral asset in DeFi.

IMPLICATIONS

🎯 For Empirical Researchers

- Transfer-level data is not a neutral unit of observation — it is a substantive assumption
- Every transfer event has ~60% chance of being a leg inside a complex transaction, not a standalone payment
- Transfer counts overstate payment volumes; concentration metrics are distorted; velocity is systematically biased
- The framework here (event signatures + factory contract membership) is transparent and reproducible — no proprietary tagging required

🏛️ For Policy / Regulators

- **PFMI alignment:** Many complex stablecoin transactions are structurally equivalent to *wholesale money settlement* — triggering Principle 9 requirements under the CPMI-IOSCO framework
- **Cross-jurisdictional:** USDT/USDC EMEA concentration vs. PYUSD AMER concentration underscores need for international data-sharing among supervisors
- **Activity-based regulation:** The action-set taxonomy (Simple vs. Exchange vs. Lending vs. Complex) provides an empirical basis for differentiating regulation by transaction type
- **Supervisory tools:** Complexity metrics (event log count, gas, priority fees) are transparent, on-chain-verifiable inputs well-suited for inclusion in supervisory monitoring toolkits

💼 For Financial Institutions

- Stablecoins are not digital cash analogues — they are *programmable financial platform infrastructure*
- USDT and USDC serve as settlement assets for DeFi protocols (AMMs, lending markets, bridges) — a fundamentally different use case from consumer payments
- PYUSD is positioned as a regulated PayPal-linked payment rail — more comparable to a digital wallet than a DeFi primitive
- Stablecoin issuer selection materially affects transaction cost, complexity exposure, and regulatory status

🔬 Limitations & Future Work

- Analysis restricted to Ethereum mainnet, single calendar year (2025)
- Off-chain arrangements (custodial netting, settlement batching) can blur on-chain interpretation
- Natural extensions: multi-chain coverage, temporal granularity, ground-truth audits, geolocation mapping, regulatory shock analysis

FIVE KEY TAKEAWAYS

1. The 60% Misclassification Problem: Nearly 6 in 10 stablecoin transfer events occur within complex, atomically bundled transactions — not as standalone payments. Treating transfers as payments is not a neutral modeling choice; it is a systematic distortion.

2. Stablecoins Are Not Interchangeable: USDT, USDC, and PYUSD occupy distinct functional niches. USDC/USDT are DeFi primitives deeply embedded in smart contract financial infrastructure. PYUSD is a regulated retail payment instrument concentrated in American business hours.

3. The DeFi Integration Gradient: USDC shows the deepest embedding in smart contract protocols (Aave, Uniswap, Circle CCTP). USDT is similarly complex but slightly more retail-oriented. PYUSD barely registers in DeFi token networks — 93% of its transactions are simple single-transfer payments.

4. Business Hours Reveal User Populations: PYUSD activity peaks during American business hours with minimal weekend effect — reflecting PayPal's consumer payment user base. USDT/USDC are concentrated during European business hours with pronounced weekend drops — reflecting international DeFi and institutional activity.

5. Urgency Is a Policy Signal: Exchange transactions command +253% priority fee premium over simple transfers, reflecting arbitrage and liquidation activity. This time-sensitive DeFi activity is directly relevant to PFMI Principle 9 considerations around settlement asset quality and systemic risk.

Source: Schär, Kosse, Rice, Shirakami & Siridhasanakul, "The Anatomy of Stablecoin Transactions," BIS Working Paper No. 1359, Monetary and Economic Department, Bank for International Settlements, June 2026.