Exchange Benchmark Report

Q3 2019: November

CryptoCompare Research
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Contents

Executive Summary

Mission Statement

Our first Exchange Benchmark, released in June 2019, came at a time when industry participants were increasingly concerned that existing metrics for evaluating exchanges were inadequate, **trading volumes** and **liquidity metrics alone** were **insufficient** as criteria, that due diligence was lacking and that there was **no established framework for assessing risk.**

Our **updated Exchange Benchmark** builds upon the first iteration to offer a more comprehensive data set, covering over 160 exchanges, and includes several new categories, more currency pairs and a refinement of existing categories to ensure market participants can most accurately evaluate exchanges.

We are committed to providing the **highest level of insight** into a typically opaque and abstruse marketplace. To do so, our approach combines expert data collection and analysis with **clearly stated methodologies and practices**.

We believe that **'fake volume analysis' and liquidity metrics must be preceded by considered due diligence** on exchanges.

We adopt an innovative ranking methodology that utilises a combination of **qualitative** (due diligence) and **quantitative** (market quality based on order book and trades) metrics, **without using volume directly** in the ranking. We assign a grade to each exchange which will help **identify the highest quality, lowest risk and most reliable exchanges in the industry.**

CryptoCompare's Exchange Benchmark is backed by thousands of research hours and covers 64 qualitative and quantitative metrics.

Why Is Volume Misleading?

When a market participant enters a trading venue, their concerns might be:

- Can I trust the data reported by this exchange?
- Is there potential market manipulation on this exchange?
- Are my funds secure and insured?
- Does the exchange have a good API?

Choosing the best exchange therefore should not be based on the trading volume but the quality and trust in the services of the exchange.

Volumes and liquidity can be easily manipulated, and any untrusted exchange can provide data. There are many ways an exchange can incentivise trading activity including trading competitions, airdrops and trans-fee mining. Therefore, to produce a more representative assessment of exchange quality, a host of other factors has to be evaluated. This is why our benchmark includes 8 categories comprising 64 metrics.
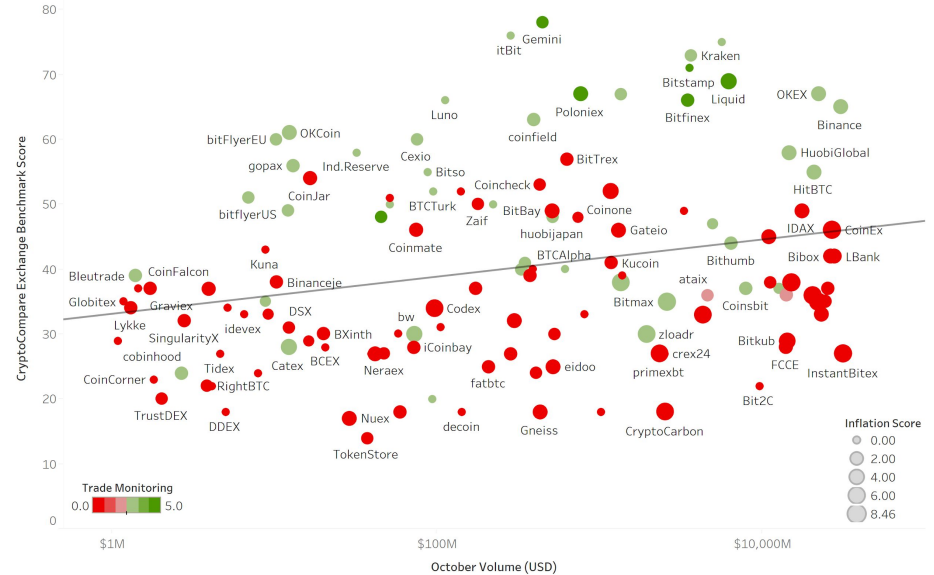
The chart shows exchange volume (x axis) against benchmark score (y axis). The size of an exchange's bubble indicates their inflation score* (which incorporates trading competitions, airdrops, transaction-fee mining, zero transaction fees and margin trading), while the colour denotes their Trade Monitoring score.

*See Methodology here

Who is this for?

- **Exchanges** looking to conduct more thorough competitor analysis, understand industry trends and areas for competitive parity.
- **Funds** looking to assess counterparty risk and opportunities in digital asset markets.
- **Investors and Traders** who want to identify the best venues for their risk appetite.
- **Exchange service providers** such as insurers, custodians and compliance services who want to gain a better understanding of the industry and identify potential customers.
- **Regulators** who are looking to develop policy, or better understand the global digital asset landscape.

The methodology and rankings themselves are free and transparent and serve as a tool for market participants to choose the best exchanges and as a way to combat fake volume. The underlying data and custom research is also available to those looking to gain deeper insights.

Q3 2019: How the Exchange Landscape is Evolving

Since we released our first Exchange Benchmark in June 2019, the cryptoasset exchange landscape has continued to evolve rapidly. In addition to a host of new exchanges entering the market, existing exchanges have expanded their suite of products, trading pairs, infrastructure and geographical scope.

Since June, however, it is far from clear that the market dynamics that prompted these concerns have substantially improved.

While top-tier exchanges have improved in several dimensions, the volumes flowing through lower tier exchanges have in fact grown - underscoring the need for a broader, more nuanced set of metrics that can be used by market participants.

Our updated Exchange Benchmark, in addition to covering **160+ spot exchanges** - up from 100 in June - now incorporates several new categories, trading pairs and important expansions and refinements to existing categories, across 64 metrics.

Q3 2019: How the Exchange Landscape is Evolving

Low-tier Exchange Volume Grows

Despite greater industry awareness of the need for greater clarity surrounding exchange quality, volume from low-tier exchanges rather than shrink in Q3, has in fact grown. Top-tier exchanges (grades AA-B) account for 33% of global volumes while lower-tier exchanges (grades C-E) account for 67% of global volumes, up from 32% and 68% respectively in June.

Security Requirements Ramping Up

In Q3, 4% of all exchanges had a formally approved cybersecurity certification. In the current benchmark this figure has increased to 6% for over 160 exchanges. Binance, for example, obtained ISO 27001 accreditation in Q3.

But There Remains Room for Improvement

Almost 10% of exchanges, however, scored below an A grade in SSL (Secure Sockets Layer) rating from Qualys or Immuniweb for at least one IP address tested. This indicates a prominent security flaw in their current browser security protocols. Exchanges in this bracket trade more than 10.36 Bn USD in monthly volume, or almost 2% of total volume globally.

Q3 2019: How the Exchange Landscape is Evolving

Vast Majority of Exchanges still not Using Custody Providers or Insurance

Despite cryptoasset hacks continuing to plague the industry and a proliferation of high-profile custody providers entering the market, only **8% of exchanges use a custody provide**r to store user assets, while **only 4% of exchanges** offer **third-party insurance** in the event of a hack.

Margin Trading Growing

Exchanges that offer margin trading now represent **62% of total volume** vs 52% in June, again underscoring how exchanges are diversifying their product offerings.

Institutional-Grade Infrastructure Still Has Room to Grow

Despite narratives in crypto media and research emphasising the increasing institutionalisation of the industry, **only 7% of exchanges offer superior infrastructure** via a **FIX connection**, perhaps indicating that there is room to grow before institutions move into the sector in earnest.

Key Methodology Changes Since Q2

Key Changes to our Methodology

1. New security category. Exchanges are key targets for cyber security attacks. They deal with sensitive user data and private keys, which exchanges must ensure are adequately protected. Although security is one area where less transparency can mean more safety, we have curated a series of high level metrics that we believe help to highlight exchanges that have paid particularly close attention to platform and user security. These include: whether an exchange has formally obtained an ISO27001 or SOC2 certificate, whether they have been hacked in the last year, and if their browser security protocols are up to date. For a full overview please see our Security Methodology here.

2. More key management positions, more weight given to experience. Two additional key positions: CCO (chief compliance officer) and CISO (chief information security officer). These are important functions which we feel reflect considerably upon an exchange's quality. For all management team member scores, less weight is given to advanced degree holders, and more weight is awarded for experience.

3. Geography. Our ratings have now reduced the grading effects of geography on exchanges within higher quality jurisdictions. We now emphasise the country risk of exchanges that situate themselves in jurisdictions with lower regulatory standards. Because geography and regulation are closely linked, we have chosen to integrate our geography rating into our legal/regulatory rating.

4. Insurance. We divided insurance into three main categories: fiat, crypto, and self-insured. Points are allocated to exchanges that have formal policies for the protection of fiat in case an **exchange** is compromised (FDIC insurance does not receive points), formal crypto insurance via an insurer or indirectly via a custody provider, or whether an exchange has publicly reserved a pool of funds for "self-insurance" purposes in the case of a breach.

Key Changes to our Methodology

5. On-Chain Transaction Monitoring. We now take into account whether the exchange monitors on-chain transactions in order to better comply with AML regulations. We take into account whether the exchange has stated they conduct this internally or via an external provider. Please see our methodology on how this is scored here.

6. An Extension to Data Provision Ratings. We have extended our data provision ratings category to now include the maximum order book level offered (L1, L2, L3), whether the exchange provides historical candlestick data, the minimum granularity of candlestick data offered, and whether the exchange offers a FIX connection.

7. Negative Reports. In contrast to the previous report, we now take into account whether there have been any negative reports such as flash crashes, wash trading allegations, other legal headlines or breaches in data privacy.

8. Wider Range of Markets. Our last benchmark report took into account the major markets by volume. In this iteration, we have extended the list to include additional crypto to fiat markets that allow us to more fairly judge top exchanges based in jurisdictions that trade more niche currency pairs.

Ranking Methodology Overview

Methodology Overview - Scope

Scope and Objectives. CryptoCompare's updated exchange ranking methodology now utilises a combination of **64 qualitative and quantitative metrics** to assign a grade to **over 160 active spot exchanges**. Each metric is converted into a series of points based on clearly defined criteria. Metrics were categorised into several buckets and distributed fairly to arrive at a final robust score, ensuring that no one metric overly influences the overall exchange ranking. Each exchange grade is derived from a broad due diligence check using qualitative data, followed by a market quality analysis that uses a combination of order book and transactional data.

Due Diligence Check. Our due diligence check comprises seven main categories that attempt to rate each exchange on the basis of legal/regulatory metrics, security, calibre of investment, team/company quality, quality of data provision, any recent negative reports, and trade surveillance.

Market Quality. We measure the market quality of each exchange using a combination of 5 metrics (derived from trade and order book data) that aim to measure the cost to trade, liquidity, market stability, behaviour towards sentiment, and "natural" trading behaviour. Exchanges were rated based on a combination of 9 of the most liquid BTC and ETH markets. Points were distributed using a rating system that compares each exchange with its peers for each metric, on each applicable market. We then arrive at an overall ranking that is robust across several markets for each exchange.

Grading. A grading system was implemented to assign each exchange a grade (AA, A, B, C, D, E, F) based on its total cumulative score out of 100.

For further information on our methodologies, please contact research@cryptocompare.com

Methodology Overview - Data Collection

Due Diligence	Market Quality (Trade)	Market Quality (Order Book)

Due Diligence

Time Period: 15 Sep - 10 Nov 2019

Sources: World Bank (2019 Data)
Transparency International (2019)
LinkedIn Profiles
Crunchbase Profiles
Exchange Websites
Github/Other API Documentation
Companies Houses
Media websites (Coindesk, Bloomberg)
Various MSB Registries

Method: Manual Data Collection, Google Form

Market Quality (Trade)

Time Period: 05 Oct - 5 Nov 2019

Sources: Exchange REST APIs (Trade Endpoint)

Method: REST API polling on exchanges

Frequency: At exchange rate limits

Market Quality (Order Book)

Time Period: 5 Oct - 5 Nov 2019

Sources: Exchange REST APIs (Order Book)

Method: REST API polling snapshots

Frequency: ~ Every 5 seconds where possible

Markets: BTC-USD, BTC-USDT, BTC-ETH, BTC-KRW, BTC-JPY, ETH-USD, ETH-USDT, ETH-KRW, ETH-JPY…+ OTHER SIGNIFICANT FIAT MARKETS
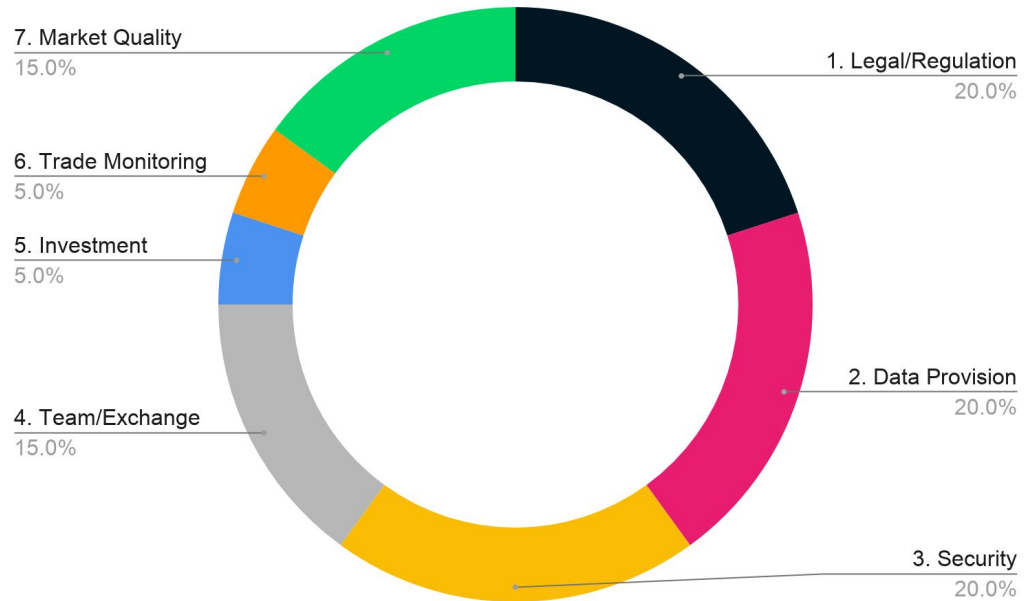
Number of Exchanges: 100+

*We have made our best effort to collect data accurately, but appreciate that certain data points might be outdated or incomplete due to lack of public availability. We are committed to updating and correcting any data point proven to be outdated or incorrect on a timely basis, and will update our Exchange Ranking accordingly.

Methodology Overview - Ranking Components

The overall ranking consists of the following components and subsequent weightings:
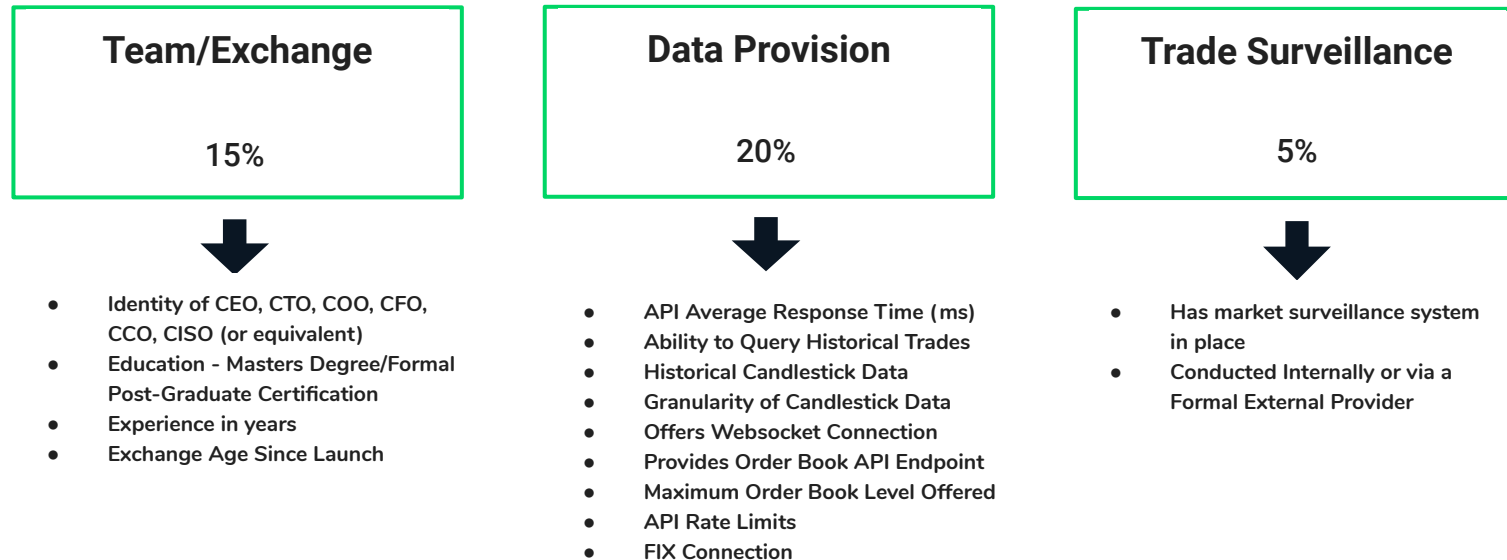
1. Legal/Regulation
2. Data Provision
3. Security
4. Team/Exchange
5. Investment
6. Trade Monitoring
7. Market Quality
8. Penalty Factor: Negative Reports (-5%)

7. Market Quality
15.0%

6. Trade Monitoring
5.0%

5. Investment
5.0%

4. Team/Exchange
15.0%

1. Legal/Regulation
20.0%

2. Data Provision
20.0%

3. Security
20.0%

Methodology Overview - Components I.

Security	Legal/Regulatory	Investment
20%	20%	5%

Security
- Formal Security Certificate
- SSL Rating
- Use of a Cold Wallet
- % Funds in Cold Wallets
- Geographical Distribution of Keys
- 2FA
- Custody Provider
- Number of Hacks
- Any Recent Hacks (within 1 year)

Legal/Regulatory
- Legal Company Name
- Registered as an MSB/Licensed
- Strict KYC/AML Procedures
- Part of Regulatory/Industry Group
- Insurance Against Losses (fiat, crypto, self-insured)
- Country Rating
- Cryptocurrency Regulatory Stringency
- Sanctions compliance statement
- PEP compliance statement
- On-chain transaction monitoring
- Chief Compliance Officer + Experience

Investment
- Funding by Large VC or Non-Crypto Established Company
- Funding by Smaller VC Companies

Methodology Overview - Components II.

Team/Exchange	Data Provision	Trade Surveillance
15%	20%	5%

Team/Exchange
- Identity of CEO, CTO, COO, CFO, CCO, CISO (or equivalent)
- Education - Masters Degree/Formal Post-Graduate Certification
- Experience in years
- Exchange Age Since Launch

Data Provision
- API Average Response Time (ms)
- Ability to Query Historical Trades
- Historical Candlestick Data
- Granularity of Candlestick Data
- Offers Websocket Connection
- Provides Order Book API Endpoint
- Maximum Order Book Level Offered
- API Rate Limits
- FIX Connection

Trade Surveillance
- Has market surveillance system in place
- Conducted Internally or via a Formal External Provider

Methodology Overview - Components III.

Market Quality	Trading Incentives (Inflation Score)	Negative Reports
15%	*Not Included in Ranking	Penalty Factor - 5%

- Market cost to trade (average spread)
- Liquidity (average depth of 1% price impact)
- Stability (minute volatility)
- Behaviour towards sentiment (volatility and volume correlation)
- Natural trading behaviour (volume standard deviation)

- Trading Competitions
- Airdrops
- Transaction-Fee Mining
- Zero Transaction Fees
- Margin Trading

- Negative reports such as a flash crash, a legal case or a large breach in data privacy

Methodology Overview - Aggregation and Grading

Scores from each category were aggregated to form a total cumulative score. The **maximum score is 100.**

Category	Maximum Points
Security	20
Legal	20
Investments	5
Management/Company	15
Data Provision	20
Trade Surveillance	5
Market Quality	15
Total Cumulative Points Available	**100**

Threshold	Grade
Above 75	AA
65-75	A
45-65	B
35-45	C
20-35	D
10-20	E
<10	F

Results

Exchange Ranking Top 20

Grade	Exchange	Δ Rank	Score	Legal	Data Provision	Security	Team	Investment	Trade Monitoring	Negative Reports	Market Quality
AA	Gemini	8	78	16.3	12.8	18.9	12.4	0.0	5.0	0.0	13.0
	itBit	4	76	14.4	16.2	15.8	10.4	5.0	2.5	0.0	11.7
	Coinbase	-2	75	15.6	13.1	19.9	10.1	5.0	2.5	-5.0	13.7
A	Kraken	3	73	13.0	13.4	14.6	13.6	5.0	2.5	0.0	11.4
	Bitstamp	-2	71	16.3	13.1	13.2	6.9	5.0	5.0	0.0	11.9
	Liquid	-1	69	15.2	10.7	10.7	11.3	5.0	5.0	0.0	11.5
	Poloniex	-6	67	13.3	13.4	9.5	8.4	5.0	5.0	0.0	12.1
	OKEX	6	67	10.0	14.1	11.5	9.8	5.0	2.5	0.0	14.3
	bitFlyer	-5	67	17.0	11.4	9.9	10.1	5.0	2.5	0.0	10.8
	Luno	14	66	11.9	12.8	15.5	6.1	5.0	2.5	0.0	12.2
	Bitfinex	4	66	11.1	15.9	8.4	11.5	0.0	5.0	0.0	13.7
	Binance	-4	65	10.7	15.5	10.5	7.8	5.0	2.5	0.0	13.4
B	coinfield		63	14.8	15.2	14.7	8.4	0.0	2.5	0.0	7.0
	OKCoin	-3	61	11.9	14.1	9.5	10.4	1.3	2.5	0.0	11.5
	Cexio	7	60	14.8	12.8	9.9	7.5	1.3	2.5	0.0	11.3
	bitFlyerEU		60	13.7	10.0	9.9	7.2	5.0	2.5	0.0	12.0
	Ind.Reserve	3	58	16.3	8.6	11.4	8.1	0.0	2.5	0.0	10.8
	HuobiGlobal	-1	58	9.6	10.7	7.9	8.4	5.0	2.5	0.0	13.6
	BitTrex	3	57	15.9	9.3	9.5	10.1	0.0	0.0	0.0	12.3
	gopax		56	10.4	5.9	16.0	7.8	5.0	2.5	0.0	8.7

CC Exchange Ranking vs Volume Ranking

As with the previous Q2 June Benchmark Report, generally speaking, there is an exponential relationship between the CryptoCompare ranking (which does not use volume directly to rank exchanges) and the monthly volume of exchanges.

This means that naturally, we expect higher volumes from higher quality exchanges.

However, we can still see that certain lower tier exchanges (bottom right) tend to dominate the volume rankings. Taking this into account, there is still a clear need for indicators of exchange quality that rely less on volume, and more on a holistic approach that takes into account a variety of other factors.

Score vs Volume by Grade

Due Diligence vs Market Quality Ranking

The Q3 benchmark continues to show a positive correlation between due diligence scores and market quality scores.

While direct causality must be investigated further, one can potentially infer the quality of a market itself from a thorough due diligence process.

Market Quality vs Due Diligence

Average Ranking Score Per Location

Our results show that in average terms, exchanges based in the US, Luxembourg, Japan and South Korea are among those boasting the highest quality exchanges.

While legal jurisdiction forms only a small component of our overall ranking, exchanges that reside in jurisdictions with higher quality regulatory frameworks tend to perform better across several metrics.

Exchanges by Jurisdiction

Average Score
11.00 — 67.00

27.00 Canada
55.92 USA
55.00 Mexico
35.00 Panama
26.33 Brazil
25.50 Chile
12.00 Russia
31.50 Lithuania
27.00 Gibraltar
39.00 Malta
22.00 Israel
30.50 United Arab Emirates
41.67 Seychelles
47.78 Japan
35.54 Singapore
35.50 Samoa
47.25 Australia
16.00 New Zealand
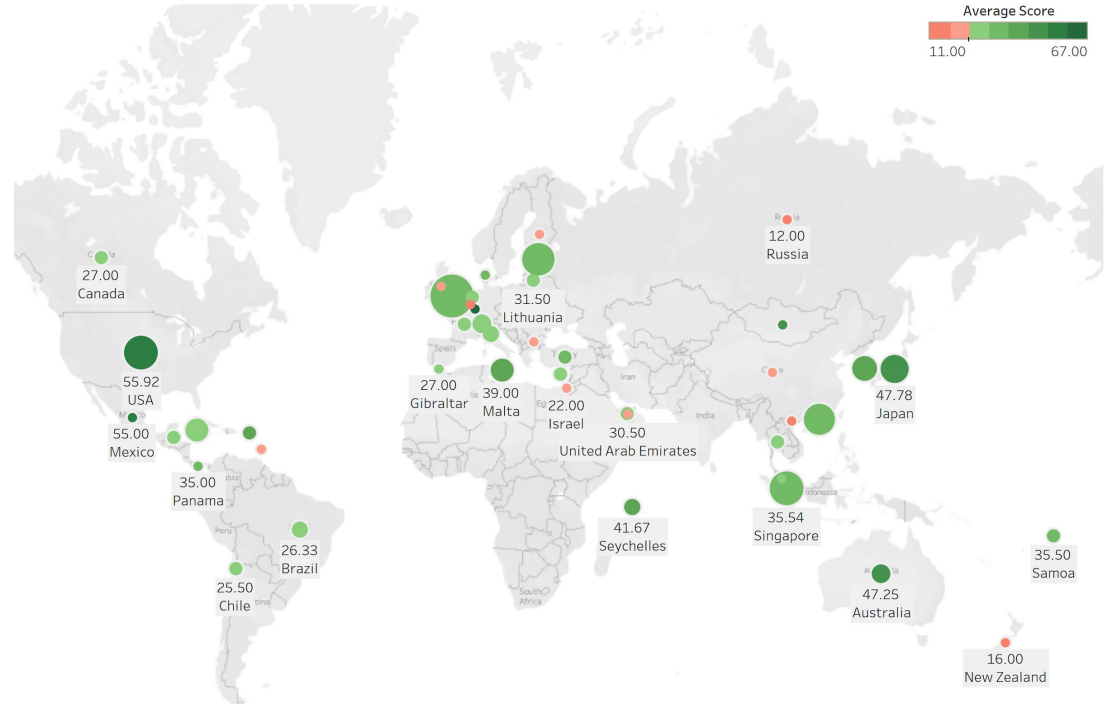
Lower Quality Exchanges Gained Market Share

Low-tier Exchange Volume Grows

Despite greater industry awareness of the need for greater clarity surrounding exchange quality, volume from low-tier exchanges rather than shrink in Q3, has in fact grown. Top-tier exchanges (grades AA-B) account for 33% of global volumes while lower-tier exchanges (grades C-E) account for 67% of global volumes, up from 32% and 68% respectively in June.

As a result of the 2018 bear market, organic trading volume decreased, which may have forced some exchanges to consider new strategies in order to compete in an industry with a dwindling customer base and chronic over supply.

Incentivised trading schemes - such as Trans-Fee Mining (TFM) - continue to be used by exchanges to boost volumes and gain status. The 'Fake Volume' narrative has become a growing trend over the past year, and research has been conducted to better understand the digital asset exchange market.

Monthly Volume by Grade
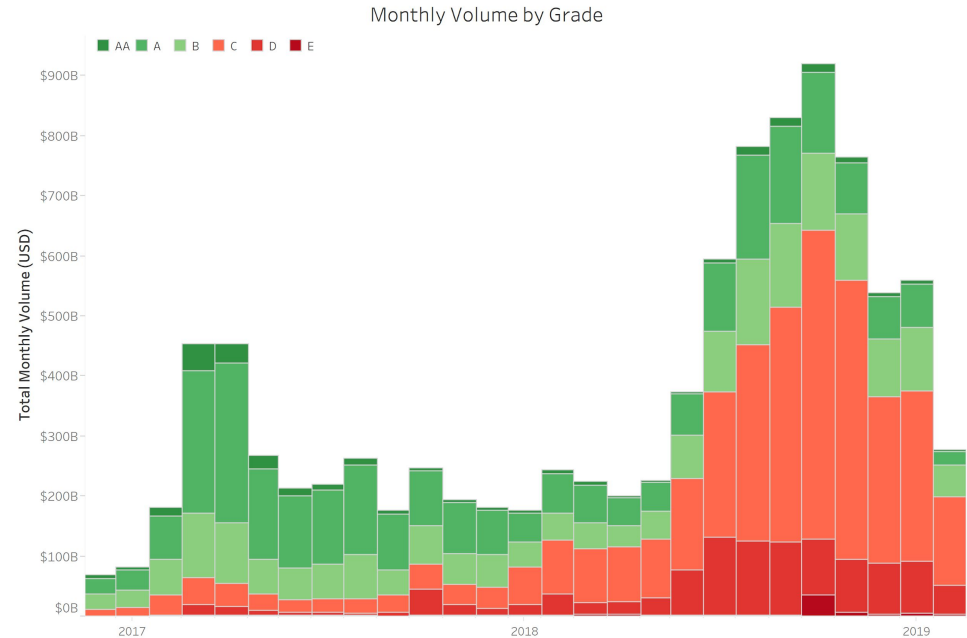
Top-Tier Volumes - Grades B and Above

CryptoCompare has established the notion of **top-tier volume** whereby investors can segment the market into higher and lower quality volumes.

We currently define top-tier volume as volume derived from exchanges scoring a B and above.

This equates to a total of **45 exchanges** that we have rated **top-tier** for the current review.
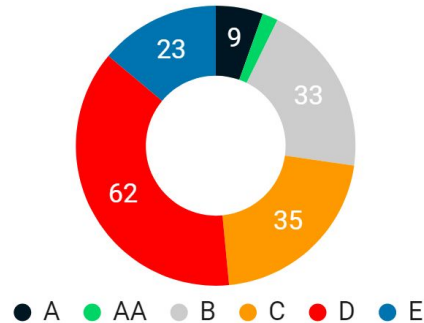
Aggregate Monthly Volume per Grade in October

E 0.7%
D 15.6%
$ 87 Bn
$ 72 Bn
A 12.8%
AA 1.1%
B 19.1%
$ 107 Bn
33% of total volume is from **top-tier** exchanges
$ 284 Bn
C 50.7%

Legend (left donut): A · AA · B · C · D · E
9 · 33 · 35 · 62 · 23
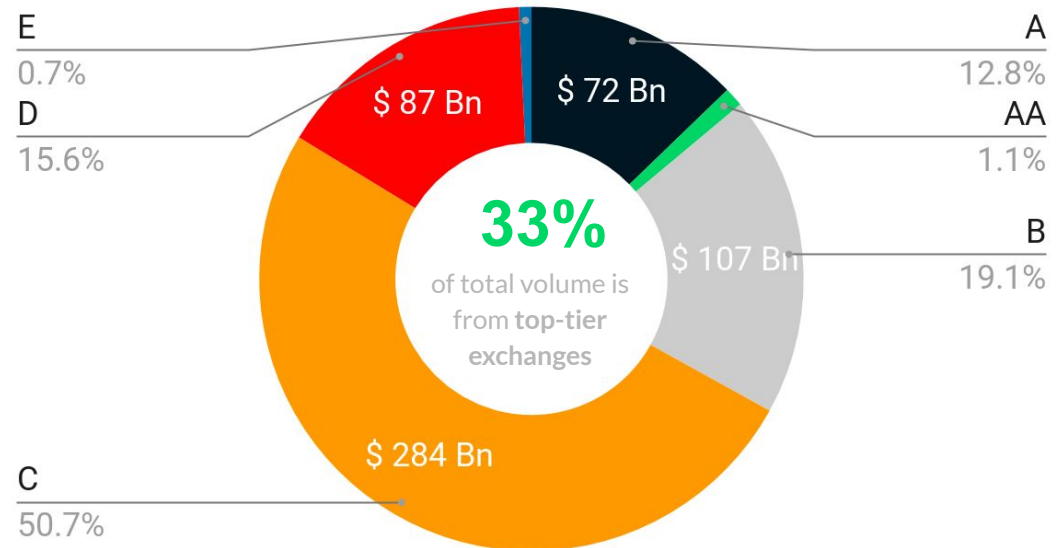
Regulation/Legal

12%

of exchanges that use an external **on-chain transaction monitoring** provider

44%

of exchanges impose **strict ID verification** requirements on users

29%

of exchanges are registered as an **MSB or possess a crypto exchange license**.

ONLY **4%**

of exchanges formally offer some form of **cryptocurrency insurance**

3%

of exchanges **informally insure** users in the case of breach (insurance fund)

% Exchanges Registered as MSBs
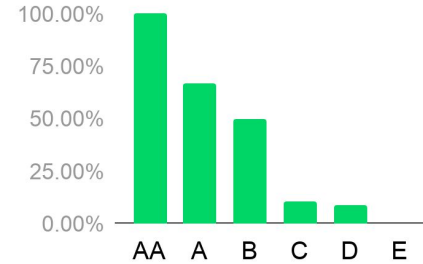
% Licensed Exchanges
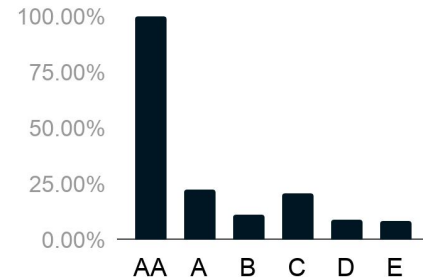
Security

2%

of exchanges have been hacked in the last year

6%

of exchanges possess an ISO 27001 or SOC2 certificate

14%

of exchanges state they **hold more than 95%** of crypto in cold wallets

94%

of exchanges offer 2-factor authentication

8%

of exchanges utilise the services of a custody provider to store user assets

Web Security Test

C
4.3%

B
1.8%

A+
34.4%

A-
1.2%

MORE THAN **10%** of exchanges scored below an A in our web security test

A
54.0%
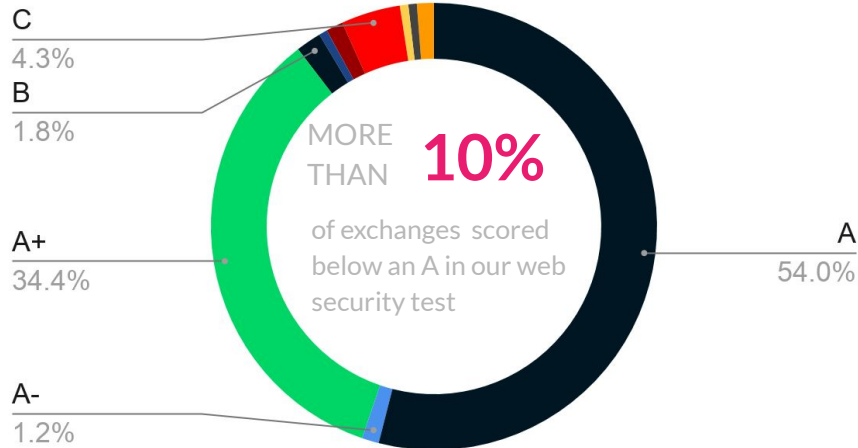
Data Provision

33%

of exchanges provide historical candlestick data

81%

of exchanges that provide historical candlestick data, offer at least **a minimum of minute granularity**.

27%

Of exchanges offer the ability to **query full historical trade data** via an API endpoint.

51%

of exchanges **offer a websocket data feed** that users can subscribe to.

7%

Of exchanges offer a FIX connection

64%

of exchanges offer **at least a level 2 order book** via REST or Websocket connection

ONLY **6%**

of exchanges offer **a full level 3 order book** via REST or Websocket connection

Transparency, ease of access, and speed of data provision are important foundations for a fair and efficient marketplace

Data Provision

AA rated exchanges had an average public REST API **response time** of **297 ms**

AA rated exchanges had an average public **rate limit** of **1255 calls/min**

Across all exchanges the public average REST API **response time** was **578 ms**

Across all exchanges the average **rate limit** was **1586 calls/min**

■ REST API Response Time (ms)
■ REST API Rate Limit (Calls per Minute)

Grade
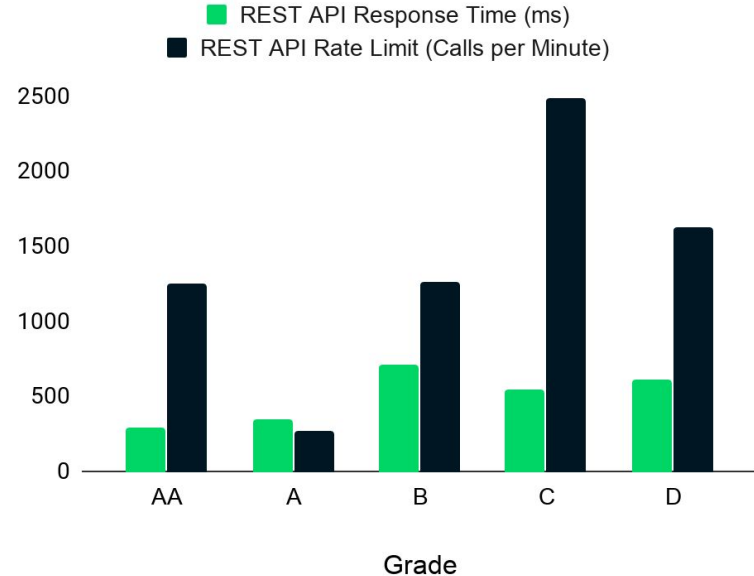
Trading Incentives

14%

of exchanges implement **transaction fee mining** models

Transaction Fee Mining

■ Yes ■ No

grade

Competitions

■ No ■ Yes

grade
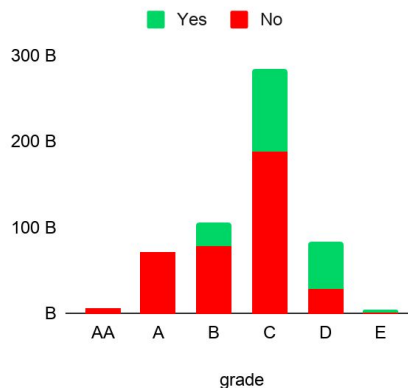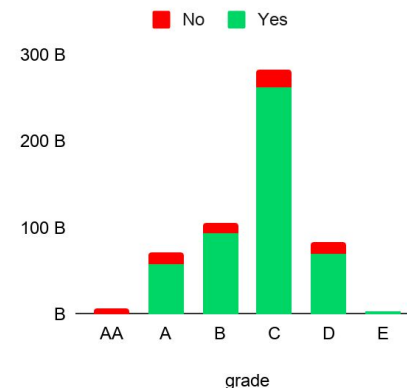
10%

of exchanges offer **no-fee trading** as part of their basic pricing model

41%

of exchanges incentivise and reward traders with the use of **airdrops**.

32%

of exchanges offer **margin trading**

41%

of exchanges have conducted some form of **trading competition** to drive volume

Conclusion

As previous research has shown, "fake" or "suspicious" exchange volume methodologies centred upon volumes, web traffic and trade histograms can be incomplete and sometimes misleading. We believe that a transparent methodology that evaluates exchange quality based on a broad due diligence check and a variety of quantitative metrics across markets is the best approach.

We have shown that our current ranking correlates with volumes, which is an expected behaviour, but also points out outlier exchanges that have surprisingly high volumes relative to their ranking. Due diligence scores tend to correlate with market quality scores, meaning that one can potentially infer market quality from an exchange's transparency, legal and regulatory compliance, investors, jurisdiction and API quality.

We have introduced alternative market quality metrics to volume, focussing on trade and order book data across several markets to measure the cost to trade, liquidity and 'natural' trading behaviours. Our current exchange benchmark methodology therefore serves as a robust guide, such that investors can identify more trustworthy exchanges that can satisfy their risk appetites.

The methodology and rankings are free and transparent and serve as a tool for exchanges, funds, traders, exchange service providers and regulators to better understand the cryptoasset exchange landscape, and offers a comprehensive, granular and reliable source of information on the best digital asset trading venues. The underlying data and custom research is also available to those looking to get deeper insights.

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Special thanks to the content and support teams for their data collection assistance.

Get the Benchmark scores using our
API

Appendix

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2. Liquidity
3. Stability
4. Behaviour Towards Market Movements
5. "Natural" Market Behaviour

Appendix C - Ranking Points System Summary

Appendix D - A Note on Fake Trading Reports

Appendix A - Due Diligence Methodology

Qualitative Data Metrics

1. Trading Incentives
2. Security
3. Legal/Regulation
4. Investment
5. Team and Company
6. Data Provision
7. Formal Trading Surveillance
8. Negative Reports

Data Collection. Qualitative data was collected manually between **15 Sep and 10 Nov 2019**. The metrics within each category were collected from a variety of sources, which include but are not limited to: the World Bank (2017 Data), LinkedIn Profiles, Crunchbase Profiles, Twitter, Exchange Websites, Github API Documentation, Companies Houses, Media websites (Coindesk, Bloomberg), and Various MSB Registries.

An effort was made to collect each metric as accurately as possible. However, we acknowledge that due to restrictions in terms of public data availability and transparency from certain exchanges, data may be outdated or incomplete. For those who are unhappy with the current ranking, or feel that any data is not up to standard we are committed to providing the most reliable data set and will ensure that any errors are dealt with quickly and the exchange ranking updated accordingly.

Data Fields Available. A surplus of metrics were collected for each exchange, and only a subset were converted into points to be used in the exchange ranking. For those interested, a full list of all available metrics for each category can be found in Appendix D - Full Metrics List.

1. Trading Incentives

Exchanges implement various incentive schemes for several reasons, which might include: **attracting additional users** to the platform, **incentivising trading** to drive fee income, and **raising the profile** of the exchange or of certain coins via high volumes to top the volume rankings tables.

Incentive Schemes. In the context of the current study, we have compiled a list of five main **incentive schemes** that we believe encourage additional trading and are often implemented by several exchanges:

  A.   Trading Competitions
  B.   Airdrops
  C.   Transaction-Fee Mining
  D.   Zero Transaction Fees
  E.   Margin Trading

Inflation Score. The presence of any of these incentive schemes **does not penalise** exchanges in the current ranking system, but only serves as a means of identifying the extent of potential **"volume inflation"** relative to volumes without such models in place. The reason for this is that incentive schemes do not necessarily imply a lower quality exchange. Each metric acts as a flag for "inflated volume" and contributes to a final "inflation score".

1.A Trading Competitions

Trading competitions are sometimes implemented by exchanges to **attract more users** to the platform, to **incentivise trading** and hence drive fee income, or to **raise the profile** of the exchange via volume rankings.

The exchange will reward participants with cryptocurrencies such at BTC or ETH or other lower profile tokens based on their performances in each competition. Bithumb for example, has implemented a number of events known as "Super Airdrop Festivals" in the past, which have had a clear effect on trading volumes for the duration of each competition.

Competitions vary considerably by structure, and by exchange, and can result in **erratic trading** behaviour. Once a competition is over, this can cause a **drop in volumes** to "normal" levels.

Offering trading competitions does not penalise exchanges in our current ranking system, however their presence is used to flag potential "volume inflation". We add 5 points to the current "inflation score" if a competition has occurred in the last year. It should be noted that this metric does not serve to detect **current** inflation given that a competition may not necessarily be ongoing, but rather serves as an indication of **potential** and **past inflation** as a result of competitions.

Competitions	Inflation Points
YES	5
NO	0

Bithumb 5th Anniversary Season 2

Super Airdrop Festival

Coin Airdrop of total 100Million KRW Everyday

Coin Airdrop to Top 300 traders who bought the event coupon and traded.

Bithumb ✔
@BithumbOfficial

Super Airdrop Festival STARTS NOW!

Bithumb has invited you to Airdrop Event.
Don't miss out and visit [bit.ly/2A4YkyG] for details.
♡ 29   9:12 AM - Oct 12, 2018

In the top for transaction amount	Reward
Ranked #1 (1 members)	3 BTC
Ranked #2 (2 members)	50 ETH
Ranked #3 (3 members)	4,000 XRP

1.B Airdrops

An airdrop is a **token distribution mechanism** in which free tokens are deposited into a users wallet based on several requirements. Most airdrops are deposited to users based on their holdings of a particular cryptoasset such as BTC at the time of a designated "snapshot" of holdings. However, some airdrops are only offered to users provided that they trade a minimum quota of a given market volume per day.

Airdrops can therefore be used as an **incentive mechanism**. We assume that exchanges that enable the airdrops of various tokens - whether as a competition reward or as a promotional event - will **encourage users to trade** on markets they may not have engaged with, had there not been an airdrop offering.

For this reason, we designate 2.5 "inflation points" to exchanges that offer airdrops. We do not penalise exchanges for the presence of airdrops in our current ranking system.

Offers Airdrop Events	Inflation Points
YES	2.5
NO	0

1.C Transaction-Fee Mining

An exchange that implements a transaction-fee mining model, will **distribute** their proprietary **exchange token** in **exchange for trading fees**. In other words, they offer up a trading fee rebate, paid back in the form of their own token.

This is very similar to an ICO in terms of structure, as users pay fees in the form of BTC, ETH, USDT etc. and receive a specific quantity of exchange tokens in return.

This trading incentive scheme first rose to prominence in mid-2018 and was used by exchanges such as FCoin, BigONE and CoinBene whose volumes topped exchange volume rankings overnight as a result.

The **more trading** that occurs, the **more tokens can be earned** by individual traders. There is therefore an incentive to trade more, given that these tokens have particular properties.

This metric is therefore used as an additional proxy for "exchange inflation". Given the clear impact on volumes that has been seen with this model, exchanges that operate under this model will be assigned an additional **15 inflation points**.
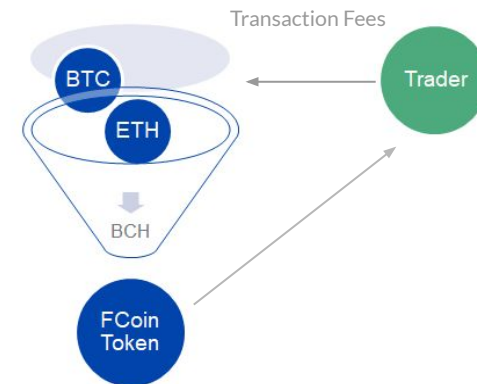
Implements a Transaction-Fee Mining Model	Inflation Points
YES	15
NO	0

1.D Zero Transaction Fees

Several exchanges might implement a zero trading fee model, the ultimate aim of which is to **incentivise additional trading** activity and attract users. With fees eliminated, the costs of trading are effectively eliminated and therefore traders are incentivised to trade more.

It is common for exchanges to offer a zero fee model to market makers, whose presence adds important liquidity to a given market. This effectively makes a market more active and stable. However, for market takers this is far less common. Hence, in our model, **zero transaction fee models refer to fees offered to takers** rather than makers.

Given that transaction fees are eliminated, an exchange must earn revenue by some other means which may include charging listing fees for new coins, offering margin trading and earning interest on leveraged funds, or implementing paid marketing campaigns for certain projects.

In our ranking points system, exchanges are not penalised for offering zero fees. However, a zero fee model will be reflected in a general "trading inflation score" for each exchange.

Implements a Zero-Fee Trading Model	Inflation Points
YES	5
NO	0

1.E Margin Trading

Margin trading is a method of trading cryptoassets using **borrowed funds** provided by a third party.

This enables traders to trade with **much larger sums of capital** such that they are able to leverage their positions and realise larger profits on successful trades. As a result, this tends to **inflate volumes** to levels that would not have been realised had there been no margin trading in place.

Borrowed funds can either be provided by other users on the platform, and in many cases exchanges themselves offer such lending services. This model can offer an additional revenue stream for exchanges that offer particularly low fees and choose to make up the shortfall with interest earned from margin traders.

Given that margin trading tends to increase the amount of capital that can be traded and hence overall trading volumes, 5 "inflation score" points were given to exchanges that offer this service.

Offers Margin Trading	Inflation Points
YES	5
NO	0

2. Security

A. Formal Security Certificate
B. SSL Rating
C. Use of a Cold Wallet
D. % Funds in Cold Wallets
E. Geographical Distribution of Keys
F. 2FA
G. Custody Provider
H. Number of Hacks
I. Any Recent Hacks

Exchanges are key targets for cyber security attacks. They deal with sensitive user data and private keys, which exchanges must protect. Although security is one area where less transparency can mean more safety, we have curated a series of high level metrics that we believe help to highlight exchanges that have paid particular close attention to platform and user security.

2A. Formal Security Certification

Security Certificate: There are two primary certifications (or attestation standards) we focus on that are used to attest to a company's effectiveness at controlling and protecting the data they use. In North America, this is the SOC 2, which reports on controls at a Service Organization relevant to security, availability, processing integrity, confidentiality or privacy. Its purpose is to help ensure that a company has met established security criteria and is adequately protected against unauthorized access.

At an international level, this is the ISO 27001, which is designed to give a best practice framework for implementing an information security management system at an organization. Both standards are internationally recognised. We award 5 points for possessing formal standards and 1.5 points for those in the process of obtaining them.

Formal Security Certification	Security Points
YES	5
IN PROGRESS	1.5
NO	0

2B. SSL Rating

SSL rating: We use the grading system from Qualys SSL Labs which grades websites' SSL (Secure Sockets Layer) protocol. Where Qualys' rating failed for any exchange, we use the rating from ImmuniWeb. While the test was not done for all possible IP addresses associated with a given exchange, our points system penalises those with a low score for a single domain, as this alone represents a potential security hole.

SSL Rating	Security Points
A+	3
A	2.5
A-	2
B+	1
B	1
B- and below	0

2C & D. Cold Wallet Storage and Ratio

Offline Storage: Whether an exchange makes use of offline - or 'cold' - storage, widely considered a more secure means of storing cryptoassets (i.e. cryptoasset private keys). Cold storage is considered more secure as keys are siloed away from internet access, with most historical hacks having taken place via hot wallets.

Cold Wallet Ratio: The ratio of an exchange's cold to hot wallets, i.e. how many of its cryptoassets are stored online vs. offline. We assume that the higher the ratio the more secure an exchange. For exchanges that have stated a specific percentage, a scaling factor of 3 has been applied.

For example, if an exchange states 90% of funds are stored in cold wallets, the points awarded will be 0.9 * 3 = 2.7.

If an exchanges states that the majority of funds are in cold wallets, a score of 2 is awarded. If there is some indication that a cold wallet is used, a score of 1 is awarded.

Offline Storage	Security Points
YES	2
NO	0

Offline Storage	Security Points
100% Cold	3
Majority Cold	2
Some Cold	1
No Evidence	0

2E & F. Geographical Key Distribution and 2FA

Geo-Key Distribution: Whether an exchange implements geographical distribution of cryptoasset private keys: we assume that distribution entails greater security. Our assessment is based on the exchange's own statement of the distribution of keys. We award 1 point for an exchange that distributes its keys.

2FA: Whether an exchange offers 2 Factor Authentication for individual account security. A widely-recognised security standard which safeguards customer information, we consider an exchange without 2FA to have a serious security flaw. We award 2 points to an exchange for implementing 2FA.

Geo Distribution	Security Points
YES	1
NO	0

2FA Authentication	Security Points
YES	2
NO	0

2G. Custody Provider

Custody Provider: Whether an exchange makes use of a custody provider to store their cryptoassets. In addition to offering greater security measures, some custody providers such as Bitso, also adhere to ISO 27001 standards.

We assume that in general, the use of a competent custody provider entails a greater standard of security and therefore will score a higher rating. We award 3 points to an exchange that makes use of a custody provider.

Custody Provider	Security Points
YES	3
NO	0

2H & I. Hacks

Number of hacks/Recent hacks: This refers to whether an exchange has been hacked in its core infrastructure - with funds or vital information extracted. While some exchanges have had social media accounts compromised, this does not form part of this assessment.

Because we are aware that exchanges can improve their infrastructure, we focus primarily on the number of recent hacks - i.e. hacks in the last year, that likely came about as a result of failure to implement industry best practices. We also assume the number of hacks to be significant as those that have been hacked more than once have likely failed to respond to weaknesses in their infrastructure.

We deduct 3 points for an exchange with more than 1 hack, and deduct 5 points if a hack has taken place in the last year.

No. of hacks	Security Points
More than 1	-3
NO	0

Hacked Recent	Security Points
YES	-5
NO	0

3. Regulatory/Legal

A. Legal Exchange Name
B. Country Risk Rating
C. Country Cryptocurrency Regulation
D. Country Regulatory Stringency
E. Registered as an MSB/Licensed
F. Strict KYC/AML Procedures
G. Part of Regulatory/Industry Group
H. Insurance Against Losses (fiat, crypto, self-insured)
I. Sanctions compliance statement
J. PEP compliance statement
K. On-chain transaction monitoring
L. Chief Compliance Officer + Experience

3.A Legal Exchange Name

It is important that the **legal name** of each exchange is available publicly. Firstly, this enables the search of relevant company **documents**, country/regulatory **registrations** and **licenses**. It also allows for **identification of which legal parties** are necessary to file a complaint/legal dispute and who is legally accountable if such an issue arises.

Ultimately, if no legal name can be found it can also be difficult to assess the quality of an exchange, where it is based, or who runs the company.

Therefore, our ranking takes into account whether a legal operating name for each exchange can be found. If so, it is awarded 5 points. If no name can be found, it receives 0 points.

Legal Exchange/Operator Name Found	Points
YES	5
NO	0

3.F Country Risk Rating

A **country risk rating** is a proxy for the **institutional quality** of the jurisdiction in which an exchange is based. It provides an indication of the likelihood of corruption as well as how strong a country's legal systems are. An exchange based in a high quality jurisdiction is subject to the standards and legal strictures of that country and therefore exposes users to a lower level of risk.

Country Risk Ratings were on a combination of data from the **World Bank Worldwide Governance Indicators (WGI Ratings)**, **Transparency International**, and **Euler Hermes** Ratings.

The WGI Rating are based on the following six dimensions of governance, which were rescaled to fit a 0-9 scoring format and averaged: "Rule of Law, Regulatory Quality, Government Effectiveness, Political Stability and Absence of Violence/Terrorism, Control of Corruption, Voice and Accountability." Transparency International ratings are a similar proxy for institutional quality by providing a rating of corruption levels in each major country. This was again rescaled to fit a 0-9 format. Euler Hermes ratings measure the financial and other credit risk factors in each major country. We score each country based on the average of the above ratings providers.

Exchanges operate from various jurisdictions. Our assumption is that the quality of a country's institutions will influence exchange standards positively i..e. **higher quality institutions enforce higher standards upon the businesses based there**.

Based on scores 0-9 - we categorise countries into Low Risk, Medium Risk, High Risk, Very High Risk.

Risk	Rating
Low	9
Medium	6
High	3
Very High	0

3.F Crypto Exchange Regulation

Our **cryptocurrency exchange regulation rating** relates specifically to the existence of regulatory frameworks that crypto exchanges fit into. This captures the possibility that certain jurisdictions may contain high quality institutions but may not necessarily impose specific regulatory requirements on crypto exchanges (e.g. sandbox environments).

Exchanges might generally choose to locate themselves in jurisdictions that have clear rules regarding cryptocurrency exchange activity, or in those that generally impose very lax or non-existent regulations.

We assume that exchanges based in countries that possess clear regulatory frameworks relevant to cryptocurrency exchanges, generally indicates a more compliant calibre of exchange.

We therefore introduce points scored from 0 to 3 to capture the level of regulation or frameworks that crypto exchanges must meet in order to operate, such as obtaining specific licenses or any registration requirements with regulators.

Rating	Basic Criteria
3	Exchanges are regulated, licensed and must register with the relevant regulatory authority. Legislation is comprehensive.
2	Regulatory stance is a grey area, some crypto exchange legislation, and some form of registration/licensing may be required.
1	Relatively unregulated, minimal registration required with financial/regulatory authorities. Minimal/no legislation.
0	No regulation or crypto exchange legislation to be found

3.G Regulatory Stringency Rating

Regulatory stringency ratings are based on how difficult, in general, it is to receive a license (if applicable), or comply with ongoing reporting or registration requirements in each exchange jurisdiction.

This metric attempts to take into account that certain environments may impose relatively more lenient or stringent regulatory frameworks or licensing requirements in place.

The assumption is that the more difficult the registration/licensing/approval requirements (given existing regulation) for any given exchange, the higher the quality of an exchange. E.g. It is difficult to obtain a BitLicense.

We award points from 0-3, with 3 being difficult to comply with, 2 being moderately difficult, 1 being relatively easy, and 0 being not applicable.

Rating	Basic Criteria
3	Difficult
2	Medium
1	Relatively Easy
0	Not Applicable

3.B Registered as an MSB (Money Services Business)

Several exchanges are registered as **money services business (MSBs)**. Although not obligatory in many jurisdictions, exchanges that are registered are normally subject to stricter reporting standards to those that are not.

For instance, those registered with **Financial Crimes Enforcement Network** (FinCEN) must identify ownership roles and controlling stakes within the company, establish a formal Anti-Money Laundering (AML) policy, enforce strict KYC procedures, and file any suspicious activity reports among several other obligations. Those registered with the **Japanese FSA** or the **UK Financial Conduct Authority (FCA)** may have similar reporting obligations.

Although we realise the not all jurisdictions will require this form of registration or may have different standards, we attempt to **reward exchanges that are registered with a regulatory authority** that maintains oversight over exchange activities. We attempt to provide a **general gauge** as to which exchanges have reporting obligations to regulatory authorities over how strict or comprehensive those reporting obligations are at this time. We also note that this metric may be biased in favour of fiat to crypto exchanges, given that crypto to crypto exchanges are generally less exposed to such requirements.

We make the assumption that when exchanges are licenced with a regulatory authority, this is also equivalent to being "registered as an MSB". We do not assume the reverse however.

Ultimately, our main assumption is that exchanges that are **registered as MSB or equivalent**, are imposed to **stricter reporting standards** and **hence higher operational quality**. Exchanges that are registered, regardless of the regulatory authority are designated maximum of 12 points. However we also apply a multiplier (stringency factor from 0-3) to take into account that certain authorities may be more lenient than others.

Registered as an MSB or Equivalent	Points
YES	12 * (stringency factor/3)
NO	0

3.B Licensed Exchanges

Although not required in many jurisdictions, obtaining an exchange license indicates that an exchange must maintain certain reporting, legal and monitoring standards. It also indicates that an exchange is most likely compliant with local regulations.

The **State of New York** requires that cryptocurrency exchanges register with the New York State Department of Financial Services (NYSDFS) to obtain a **BitLicense**. This is contingent upon maintain specific operational standards and passing various reviews.

Similarly, **Japan** requires exchanges to register with the FSA such that they can obtain approval to operate. Other jurisdictions such as **Estonia** licenses exchanges via the FIU with a designated license for operating a digital currency exchange.

Not all exchanges must be licensed, however those that are licensed are assumed to operate under higher standards than those that are not, **i.e. possession of a license is indicative of a higher quality exchange**.

However, not all licenses are made equal. We attempt to differentiate this by implementing regulatory stringency rating multiplier (0-3). Exchanges receive points between 0-12 depending on this factor.

Licensed	Points
YES	12 * (stringency factor/3)
NO	0

3.C KYC/AML

As part of most anti-money laundering regulations, it is important that exchanges **identify users** before they are able to trade.

Many exchanges now implement **strict Know Your Customer (KYC) policies** as a means of verifying identity - such that any illicit activity can be monitored and tracked effectively.

As part of our ranking system, exchanges that require identification verification before trading is enabled are awarded 5 points, while those that do not are awarded 0 points.

Data collection is based predominantly on terms and conditions pages of various exchanges. If no policy can be found from these pages, the exchange is assumed to implement a policy that does not require identity verification to trade.

Requires Proof of ID to Trade	Points
YES	5
NO	0

3.D Member of Regulatory/Industry Group

Several cryptocurrency exchanges are members of cryptocurrency industry groups. Their respective purposes vary between developing a code of conduct within the industry, assisting in terms of innovation, or offering a form of self-regulation and advice to other cryptocurrency exchanges.

Examples of what we could consider **self-regulatory membership** groups include: Japan's Virtual Currency Exchange Association (JVCEA), Global Digital Finance (GDF) and the Chamber of Digital Commerce. We assume that if an exchange is a member of an SRO, they must conform to certain membership rules and codes of conduct. **2 points** are awarded to exchanges that maintain membership in an SRO

More **general crypto industry groups** include bodies such as the Virtual Commodity Association Working Group (VCA). While membership requirements may not be as stringent as in an SRO, exchanges that are part of these industry groups might participate in order to generally **improve the space**. They are known in the industry and thus assume to be more **transparent**, and they importantly **maintain a code of conduct** within their industry group in order to maintain their member status. **1 point** is awarded when exchanges are a member of **at least one** industry group.

一般社団法人
日本仮想通貨交換業協会
JVCEA - Japan Virtual Currency Exchange Association

GDF

CHAMBER OF
DIGITAL
COMMERCE

Member of a Self-Regulatory Organisation	Points
YES	2
NO	0

Member of a Cryptocurrency or Blockchain Industry Group	Points
YES	1
NO	0

3.E Insurance Against Losses

Several exchanges offer insurance for certain funds held in custody by the exchange. It is assumed that for exchanges to seek to offer such a service to their customers, they must first prove that they have met certain standards such that they can solicit the services of an insurer. It also serves as a declaration of taking responsibility for unexpected losses that occur on the part of the exchange.

Exchanges that guaranteed coverage in terms of lost funds will ultimately expose users to a relatively lower risk service than exchanges that are yet to offer such a service. We consider the offering of such a service to be highly indicative of the quality of an exchange.

We grade exchanges based on three main categories of insurance:

1. Insurance for **fiat funds** held by the exchange (FDIC insurance excluded)
2. Formal cybersecurity insurance for **cryptoassets**
3. **Self-insured** via a "fund" in the case of a hack

We believe that although self-insurance is a way of ensuring clients via their own balance sheet, a public declaration to compensate users in the case of a hack with a pool a funds is one indicator of quality.

We award 3 points for fiat insurance, 3 points for cryptoasset insurance **or** 1 point for a self insurance fund.

Insurance Fiat	Points
YES	3
NO	0

Insurance Crypto	Points
YES	3
NO	0

OR

Self Insurance Fund	Points
YES	1
NO	0

3. H/I - Sanctions Compliance/PEP Screening

Sanctions Compliance

It is important when assessing exchange quality to note when exchanges comply with sanctions rules and international recommendations. This will vary from country to country, however the ultimate aim is to state compliance with local regulations and to limit funds entering an exchange from any illicit sources.

Although we are unable to check for compliance via public sources, we assume that at the bare minimum that an exchange that states it has complied with certain country restrictions or compliance with UN sanctions lists, indicates at least an intention to comply with certain rules. For this we award **1 point**.

PEP Screening

PEP (Politically Exposed Persons) screening refers to screening for a person who serves or has served in a prominent public function (e.g. government), and by virtue of their position and the influence that they may hold, may present a higher risk for potential involvement in corrupt activity. We therefore consider at least a statement suggesting the intention to screen for PEPs as a positive indication of compliance. We therefore award **1 point** for this.

Sanctions/Country Restrictions Statement	Points
FOUND	1
NOT FOUND	0

PEP Screening Statement	Points
FOUND	1
NOT FOUND	0

3.J On-chain Transaction Monitoring

On-chain transaction monitoring refers to the process of collecting, tracking and analysing transactional flows between cryptoasset addresses on various blockchains.

One of the key functions of on-chain transactional monitoring is to identify and flag any suspicious flows of crypto that may have been derived from illicit sources.

This is an important consideration if a crypto exchange wishes to add an additional layer of AML compliance in order to reduce the chances that any funds flowing to or from the exchange is illicit.

Given the above, we award exchanges that conduct on-chain transaction via an external provider such as Chainalysis, Elliptic or Ciphertrace with **4 points.** Certain exchanges may have an internal transaction monitoring system to some extent. We award this **2 points.**

Formal Trade Surveillance Provision	Points
YES - EXTERNAL	4
YES - INTERNAL	2
NO	0

3.K Chief Compliance Officer

The compliance officer serves an important function in any cryptocurrency exchange, and helps to ensure that any relevant laws are complied with.

We assume that exchanges with an in-house compliance capacity driven by a chief compliance officer will be more capable of ensuring compliance with regulations and other local laws.

We therefore award **1 point** if we are able to successfully find the relevant staff member.

If this staff member is found, we also attempt to gauge their competence based on the number of years in compliance or legal roles. We award 1 point for 0-2 years, 2 points for 2-5 years, 3 points for 5-10 years and 4 points for more than 10 years.

Chief Compliance Officer	Points
FOUND	1
NOT FOUND	0

Professional Experience	Points
Years = 0	0
0 < Years$\leq$ 2	1
2 < Years$\leq$ 5	2
5 < Years$\leq$ 10	3
Years>10	4

4. Investment

In order to expand and develop, many cryptocurrency exchanges have attracted investments from large well-known venture capital firms or prominent technology companies.

We assume that the **calibre of an investor** can provide us with an indication of the quality of the exchange in three ways.

1. High quality investment banks, tech companies or professional VC firms invest in firms that meet a certain standards.

2. VC firms might invest in companies based on a selection of conditions or milestones that must be met moving forward. As a result, exchanges may be required to operate to a certain standard in order to meet these conditions. Effectively, high quality investors might impose their quality standards on exchanges that they invest in.

3. Finally, exchanges that receive investments from prominent investors have larger sums of capital with which to improve their operational and legal standards.

Large Institutional/Professional VC/Prominent Tech Investment. We only award points based on investments from investors that have been operating for a minimum of 5 years and predominantly invest in non-crypto related industries. Exchanges that have received investments from these types of investors are awarded 3 points.

Smaller High Quality Investors. Similar to the above, exchanges that have received investments from smaller well-known investors (VC/tech companies) are awarded 1 point.

For each investment category, if no investors could be found, they recieve zero points.

High Quality Investment Large Investor	Points
YES	3
NO	0

High Quality Investment Smaller Investor(s)	Points
YES	1
NO	0

5. Executive Management & Company Quality

The **calibre of the executive management team** and their level of **transparency** can be a clear proxy for how well an exchange is managed and accountable to any problems. Furthermore, the **age of an exchange** can provide us with a second gauge of infrastructure quality based on the assumption that older exchanges may have had the time to develop a more robust technical and legal infrastructure.

The first two metrics relate to **identity/transparency**, while the subsequent three metrics relate to **team/exchange quality**:

A. Identity of Executive Team
B. Post-Graduate/Professional Degrees
C. Professional Experience
D. Exchange Age

The assumption here is that the **more transparent** and **experienced/educated** an exchange's executive team, and the **older** an exchange is, the **higher the quality** of the exchange.

5.A Identity of Executive Team

A. Identity of Executive Team. The identity of the CEO, CTO, COO, CFO, CCO and CISO is registered in our data set. If no such title is available, the closest match is noted (e.g. VP of Engineering vs CTO). Those responsible for each position are searched for via company pages and LinkedIn. Each Identity that is found will receive 2 points. Those that cannot be found receive 0 points. The maximum points available is therefore 12 points (6 x 2).

Identity of Exec Member (CEO/CTO/CFO/COO/CCO/CISO)	Points
Found	2
Not Found	0

5.B-D Executive Quality and Exchange Age

B. Post-Graduate/Professional Degrees. As a measure of executive quality for each position, those that have attained either a masters-level degree or an additional professional qualification (e.g. CFA) will receive 1 point. Those that have not, will receive 0 points.

C. Professional Experience. This metric assumes that executives with more experience will be better at their respective roles. For the CEO, we gauge the number of years of experience at manager/director to C-level. For the CTO we gauge the number of years of experience in software related roles. For the CFO/COO we measure the number of years of experience in financial/operational roles respectively. For the chief compliance officer, we measure the number of years in legal or compliance roles. Finally for the CISO, we judge based on the number of years of relevant security/software/IT experience. Points are scored using a threshold system.

D. Exchange Age. The number of years of operation since launch can provide us with a measure of infrastructure quality based on the assumption that older exchanges may have had the time to develop a more robust technical and legal infrastructure. Ages are measured in years and scored using a tiered system. Older exchanges are scored higher than younger exchanges.

Post-Graduate/Professional Degree	Points
YES	1
NO	0

Professional Experience	Points
Years = 0	0
0 < Years$\leq$ 2	1
2 < Years$\leq$ 5	2
5 < Years$\leq$ 10	3
Years>10	4

Exchange Age	Points
Years $\leq$ 1	1
1<Years $\leq$ 3	4
3 < Years$\leq$ 5	5
5 < Years$\leq$ 7	7
Years>7	10

6. Data Provision

This section assesses the quality of the API of an exchange. The following metrics were collected:

A.   API Average Response Time (ms)
B.   Ability to Query Historical Trades
C.   Historical Candlestick Data
D.   Granularity of Candlestick Data
E.   Offers Websocket Connection
F.   Provides Order Book API Endpoint
G.   Maximum Order Book Level Offered
H.   API Rate Limits
I.   FIX Connection

6.A Average API Response Time

API Response Time: Defined as the average time taken for an exchange to begin responding to a request once they have received it. This was designed to measure the efficiency of an exchange's infrastructure.

It is measured across four publicly available endpoints, each polled five times consecutively, 2000ms apart.

For high frequency traders, this metric is particularly important as it is critical to the ability react to new market information swiftly and to place orders at low latency.

The **lower** the average response time, the **better the rating**. This metric was scored using the basic threshold system on the right.

Threshold	Points
0 < Time ≤ 150	5
150 < Time ≤ 400	4
400 < Time ≤ 700	3
700 < Time ≤ 1000	2
1000 < Time ≤ 2000	1
2000 < Time	0

6.B Ability to Query Historical Trades

Ability to Query Historical Trades: refers to whether an exchange offers any public API endpoints that allow users to query for historical trades at any point in the past.

This is an important metric in terms of transparency and accountability as it allows users or authorities to cross-check any calculated values at certain points in time.

Ratings were assigned based based on a YES or NO response. Exchanges that offer the ability to query historical trades were awarded 5 points, while those that do not were awarded 0.

Response	Points
YES	5
NO	0

6.C & D Historical Candlestick Data

C. Does the exchange offer historical candlestick data?

While not as transparent as providing access to full historical trade data, the provision of historical candlestick data allows for the querying of the historical OHLC data via an API at some level of granularity.

Ratings were assigned based based on a YES or NO response. Exchanges that offer historical candlestick data were awarded 2 points, while those that do not were awarded 0.

D. What is the most granular level of data that can be queried?

We assume that the more granular the data, the more transparent the exchange, and more competent in terms of data provision. We award 2 points for 1 minute data or less and 1 point for between 1 minute and hourly.

Candlestick Response	Points
YES	1
NO	0

Granularity	Points
1 Min or Less	2
Between 1 Min - Hourly	1
More than Hourly	0

6.E Websocket Connection

Websocket Connection (WS): A websocket connection provides a standardized way for an exchange server to send data to a user without being first requested by the client (i.e. REST API).

Instead of a client requesting data from an exchange via an API, a user can maintain an open connection that "listens" for data, allowing a stream of data to pass back and forth between the user and the exchange. Web sockets are capable of much larger quantities of data transfer and at higher rates than REST APIs.

Ratings were assigned based based on YES or NO response. Exchanges that offer a WS connection are awarded 3 points, while those that do not are awarded 0.

Response	Points
YES	3
NO	0

6.F Order Book API Endpoint

Order Book: An order book contains a list of orders that an exchange uses to record the interests of buyers and sellers. A matching engine uses the order book to determine which orders can be filled.

The provision of an order book API endpoint provides users with the ability to gauge current order book depth, likely pricing consequences and risk of placing a market order at a given time, as well as signs as to where the price might move next. Exchanges that do not offer this endpoint effectively hide important information regarding the characteristics of a market and how this changes over time.

Ratings were assigned based based on YES or NO response. Exchanges that offer an order book endpoint were awarded 1 point, while those that do not were awarded 0.

Maximum Order Book Level Offered

Providing granular order book data is both an indication of data transparency and technical competence. Level 1 order books refer to just the best bid and ask. Level 2 refers the aggregate orders at each bid and ask position. Level 3 refers to a fully granular order book with non-aggregated positions.

Order Book Endpoint Offered?	Points
YES	1
NO	0

Maximum Order Book Level Available	Points
Level 1	0
Level 2	1.5
Level 3	3

6.H API Rate Limits

Exchanges make their data public via an API (Application Programming Interface). Users are able to query data using various API endpoints.

Exchanges will vary in terms of the amount of **data requests per minute** (times a users can query data) they offer publicly to users. If a user exceeds the allocated rate limit (number of maximum requests per API endpoint), they will be unable to access data via the API.

In terms of data provision, exchanges that offer **higher rate limits** per minute are given a **higher score** than those that offer lower rate limits. We award 1 point for between 0 and 100 minutes, 2 points for between 100 and 400 minutes, 3 points for between 400 and 700 minutes, 4 points for between 700 and 1000 minutes, and 5 points for more than 1000 minutes.

Threshold (minutes)	Points
0 < Rate Limit ≤ 100	1
100 < Rate Limit≤ 400	2
400 < Rate Limit≤ 700	3
700 < Rate Limit≤ 1000	4
Rate Limit>1000	5

6.1 FIX Connection

FIX, or Financial Information eXchange is an electronic communications protocol used to exchange securities transaction information. Used by over 300 firms including the major investment banks, it has become the international standard for trade communication and regulatory reporting.

We consider an exchange that offers FIX to be of higher quality as it demonstrates a superior infrastructure and better integration with existing institutional protocols. We award 2 points for those that offer FIX.

Offers FIX?	Points
YES	2
NO	0

7. Trade Surveillance

Several high profile exchanges have employed the services of **third party trade surveillance providers** to monitor and flag any **suspicious trading activity**. Examples of these providers include Irisium Market Surveillance, Nasdaq SMARTS, and NICE Actimize.

In the current exchange ranking model, we make the assumption that exchanges that engage with a formal external market surveillance provider are more **transparent** and able to **detect** and **report** any illicit trading activity, and are therefore of **higher quality in terms of trade monitoring**.

There are exchanges that implemented their own "internal" trade monitoring systems. Given that this process is not conducted as independently, we assume that it is less indicative of quality than a formal system that is independently administered by a known surveillance provider.

For these reasons, we award 5 points to exchanges that implement external formal trade surveillance provision, and 2.5 points to those that have formally stated the use of their own internal monitoring systems. Exchanges that do not explicitly mention any formal trade monitoring system are awarded 0 points.

Formal Trade Surveillance Provision	Points
YES - EXTERNAL	5
YES - INTERNAL	2.5
NO	0

8. Negative Reports

We incorporate a "negative reports" deduction in our rating system that encompases a broad range of recent events.

These events might include a recent flash crash, a high profile legal dispute or a data privacy breach. While broad, we feel that exchanges that demonstrate high profile negative events in general indicate higher degree of trading risk vs those that don't.

For this reason, we apply a penalty factor of 5 points to any exchange that has demonstrated a recent high profile negative event or allegation.

Negative Reports	Points Deduction
YES	-5
NO	0

Appendix B - Market Quality Methodology

Introduction

As part of providing an assessment of exchanges, it is important to also include a representative picture of what trading looks like on their markets.

The metrics defined here are designed to separate exchanges which behave differently from the average exchange. Metrics are converted into ranking scores which are aggregated into the total exchange ranking.

We first present common metrics often used to describe a market, followed by metrics which can be shown to isolate specific unusual trading behaviours.

1. Market Cost to Trade (spread)
2. Liquidity (depth)
3. Stability (volatility)
4. Behaviour Towards Market Movement - (volatility & volume correlation)
5. "Natural" Market Behaviour (standard deviation of volume)

Data Collection

Pairs	BTC-USD, BTC-USDT, BTC-ETH, BTC-KRW, BTC-JPY ETH-USD, ETH-USDT, and ETH-KRW, ETH-JPY and others.
Time Period	Oct 5th - Nov 5th 2019
Trade Data	Transaction level data which provides insight into matches between two parties. It is used to calculate minute volatility and to measure an exchange's volume. Collection method: REST API polling on exchanges at exchange rate limits.
Order Book Data	Provides a view of all limit orders (offers to trade) on a particular market at any given moment. It is used to calculate spread and depth. Collection method: REST API polling snapshots.*

*CryptoCompare streams order books for the most notable exchanges via websocket connection; however, for the purposes of this report and to allow for the collection of the broadest data set possible we scaled out using the more widely available REST APIs.

Scoring Market Quality

Comparative

Used when a metric varies greatly between different markets, so we rank each exchange and market combination relative to its peers on a market by pair basis.

Following an ordered sort (direction is specific to each metric), a score of 0-10 is distributed across the group.

$$score(i) = \left\lfloor \frac{10i}{n} \right\rfloor \quad where \; i = position \; in \; the \; list$$

- Average spread
- 1% depth
- Minute volatility

Threshold

Used when a metric is completely market agnostic, so a threshold can be applied to fairly rank it across any market.

Pearson's correlation is one such measure where we can assign a fixed score to any given value.

- Volatility & volume correlation

Comparative + Threshold

Used when a metric varies greatly between different markets, but also when a logical threshold can be applied.

A threshold might be a fixed figure or one based on a group average or median.

- Standard deviation of trading volume

Each **exchange** receives an **aggregate score** based on an average of the markets we tested.

A Note on Aggregate Scoring

The pairs that were chosen for this report capture the majority of volume of crypto trading, and as such should give a fairly representative picture of exchanges.

A possible implication of focusing on just the specific markets considered in this report is that exchanges whose primary purpose is to cater to a specific jurisdiction (e.g. an exchange whose most liquid trading pairs are in GBP) may appear to have descriptive market metrics which under-represent the true liquidity on these exchanges. These exchanges will not, however, be penalised by other metrics unless the markets show particularly unusual trading behaviour.

1.a Market Cost to Trade - Average Spread

Spread is the difference between the best bid (the highest price at which someone is willing to buy) and the best ask (the lowest price at which someone is willing to sell).

Spreads are tight when markets are liquid. While they may widen in times of volatile price movements, the average spread gives an idea of the liquidity of the market, and quantifies how risky market makers believe the exchange is.

Higher spreads make it costlier to trade and increase market friction.

$$spread = \mathbb{E}(ask - bid)$$

Bid and ask values were collected every 5 seconds (subject to exchange rate limiting) and averaged across Oct 5th to Nov 5th. The long time period used for data collection was chosen to allow for accurate average spread values to be estimated even in the presence of API downtime and differing rate limits.

1.b Spread Overview

Generally, those exchanges which offer incentives to provide liquidity through either low or negative maker fees will achieve the tightest spreads.

Due to the spread being calculated using the best bid and offer, it is misleading to use it as a sole gauge of liquidity and therefore as the market cost to trade; it must be used in conjunction with a depth measurement to find the likely transaction price for any given size of transaction.

The spreads on some notable exchanges are shown on the right hand chart to display their variability even on relatively short time horizons (5 mins).

Exchange spreads variability (BTC-USD)
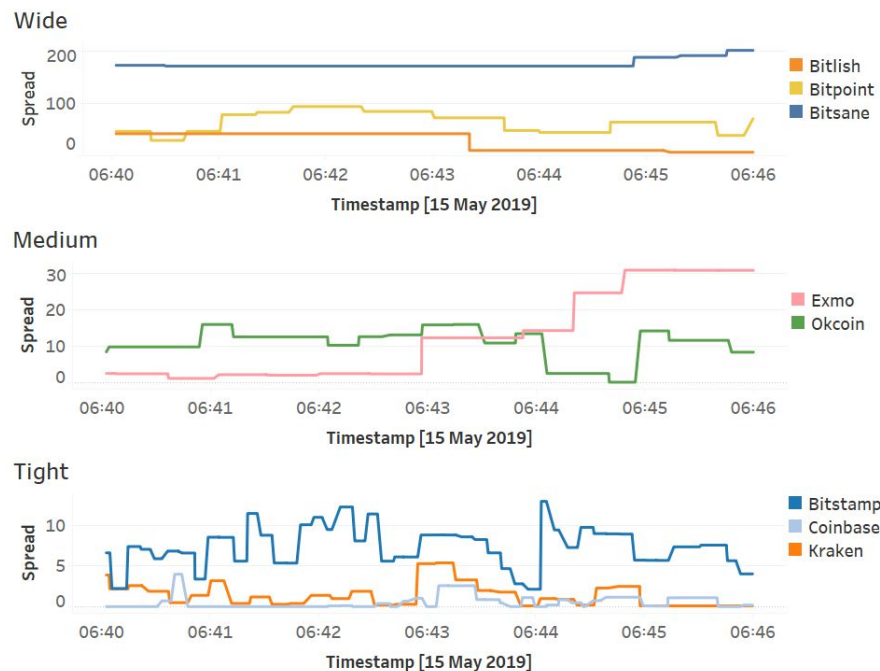
1.c Scoring Average Spread

Define metric	Score across each market	Aggregate

Higher spread = Lower score

Lower spread = Higher score

Comparative

We rank each exchange and market combination relative to its peers on a market by pair basis.

Following an ordered sort (direction is specific to each metric), a score of 0-10 is distributed across the group.

$$score(i) = \left\lfloor \frac{10i}{n} \right\rfloor \quad where \; i = position \; in \; the \; list$$

Exchange	Market	Metric	Metric Score
Exchange A	BTC-USD	40	0
Exchange B	BTC-USD	28	0
Exchange C	BTC-USD	20	1
Exchange D	BTC-USD	15	1
Exchange E	BTC-USD	12	2
...	...	...	...
Exchange R	BTC-USD	3	8
Exchange S	BTC-USD	2.3	9
Exchange T	BTC-USD	1.5	9
Exchange U	BTC-USD	0.9	10
Exchange V	BTC-USD	0.8	10

Exchange	Markets	Aggregated Metric Score
Exchange B	BTC-USD ETH-USD ETH-BTC	8.4
Exchange C	ETH-USD ETH-KRW ETH-JPY	8.0
Exchange A	BTC-USD BTC-KRW ETH-BTC	6.5
Exchange D	BTC-JPY ETH-BTC	6.2
Exchange E	BTC-USDT ETH-USDT ETH-BTC	5.9

2.a Liquidity - Average 1% Depth

Market depth is the total volume of orders in the order book. It provides an idea of how much it is possible to trade on an exchange, and how much the price is likely to move if large amounts are traded.

An exchange with greater average depth is likely to be more stable (i.e flash crashes are much less likely) and allows trading of greater amounts at better prices.

We consider the depth up to 1% either side of the mid price.

$$depth = \mathbb{E}\left(\frac{depthUp + depthDown}{2}\right)$$

Where depthUp is the total volume that would be required to move the price by 1% upwards from the mid price, and depthDown is the total volume that would be required to move the price by 1% downwards from the mid price.

2.b Depth Overview

Generally, exchanges which offer incentives to provide liquidity, through either low or negative maker fees, will achieve the deepest order books.

Exchanges that attract the most trading activity will naturally have more orders resting on their book at larger sizes, increasing the depth.

There are stark differences in the depth between exchanges, as shown on the right hand chart. Depth tends to stay relatively constant throughout any given day, but news and other price impacting events can cause sharp changes.

Exchange depth* variability (BTC-USD)
*total liquidty 1% above and below mid price / 2
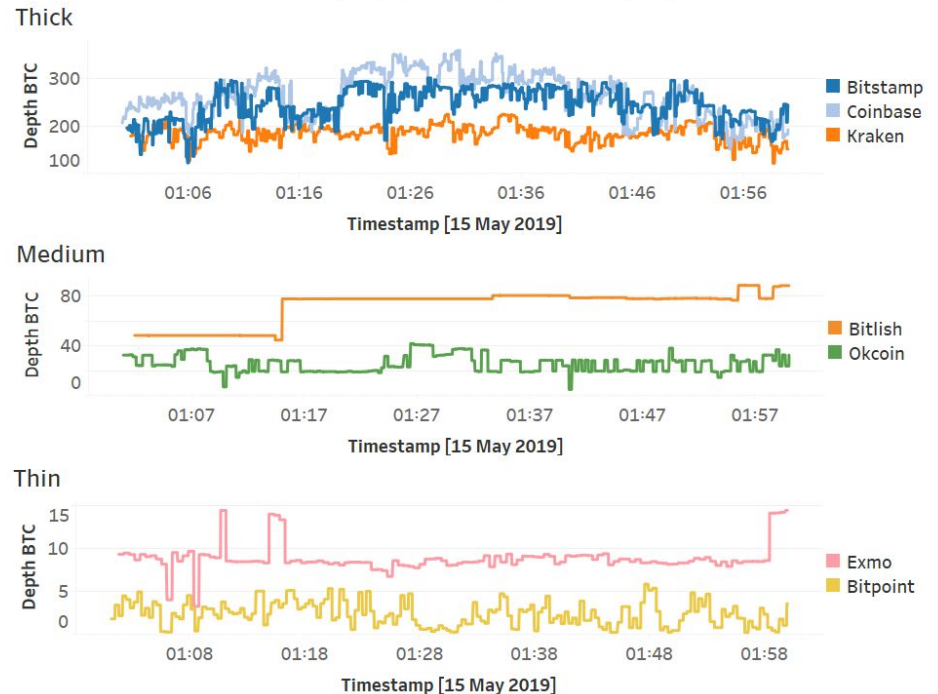
2.c Scoring Average 1% Depth

Define metric	Score across each market	Aggregate

Less depth = Lower score
More depth = Higher score

Comparative

We rank each exchange and market combination relative to its peers on a market by pair basis.

Following an ordered sort (direction is specific to each metric), a score of 0-10 is distributed across the group.

$$score(i) = \left\lfloor \frac{10i}{n} \right\rfloor \quad where \; i \; = position \; in \; the \; list$$

Exchange	Market	Metric	Metric Score
Exchange A	BTC-USD	6	0
Exchange B	BTC-USD	12	0
Exchange C	BTC-USD	16	1
Exchange D	BTC-USD	56	1
Exchange E	BTC-USD	100	2
…	…	…	…
Exchange R	BTC-USD	500	8
Exchange S	BTC-USD	534	9
Exchange T	BTC-USD	611	9
Exchange U	BTC-USD	900	10
Exchange V	BTC-USD	1456	10

Exchange	Markets	Aggregated Metric Score
Exchange B	BTC-USD ETH-USD ETH-BTC	8.4
Exchange C	ETH-USD ETH-KRW ETH-JPY	8.0
Exchange A	BTC-USD BTC-KRW ETH-BTC	6.5
Exchange D	BTC-JPY ETH-BTC	6.2
Exchange E	BTC-USDT ETH-USDT ETH-BTC	5.9

3.a Stability - Minute Volatility

When trading the same asset across exchanges, it is preferable to have lower volatility. Measures of market risk such as the Sharpe ratio use the volatility of an asset.

As we would prefer lower risk when holding an asset on an exchange, we would also prefer lower volatility.

$$volatility = \sigma \left(\frac{price_t - price_{t-1}}{price_t} \right)$$

To calculate the metric, price is bucketed into minutes and the volatility is calculated using the close price of each minute bucket over a rolling 6H period. The volatility is then averaged over the full time period (Oct 5th - Nov 5th).

3.b Scoring Minute Volatility

| Define metric | Score across each market | Aggregate |

Higher volatility = Lower score
Lower volatility = Higher score

Comparative

We rank each exchange and market combination relative to its peers on a market by pair basis.

Following an ordered sort (direction is specific to each metric), a score of 0-10 is distributed across the group.

$$score(i) = \left\lfloor \frac{10i}{n} \right\rfloor \quad where \ i = position \ in \ the \ list$$

Exchange	Market	Metric	Metric Score
Exchange A	BTC-USD	0.3	0
Exchange B	BTC-USD	0.18	0
Exchange C	BTC-USD	0.12	1
Exchange D	BTC-USD	0.11	1
Exchange E	BTC-USD	0.10	2
...	...	...	...
Exchange R	BTC-USD	0.04	8
Exchange S	BTC-USD	0.03	9
Exchange T	BTC-USD	0.01	9
Exchange U	BTC-USD	0.009	10
Exchange V	BTC-USD	0.003	10

Exchange	Markets	Aggregated Metric Score
Exchange B	BTC-USD ETH-USD ETH-BTC	8.4
Exchange C	ETH-USD ETH-KRW ETH-JPY	8.0
Exchange A	BTC-USD BTC-KRW ETH-BTC	6.5
Exchange D	BTC-JPY ETH-BTC	6.2
Exchange E	BTC-USDT ETH-USDT ETH-BTC	5.9

4/5 Metrics to Identify Unusual Behaviour

Recent industry focus has centred around highlighting suspicious trading behaviour on exchanges. There has, however, been a shortage of clear and transparent methodologies published for ascertaining whether trading is suspicious for a given market.

We provide a summary of metrics deemed to give a good assessment of whether the trading on an exchange conforms to behaviour that one might generally expect to see. Each of these metrics are designed to single out specific types of trading behaviour.

Behaviour towards market movement - volatility & volume correlation

We analyse the correlation between volume and volatility and use this to provide insights into the types of market participants trading on exchanges, and consider how this differs from the aggregate average.

Natural trading behavior - standard deviation of trading volume

We analyse the standard deviation of trading volumes over different time periods and show that this metric can be used to separate two very different trading behaviours on an exchange.

4.a Behaviour Towards Market Movement

Volatility & volume correlation

The relationship between market volatility and volume can be used to glean an insight into the sorts of trading activity which are being carried out on an exchange.

To explain the modes of trading behaviour seen on exchanges, we define two types of market participants:

- Market makers operate on exchanges, and aim to make a profit while maintaining a market neutral position. They provide liquidity and narrow spreads on a market . Generally, they make money from payments from the exchange, through arbitrage, or on the bid-ask spread.

- Investors are defined here as traders who take a position in the market. They make money based on the price movements of the asset.

4.b An 'Investor Market'

Investors who take a position in the market are likely to trade more actively in times of volatility.

Price movements may cause limit orders to be filled and new investors will likely join the market to react to price movements.

The end result of this is that volume is positively correlated with price volatility.

4.c A 'Maker Market'

In times of high volatility it becomes less certain that market makers are able to hedge any trade they make effectively.

They therefore reduce volumes at each position or increase the spread they are willing to provide for the market. This makes the asset less liquid and means that smaller trades will cause larger price movements.

To avoid large slippage, traders therefore need to trade smaller amounts and the volume becomes negatively correlated to the volatility.

4.d Differentiating Between Types of Market

Taking the Pearson correlation coefficient between hourly trading volume and standard deviation of trade-on-trade return we can separate exchanges which operate with trading in each of these regimes. Size of the marker represents reported trading volume.
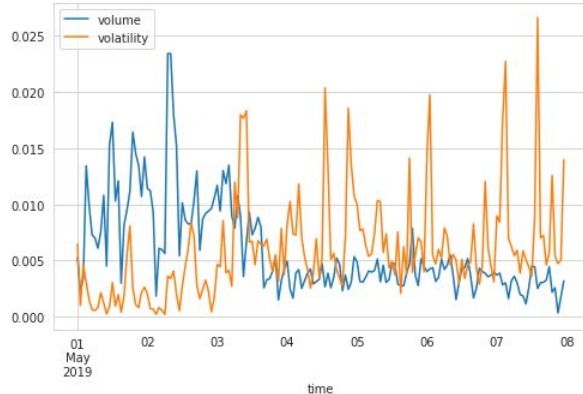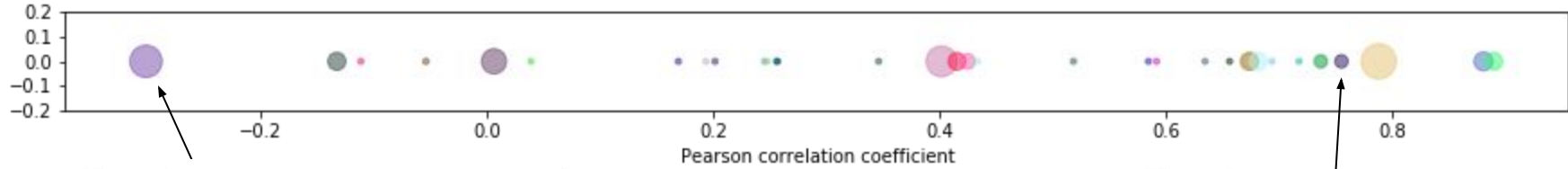
'Maker market'
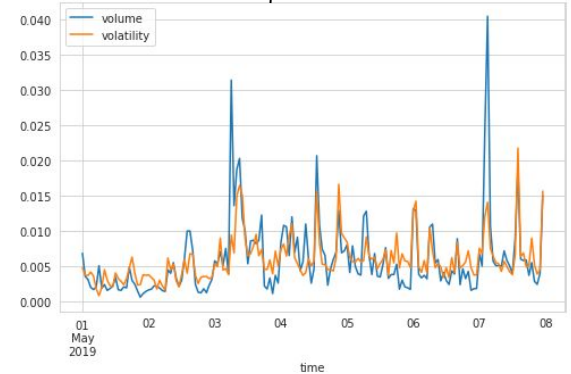
'Investor market'

4.e Differentiating Between Types of Market
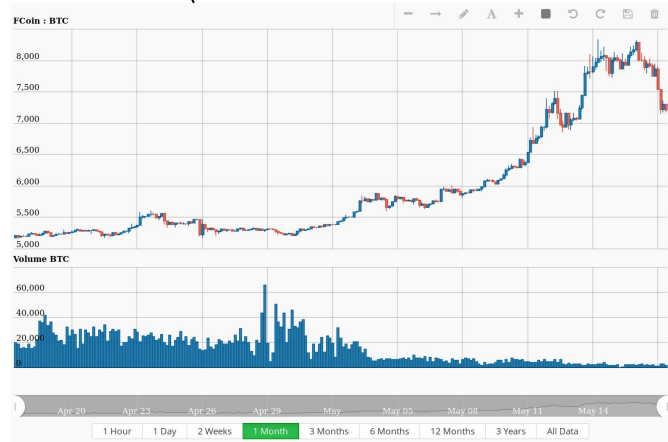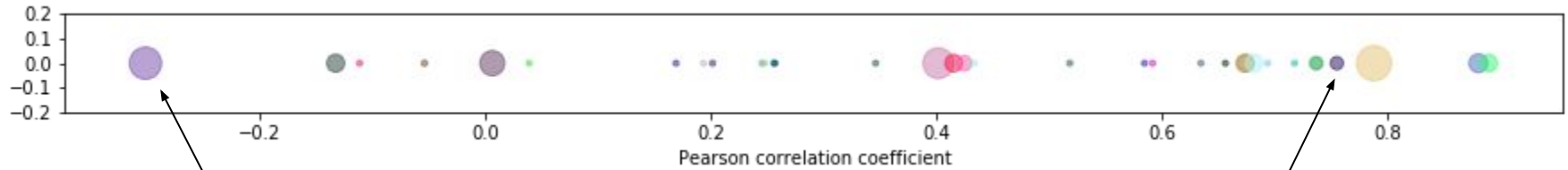
'Maker market'
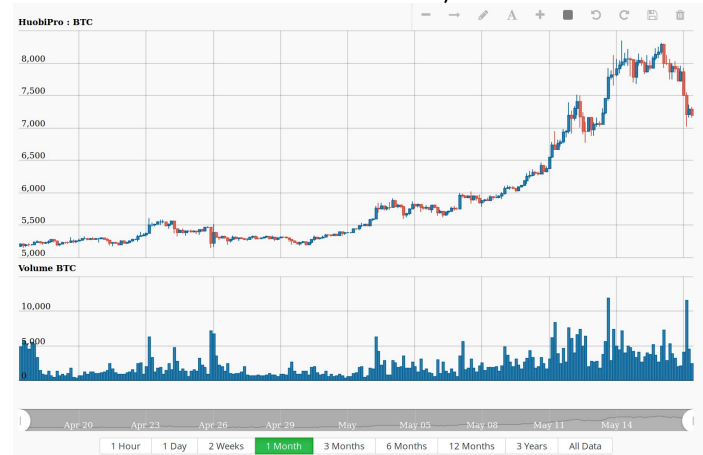
'Investor market'

4.f The Market as a Whole

Both types of behaviour occur in traditional financial markets, but to define what we expect for a cryptocurrency market we turn to a market aggregate.

Here we use the CryptoCompare Index (CCCAGG) as an example of a wide market index. The volume can be seen to correlate with price movements. This is therefore considered to be the preferred behaviour for an exchange.

4.g Scoring Behaviour Towards Market Movement

Volatility & Volume Correlation

| Define metric | Score across each market | Aggregate |

Low or negative correlation = Lower score

High positive correlation = Higher score

Threshold

A correlation threshold can be applied to fairly rank it across any market.

Pearson's correlation is one such measure which we can assign a fixed score to any given value.

The table on the right sets out the thresholds for each score.

Correlation	Metric Score
<= 0	0
< 0.12	1
< 0.19	2
< 0.27	3
< 0.35	4
< 0.42	5
< 0.5	6
< 0.58	7
< 0.65	8
< 0.73	9
>= 0.73	10

Exchange	Markets	Aggregated Metric Score
Exchange B	BTC-USD ETH-USD ETH-BTC	8.4
Exchange C	ETH-USD ETH-KRW ETH-JPY	8.0
Exchange A	BTC-USD BTC-KRW ETH-BTC	6.5
Exchange D	BTC-JPY ETH-BTC	6.2
Exchange E	BTC-USDT ETH-USDT ETH-BTC	5.9

5.a Natural Trading Behavior

Standard deviation of trading volume

While, as previously discussed, we might expect price volatility to affect trading volume, it is unlikely that in a time of constant price volatility the trading volume would remain constant.

This behaviour is explored by considering how much the minutely, hourly and daily volume vary on average using the standard deviation.
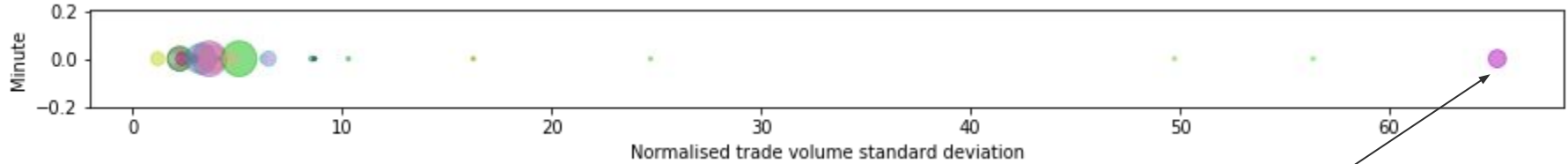
5.b Varying the Time Period

We take the standard deviation of the trading volume over different time periods, and normalise by the mean trading volume for the period.
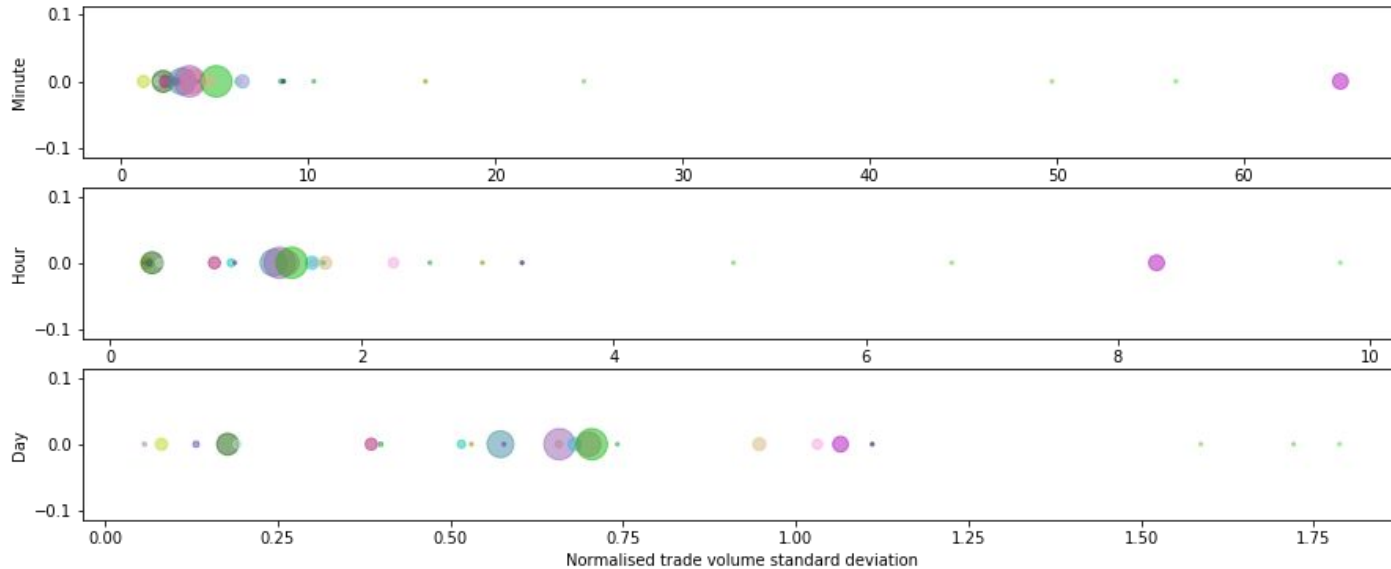
5.c Small Time Periods

Outliers at small time periods are caused by exchanges which trade very infrequently.

5.d Long Time Periods

Groups at longer time periods (1 day volume) display clear demarcation of the target behaviour.
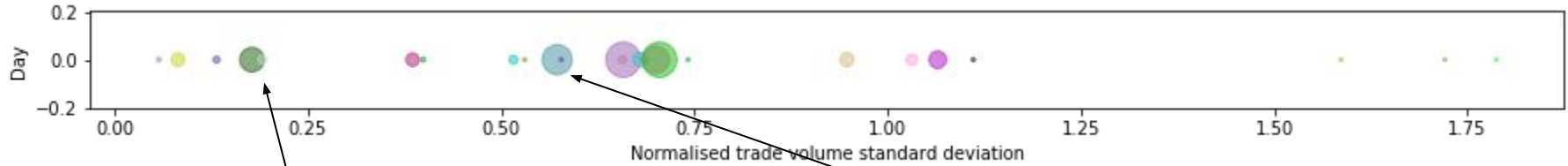
5.e Scoring Natural Trading Behavior

Standard deviation of trading volume

Define metric → **Score across each market** → **Aggregate**

Low standard deviation = Lower score

High standard deviation = Higher score

Comparative + Threshold

Following a ascending sort, a median standard deviation is determined.

Every constituent with a higher standard deviation than the median is given a score of 10.

With the remaining constituents, a score of 0-10 is distributed across the group.

Exchange	Market	Metric	Metric Score
Exchange A	BTC-USD	0.03	0
Exchange B	BTC-USD	0.09	1
Exchange C	BTC-USD	0.10	2
Exchange D	BTC-USD	0.13	3
...	...	...	...
Exchange K	BTC-USD	0.43	10
...	...	...	...
Exchange S	BTC-USD	0.71	10
Exchange T	BTC-USD	0.81	10
Exchange U	BTC-USD	0.85	10
Exchange V	BTC-USD	0.91	10

Exchange	Markets	Aggregated Metric Score
Exchange B	BTC-USD ETH-USD ETH-BTC	8.4
Exchange C	ETH-USD ETH-KRW ETH-JPY	8.0
Exchange A	BTC-USD BTC-KRW ETH-BTC	6.5
Exchange D	BTC-JPY ETH-BTC	6.2
Exchange E	BTC-USDT ETH-USDT ETH-BTC	5.9

Appendix C - Points and Grading Summary

Points Categories

A. Legal/Regulatory Assessment
B. Security
C. Investment
D. Team/Exchange
E. Data Provision
F. Trade Surveillance
G. Market Quality
H. Negative News (penalty factor)
I. Inflation Score (*not used in ranking)

Points Category A - Legal/Regulation

A. Legal/Regulation	Scoring
Legal Company Name	Found: **5**, Not Found:**0**
Registered as an MSB or Licensed as a CryptoCurrency Exchange	YES: **12** x **Compliance Stringency Factor [0-3]/3*** , NO: **0**
Geography Country Rating	Low Risk: **9**, Medium Risk: **6**, High Risk: **3**, Very High Risk: **0**
Country Regulation Rating	Crypto Exchange Regulation: **[0-3]**
Part of Self-Regulatory Organisation	YES: **2**, NO: **0**
Part of Industry Group	YES: **1**, NO: **0**
Strict KYC/AML (proof of ID)	YES: **5**, NO: **0**
On-chain transaction monitoring	YES: **2**, NO: **0**
On-chain transaction monitoring - Internal of External Provider	INTERNAL: **0**, EXTERNAL: **2**
Fiat Insurance Against Losses	YES: **3**, NO: **0**
Crypto Insurance Against Losses OR	YES: **3**, NO: **0**
Self-Insurance Fund	YES: **1**, NO: **0**
CCO (Chief Compliance Officer)	Found: **1**, Not Found: **0**
CCO Experience (in Compliance or Legal Roles)	Years = 0: 0, **0** < Years< 2: **1** , 2 < Years< 5: **2** , 5 < Years< 10: **3** , Years>10: **4**
Sections Compliance Statement	YES: **1**, NO: **0**
PEP Statement	YES: **1**, NO: **0**
Total Legal/Regulatory Points	**0-54**
Re-Scaled Legal Points Available	**20%**

See Compliance Stringency Methodology here for more information on scoring.

Points Category B - Security

B. Security	Scoring
Formally Certified and Compliant with Security Industry Standard (E.g. ISO 27001, SOC2)	YES: **5**, NO: **0**
SSL Security Rating by Qualys or ImmuniWeb	A+ =**3**, A=**2.5**, A-=**2**, B+ or B=**1**, <B-=**0**
Offline Storage (Cold Wallet)	YES: **2**, NO: **0**
Cold Wallet %	**Cold Wallet % * 3 (weighting factor),** "Majority": **2**, "Some": **1**, Not Found: **0**
Geographical Key Distribution	YES: **2**, NO: **0**
2FA	YES: **2**, NO: **0**
Custody Provider (E.g Bitgo)	YES: **3**, NO: **0**
Number of Hacks	More than 1: **-3,** Less than 2: **0**
Hacked Recently	Yes: -**5**, No: **0**
Total Security Points	0-19
Re-Scaled Investments Points Available	20

Points Categories C/D - Investment and Team/Exchange

C. Investments	Scoring	D. Team/Company	Scoring
Funding by Large VC or Non-Crypto Established Company	YES: **3** NO: **0**	CEO/CTO/CFO/COO/CCO/CISO *Repeat for each executive	Found:**2** Not Found: **0** (12 Total Max)
Funding by Smaller VC Companies	YES: **1** NO: **0**	CEO/CTO/CFO/COO/CCO/CISO Masters or Postgraduate Certification *Repeat for each executive	YES:**1**, NO:**0** (6 Total Max)
Total Investment Points	**0-4**	CEO/CTO/CFO/COO/CCO/CISO *Repeat for each executive For CEO: director to c-level For CTO: software roles For CFO: financial/accounting roles COO: operations roles CCO: compliance/legal roles CISO: software roles	Years = 0: **0** 0 < Years< 2: **1** 2 < Years< 5: **2** 5 < Years< 10: **3** Years>10: **4** (24 Total Max)
		Exchange Age Since Launch	Months < 12: **1** 12<Months < 36: **3** 36 < Months< 60: **5** 60 < Months< 84: **7** Months>84: **10**
		Total Team/Exchange Points Available	**0-52**
Re-Scaled Investments Points Available	**5**	**Re-Scaled Team/Company Points Available**	**15**

Points Category E/F - Data Provision - Trade Surveillance

E. Data Provision	Scoring	F. Trade Surveillance	Scoring
API Average Response Time (ms)	0 < Time < 150: **5** 150 < Time < 400: **4** 400 < Time < 700: **3** 700 < Time < 1000: **2** 1000 < Time < 2000: **1** 2000 <Time: **0**	Market Surveillance System	YES: 2 NO: 0
Ability to Query Historical Trades	YES:**5**, NO: 0	External/Internal (if YES to above)	External:3 Internal: 0.5
Historical Candlestick Data	YES:**1**, NO: **0**	**Total Trade Surveillance Points Available**	**5**
Minimum Candlestick Data Granularity	=<1min = **2** 1min - 1hour: **1** >1hour: **0**		
Offers Websocket Connection	YES: **5**, NO: **0**		
Provides Order Book API Endpoint	YES: **1**, NO: **0**		
Maximum Order Book Level	L1=**0**, L2=**1.5**, L3=**3**		
API Rate Limits	0 < Rate Limit < 100: **1** 100 < Rate Limit< 400: **2** 400 < Rate Limit< 700: **3** 700 < Rate Limit< 1000: **4** Rate Limit>1000: **5**		
FIX Connection	YES: **2**, NO: **0**		
Total Data Provision Points Available	**29**		
Re-Scaled Data Provision Points Available	**20**	**Trade Surveillance Points Available**	**5**

Points Categories G/H/I - Market Quality, Inflation, Negative News

A. Market Quality	Scoring	B. Inflation Score	Scoring	Negative Reports	Scoring
Market cost to trade (average spread)	0-10	Competitions	YES:5 NO: 0	Negative Reports Found	YES: -5 NO: 0
Liquidity (average depth of 1% price impact)	0-10	Airdrops	YES: 2.5 NO: 0	**Total Negative News Points Deductible**	**-5**
Stability (minute volatility)	0-10	Transaction Fee Mining	YES: 15 NO: 0		
Behaviour towards sentiment (volatility and volume correlation)	0-10	Margin Trading	YES: 5 NO: 0		
Natural trading behaviour (volume standard deviation)	0-10	No Fees	YES: 5 NO: 0		
Total Market Quality Points	**0-50**	**Total Inflation Points**	**0- 32.5**		
Re-Scaled Market Quality Points Available	**15**	**Re-Scaled Inflation Score Available**	**10**	**Re-Scaled Negative News Points**	**-5**

Points Aggregation and Grading

Scores from each category were aggregated to form a total cumulative score. The **maximum score is 100.**

Category	Maximum Points
Security	20
Legal	20
Investments	5
Management/Company	15
Data Provision	20
Trade Surveillance	5
Market Quality	15
Total Cumulative Points Available	**100**

Threshold	Grade
Above 75	AA
65-75	A
45-65	B
35-45	C
20-35	D
10-20	E
<10	F

Appendix D - A Note On Fake Trading Reports

A Note On Fake Trading Reports

CryptoCompare wanted to explore the anomalous trading patterns pointed out in several reports.

It was found that measuring an exchange's quality by focussing on trading patterns is still very challenging.

Some of our concerns with this approach:

- Trade patterns can easily be manipulated
- Trade pattern normality by itself does not assess exchange quality as a whole
- Previous reports have truncated histograms, which omits potentially important information

For the above reasons, trading patterns are only analysed but not included in the CryptoCompare Exchange Ranking.

Trade size distributions
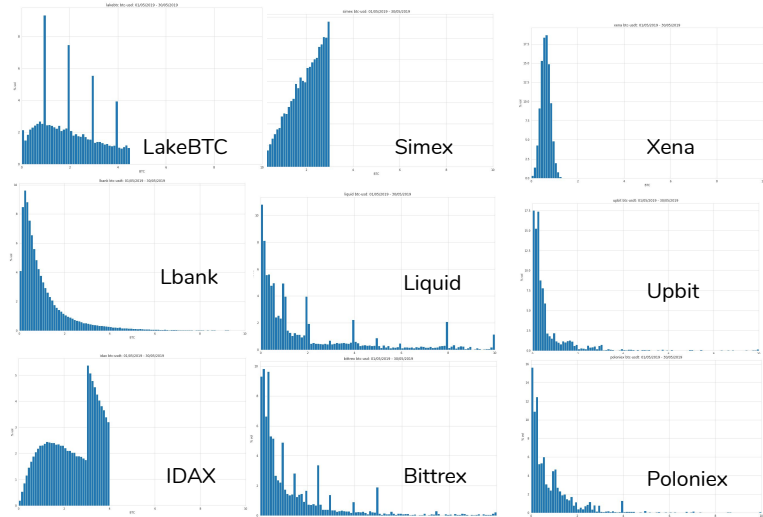
Collected 1-30 May 2019
Source: CryptoCompare

Trade Patterns Can Be Manipulated

Multiple sources pointed out the recent change in trading patterns on the Huobi Global BTC-USDT market - as shown below in the March and May trade size histograms. Huobi Global explained this by its efforts to stop market makers from wash trading.

This has raised concerns that market makers are trading with different patterns to avoid detection instead of ceasing their wash trading activities (total BTC volume for each month is similar for March and May). We believe that due to the ease at which trade distribution patterns can be altered they do not represent a sufficiently robust indicator of market quality.

March 2019

May 2019

Huobi Global
BTC-USDT

Total Volume: 693k BTC

Total Volume: 696k BTC

Source: CryptoCompare
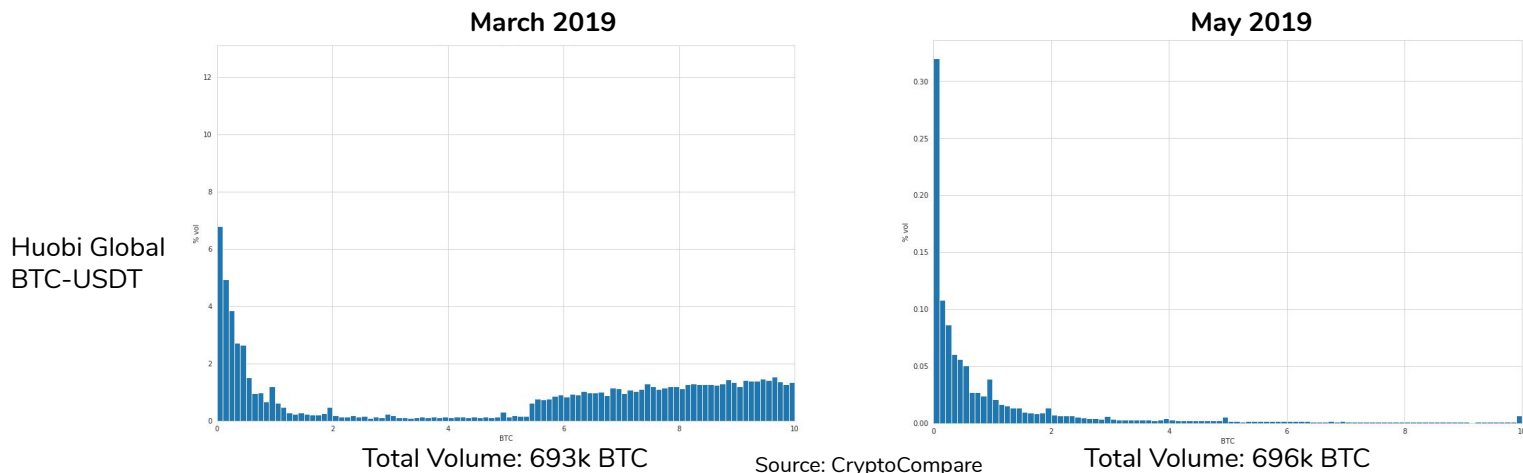
Trade Patterns Can Be Manipulated

This behaviour is not unique to Huobi Global - comparing exchange volume distributions over time on other exchanges reveals similar changes to trading patterns.

EXX
BTC-USDT
2019-03-29 vs 2019-04-26
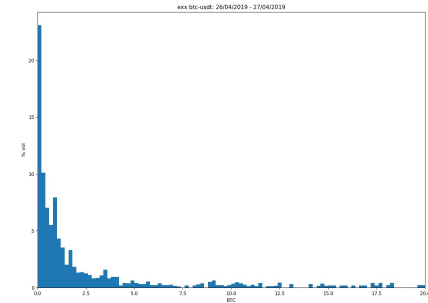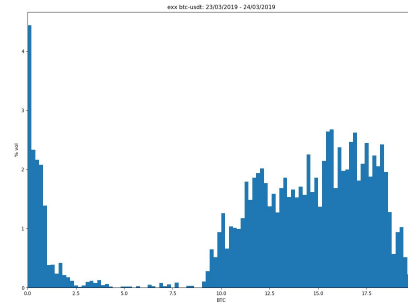
Exrates
BTC-USD
2019-03-29 vs 2019-04-28

Source: CryptoCompare
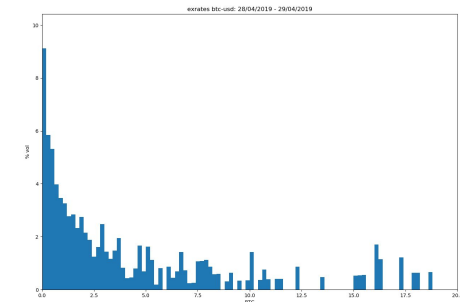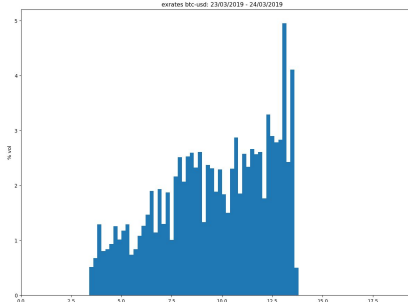
Trade Pattern Does Not Assess Exchange Quality

Using trade size patterns to evaluate an exchange can result in both false positives and false negatives.

Gemini is a top tier exchange, it's ETH-BTC market clearly does not match the expected distribution.

On the other hand, ZB exchange shows a perfect distribution on its BTC-USDT market. However, the CryptoCompare Exchange Ranking rated it as an E tier exchange due to its lack of transparency, market quality and further aspects described in our methodology.
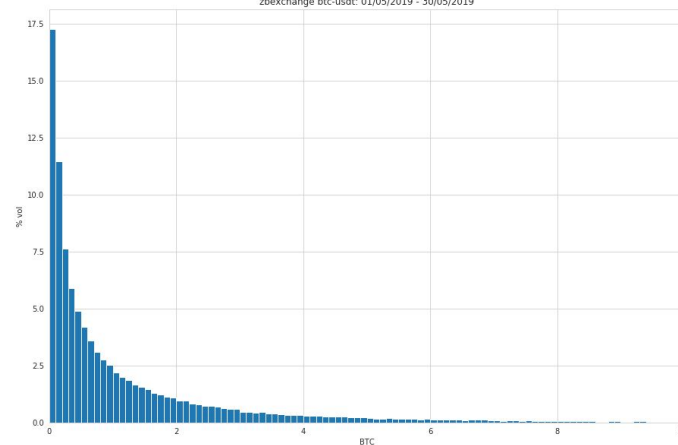
Gemini ETH-BTC
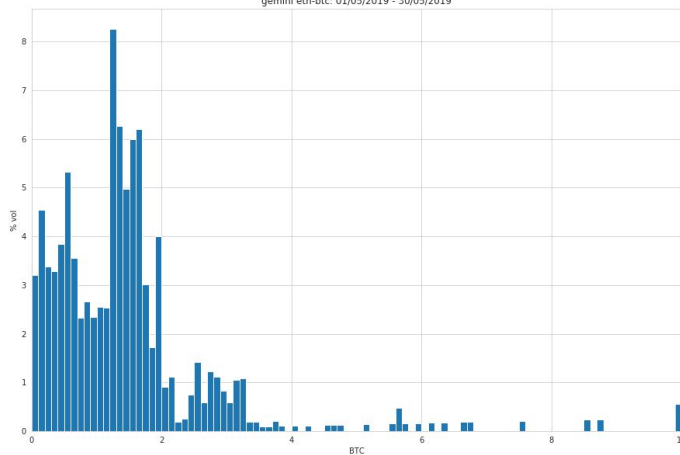
ZB BTC-USDT

Lost Information By Truncating Histogram

One vector of analysis which is overlooked in the final histogram data set is the cumulative sum of volume.

Here we plot the trading distributions for some exchanges in the Bitwise report, alongside their cumulative density functions.

This gives a much clearer idea of the percentage of the trades which are being accounted for in the 0-10 BTC period.
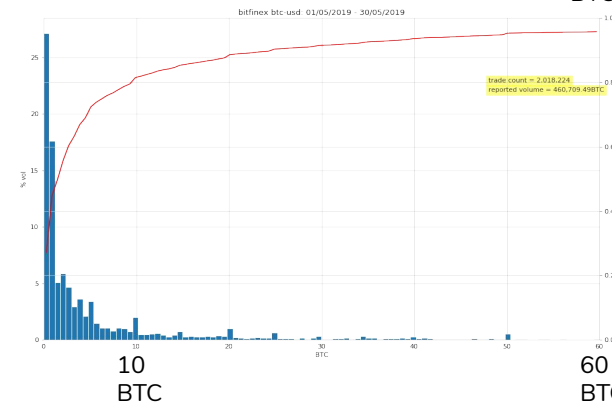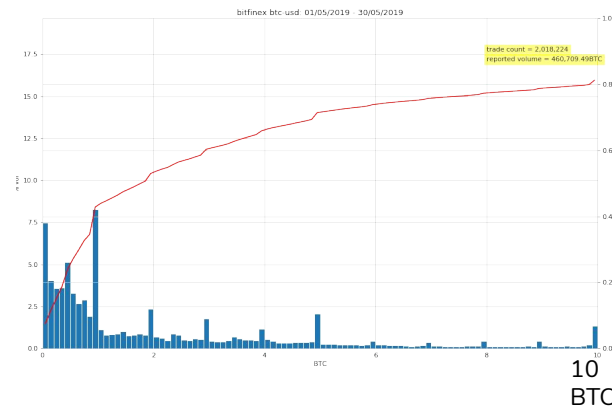

Binance

HitBTC

BitTrex
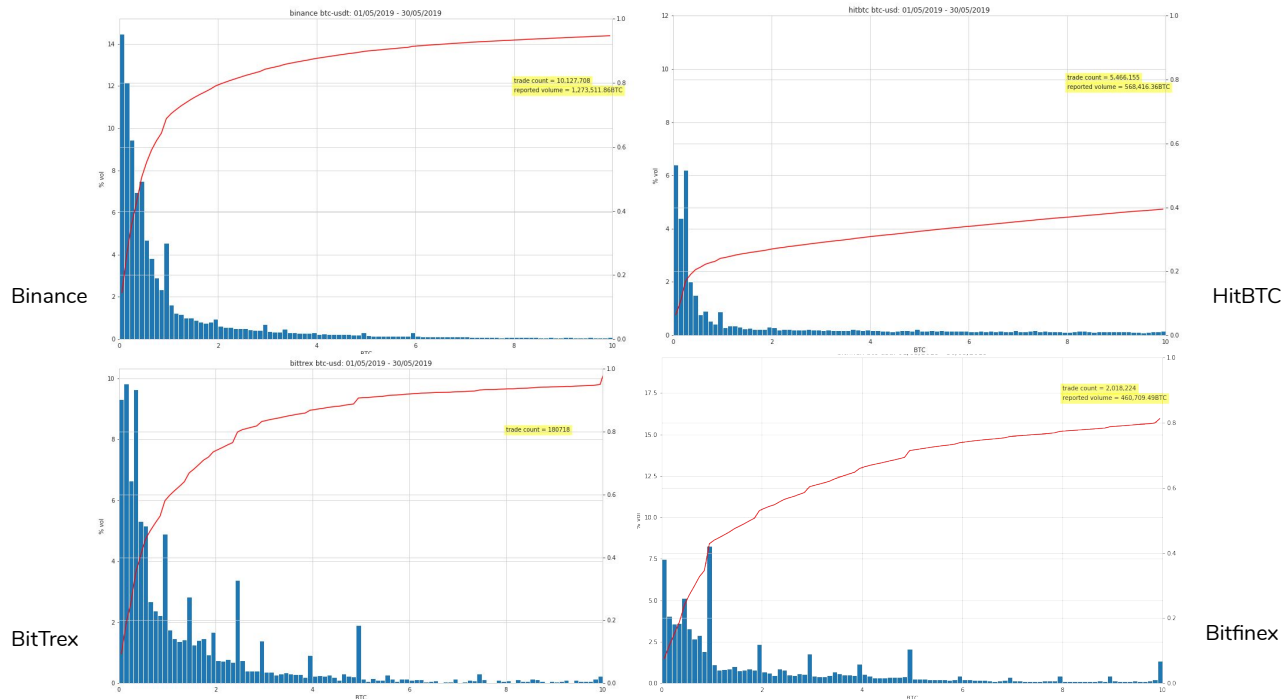
Bitfinex

Lost Information By Truncating Histogram

Bitfinex was one of the exchanges Bitwise chose as part of its 10 most trusted exchanges. However, when we look at the cumulative density function of the trading distributions we can see that only about 80% of trading is accounted for in the period 0-10 BTC.

Extending the period to 0-60 BTC we now can see 95% of trading activity. Bitfinex has many more trades at high volume than other exchanges in the Bitwise 10.

Whether this is unusual is a matter of judgement, but it demonstrates that the methodology is at best qualitative, and potentially easily gameable (a few very large wash trades would never appear in the truncated histogram).

0-10 BTC CDF 0.8

0-60 BTC CDF 0.95

With thanks to

GDF

Hogan Lovells