Iran Digital Asset Liquidity and Execution Report

Pilot Study | Edition 01

Displayed liquidity, depth boundaries and indicative execution costs across three Iranian digital asset trading venues.

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Study at a glance

Design	Observed scope
Observation date	24 October 2026
Window UTC	10:02:08.999 to 10:32:10.200
Sampling	31 rounds at 60-second spacing; 279 valid books
Venues	Nobitex, Tabdeal and Exir
Pairs	USDT/IRT, BTC/USDT and BTC/IRT

A quoted spread, the depth visible near the midpoint and the cost of a specified order measure different aspects of liquidity. This pilot reports each with its observation limits. The primary comparison uses the nearest ten price levels on each side; all returned levels provide a sensitivity view of the same books.

Scope and evidence

Prepared 25 October 2026. This independent 30-minute pilot describes selected public order books in one observation window. No employer sponsorship, venue endorsement or external peer review is implied. Raw responses and downloadable observation-level datasets are not part of this publication.

Reader guide: executive findings on page 2; collection and definitions on pages 4-5; six exhibits on pages 6-11; interpretation and disclosures on page 13; references and evidence map on pages 14-15.

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RESEARCH NOTE

Executive summary

The defensible result is a measurement distinction with practical consequences: the best quoted price, the quantity visible near that price, and the cost of a specified base-size order answer different questions. All three must be reported with the depth cap and timing evidence.

Observed fact	Result	Evidence
Valid collection	279/279 venue-market books	C01
Both 25-bps boundaries covered	124/279 top-10 books	C02
One-BTC sweep coverage	62/372 buy/sell scenarios	C03

Key findings

First, common level counts do not create common band coverage. In 155/279 primary books, at least one 25-bps boundary lay beyond the returned nearest ten levels. Their depth sums are observed lower bounds, not estimates of complete liquidity. Band-specific imbalance is therefore withheld when either boundary is unobserved.

Second, endpoint caps matter to a size-based conclusion. For Nobitex USDT/IRT, the median quoted spread was 1.12 bps, while a 10,000-USDT sell was fully covered in 15/31 primary snapshots and 30/31 all-returned snapshots. These are alternative views of the same books, not independent observations or evidence of a change in venue quality. [C04]

Third, cross-venue midpoint differences are observable, but originating book-event synchronization is unverified. Receive-time matching narrows one timing problem without eliminating caching, source-clock or update-time ambiguity. Dispersion cannot be treated as a net trade opportunity.

Confidence and decision use

Arithmetic and traceability were checked against the retained responses: a separate exact-rational implementation matched 70,130 exported-field and summary comparisons without discrepancies. Eleven calculation tests and nineteen independent synthetic assertion groups also passed. Representativeness is limited. A single 30-minute, one-location convenience sample cannot support typical daily or weekly conditions, persistent venue superiority, causal explanations, fill probability or realized execution quality. No actual orders were submitted.

The next research step is a separately authorized, rights-cleared, multi-day sample with verified timestamp and book-completeness semantics. This pilot supplies the pipeline and a precise extension plan; no continuous collection has been established.

METHODS

Research scope and source selection

The study asks how displayed quotes, near-midpoint depth, bid/ask asymmetry and static order-size costs differed across selected public spot endpoints during the observed window. It also tests how source formats, capped depth and timing uncertainty limit fair comparison. It does not measure hidden liquidity, actual execution or replenishment resilience.

Provider	Repeated sample	Selection and limits
Nobitex	Three pairs	Current documented apiv2 host; ordinary public GET access; IRR fiat units.
Tabdeal	Three pairs	Documented public depth route; limit=100; IRT means toman.
Exir	Three pairs	Documented public v2 book route; IRT means toman; actual caps recorded.
Wallex	Excluded	Broad API robots exclusion left unresolved for this automated research client.
Bitpin	Excluded	Broad API robots exclusion left unresolved for this automated research client.

Eligibility is an access and comparability decision, not a quality ranking. Wallex and Bitpin have documented public API features; excluding them does not imply an outage or poor liquidity. Nobitex documentation states a regional access restriction. Requests used normal connectivity without routing changes or bypasses. Public accessibility does not establish a redistribution license. [P1-P5]

Relation to existing research

Angerer, Gramlich and Hanke [R1] provide a crypto order-book precedent for separating spread, deeper liquidity and imbalance. This study uses fixed base-size sweeps rather than treating top-level VWAP spreads as fixed-size execution. Bouveret and coauthors [R2] motivate explicit size and insufficient-depth reporting. ECB and New York Fed work [R3-R4] distinguish liquidity dimensions and quoted measures from transaction-based impact estimates.

Makarov and Schoar [R5] motivate attention to segmented cross-venue prices, while ESMA [R6] cautions against treating displayed quantities across venues as guaranteed consolidated liquidity. Their historical international findings are not imported as Iranian evidence. The original contribution here is the collected pilot, its normalized metrics and a transparent account of API-driven censoring and timing limits.

METHODS

Collection and normalization

The primary cohort contains 279 records and 279 valid books from 24 October 2026, 10:02:08.999 to 10:32:10.200 UTC. The locally timestamped protocol was frozen before the first main request. It is a pre-analysis plan, not a public preregistration. An earlier two-source connectivity preflight was excluded before analysis when the current Nobitex host became eligible; it is not pooled into the cohort.

There were 31 scheduled rounds at 60-second spacing, including minute 0 and minute 30. Nine concurrent public GET requests were dispatched per round, three per provider per minute. The collector recorded send and receive times, elapsed latency, status, payload hash, level counts and supplied timestamps. It used no account, authentication key or trading function. Missed observations were neither backfilled nor imputed as zero.

Provider	Valid / records	Levels per side received	Latency range ms
Nobitex	93/93	24-24	52-1,372
Tabdeal	93/93	91-100	172-2,427
Exir	93/93	5-20	436-2,543

Level counts pool sides and the three sampled pairs within each source. They describe returned data, not the total venue book. Exir documentation describes ten levels, while responses can contain more; actual counts are used and disclosed. Tabdeal was requested with a 100-level limit; Nobitex used its documented default route. The primary nearest-ten view controls the level cap but cannot equalize the distance covered in price.

Currency and quantity units

Native Nobitex fiat prices are IRR per base unit, despite the IRT symbol, and are multiplied by exactly 0.1 to produce IRT (toman). Tabdeal and Exir IRT prices are already toman. BTC/USDT prices need no conversion. Quantities remain in USDT or BTC base units; quote depth is the sum of price times base quantity. USDT is a separate quoted asset, not USD. No FX rate, USD proxy or cross-currency total is introduced. [P1-P3]

Validation and missingness

Positive finite prices and quantities, nonempty sides and best bid strictly below best ask are required. Repeated price levels are aggregated and flagged; original sorting changes are logged. Invalid books are quarantined. Economically large spreads and costs are retained rather than winsorized. Transport, validation and timing exclusions have distinct denominators. Source timestamp semantics remain a separate uncertainty, even for an otherwise valid book.

METHODS

Measurement definitions

Quotes and fixed price bands

For best bid b and best ask a, midpoint m = (a + b) / 2. Quoted spread is a − b in quote units. Relative quoted spread is 10,000 × (a − b) / m, in basis points. All arithmetic uses 40-digit decimal precision from API decimal strings or tokens, without binary floating-point parsing of book prices.

For each band h = 10, 25, 50 or 100 bps / 10,000, sum bids at prices at least m × (1 − h), and asks at prices at most m × (1 + h). Report base quantity and quote value separately by side. The anchor includes the spread: a narrow band can validly contain zero depth when the best quote is outside it.

A bid band is marked covered only when the last returned bid reaches or passes the lower boundary; an ask band requires the analogous upper boundary. This assumes complete aggregated quantities at returned, contiguous price levels. A short response is not assumed to be a complete book. Otherwise the observed band sum is a lower bound. Base-depth imbalance is (bid depth − ask depth) / (bid depth + ask depth), only when both boundaries are covered and their sum is positive. Positive imbalance is not a price forecast.

Fixed base-size sweeps

The prespecified USDT grid is 100, 1,000, 10,000 and 50,000 USDT; the BTC grid is 0.001, 0.01, 0.1 and 1 BTC. A buy consumes asks from lowest upward; a sell consumes bids from highest downward. The final level may be partially consumed. Full-order VWAP = sum(price × filled base) / target base, only when the entire target is covered.

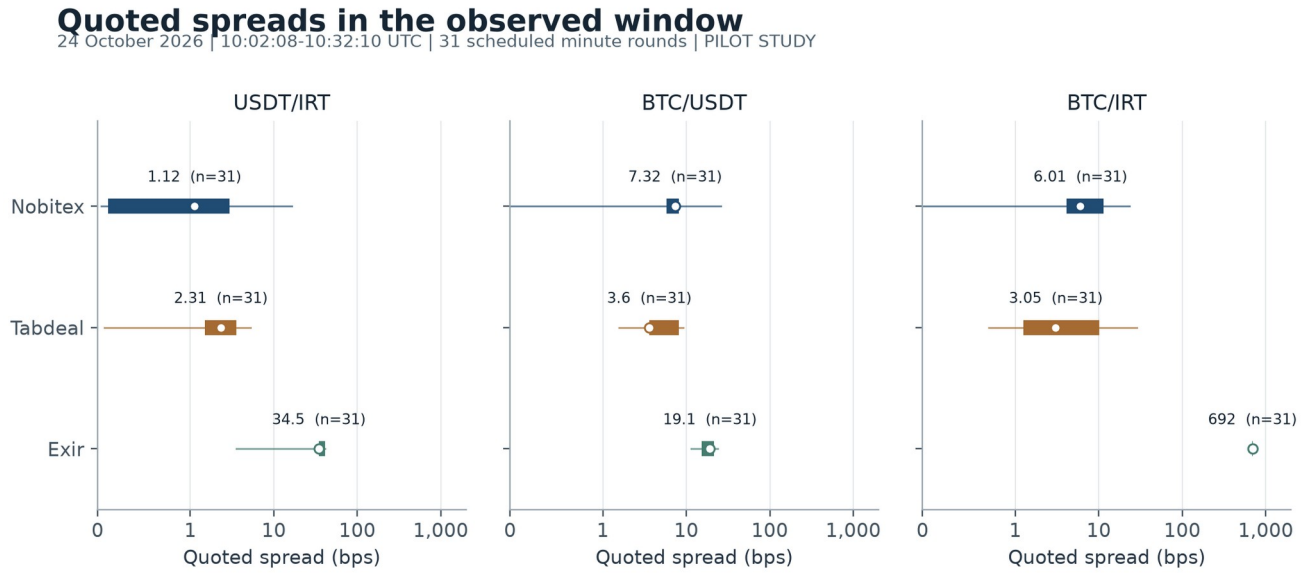
Indicative buy cost = 10,000 × (VWAP / m − 1); indicative sell cost = 10,000 × (1 − VWAP / m). Separate book-walk costs use the best ask or bid denominator. These components do not add exactly across different denominators. Insufficient sweeps retain filled quantity and coverage fraction, while full-order VWAP and cost are blank. No liquidity beyond returned levels is extrapolated.

Timing and descriptive statistics

A three-venue pair-round comparison requires all valid books, each request latency at most ten seconds, and receipt span at most five seconds. Dispersion = 10,000 × (maximum midpoint − minimum midpoint) / mean midpoint. A one-second receipt-span sensitivity is also shown. These rules do not establish event simultaneity. Medians and interquartile ranges use sorted linear interpolation at positions (n − 1) × p. Observations are serially dependent; no significance test, confidence interval or causal estimate is presented.

FINDINGS

Quoted spreads in the pilot window



Dots: medians; thick segments: IQR; thin segments: full observed range. All panels use the same symlog scale: linear from 0 to 1 bps, logarithmic above 1 bps. Spread = 10,000 × (ask − bid) / midpoint. No persistent ranking.

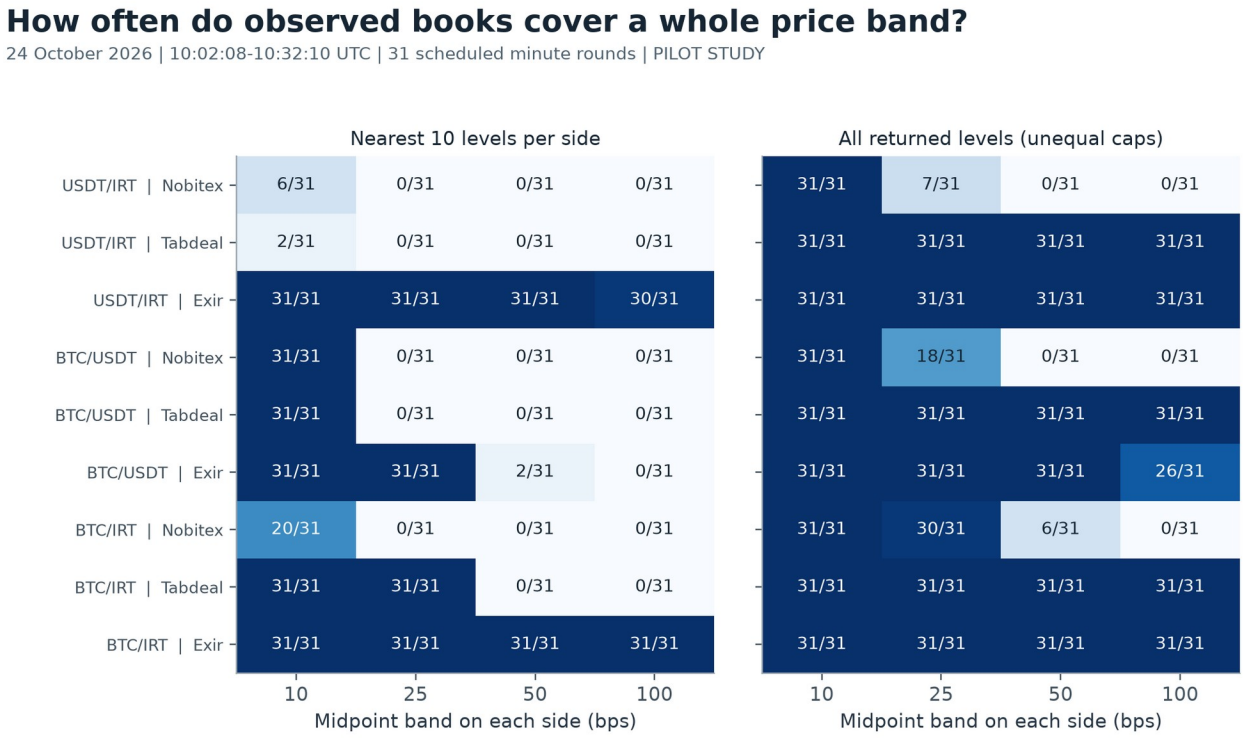
Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

Pair	Provider	n	Median bps	IQR bps
USDT/IRT	Nobitex	31	1.12	0.11-2.92
USDT/IRT	Tabdeal	31	2.31	1.49-3.56
USDT/IRT	Exir	31	34.55	34.36-40.77
BTC/USDT	Nobitex	31	7.32	5.84-8.19
BTC/USDT	Tabdeal	31	3.60	3.60-8.08
BTC/USDT	Exir	31	19.13	15.32-21.57
BTC/IRT	Nobitex	31	6.01	4.12-11.42
BTC/IRT	Tabdeal	31	3.05	1.26-10.17
BTC/IRT	Exir	31	691.89	683.84-696.55

Exhibit 1 uses identical symlog spread scales: linear from zero to one bps, logarithmic above one bps. The full observed ranges, including near-zero positive spreads, are shown. The table rounds to two decimals; unrounded values remain in the data. Medians summarize dependent minute observations. Differences are not attributed to a cause and do not rank service, access, solvency or realized execution quality.

FINDINGS

Depth boundaries and liquidity asymmetry



Cells: snapshots where both returned sides reach the band boundary / valid snapshots. Color: percentage (0-100%).
Coverage assumes complete quantity at returned price levels. A short response is not assumed to be a complete book.
Uncovered band depth is an observed lower bound. Top-10 and native views use the same snapshots.

Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

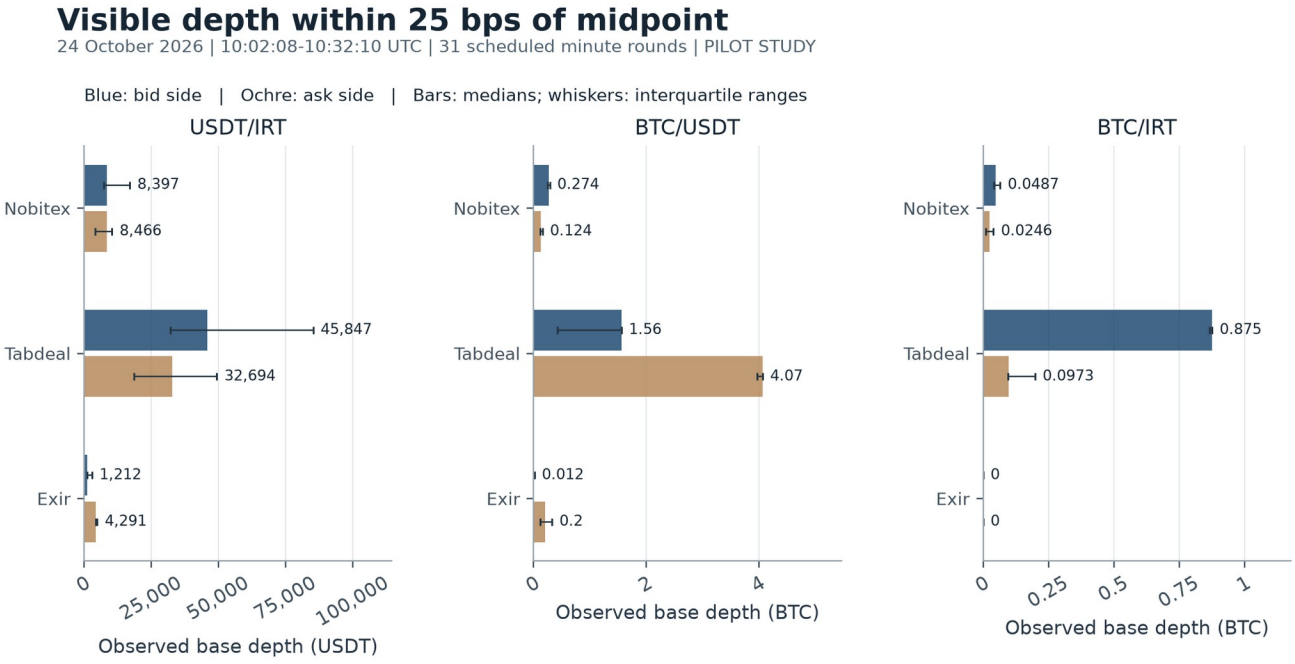
Exhibit 2 reports exact both-side boundary-coverage counts rather than assuming a level cap is a fixed price band. In the primary 25-bps view, 124/279 books covered both boundaries. Where either boundary is unobserved, depth is still recorded as a visible lower bound, but band-specific imbalance is unavailable. [C02]

At 25 bps, 93 primary books permit a nonzero-denominator imbalance calculation. All remaining books are unavailable for that statistic because of boundary censoring or a zero total. Large spreads can produce fully covered bands with zero displayed quantity; coverage alone does not imply substantial liquidity.

All-returned results are a sensitivity analysis of the same observations, with different native caps. More reported levels can improve band coverage without indicating that the underlying venue changed. The package retains side-specific coverage so a bid-complete, ask-censored book is not reduced to an unexplained aggregate score.

FINDINGS

Observed near-midpoint depth



Nearest 10 levels per side; base units; pair-specific scales; n=31 per venue-pair.
Values include band-censored lower bounds, not complete venue depth. A zero may reflect a spread wider than the band, rather than an empty book. No USDT/USD conversion or cross-asset aggregation.

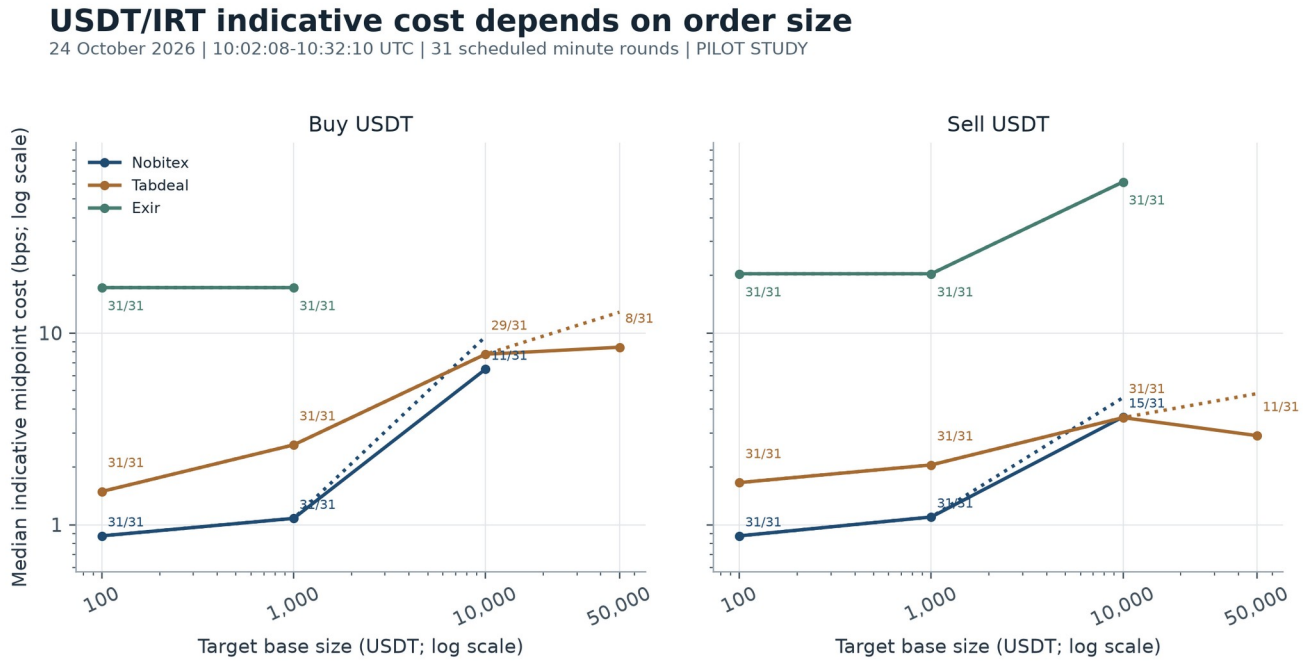
Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

Pair	Provider	Bid base median	Ask base median	Both covered
USDT/IRT	Nobitex	8,396.5200	8,465.5700	0/31
USDT/IRT	Tabdeal	45,846.9106	32,694.3907	0/31
USDT/IRT	Exir	1,212.5000	4,291.0500	31/31
BTC/USDT	Nobitex	0.2740	0.1237	0/31
BTC/USDT	Tabdeal	1.5593	4.0683	0/31
BTC/USDT	Exir	0.0120	0.2000	31/31
BTC/IRT	Nobitex	0.0487	0.0246	0/31
BTC/IRT	Tabdeal	0.8751	0.0973	31/31
BTC/IRT	Exir	0.0000	0.0000	31/31

Exhibit 3 and the table show observed depth within 25 bps in the nearest-ten view, including lower bounds for uncovered bands. Units are USDT base for USDT/IRT and BTC base for both BTC pairs; the panels have separate quantity scales. Bid and ask asymmetry describes displayed quantity in this window, without predicting the next price move or implying that a static book will persist.

FINDINGS

USDT indicative execution cost



Solid: nearest 10 levels; dotted: all returned levels. Labels: sufficient / eligible snapshots for solid points. Both axes use log scales. Medians condition on sufficient depth; gaps mean no full sweep; native caps differ. Fees, latency, cancellation, settlement and actual fills are excluded. Lines join fixed-size scenarios, not time.

Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

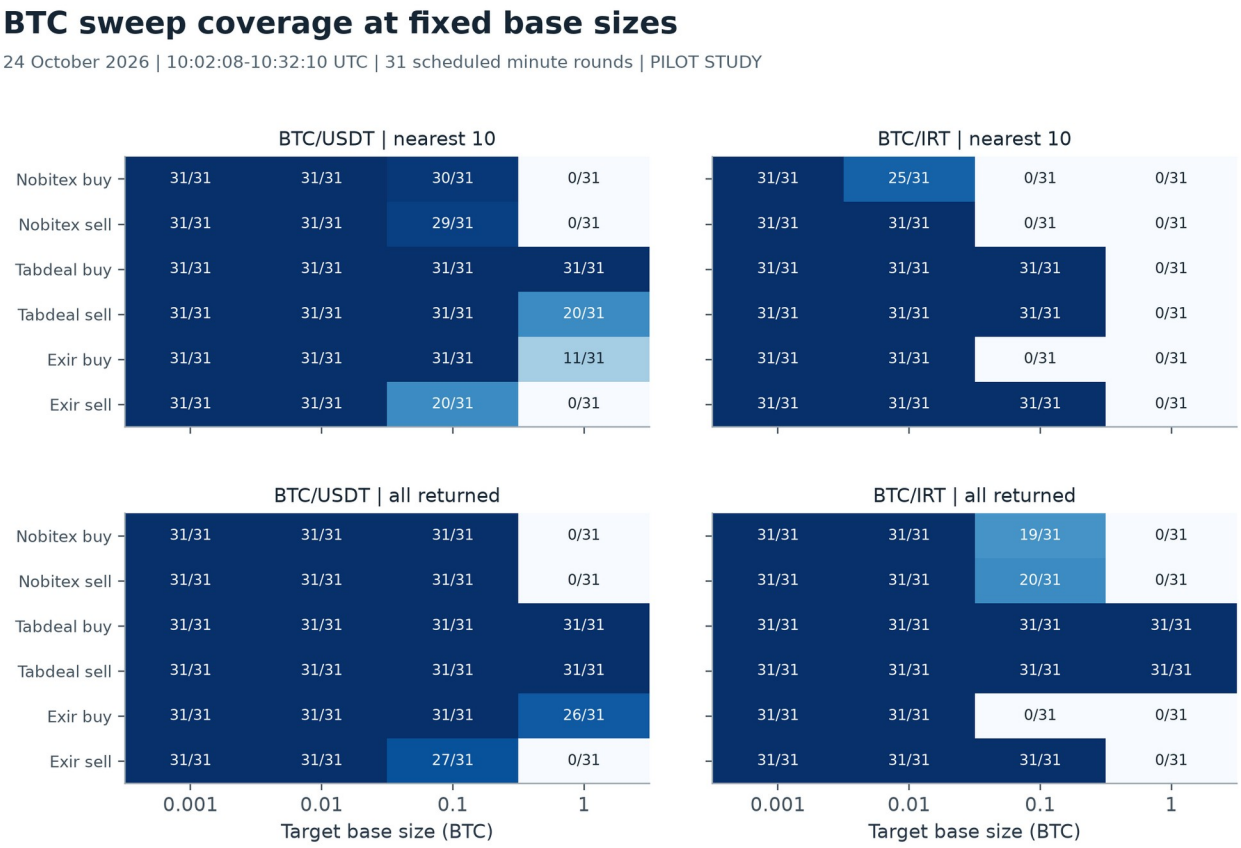
Provider	Direction	10,000 USDT covered	Median cost bps
Nobitex	buy	11/31	6.48
Nobitex	sell	15/31	3.65
Tabdeal	buy	29/31	7.75
Tabdeal	sell	31/31	3.62
Exir	buy	0/31	Insufficient
Exir	sell	31/31	61.45

Exhibit 4 uses logarithmic size and cost axes. Every cost median conditions on enough observed depth for the full target. Different sizes or views can therefore have different eligible subsets; their median line is not a single-book supply curve. Missing full-order estimates are not zero cost. The largest size is retained even when insufficient, avoiding selective presentation of only easily filled scenarios.

These are static pre-fee counterfactuals against a received book. A market order could encounter changes before arrival, cancellations, hidden liquidity, account limits and different fees. The study estimates none of those effects and makes no realized execution or price-impact claim.

FINDINGS

BTC order size and observed coverage



Cells: sufficient / eligible snapshots; color: percentage (0-100%). A fully covered sweep requires enough displayed base quantity on the relevant side. Insufficient observed depth is not a full-book venue liquidity judgment. Primary and native sensitivities use identical snapshots; additional native levels have unequal source caps.

Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

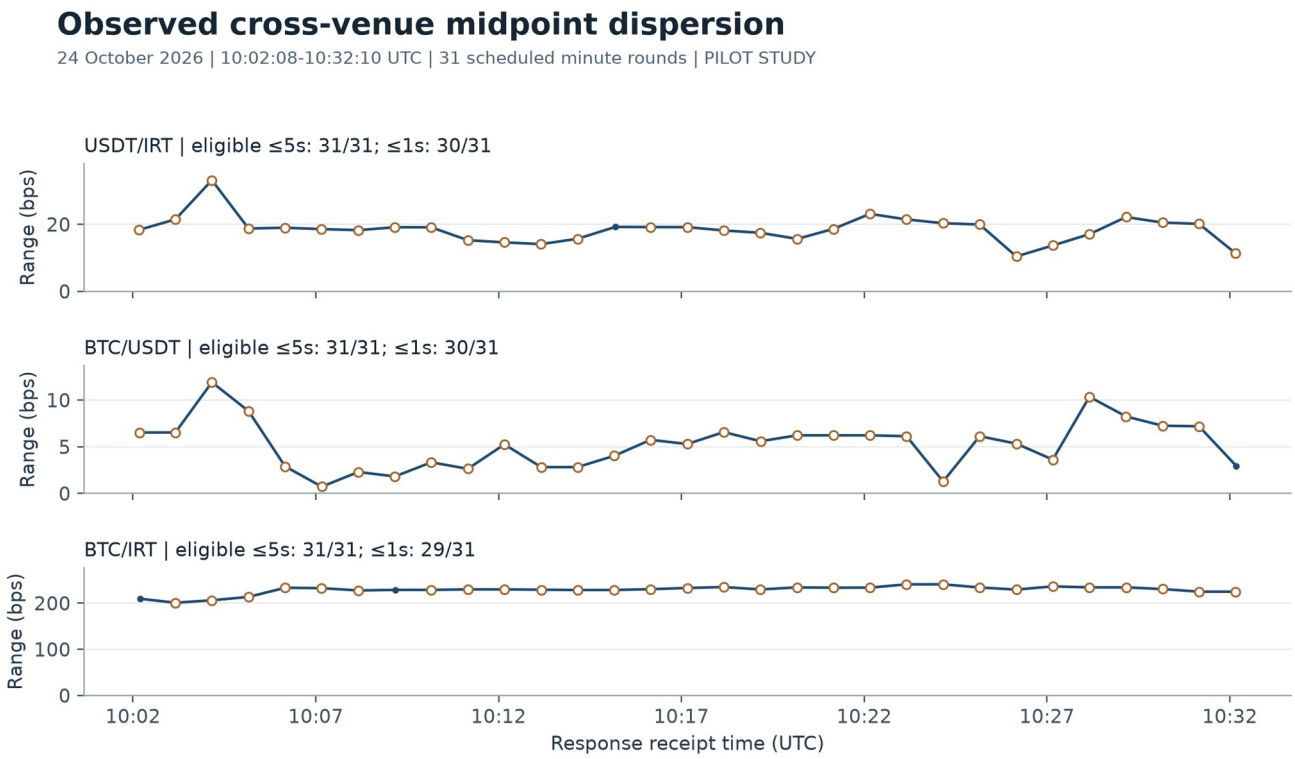
At the one-BTC target, 62/372 primary buy/sell scenarios across the two BTC pairs and three venues were fully covered. The denominator counts two directions on each underlying book; it is not a count of independent books or real trades. Other sizes and all-returned sensitivity counts appear in Exhibit 5 and sweeps.csv. [C03]

A sufficient sweep can coexist with a censored 100-bps band: the target may be fully present before an unobserved band edge. Conversely a fully covered narrow band can contain too little quantity for the target. Sweep sufficiency and band-boundary coverage therefore remain separate flags. No full-book liquidity failure is inferred from an insufficient capped response.

The same BTC base grid is applied across BTC/USDT and BTC/IRT. Quote payments remain in their respective assets. No USD-equivalent notional or cross-pair liquidity score is created; comparing such values would require an additional documented conversion and a different research question.

FINDINGS

Receipt aligned cross venue dispersion



Each point requires all three valid venues, response span ≤5s and individual latency ≤10s. Open rings also satisfy ≤1s.
Range = 10,000 × (maximum midpoint − minimum midpoint) / mean midpoint. Panel scales differ.
Receipt alignment does not synchronize originating book events; dispersion is not an executable arbitrage return.

Source: public Nobitex, Tabdeal and Exir order-book APIs; author calculations.

Pair	n ≤5s	n ≤1s	Median bps ≤5s	Median bps ≤1s
USDT/IRT	31/31	30/31	18.78	18.72
BTC/USDT	31/31	30/31	5.60	5.67
BTC/IRT	31/31	29/31	229.99	230.49

Exhibit 6 compares all three same-pair midpoints only in qualifying rounds; panel scales differ. Its timeline is a description of this window, not an intraday pattern or a persistent price premium. The tighter receipt-span sensitivity can change the sample composition as well as the median. No originating-event-time filter is applied because source timestamp semantics are unverified.

Observed disagreement is consistent with multiple mechanisms, including different quote updates, caching, inventory preferences and segmentation. The pilot cannot distinguish them. It does not observe simultaneous executable prices, fees, transfer ability, prefunding or settlement exposure, and therefore does not identify a realizable arbitrage return. [R5-R6]

RESEARCH NOTE

Market data quality and timing limits

Provider	Pair	Median metadata age s	Unchanged transitions	Valid n
Nobitex	USDT/IRT	0.30	0	31
Nobitex	BTC/USDT	0.40	0	31
Nobitex	BTC/IRT	0.34	0	31
Tabdeal	USDT/IRT	Not supplied	0	31
Tabdeal	BTC/USDT	Not supplied	14	31
Tabdeal	BTC/IRT	Not supplied	2	31
Exir	USDT/IRT	56.82	15	31
Exir	BTC/USDT	3.82	0	31
Exir	BTC/IRT	30.96	8	31

Metadata age is response-receipt time minus the supplied source field, using ISO time for Exir and an inferred Unix-millisecond interpretation for Nobitex lastUpdate. The exact event represented by either field was not established. Tabdeal supplied no source event timestamp. These values are not certified order-book freshness or an outage test. Small negative ages, if present, reflect clock or interpretation uncertainty rather than future market information.

Unchanged transitions count equality of normalized price/quantity arrays with the immediately prior observation for that provider-pair; each group has at most n − 1 comparable transitions. An unchanged book can reflect a quiet book, caching, update policy or another cause. The pilot does not identify which. HTTP Date/Age headers are retained separately and never substituted for exchange book-event time.

Missing data and outliers

279/279 records passed the collector transport check and 279/279 passed book validation. Full HTTP and parsing outcomes are retained in provenance.csv; partial-depth outcomes remain in the dataset. No economic outlier was removed merely for being large. The chart and tables expose spread ranges, response sizes, request latency, timestamp uncertainty and band censoring as separate quality dimensions.

What this sample does not validate

A successful public response does not certify production trading uptime, order acceptance, custody, settlement quality, withdrawal availability or exchange-wide data completeness. The collector was run once from one connectivity context, without geographic bypass. Regional access policies remain binding. Provider comparisons cover only the documented, reachable routes and this sample window.

The independent implementation check is part of the same assisted research workflow. It verifies arithmetic and provenance using separate code; it is not external academic peer review, an audit of the exchanges or employer approval.

RESEARCH NOTE

Operational implications and conclusions

Implications for execution research

Specify instrument, direction, base size, price benchmark and data cap before comparing costs. Retain an insufficient-depth outcome rather than manufacturing a full-order VWAP. Show sufficiency counts beside conditional cost medians. Use band-boundary flags before interpreting depth asymmetry. Preserve original quote units and event-time uncertainty in downstream data pipelines.

Treat displayed depth as revocable information. A desk would also need live order handling, fees, funding, account eligibility, cancellation behavior, venue access and settlement controls before making an execution decision. This report does not recommend a venue, trade or allocation, and does not optimize an executable routing strategy.

Limitations and bias

The 30-minute observation window is short, convenience-selected and serially dependent. Three accessible providers are not the entire Iranian market; the conservative robots-based exclusions may affect the observed sample. One-minute REST snapshots miss events and replenishment between observations. One collection location cannot establish other users' access. Unequal native caps, unknown completeness guarantees and unverified update semantics limit both depth and dispersion interpretation.

Fees, private liquidity, actual orders and transactions, hidden or conditional liquidity, access limits, custody and settlement risks are absent. There is no benchmark of normal market conditions or event classification for this window. No causal or representative longitudinal claim follows from descriptive differences. Exact external historical recomputation is constrained because the retained raw responses are not publicly distributed.

Conclusion and full edition requirements

The pilot establishes a traceable measurement workflow and shows why quoted spread, displayed band depth and fixed-size book costs require separate evidence. Its empirical conclusions are limited to the sampled endpoints and times. A full edition should first clear public reuse, confirm timestamp and completeness semantics, then collect a reviewed multi-day panel spanning varied times. The supplied seven-day extension plan is a proposal, not an active collector or proof of future access.

Research disclosure

Seyed Iman Hosseini is Market Making & Dealing Desk Lead at Blu Caps and previously worked at Wallex, as disclosed by the author. These affiliations may be relevant to potential conflicts. This personal, independent study implies no sponsorship or endorsement by either employer or any sampled venue. No confidential employer, customer, account or execution data were used. AI assistance supported collection, analysis, editorial production and validation. Separate-code checks are part of the same assisted workflow, not external peer review. The publication provides original analysis; it does not confer a license to redistribute provider data.

RESEARCH NOTE

Research references

References were checked against primary institutional or publisher material on 24 October 2026. They motivate definitions and limitations; their empirical results are not substituted for this study’s observations.

[R1] Angerer M, Gramlich M, Hanke M (2025). Order Book Liquidity on Crypto Exchanges. Journal of Risk and Financial Management 18(3),124.

Primary source: doi.org

[R2] Bouveret A, Haferkorn M, Marseglia G, Panzarino O (2022). Flash crashes on sovereign bond markets - EU evidence. Banca d’Italia, Markets, Infrastructures, Payment Systems, Research Paper 20.

Primary source: www.bancaditalia.it

[R3] Jurkšas L, Kapp D, Nyholm K, Von Landesberger J (2018). Euro area sovereign bond market liquidity since the start of the PSPP. ECB Economic Bulletin 2, Box 2.

Primary source: www.ecb.europa.eu

[R4] Fleming MJ (2003). Measuring Treasury Market Liquidity. Federal Reserve Bank of New York, Economic Policy Review 9(3), 83-108.

Primary source: www.newyorkfed.org

[R5] Makarov I, Schoar A (2020). Trading and arbitrage in cryptocurrency markets. Journal of Financial Economics 135(2), 293-319.

Primary source: doi.org

[R6] ESMA (2016). Order duplication and liquidity measurement in EU equity markets. Economic Report 1/2016, reference 2016/907.

Primary source: www.esma.europa.eu

RESEARCH NOTE

Methodology appendix and evidence map

Reproducibility package

The private archive file data/snapshots.csv contains quote and total visible-depth metrics for both measurement views. data/band_depth.csv records band sums, side coverage and eligible imbalance. data/sweeps.csv records every prespecified direction and size, including insufficient targets. data/dispersion.csv retains three-venue receipt matching. data/provenance.csv links each observation to endpoint, units, timestamps, status and response hash. summary.json supplies unrounded group statistics.

The private archive file methodology/claim-ledger.csv maps headline claims and spread/dispersion tables to exact dataset filters. Figure definitions, captions and accessible descriptions are in figures/figure-catalog.json. source_inventory.csv, evidence-log.csv and the provider references identify public documentation and access evidence. The log covers the documented source-review requests; it is not represented as a complete log of every preliminary connectivity check.

Execution of the analysis

code/collect.py is a bounded public-data collector, not an ongoing service. code/analyze.py reads retained raw bytes using exact-decimal calculations and verifies SHA256 hashes. code/independent_validate.py uses exact rational arithmetic without importing that analysis implementation. Synthetic fixtures exercise partial final levels, insufficiency, sorting, duplicate aggregation, invalid books, band edges and currency conversion. The internal reproducibility record preserves the commands and environment requirements. The collector has not been established as an ongoing service.

Raw responses, normalized book-level arrays and observation-level datasets remain in a private evidence archive. Aggregate tables and original figures are presented here, including the receipt-aligned derived time series. They cannot independently reconstruct every underlying book-level calculation. The retained source bytes support the documented internal validation. This is not a fully open historical dataset; a fresh collection would produce a different sample.

Provider references

[P1] Nobitex market-data and spot-trade OpenAPI schemas: apidocs.nobitex.ir/openapi/market_data.yaml and /openapi/spot_trade.yaml. [P2] Tabdeal public REST documentation: docs.tabdeal.org. [P3] Exir API documentation: apidocs.exir.io; API overview: www.exir.io/api. [P4] Wallex: api-docs.wallex.ir. [P5] Bitpin: docs.bitpin.ir/v1/docs/market-data/orderbook. Provider access, unit and timing qualifications are described in this report and on the research landing page.

Publication and reproduction scope

This edition presents the English report, Persian executive summary, six original statistical exhibits and measurement definitions. The research does not grant an open-data license for source responses or provide a venue data feed. Attribution identifies data sources without implying their sponsorship, approval or endorsement. Future sampling is a separate proposed study and has not been scheduled.