

MEMORANDUM

TO: File No. SR-NYSEArca-2019-01

FROM: Lauren Yates
Office of Market Supervision, Division of Trading and Markets

DATE: March 20, 2019

SUBJECT: Meeting with Bitwise Asset Management, Inc., NYSE Arca, Inc., and Vedder Price P.C.

On March 19, 2019, Elizabeth Baird, Christian Sabella, Natasha Greiner, Michael Coe, Edward Cho, Neel Maitra, David Remus (by phone), and Lauren Yates from the Division of Trading and Markets; Charles Garrison, Johnathan Ingram, Cindy Oh, Andrew Schoeffler (by phone), Amy Starr (by phone), Sara Von Althann, and David Walz (by phone) from the Division of Corporation Finance; and David Lisitza (by phone) from the Office of General Counsel, met with the following individuals:

Teddy Fusaro, Bitwise Asset Management, Inc.
Matt Hougan, Bitwise Asset Management, Inc.
Hope Jarkowski, NYSE Arca, Inc.
Jamie Patturelli, NYSE Arca, Inc.
David DeGregorio, NYSE Arca, Inc. (by phone)
Tom Conner, Vedder Price P.C.
John Sanders, Vedder Price P.C.

The discussion concerned NYSE Arca, Inc.'s proposed rule change to list and trade, pursuant to NYSE Arca Rule 8.201-E, shares of the Bitwise Bitcoin ETF Trust. Bitwise Asset Management, Inc. also provided the attached presentation to the Commission Staff.



Bitwise Asset Management

Presentation to the U.S. Securities and Exchange Commission

March 19, 2019



About Bitwise



01

Pioneer: Created the world's first crypto index fund.

02

Specialist: The only asset we invest in is crypto.

03

Experienced: Deep expertise in crypto, asset management and ETFs.

VENTURE INVESTORS

BLOCKCHAIN
CAPITAL

khosla ventures

GENERAL  CATALYST

TEAM BACKGROUNDS

Google

facebook

BLACKROCK

NEW YORK
LIFE
MAINSTAY
INVESTMENTS

wealthfront

Goldman
Sachs

J.P.Morgan

ETF
.com





Today's Speakers



Teddy Fusaro

Chief Operating Officer

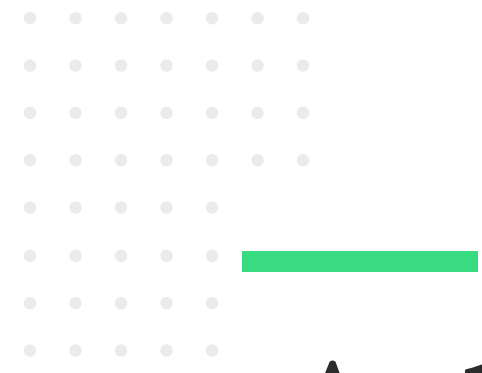
Previously Senior Vice President and Senior Portfolio Manager at New York Life; earlier, Head of Portfolio Management and Trading at IndexIQ; before that, Direxion and Goldman Sachs.



Matt Hougan

Global Head of Research

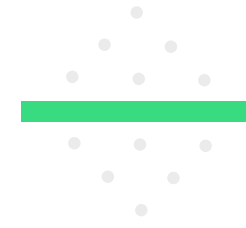
Previously CEO of Inside ETFs. Before that, CEO of ETF.com. Co-author of the CFA Institute's monograph on ETFs and three-time member of the Barron's ETF Roundtable.



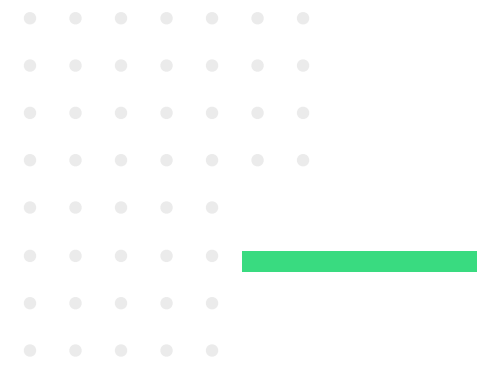
A large number of issuers have filed applications for bitcoin or bitcoin futures ETFs.



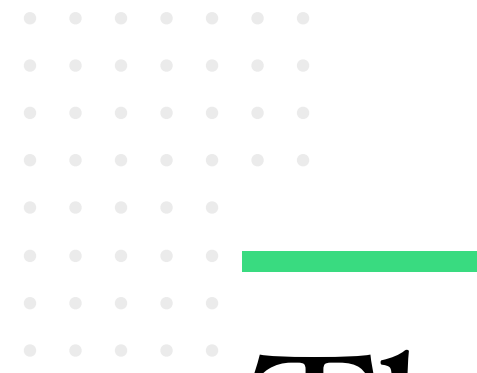
We appreciate how clear the Commission has been in responding to these applications.



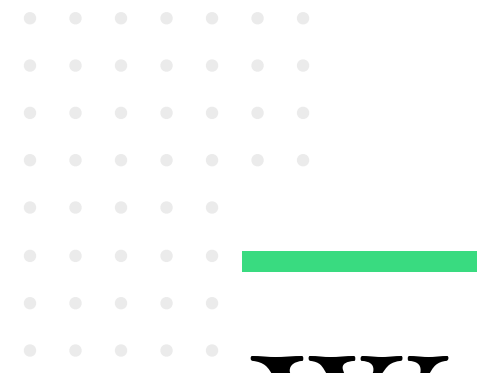
Our approach is different.
And simple.



The Bitwise Bitcoin ETF Trust ("the Trust") intends to provide direct exposure to bitcoin, priced off the equivalent of a crypto consolidated tape, while custodizing assets at a regulated, insured, third-party custodian.



This down-the-middle approach is based on an accurate understanding of the bitcoin market, which is more orderly, regulated, and efficient than is commonly known.



We will show that our application and supporting data mitigate the Commission's concerns around market manipulation, custody, liquidity, pricing, and arbitrage.



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12	The Real Bitcoin Market	The real market for bitcoin is significantly smaller, more orderly, and more regulated than is commonly understood.
83	Market Manipulation	The bitcoin market is uniquely resistant to manipulation, and the regulated and surveilled futures market is significant.
133	Custody	Custody is a solved problem in crypto, with multiple insured, regulated, third-party custodians present in the market.
168	Valuation	Bitcoin trades at a unified global price, and established procedures exist for hard forks, air drops, and other situations.
189	Liquidity & Arbitrage	The bitcoin market is sufficiently liquid, well-organized and developed to support liquidity and effective arbitrage in an ETF.
200	Appendix	Direct answers to each question raised in the January 18, 2018, Staff Letter on Fund Innovation and Cryptocurrency-related Holdings



Supporting Materials

Bitwise has prepared extensive research in support of our application and this meeting. In addition to this presentation deck, we will be submitting the following materials to the Commission electronically to aid your review.

1. Commentary On The Winklevoss Order

The Commission provided extremely detailed analysis of the bitcoin market in its July 28, 2018, Winklevoss ETF Trust Order. We have analyzed each of the Commission's arguments and explored how it applies to or is mitigated by our application.

2. Commentary On And Fact-Checking Of Comment Letters

Comment letters are a critical source of public input. We have analyzed and fact-checked all comment letters received for the Bitwise Bitcoin ETF Trust, as well as those comment letters cited in the Winklevoss Order.

3. Economic And Non-Economic Trading In Bitcoin: Exploring The Real Market

This presentation argues that the vast majority of reported bitcoin trading volume is either fake volume or represents non-economic wash trading. Our supporting white paper provides exhaustive proof to support that argument, and explores the real nature of the bitcoin spot market.

4. Available On Request: Comprehensive Data Set And Analysis

Bitwise has compiled a comprehensive bitcoin market data set for more than 80 different exchanges. We are happy to make this data set available to the Commission on request, or to perform additional analysis as needed, subject to third-party data licensing agreements.

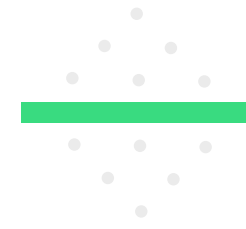


The Real Bitcoin Market

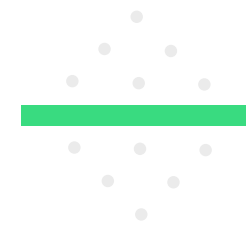
KEY FINDINGS

The real market for bitcoin is significantly smaller, more orderly, and more regulated than is commonly understood.

What Makes Bitcoin Unique?

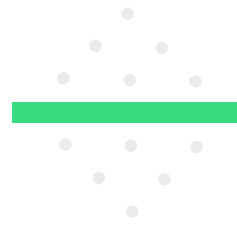


Bitcoin is a globally fungible commodity with low transaction costs, near-zero transportation costs and low-to-zero storage costs.



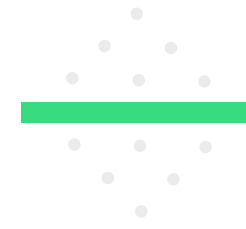
Bitcoin is a **globally fungible** commodity with low transaction costs, near-zero transportation costs and low-to-zero storage costs.

A bitcoin is the same everywhere in the world.



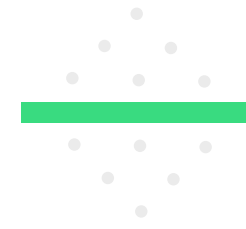
Bitcoin is a globally fungible commodity with **low transaction costs,** near-zero transportation costs and low-to-zero storage costs.

On leading exchanges, bitcoin commonly trades with a \$0.01 spread on an approximately \$4,000 handle with significant volume.



Bitcoin is a globally fungible commodity with low transaction costs, **near-zero transportation costs** and low-to-zero storage costs.

Unlike physical commodities, there is virtually no cost to transport bitcoin anywhere in the world.



Bitcoin is a globally fungible commodity with low transaction costs, near-zero transportation costs

and low-to-zero storage costs.

Bitcoin can be safely custodied with established third-party custodians at a cost that ranges from 0% to 1.5% per year.



What does that mean?

As a result, you would expect the bitcoin market to **be uniquely orderly and efficient, with tight spreads and nearly perfect arbitrage.**

Bitcoin fits the textbook definition of an arbitrable good to a degree unmatched in history, which would suggest a uniquely efficient market.

Unfortunately, Public Perception *And* Data Suggest Exactly The Opposite

Bitcoin Markets

Pair: All | Category: Spot | Fee Type: All | USD

#	Source	Pair	Volume (24h)	Price	Volume (%)	Category	Fee Type	Updated
2	CoinBene	BTC/USDT	\$258,399,000	\$3,562.29	3.05%	Spot	Percentage	Recently
3	Binance	BTC/USDT	\$232,019,000	\$3,562.28	2.74%	Spot	Percentage	Recently
4	OKEEx	BTC/USDT	\$217,034,500	\$3,562.28	2.56%	Spot	Percentage	Recently
5	OEX	ETH/BTC	\$163,006,485	\$3,562.28	1.92%	Spot	Percentage	Recently
6	FCoin	BTC/USDT	**\$157,204,555	\$3,562.29	1.86%	Spot	Transaction Mining	Recently
7	Coinbit	BTC/KRW	**\$153,973,091	\$3,444.30	1.82%	Spot	Transaction Mining	Recently
8	Huobi	BTC/USDT	\$148,604,031	\$3,564.94	1.75%	Spot	Percentage	Recently
9	Bitfinex	BTC/USD	\$131,230,813	\$3,654.30	1.55%	Spot	Percentage	Recently
10	DigiFinex	BTC/USDT	\$130,519,257	\$3,563.20	1.54%	Spot	Percentage	Recently
11	DOBI trade	LTC/BTC	\$118,234,866	\$3,555.20	1.40%	Spot	Percentage	Recently
12	DOBI trade	ETH/BTC	\$116,594,281	*\$3,561.98	1.38%	Spot	Percentage	Recently
13	Liquid	BTC/JPY	**\$113,659,671	\$3,520.71	1.34%	Spot	No Fees	Recently
14	HitBTC	BTC/USDT	\$103,090,002	\$3,649.19	1.22%	Spot	Percentage	Recently
15	RightBTC	ETH/BTC	\$95,898,916	\$3,558.53	1.13%	Spot	Percentage	Recently
16	IDAX	BTC/USDT	\$87,557,665	\$3,563.79	1.03%	Spot	Percentage	Recently
17	DOBI trade	EOS/BTC	\$80,796,400	\$3,558.82	0.95%	Spot	Percentage	Recently
18	Fatbtc	BTC/CNY	\$79,055,472	\$3,363.28	0.93%	Spot	Percentage	Recently
19	Coinbase Pro	BTC/USD	\$77,266,732	\$3,520.75	0.91%	Spot	Percentage	Recently
20	BCEX	BTC/USDT	\$77,080,267	\$3,560.41	0.00%	Spot	Percentage	81 hours ago
21	BitForex	BTC/USDT	\$75,204,770	\$3,543.60	0.89%	Spot	Percentage	Recently
22	ZB.COM	XRP/BTC	\$73,513,000	\$3,543.60	0.87%	Spot	Percentage	Recently
23	BCEX	BTC/CKUSD	\$67,946,000	\$3,203.60	0.00%	Spot	Percentage	81 hours ago
24	OOBTC	BTC/USDT	\$67,923,000	\$3,538.42	0.80%	Spot	Percentage	Recently
25	Kraken	BTC/USD	\$64,996,009	\$3,538.42	0.77%	Spot	Percentage	Recently
26	Simex	BTC/USD	\$62,126,103	\$3,520.61	0.73%	Spot	Percentage	Recently
27	Bitstamp	BTC/USD	\$58,002,667	\$3,519.28	0.68%	Spot	Percentage	Recently

Public perception holds that the bitcoin market is in fact uniquely *disorderly* and *inefficient*.

This is a rational response to the information most people have at their disposal.

For example, leading data aggregators show prices on different exchanges separated by hundreds of dollars.



How Can This Be?

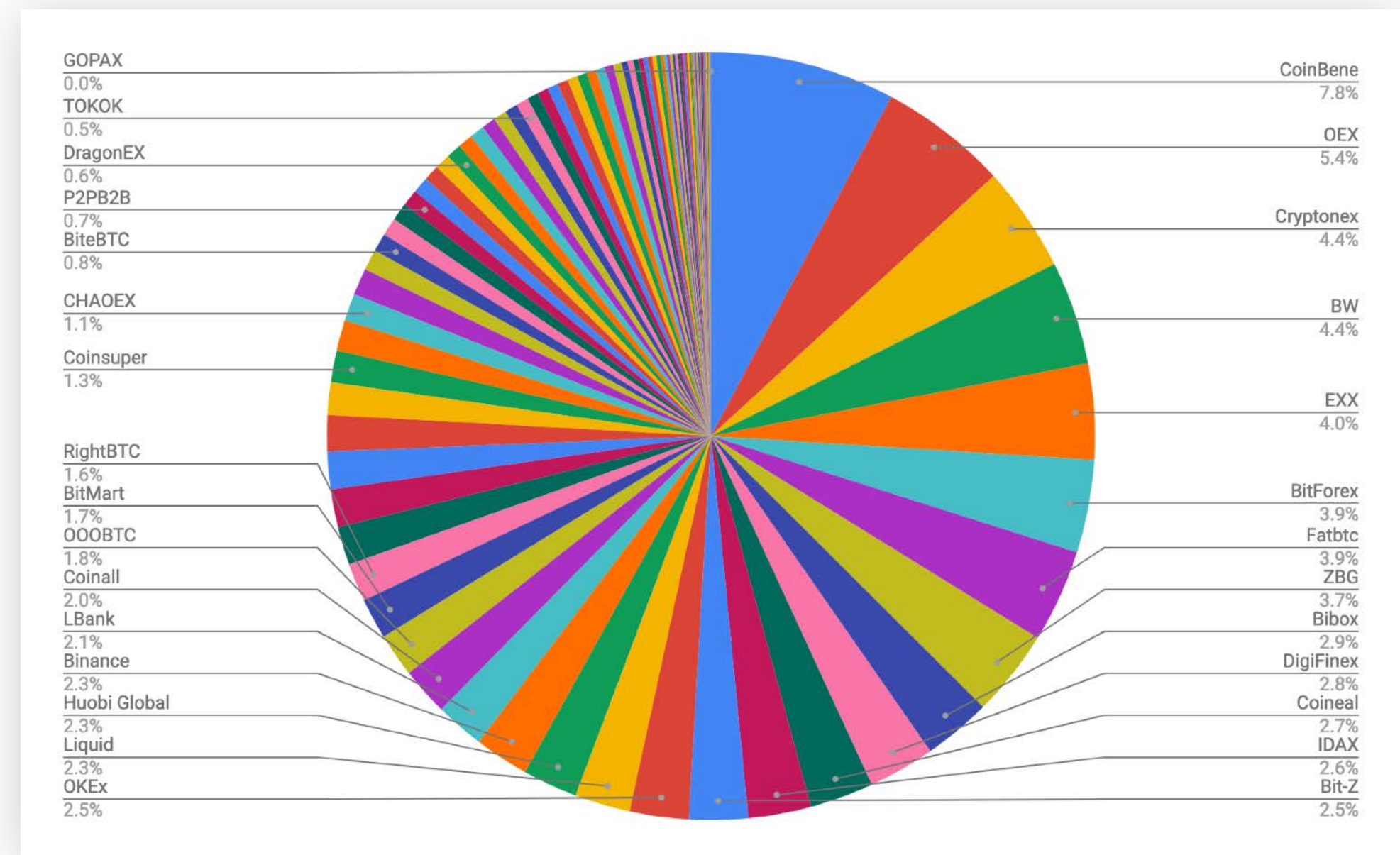
Top Bitcoin Exchanges by Reported Volume

Reported volume adds to roughly \$6 billion/day*, but under the hood the exchanges that report the highest volumes are unrecognizable. The vast majority of this reported volume is fake and/or non-economic wash trading.

CoinMarketCap Top Exchanges

#	Source	Pair	Volume (24h)	Price	Volume (%)	Category	Fee Type	Updated
2	CoinBene	BTC/USDT	\$519,473,547	\$3,965.49	3.93%	Spot	Percentage	Recently
3	OEX	BTC/USDT	\$344,465,558	\$3,964.29	2.61%	Spot	Percentage	Recently
4	BW	BTC/USDT	\$287,808,371	\$3,962.83	2.18%	Spot	Percentage	Recently
5	BitForex	BTC/USDT	\$273,338,561	\$3,963.72	2.07%	Spot	Percentage	Recently
6	ZBG	BTC/USDT	**\$235,219,535	\$3,966.05	1.78%	Spot	Transaction Mining	Recently
7	Bibox	BTC/USDT	\$227,182,722	\$3,964.59	1.72%	Spot	Percentage	Recently
8	DigiFinex	BTC/USDT	\$196,151,977	\$3,966.80	1.49%	Spot	Percentage	Recently
9	Coineal	BTC/USDT	\$189,723,011	\$3,964.75	1.44%	Spot	Percentage	Recently
10	IDAX	BTC/USDT	\$182,114,079	\$3,965.26	1.38%	Spot	Percentage	Recently
11	DigiFinex	LTC/BTC	\$180,772,269	\$3,956.79	1.37%	Spot	Percentage	Recently
12	Coineal	LTC/BTC	\$177,085,654	\$3,955.72	1.34%	Spot	Percentage	Recently
13	OKEx	BTC/USDT	\$162,231,333	\$3,964.23	1.23%	Spot	Percentage	Recently
14	Bit-Z	BTC/USDT	\$157,452,242	\$3,965.27	1.19%	Spot	Percentage	Recently
15	DOBI Exchange	ETH/BTC	\$157,381,534	\$3,962.00	1.19%	Spot	Percentage	Recently
16	Coinall	BTC/USDT	**\$155,776,905	\$3,964.15	1.18%	Spot	Transaction Mining	Recently
17	Coinall	LTC/BTC	**\$155,406,913	\$3,952.56	1.18%	Spot	Transaction Mining	Recently
18	Bgogo	BTC/USDT	**\$138,951,870	\$3,962.86	1.05%	Spot	Transaction Mining	Recently
19	55 Global Markets	BTC/USDT	\$138,245,374	\$3,965.49	1.05%	Spot	Percentage	Recently
20	EXX	BTC/USDT	**\$133,624,207	\$3,962.95	1.01%	Spot	Transaction Mining	Recently
21	LBank	BTC/USDT	\$132,426,103	\$3,966.80	1.00%	Spot	Percentage	Recently
22	Binance	BTC/USDT	\$131,745,321	\$3,965.22	1.00%	Spot	Percentage	Recently
23	Bibox	ETH/BTC	\$131,590,304	\$3,965.45	1.00%	Spot	Percentage	Recently
24	Liquid	BTC/JPY	**\$131,183,093	\$3,897.30	0.99%	Spot	No Fees	Recently
25	Huobi Global	BTC/USDT	\$122,031,909	\$3,962.97	0.92%	Spot	Percentage	Recently
26	EXX	ETH/BTC	**\$120,000,891	\$3,959.85	0.91%	Spot	Transaction Mining	Recently
27	Binance	ENJ/BTC	\$116,926,318	\$3,928.83	0.89%	Spot	Percentage	Recently
28	OOBTC	BTC/USDT	\$115,245,922	\$3,959.95	0.87%	Spot	Percentage	Recently
29	Simex	BTC/USD	\$113,347,372	\$3,919.23	0.86%	Spot	Percentage	Recently
30	BitMart	BTC/USDT	\$112,926,902	\$3,964.57	0.86%	Spot	Percentage	Recently

Exchange Breakdown

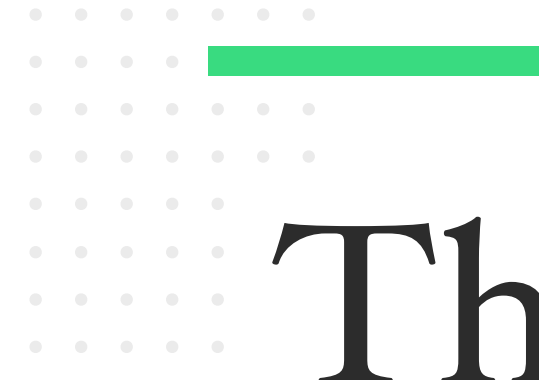


Reported: ~\$6 Billion in Avg. 24hr Daily Volume*

* Only counting trading volumes where BTC trades against fiat currencies or stablecoins.

Screenshot: Coinmarketcap on March 9, 2019

Data Source: Coinmarketcap. March 4-8, 2019



This Data Is Widely Reported ... And Extremely Wrong

This data comes from CoinMarketCap.com, the most widely cited source for bitcoin volume. It is used by every major media outlet in the world (examples shown to the right).

Despite its widespread use, the CoinMarketCap.com data is wrong. It includes a large amount of fake and/or non-economic trading volume, thereby giving a fundamentally mistaken impression of the true size and nature of the bitcoin market.

We will demonstrate in multiple different ways that approximately 95% of this volume is fake and/or non-economic in nature, and that the real market for bitcoin is significantly smaller, more orderly, and more regulated than commonly understood.

“Binance, currently the largest online exchange by volume, according to research site [coinmarketcap.com...](https://CoinMarketCap.com)”

THE WALL STREET JOURNAL. August 5, 2018

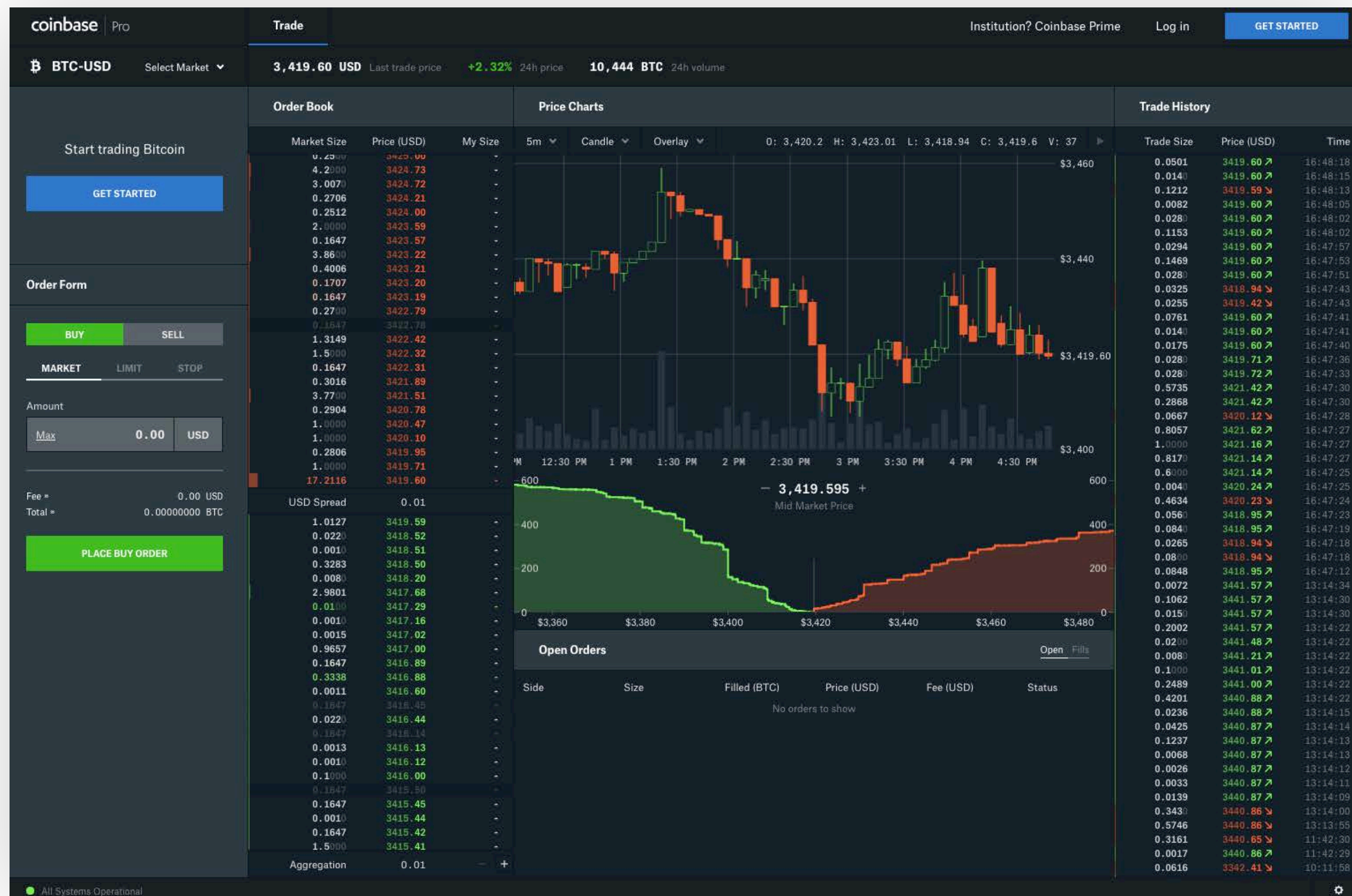
“According to data from the website [coinmarketcap.com...](https://CoinMarketCap.com)”

The New York Times August 20, 2018

“Digital coins are collectively valued at \$140 billion, according to [coinmarketcap.com...](https://CoinMarketCap.com)”

BARRON'S November 23, 2018

What Do Real Exchanges Look Like?



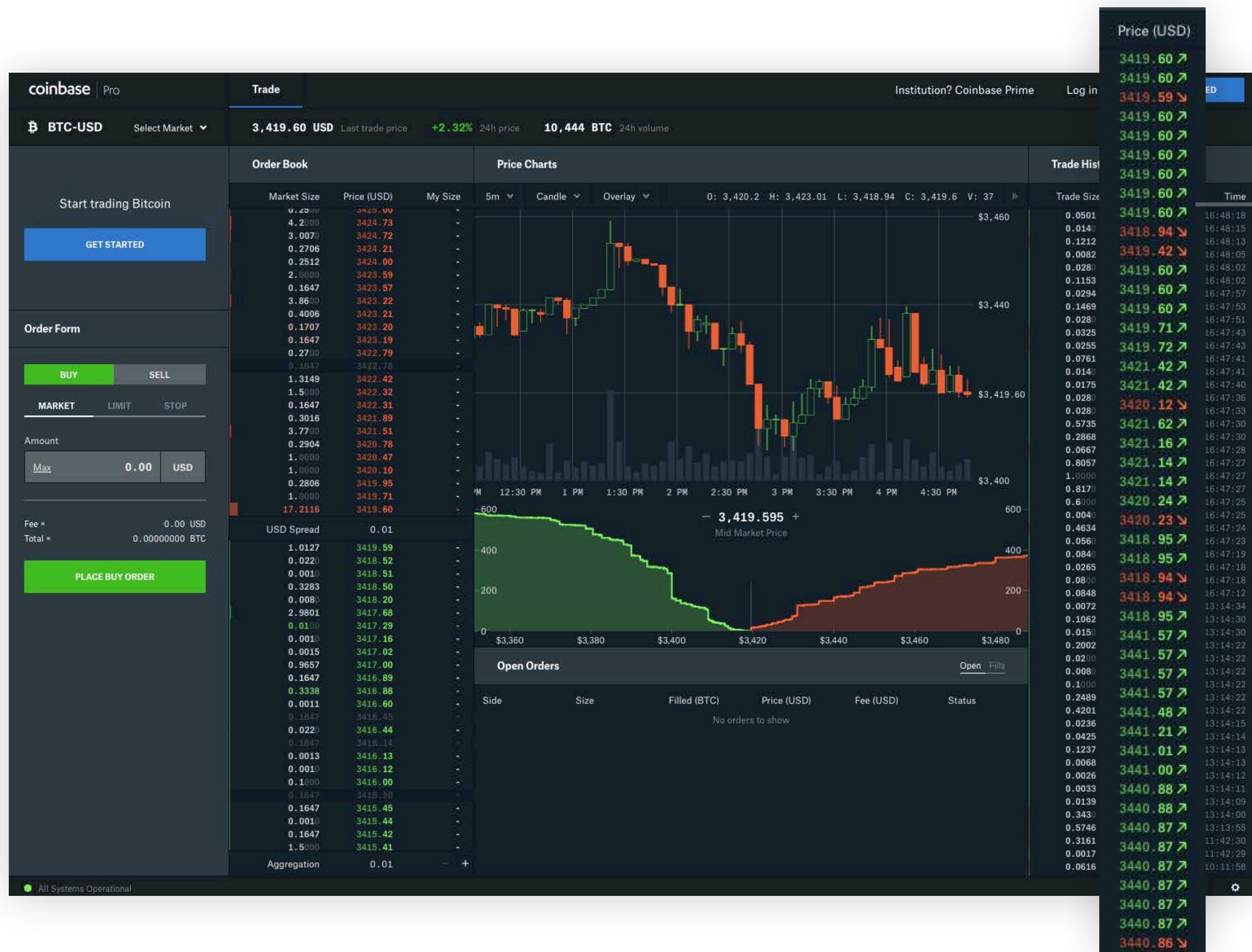
Coinbase Pro (\$27M*)

Coinbase is a San Francisco-based firm that has raised \$546 million* in venture capital. It does about \$27 million in daily bitcoin volume. The firm has a BitLicense from the New York State Department of Financial Services, and is generally well-known in the community.

On the left is a screenshot of its trading interface.

* Average Daily Volume. Data Source: Kaiko. March 4-8, 2019 . Funding estimate is from Crunchbase.

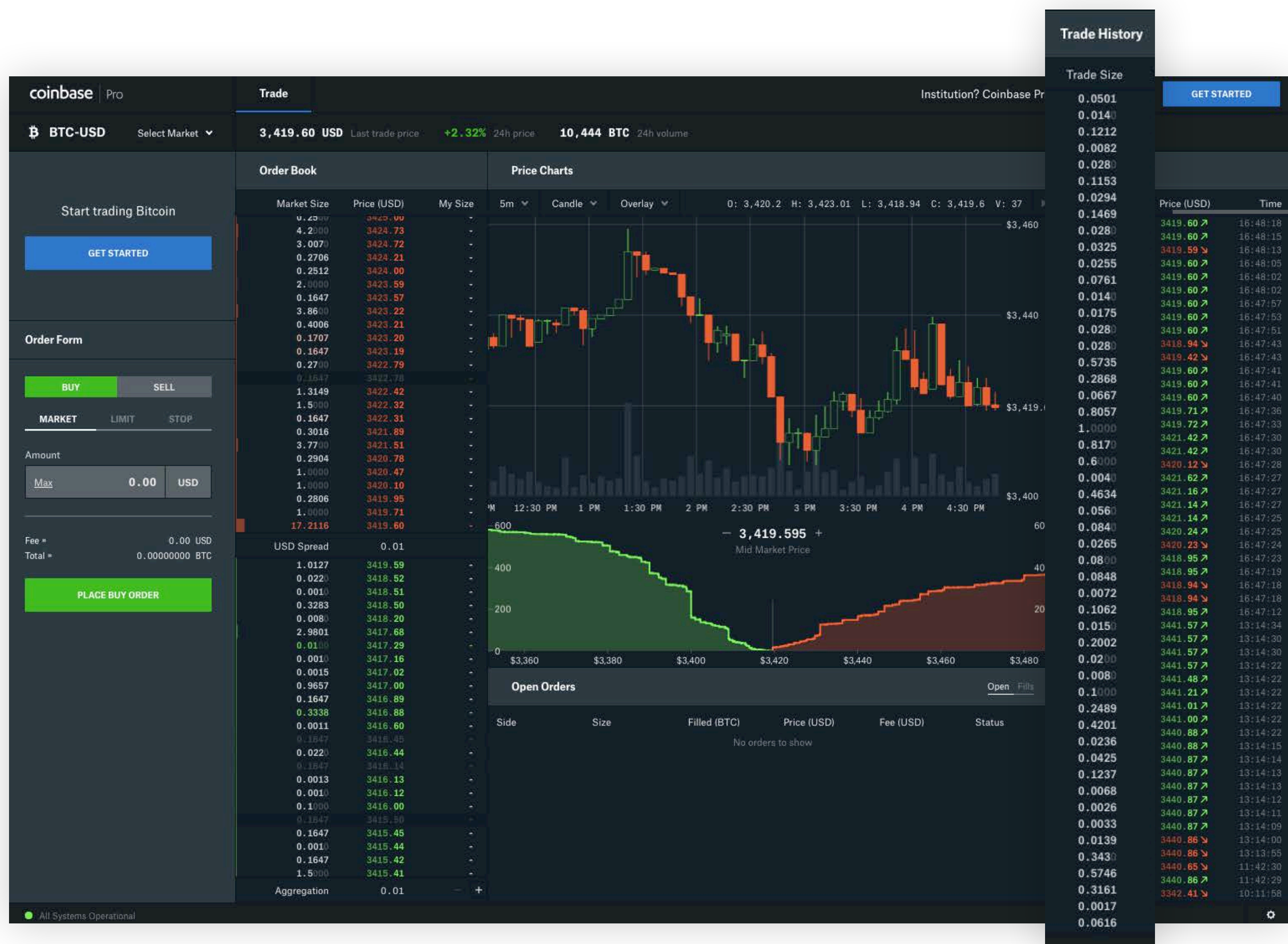
What Do Real Exchanges Look Like?



This column captures the trade history on Coinbase Pro. Green trades reflect buy orders that lifted the offer, while red trades reflect sell orders that hit the bid.

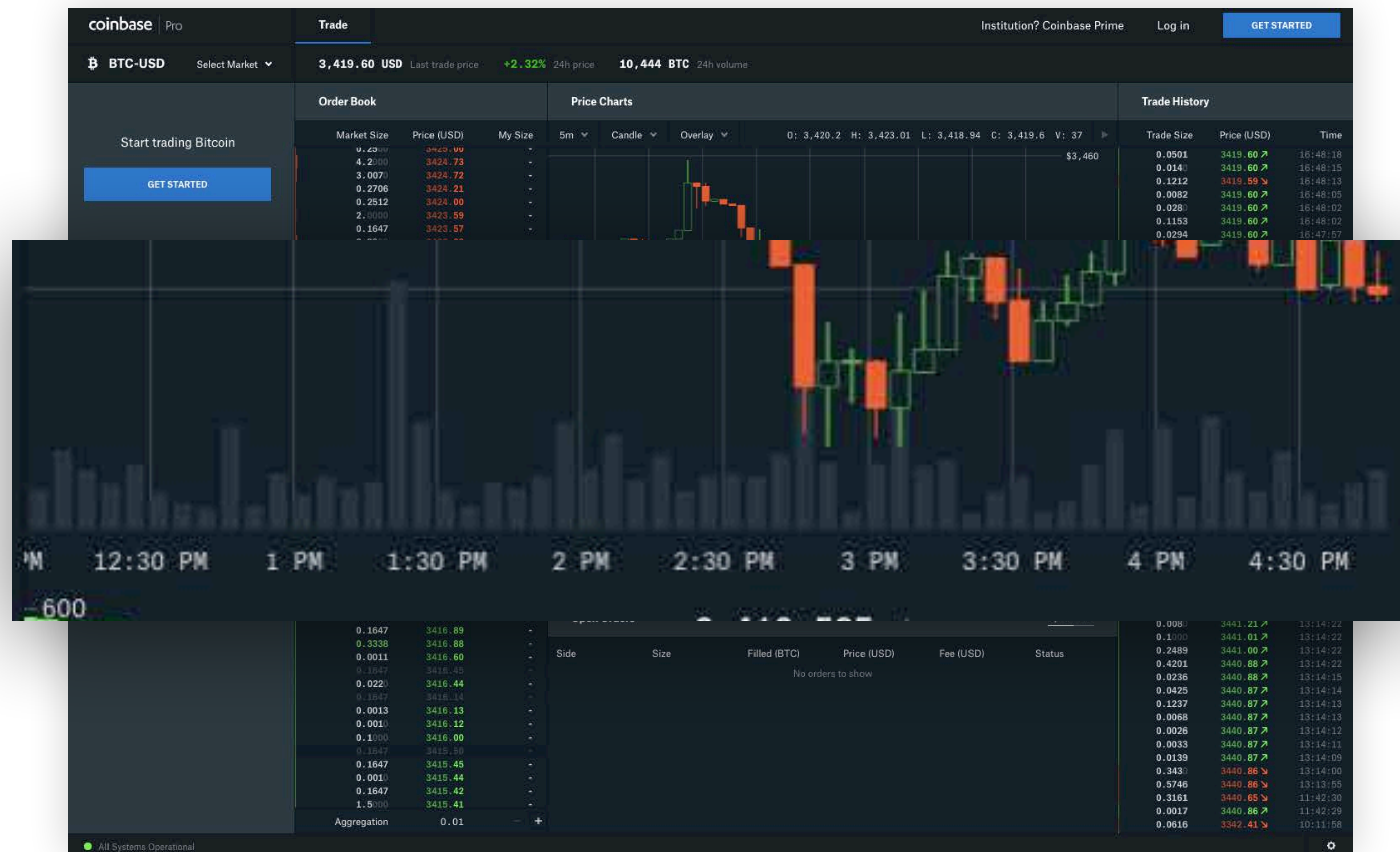
Notice that the mix of red and green trades is unequal and streaky. In this case, there was more buying activity (green) than selling activity (red). If you took this screenshot at a different time, the reverse could easily have been true.

What Do Real Exchanges Look Like?



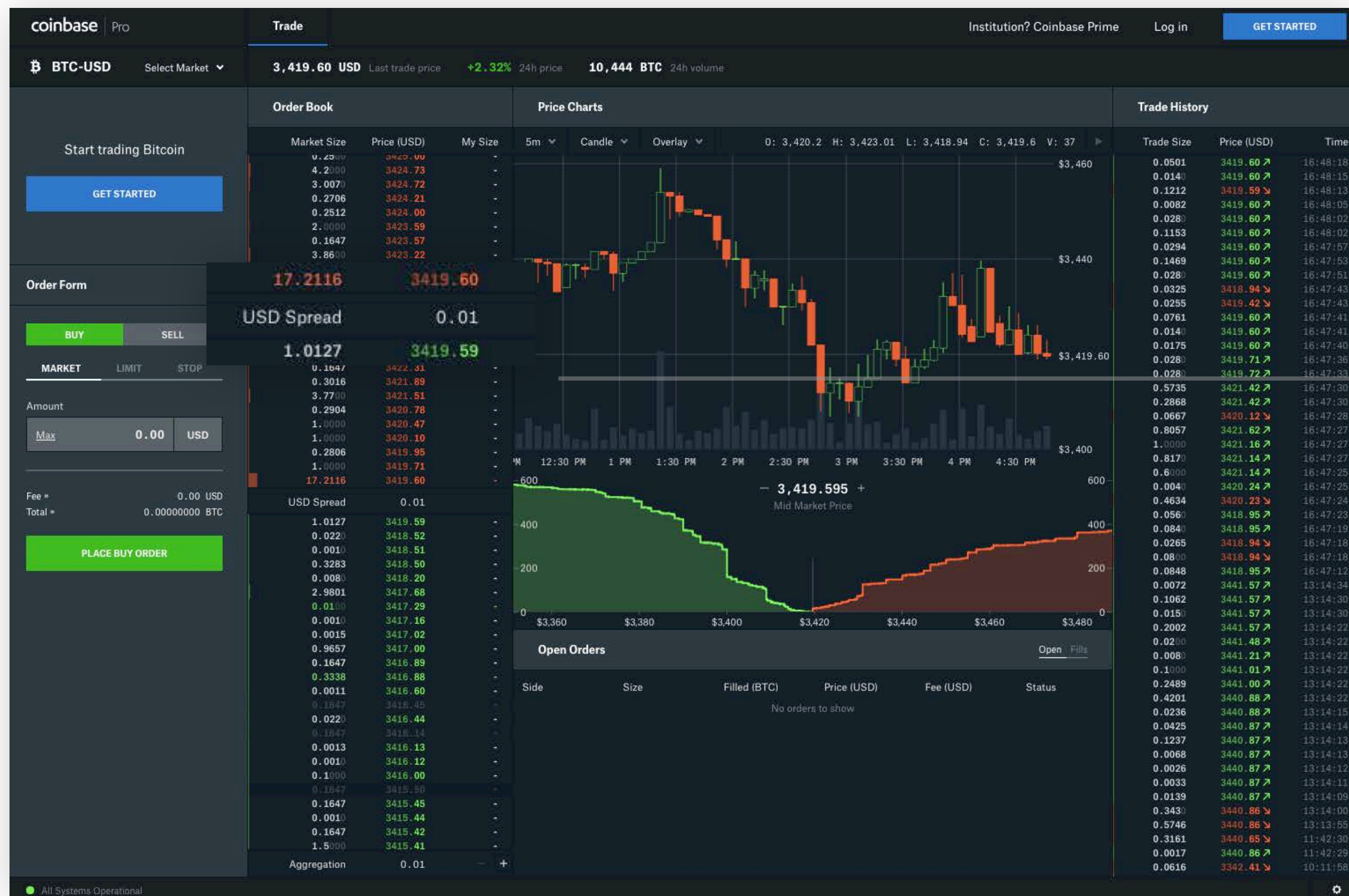
This column captures trade sizes. Notice that they vary over time, from 0.0017 bitcoin to 1.00 bitcoin. You'll also see a greater-than-random number of round trade sizes: 1.00 bitcoin, 0.60 bitcoin, 0.10 bitcoin, etc. This is natural behavior: People are more likely to trade 1 bitcoin than 0.821 bitcoin.

What Do Real Exchanges Look Like?



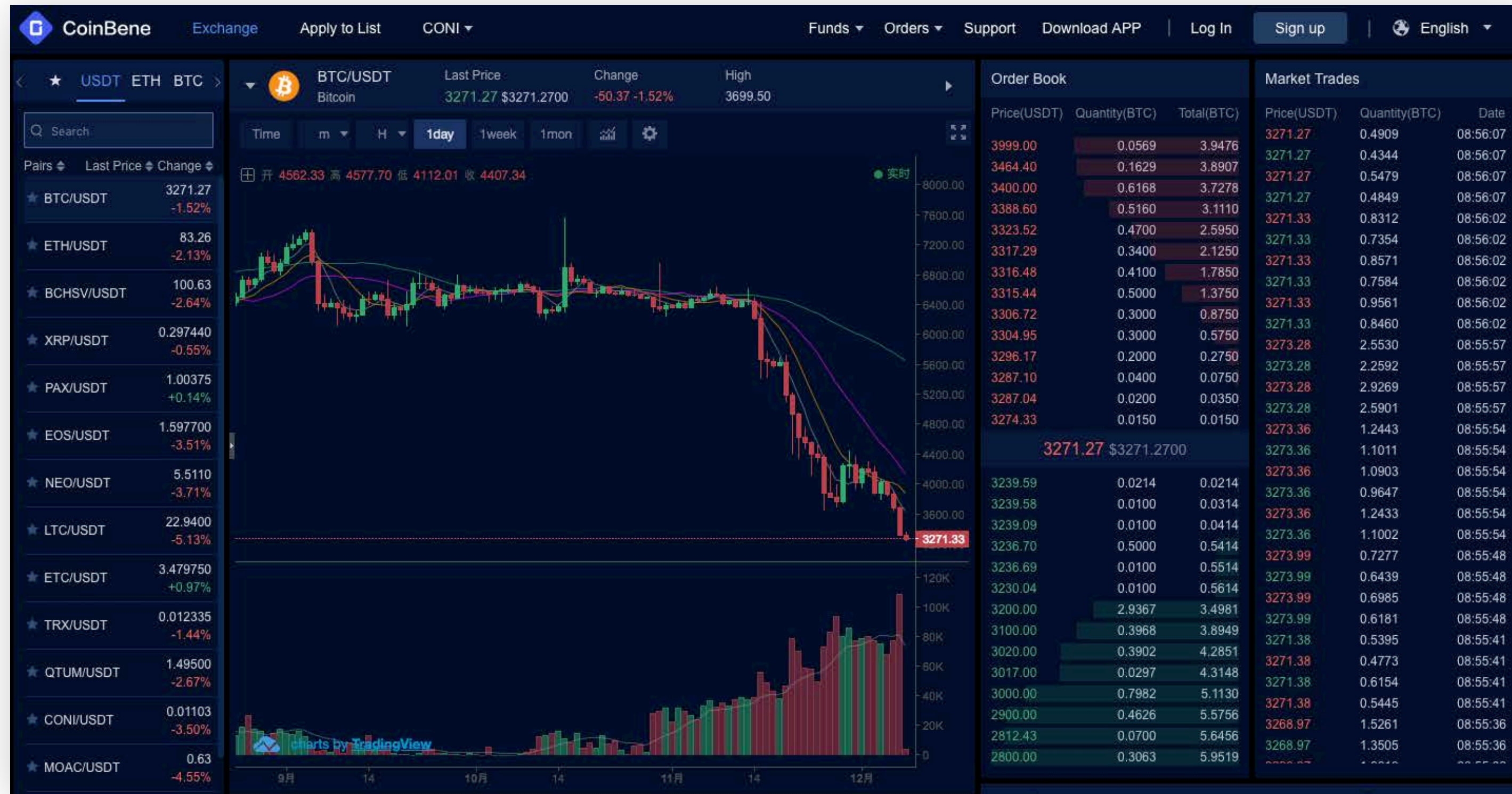
Each of these grey “candles” represents the amount of bitcoin traded on Coinbase Pro in a 5-minute period. Notice that the size of these candles changes over time: Some 5-minute periods have more volume than others, as you would expect.

What Do Real Exchanges Look Like?



This is the spread. It's \$0.01. At the time this screenshot was taken, bitcoin was trading at \$3,419. That means bitcoin was trading at a 0.0003% spread, making it amongst the tightest quoted spread of any financial instrument in the world.

What Do Suspicious Exchanges Look Like?



EXAMPLE 1: TRADE PRINTING BETWEEN BID AND ASK

CoinBene (\$480M*)

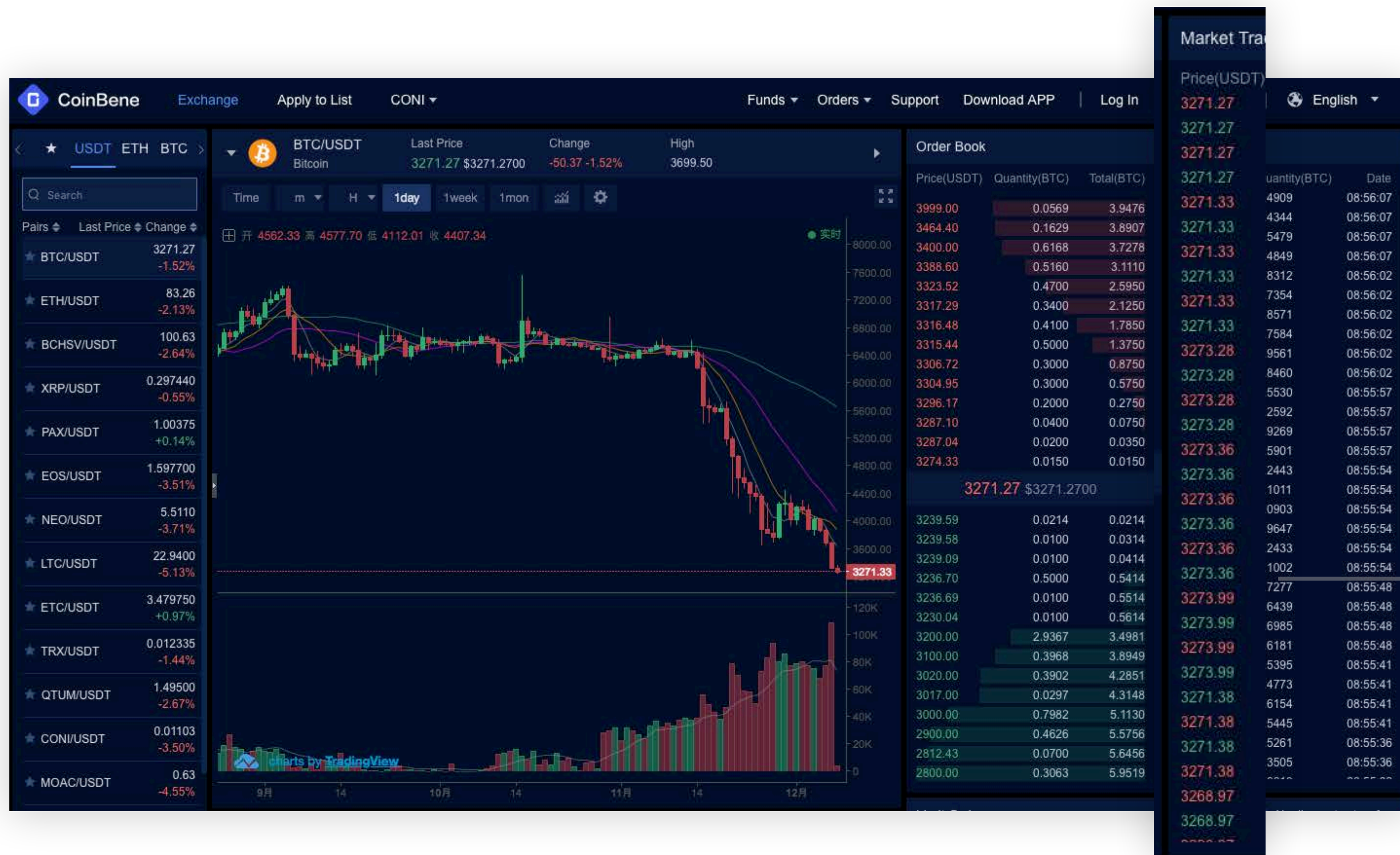
CoinBene is reported to be the largest bitcoin exchange in the world, with \$480m in daily volume (18x Coinbase Pro). Essentially all of its trades print inside the prevailing bid and ask.

* Average Daily Volume. Data Source: CoinMarketCap. March 4-8, 2019

Screenshot: CoinBene on December 12, 2018

Note: CoinBene's exact mechanism of printing fake trades between the bid and ask has changed since this part of the presentation was initially developed in December 2018. The example is still illustrative. We will examine CoinBene's current trading patterns later in the presentation.

What Do Suspicious Exchanges Look Like?

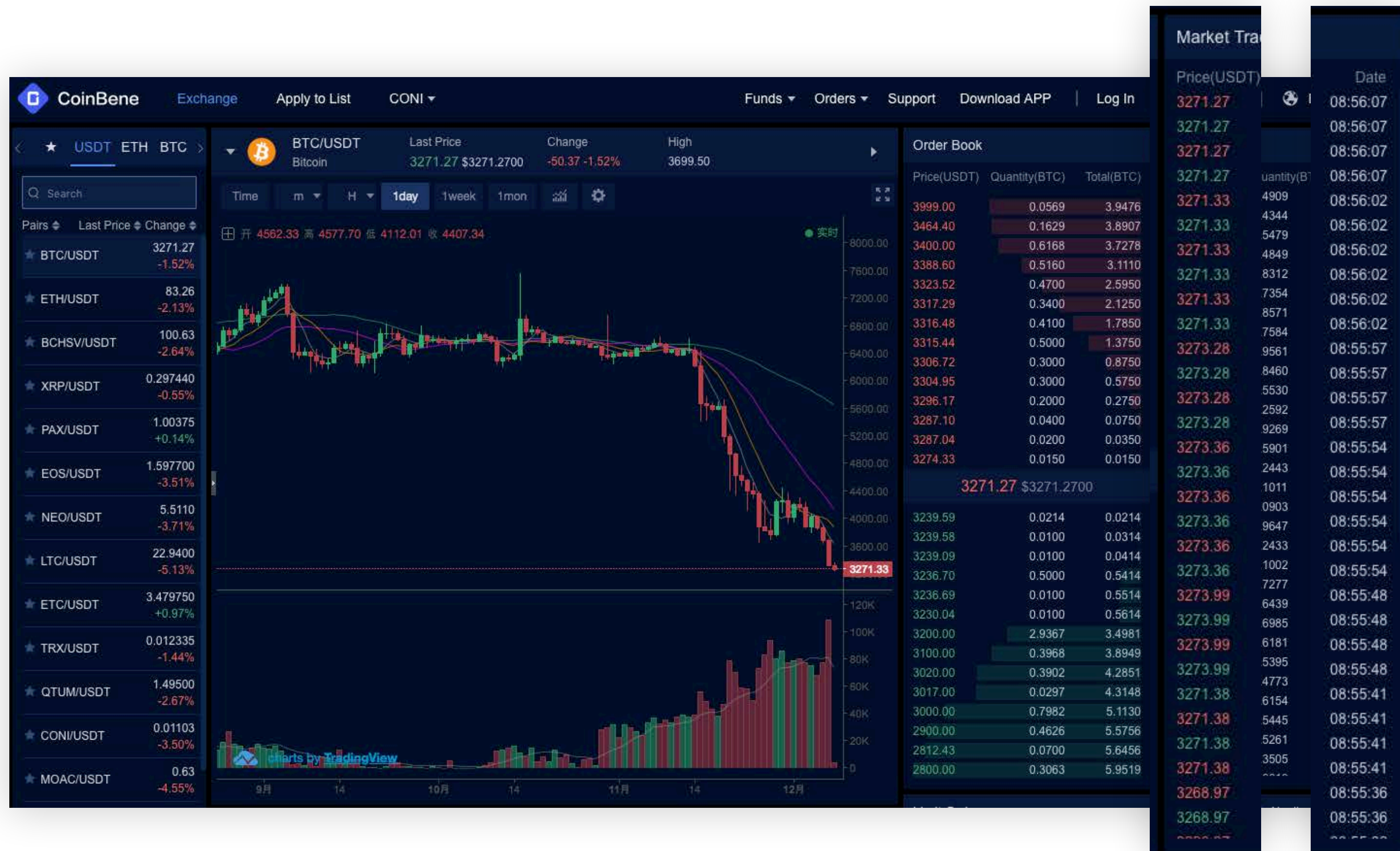


EXAMPLE 1: TRADE PRINTING BETWEEN BID AND ASK

This column captures trades. Notice the perfectly alternating pattern of green and red trades. Compare this to Coinbase Pro, where we saw a more random distribution of buying and selling activity.

It's highly unlikely that there is a perfect, even distribution of economic buy and sell orders.

What Do Suspicious Exchanges Look Like?

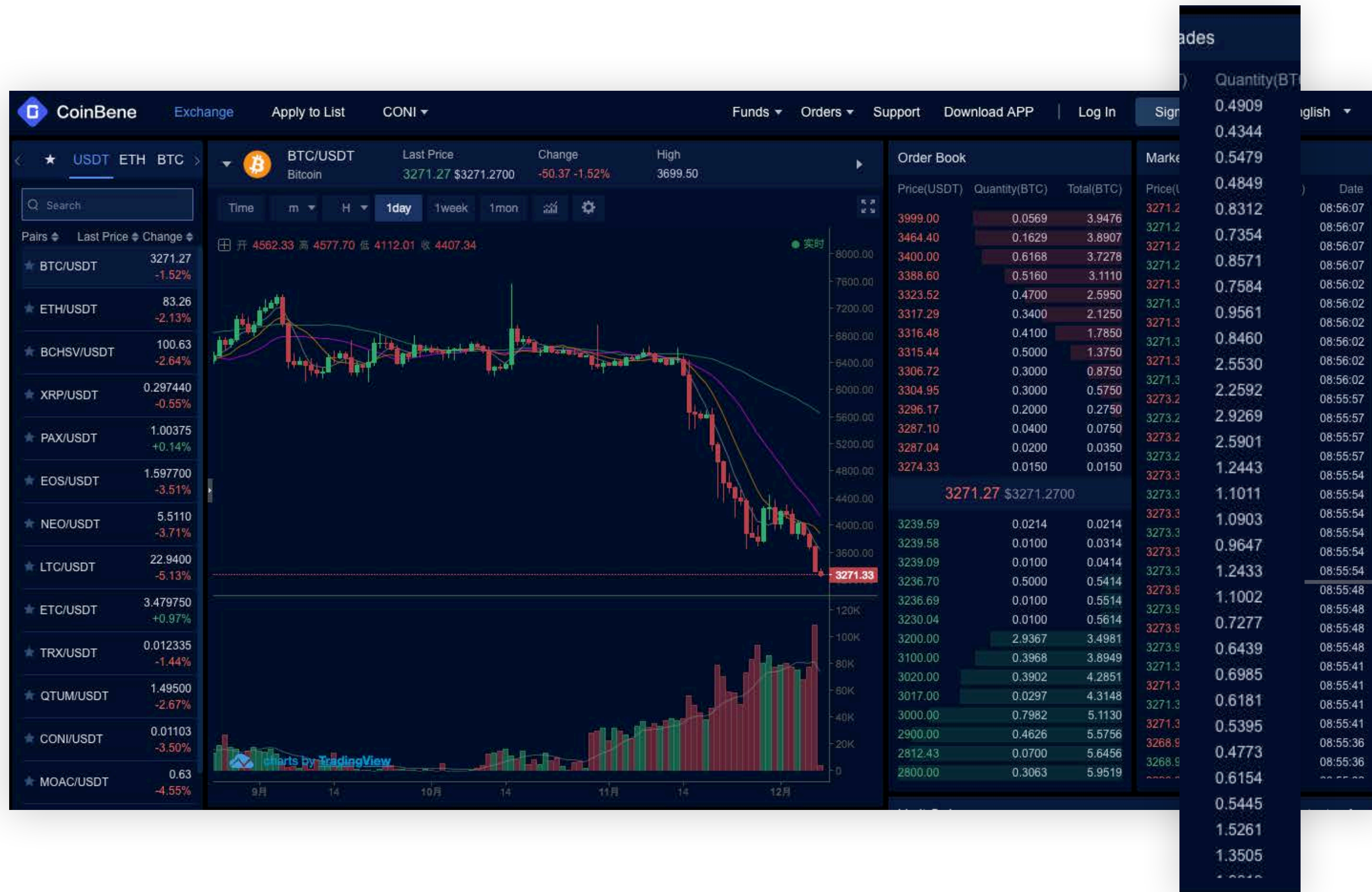


EXAMPLE 1: TRADE PRINTING BETWEEN BID AND ASK

This column shows the “timestamp” for each trade. Combine it with the “trades” column and you’ll see that trades on CoinBene come in pairs, and each pair has one buy (green) and one offsetting sell (red).

The size of these trades are always roughly equal in size (as shown in the middle column), allowing them to nearly offset one-another over time.

What Do Suspicious Exchanges Look Like?



EXAMPLE 1: TRADE PRINTING BETWEEN BID AND ASK

The distribution of trade sizes is also very different than Coinbase Pro.

For starters, there are no very small trades—the smallest trade shown is 0.43 bitcoin, or roughly \$1,400. Coinbase Pro had trades as small as \$5.

Also, there are no “round number” trades, despite the obvious behavioral reasons for their existence.

What Do Suspicious Exchanges Look Like?



EXAMPLE 1:

TRADE PRINTING BETWEEN BID AND ASK

At the time of this screenshot, the best offer to buy bitcoin on CoinBene was \$3,239.59, while the best offer to sell was \$3,274.33. This means the “spread” was \$34.74. That compares to \$0.01 on Coinbase Pro.

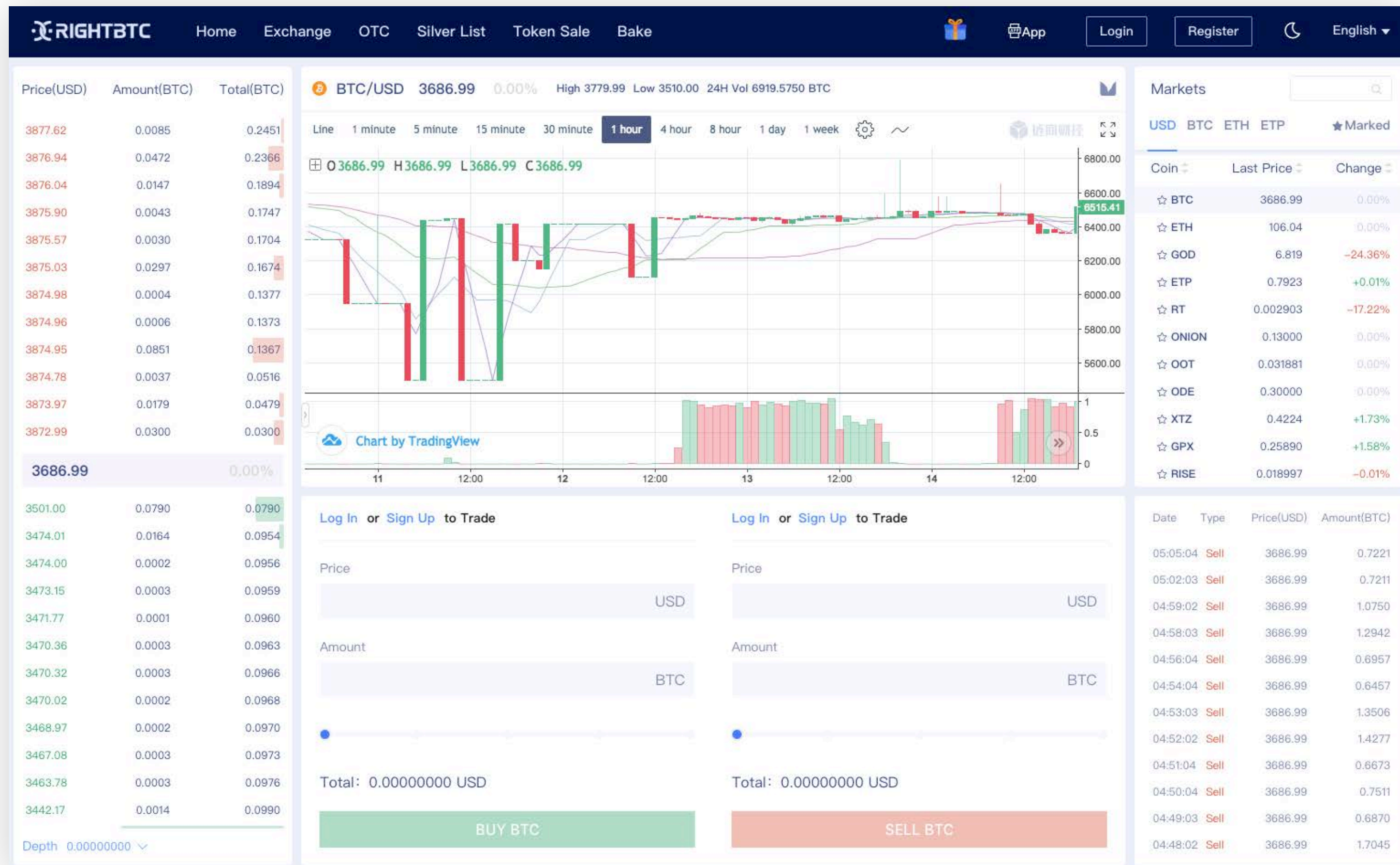
It is surprising that an exchange claiming 18x more volume than Coinbase Pro would have a spread that is 3400x larger.



CoinBene's Real-World Footprint Is Also Suspiciously Smaller Than Coinbase's

	CoinBene	Coinbase
Number of Twitter Followers	10K	1M
Number of Google Search Results	1.25M	26M
Web Traffic by SimilarWeb	Ranked 90,701 among websites globally based on an estimated 617,475 monthly web visitors	Ranked 1,917 among websites globally based on an estimated 25,045,634 monthly web visitors
Venture Funding Raised	Unreported	\$546M over seven years
Number of Employees on LinkedIn	42, most appear to be part-time	852

What Do Suspicious Exchanges Look Like?



**EXAMPLE 2:
MULTIPLE HOURS (AND DAYS) WITH ZERO
VOLUME**

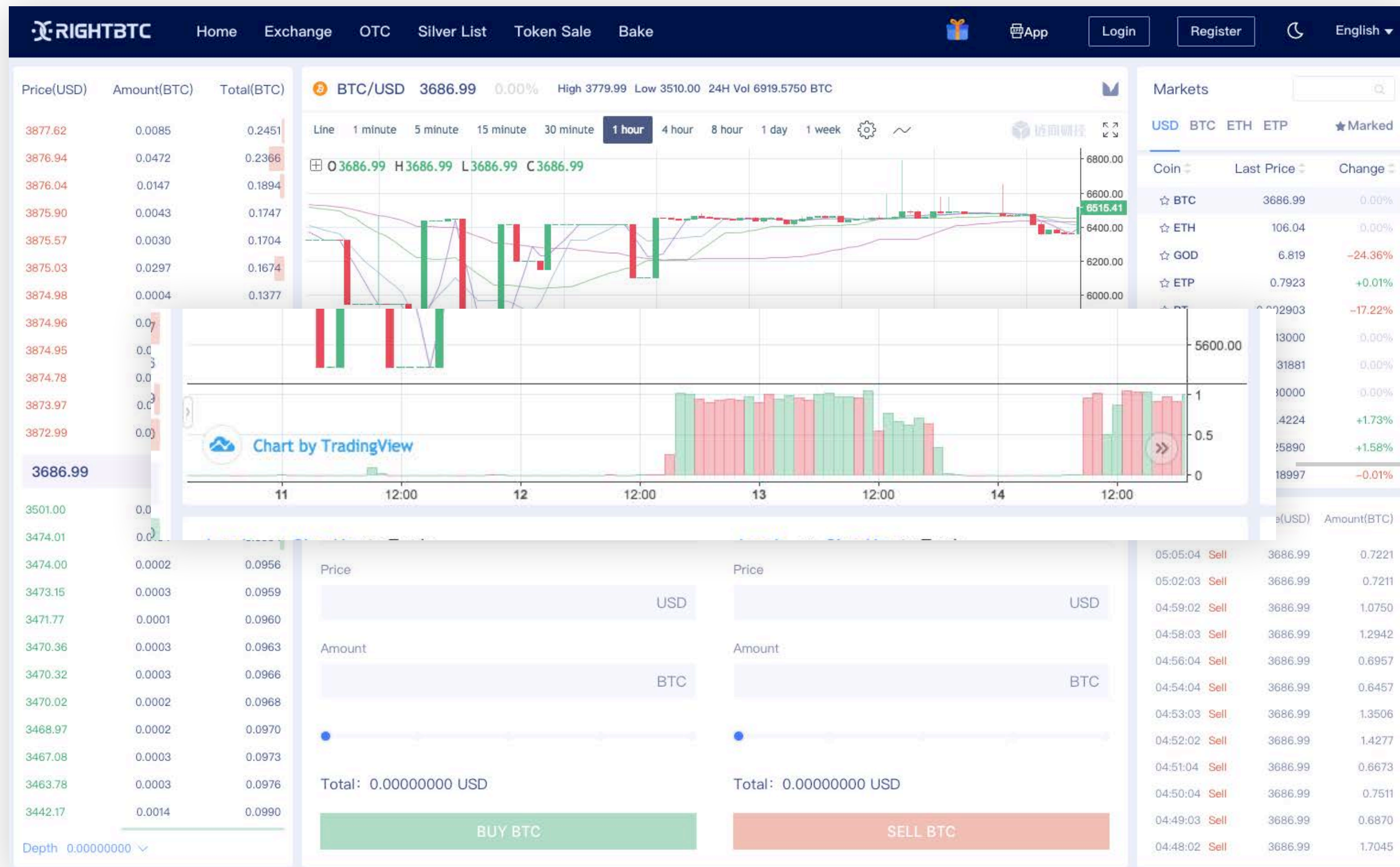
RightBTC (\$100M*)

RightBTC claims to have roughly 4x the volume of Coinbase Pro. However, it shows multiple hours (and days) with zero volume. These gaps are not correlated with business hours, volatility, up time or other factors. The two likely explanations are fake volume and/or trade mining.

* Average Daily Volume. Data Source: CoinMarketCap. March 4-8, 2019

Screenshot: RightBTC on December 8, 2018

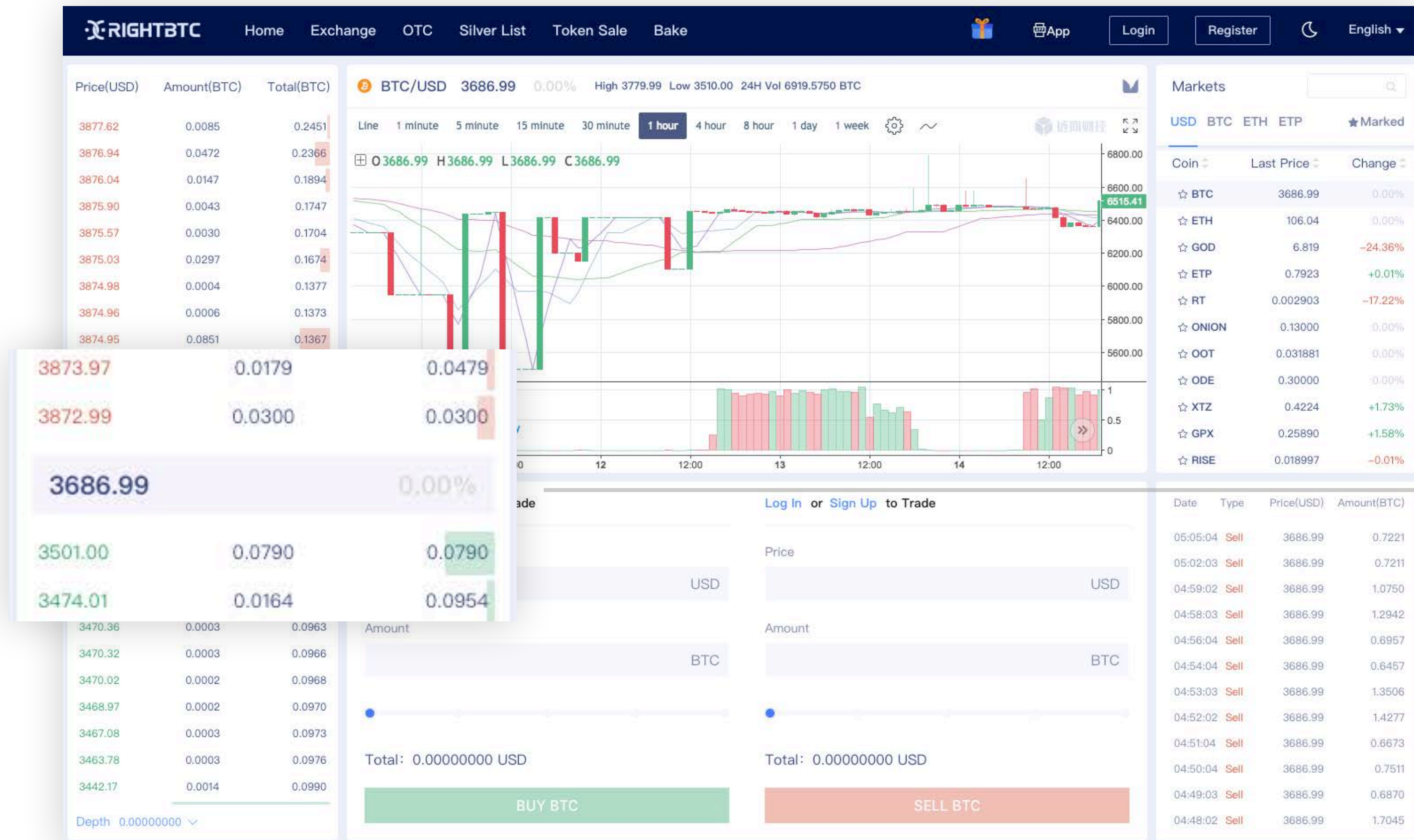
What Do Suspicious Exchanges Look Like?



**EXAMPLE 2:
MULTIPLE HOURS (AND DAYS) WITH ZERO
VOLUME**

Each “candle” represents the amount of volume on RightBTC during a one-hour period. Notice that there are large gaps (stretching for days in some cases) where no volume occurs.

What Do Suspicious Exchanges Look Like?



**EXAMPLE 2:
MULTIPLE HOURS (AND DAYS) WITH ZERO
VOLUME**

RightBTC's displayed spread here is \$371.99.
That compares to \$0.01 for Coinbase Pro.

This is ridiculous, especially considering it
claims to have significantly more volume than
Coinbase Pro.

What Do Suspicious Exchanges Look Like?



EXAMPLE 2: MONOTONIC TRADING VOLUME

CHAOEX (\$70M*)

CHAOEX claims to have \$70 million in daily bitcoin volume, more than 2x the volume of Coinbase Pro. However, that volume is mostly monotonic: Roughly an identical amount gets printed every hour of every day. This volume pattern is insensitive to price movements, news, waking hours, weekends, or other real-world factors.

* Average Daily Volume. Data Source: CoinMarketCap. March 4-8, 2019

Screenshot: CHAOEX on December 8, 2018

What Do Suspicious Exchanges Look Like?



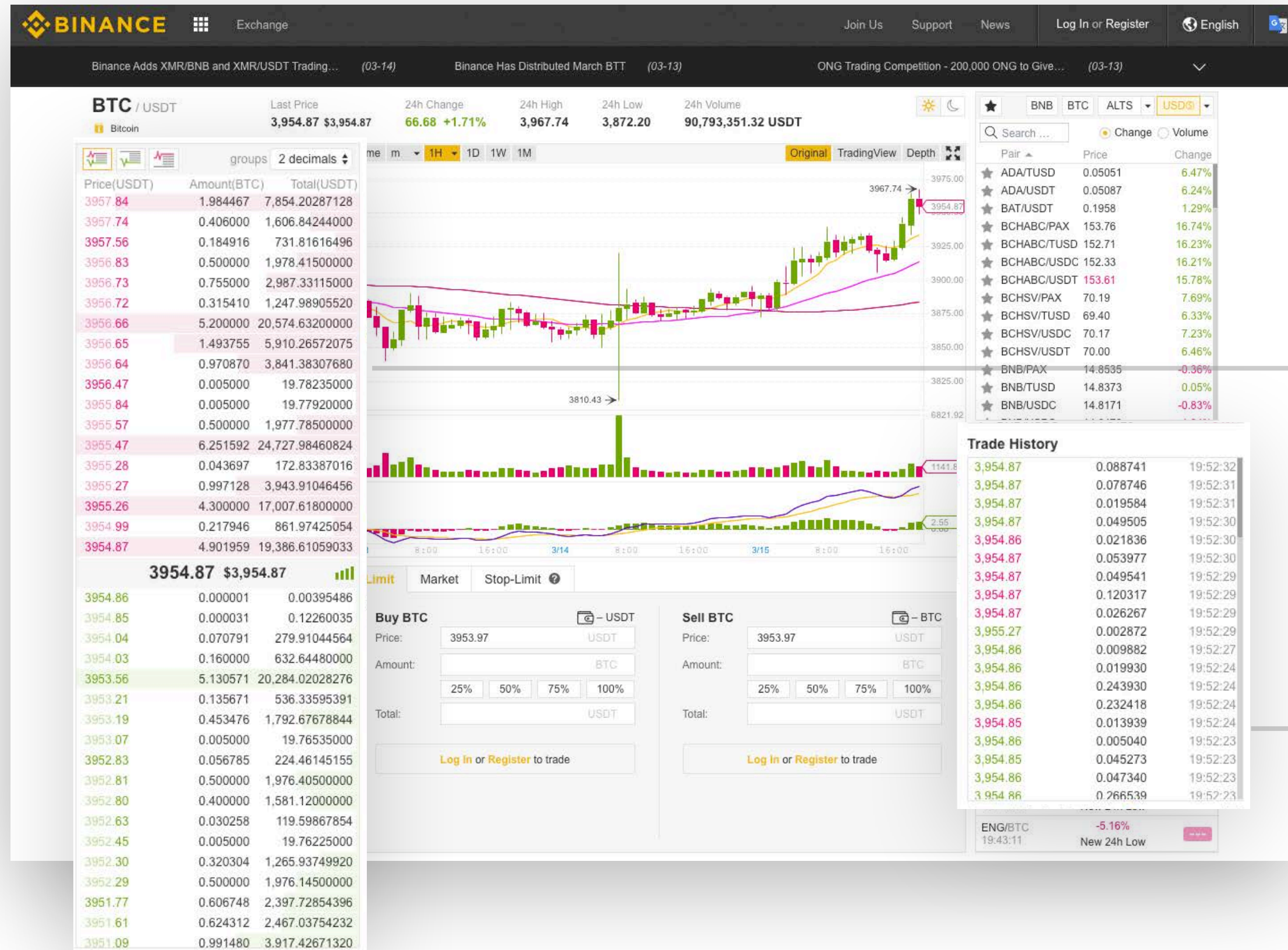
Each of these bars reflects one hour's volume.

It is highly unlikely that real trading volume would remain this consistent every hour of the day for nearly three consecutive days.

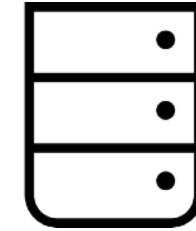
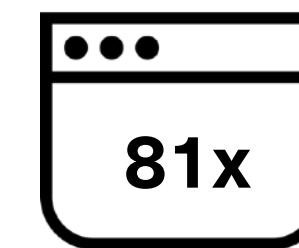
—
Not All Fake Exchanges Are Easy To Spot.
You Need More Data To Dive Deeper.

We've collected data from 81 exchanges*

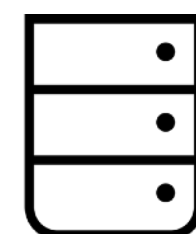
We needed a universal method of collecting data across any exchange. So we built infrastructure to programmatically read data off the screen. We read the order book and recent trades four times a second.



Order Book



Order Books



Trades

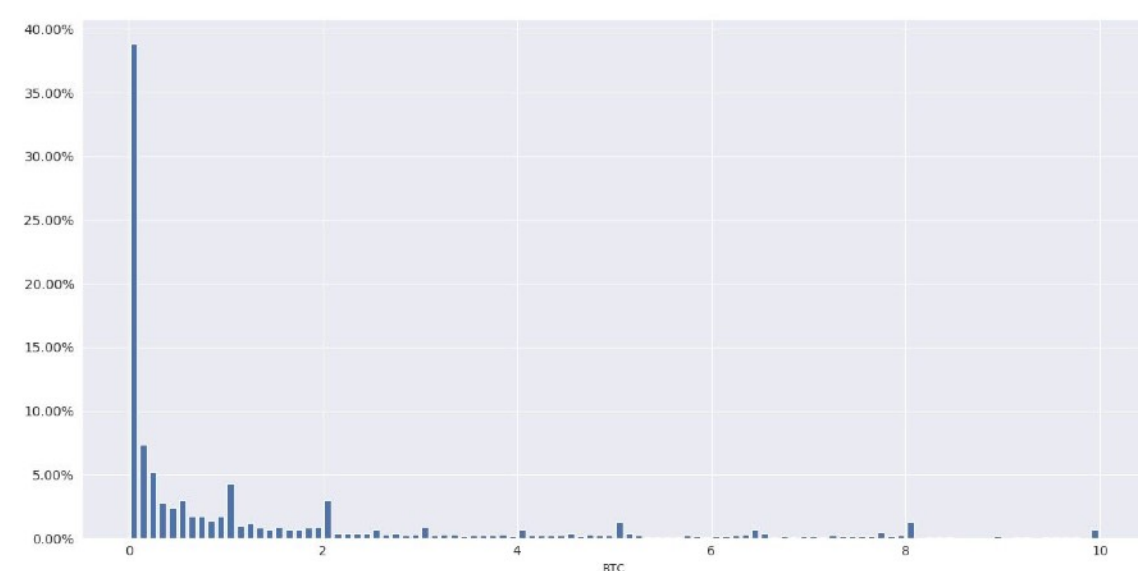
Trade History

* Practically every relevant exchange. We started from the top of the reported bitcoin volume list on the bitcoin markets page on CoinMarketCap on December 5, 2018 and worked our way down to the bottom, stopping at exchanges with less than \$1 million in daily volume.

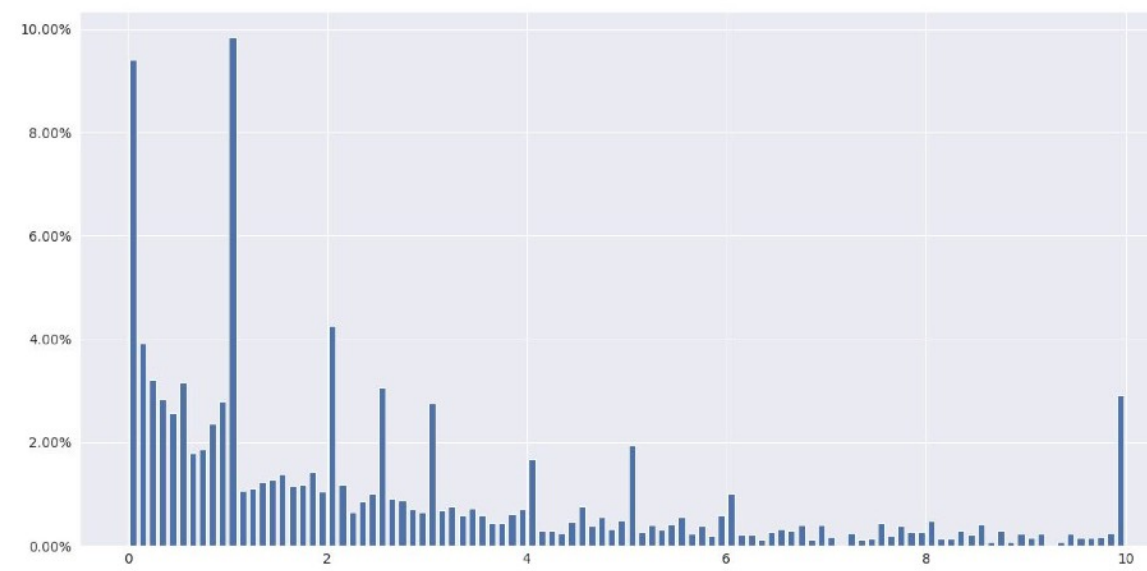


Trade Size Histograms For Well-Known Exchanges Show Natural Patterns

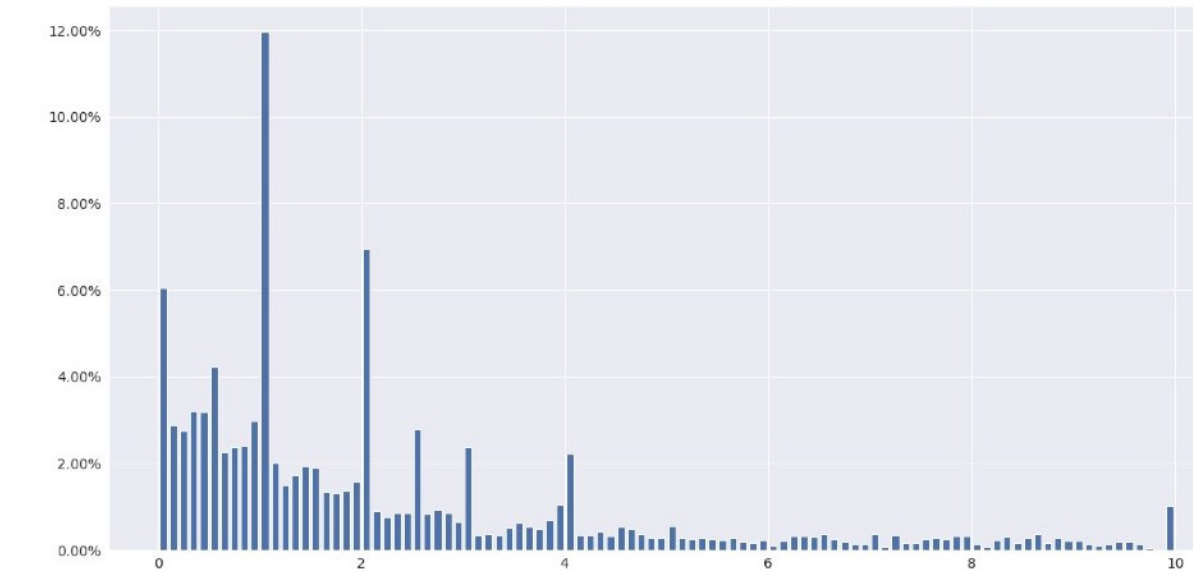
These histograms show the percentage of volume that is captured within each trade size bucket (0-0.1 BTC, 0.1-0.2 BTC, etc). They reveal consistent, intuitive patterns: Percentage weight in each bucket declines as trade size increases, and there are noticeable peaks at whole bitcoin sizes (1, 2, 3, etc). X-axis is from 0 to 10 BTC.



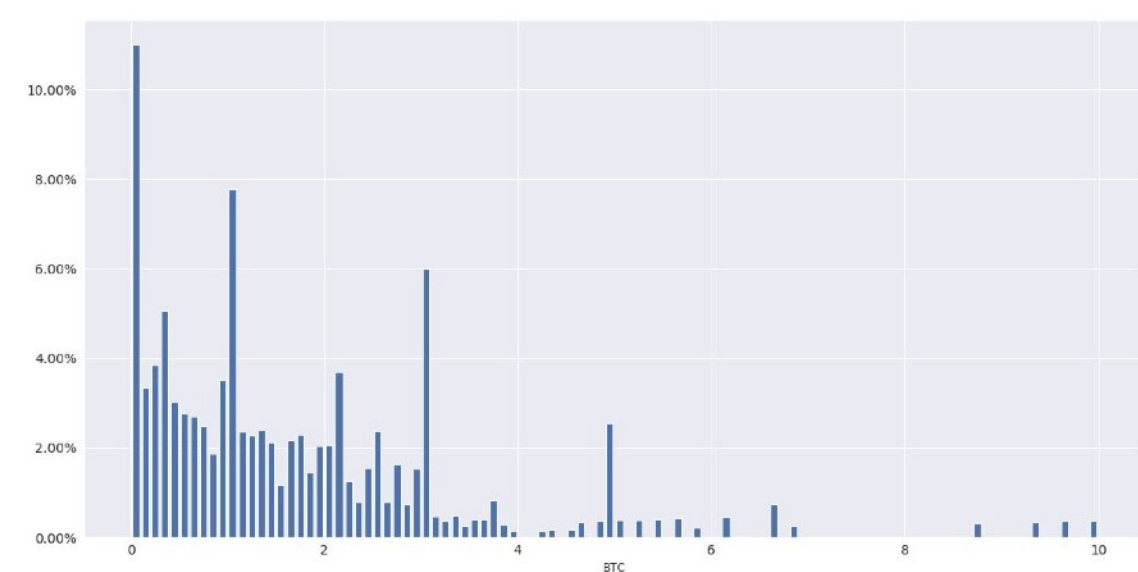
Coinbase (\$27M*)



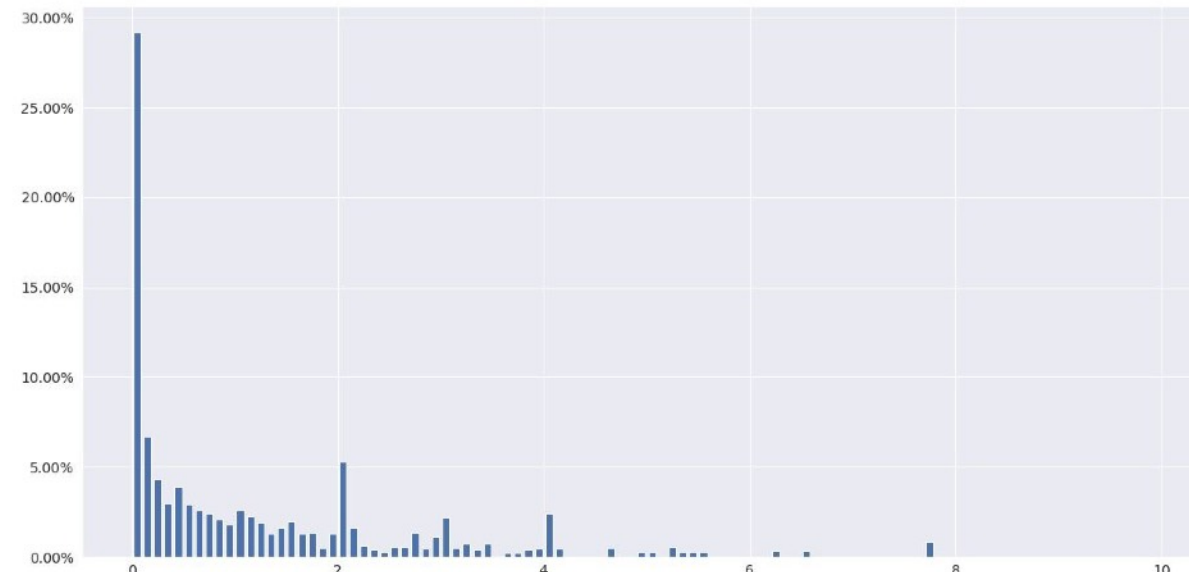
Kraken (\$31M*)



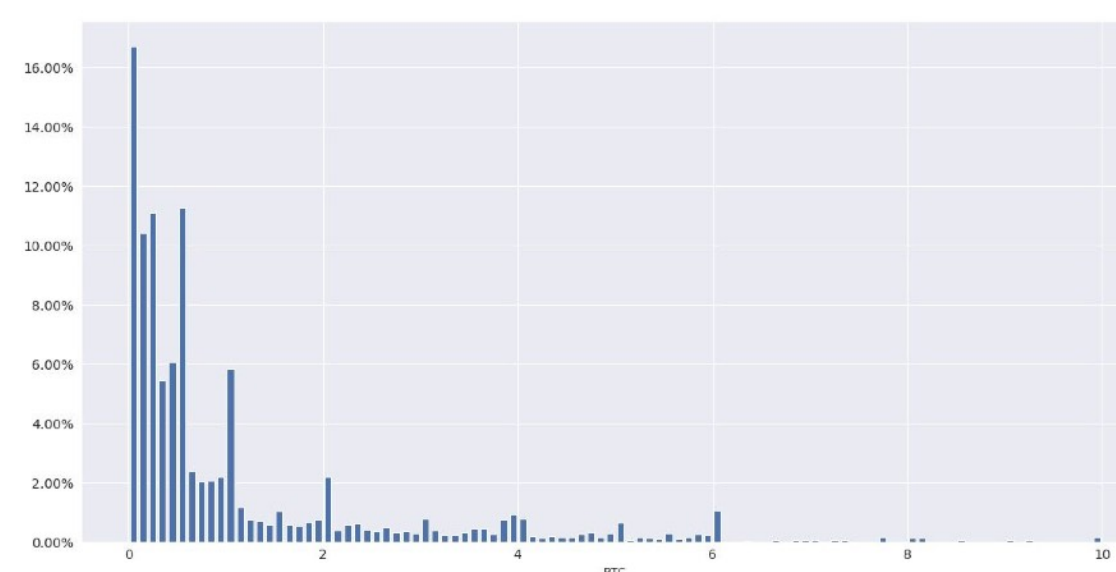
Bitstamp (\$31M*)



Bittrex (\$5M*)



Poloniex (\$1.4M*)

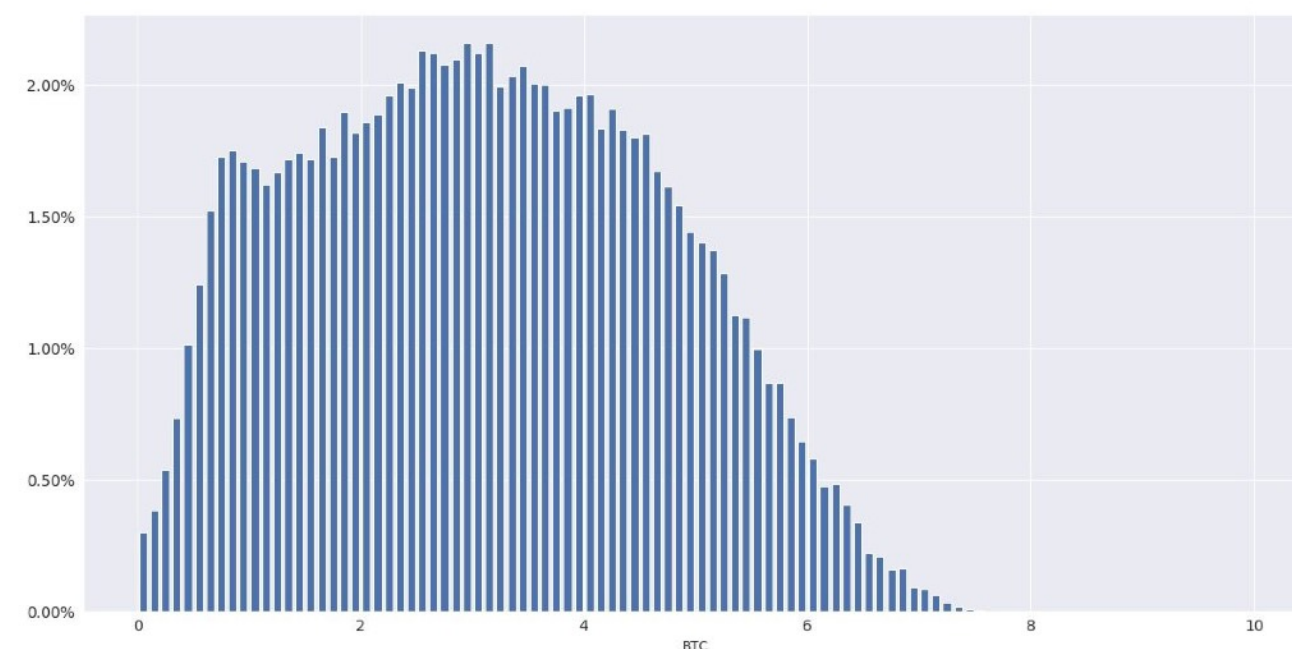


bitFlyer (\$13M*)

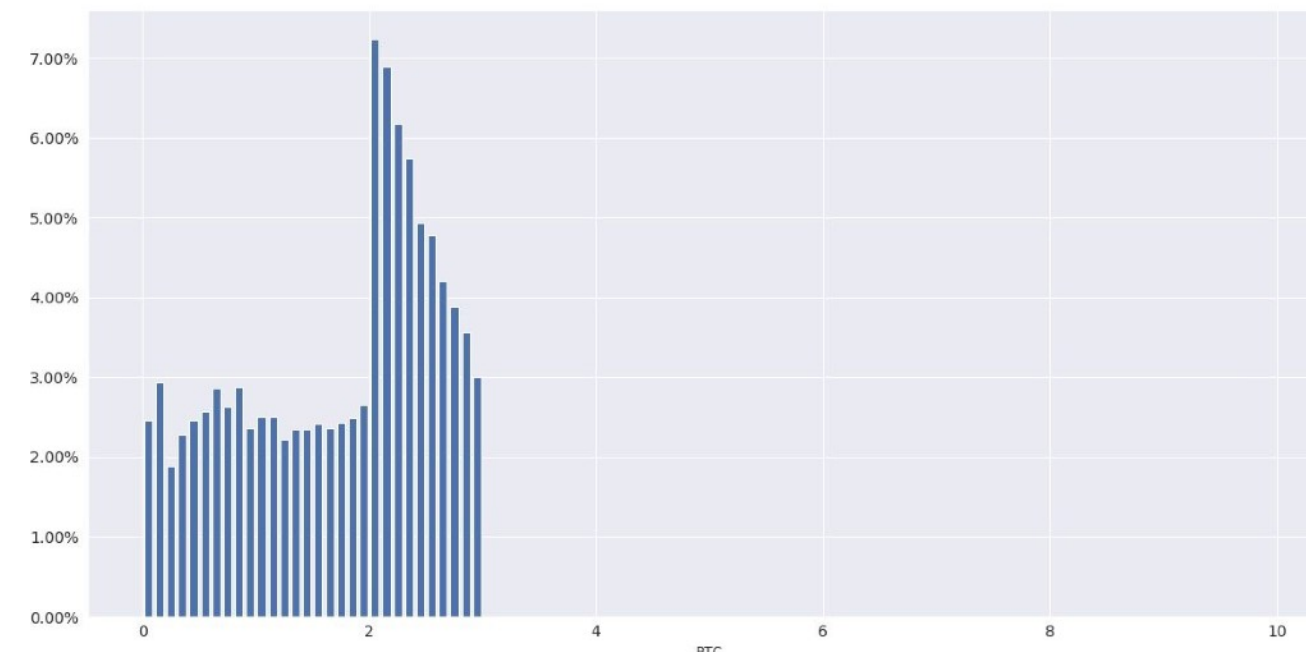


Trade Size Histograms For Suspect Exchanges

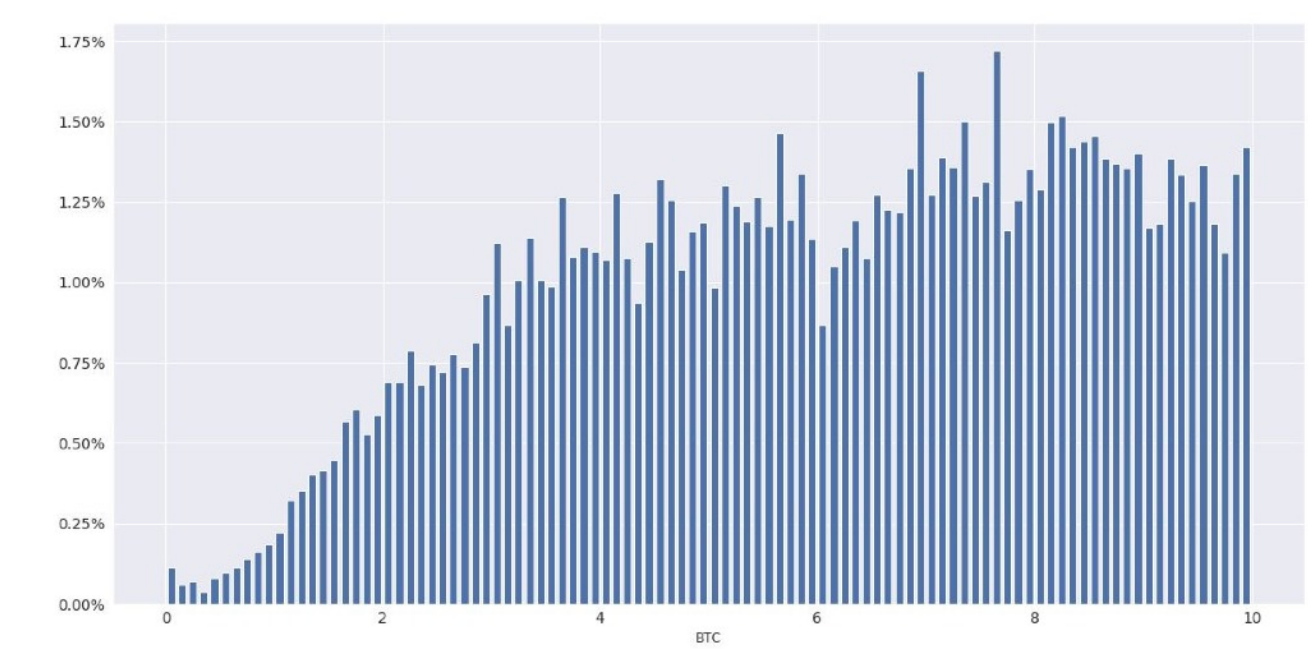
Trade Size Histograms for exchanges with suspicious volume look completely different, and showcase patterns that are both idiosyncratic and highly suspicious.



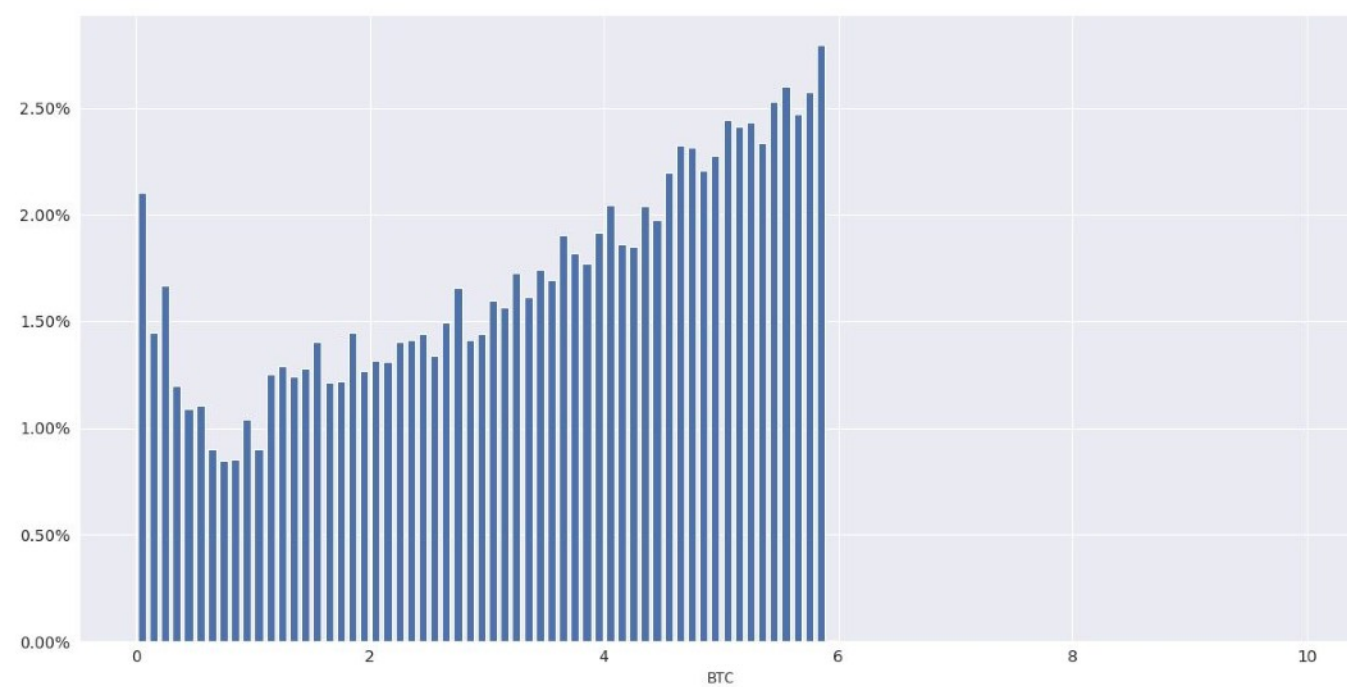
CoinBene (\$480M*)



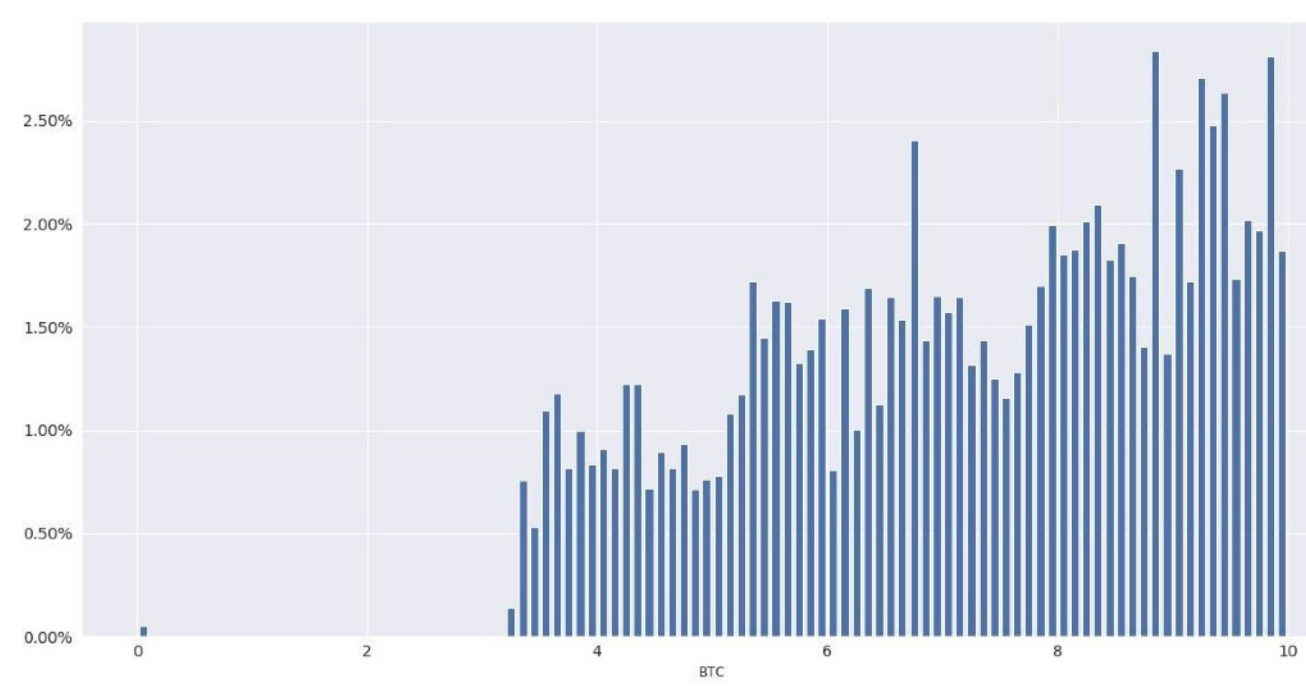
IDAX (\$163M*)



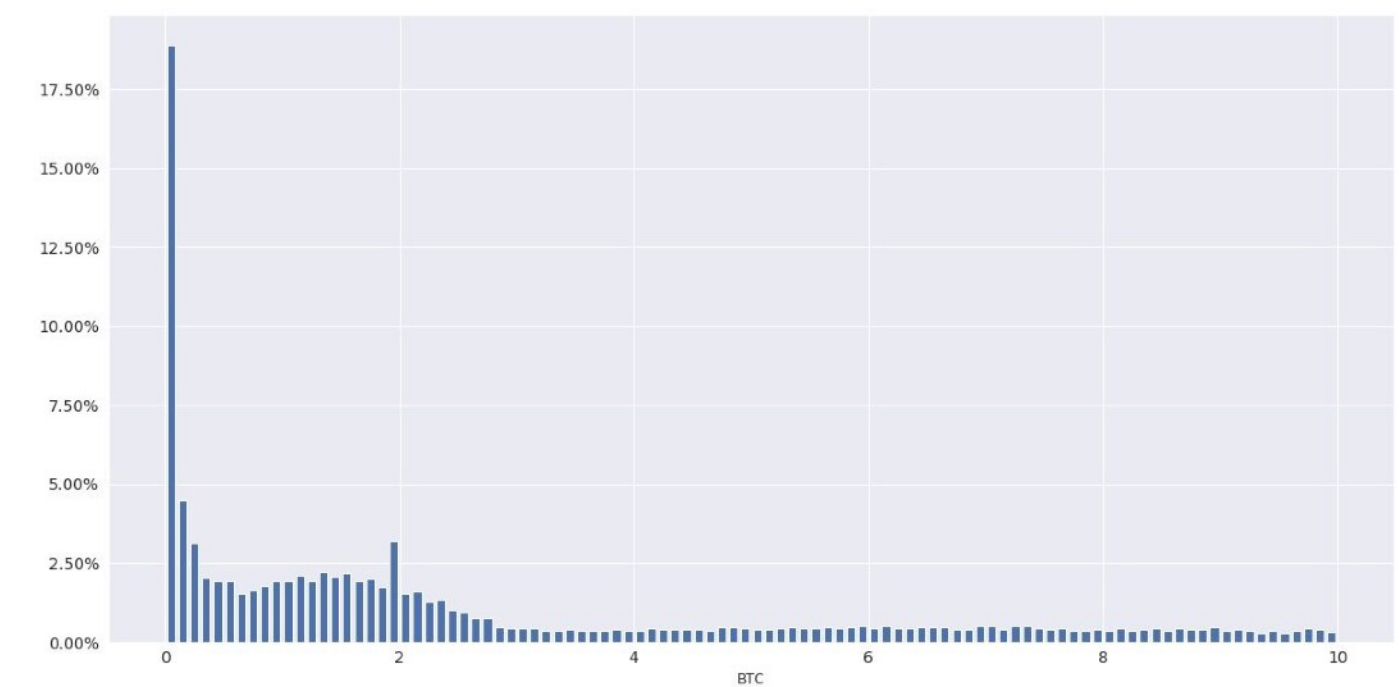
LBank (\$127M*)



BitForex (\$241M*)



Exrates (\$35M*)

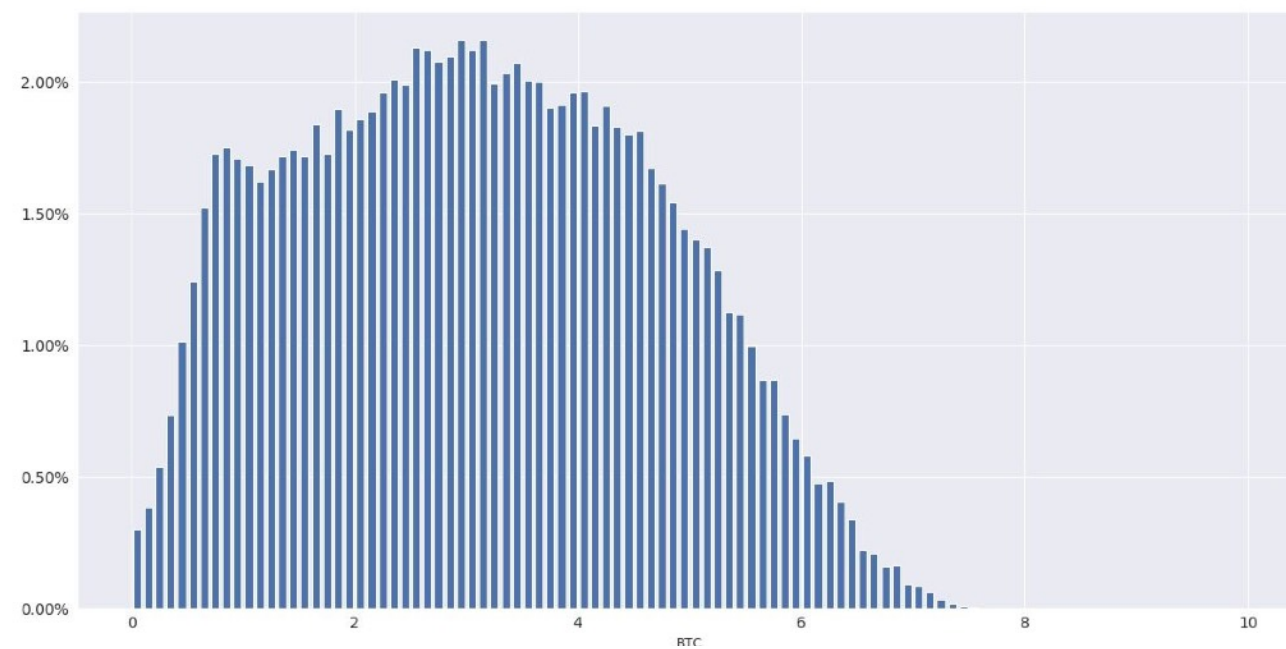


OKEx (\$152M*)



Trade Size Histograms For Suspect Exchanges

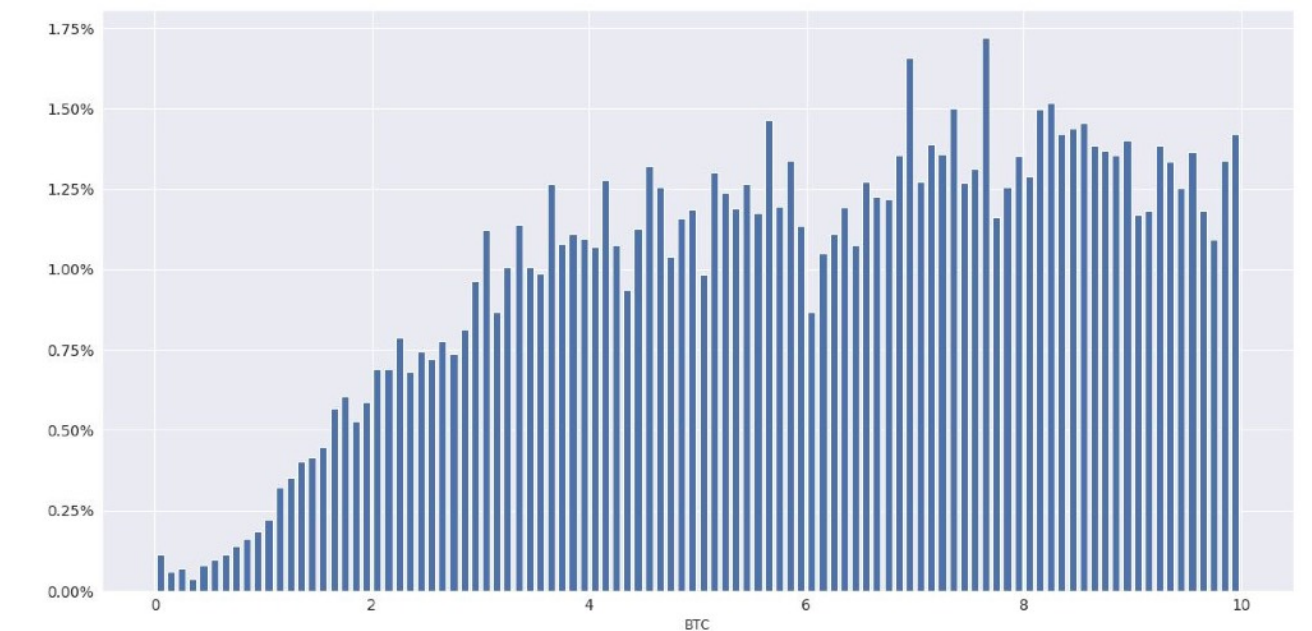
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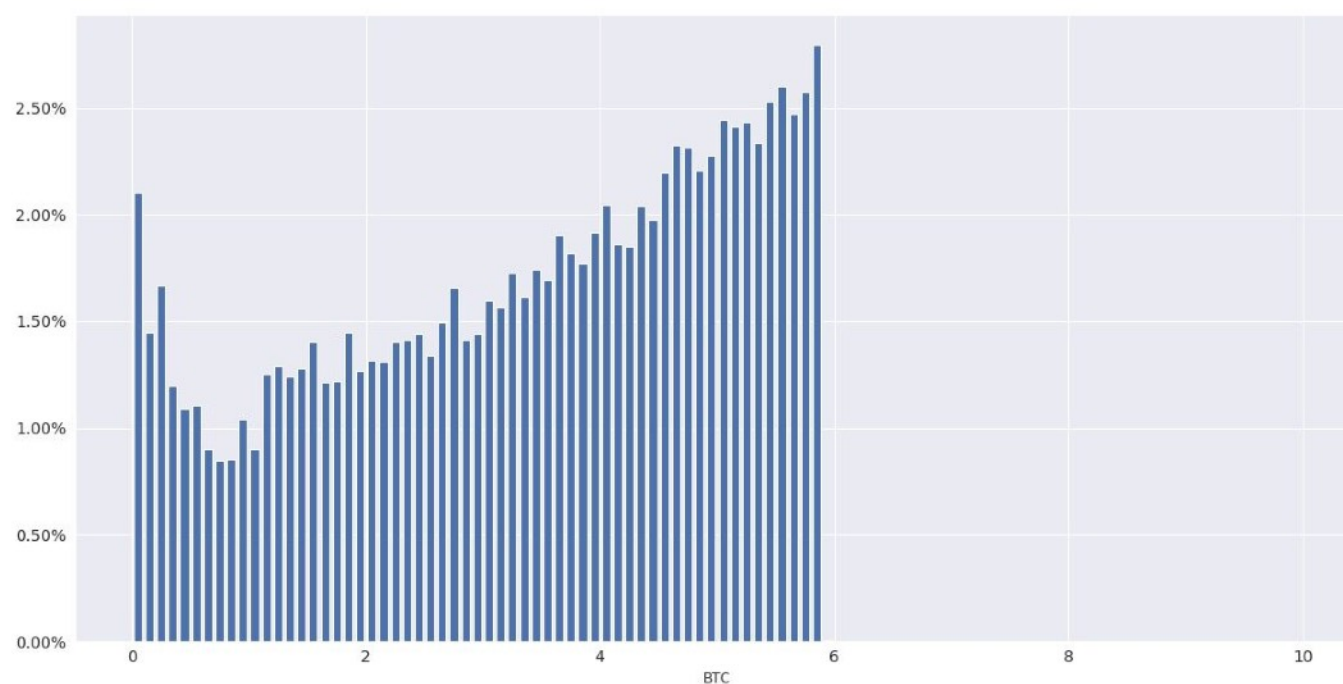
CoinBene (\$480M*)

For example, CoinBene's histogram shows an odd bell curve-like distribution.

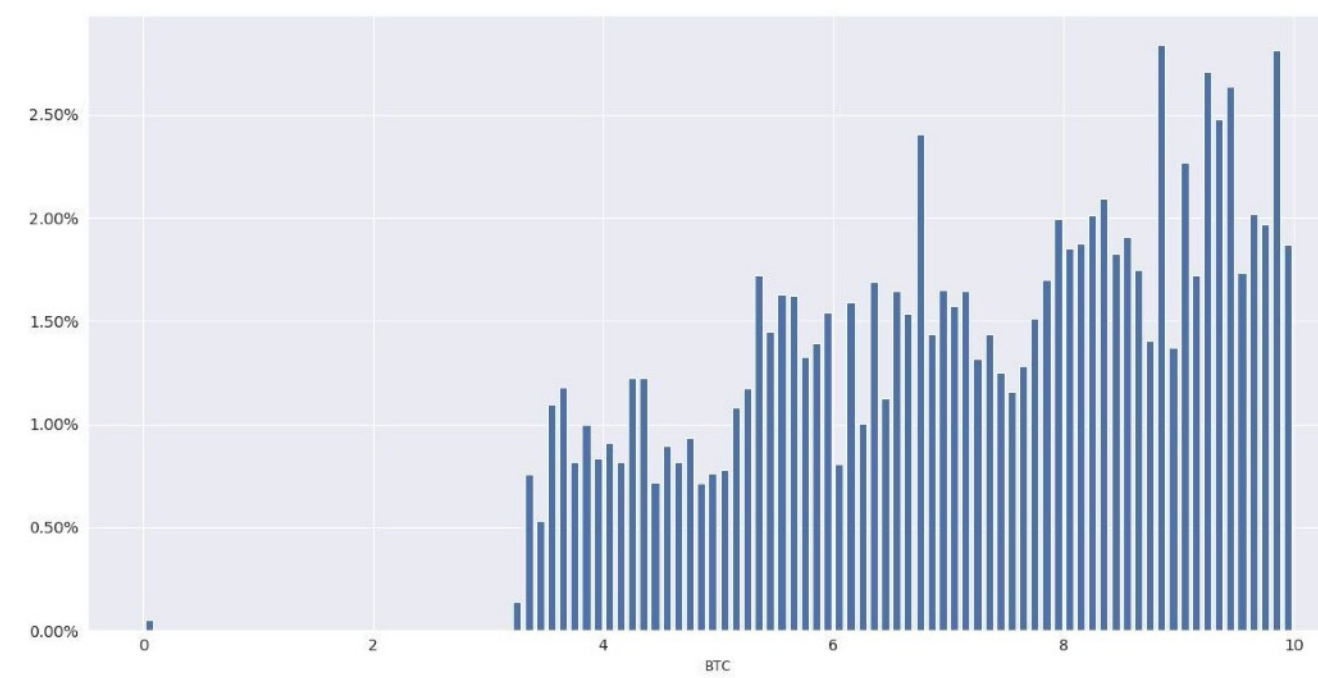
It also has no peaks at whole bitcoin quantities.



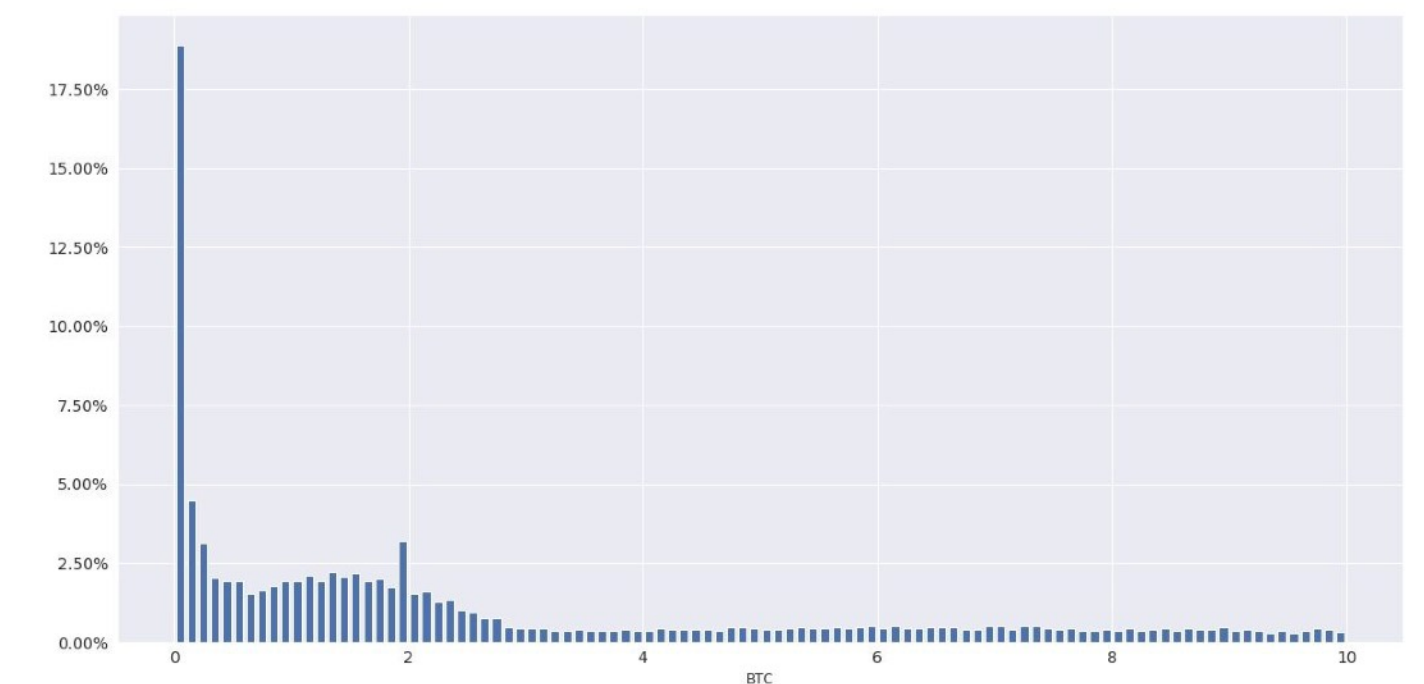
LBank (\$127M*)



BitForex (\$241M*)



Exrates (\$35M*)

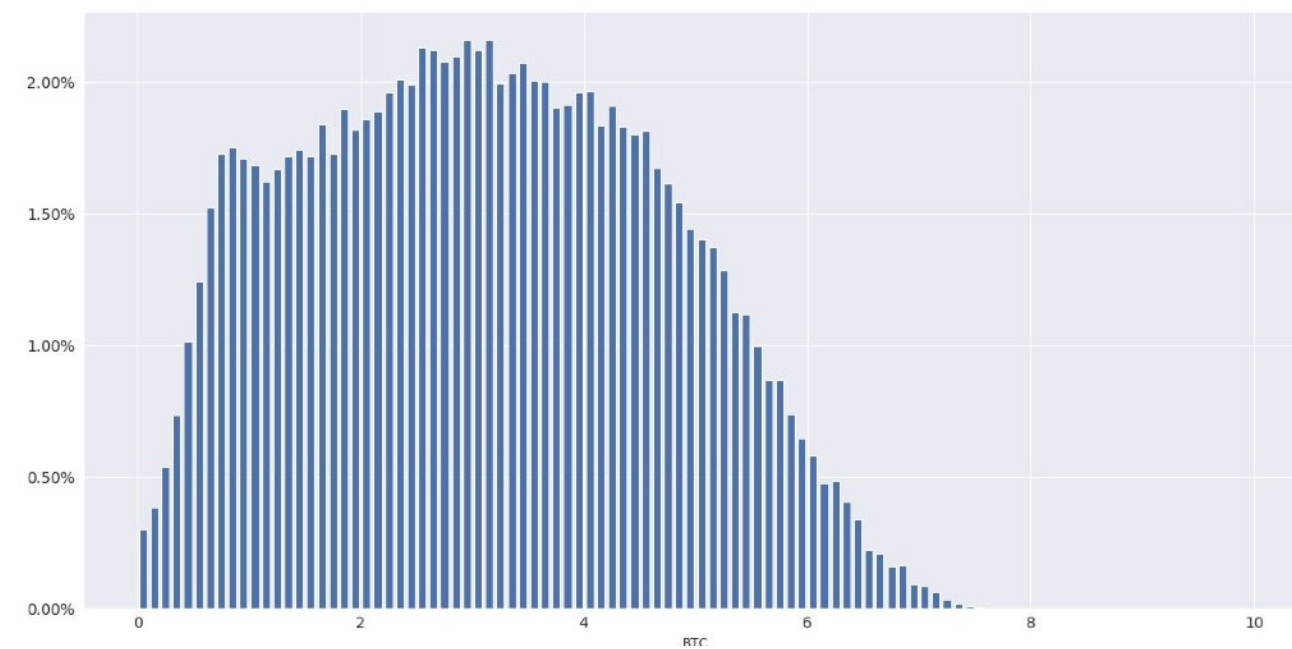


OKEx (\$152M*)



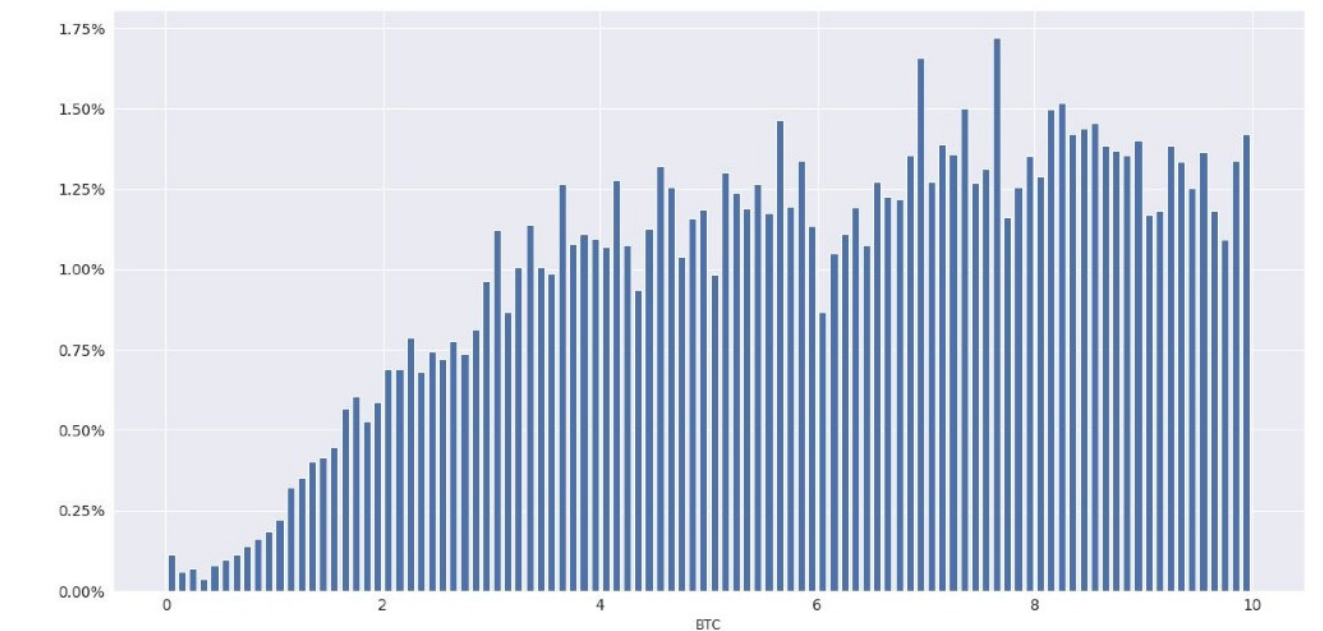
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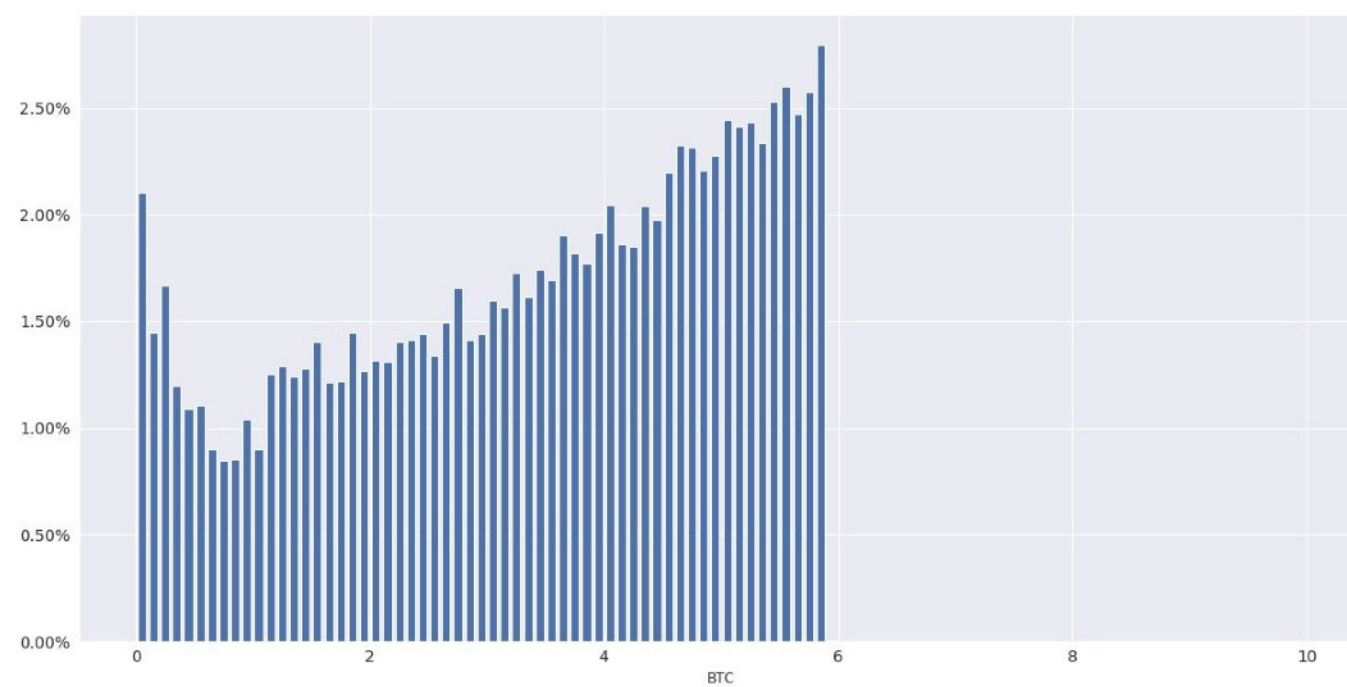


CoinBene (\$480M*)

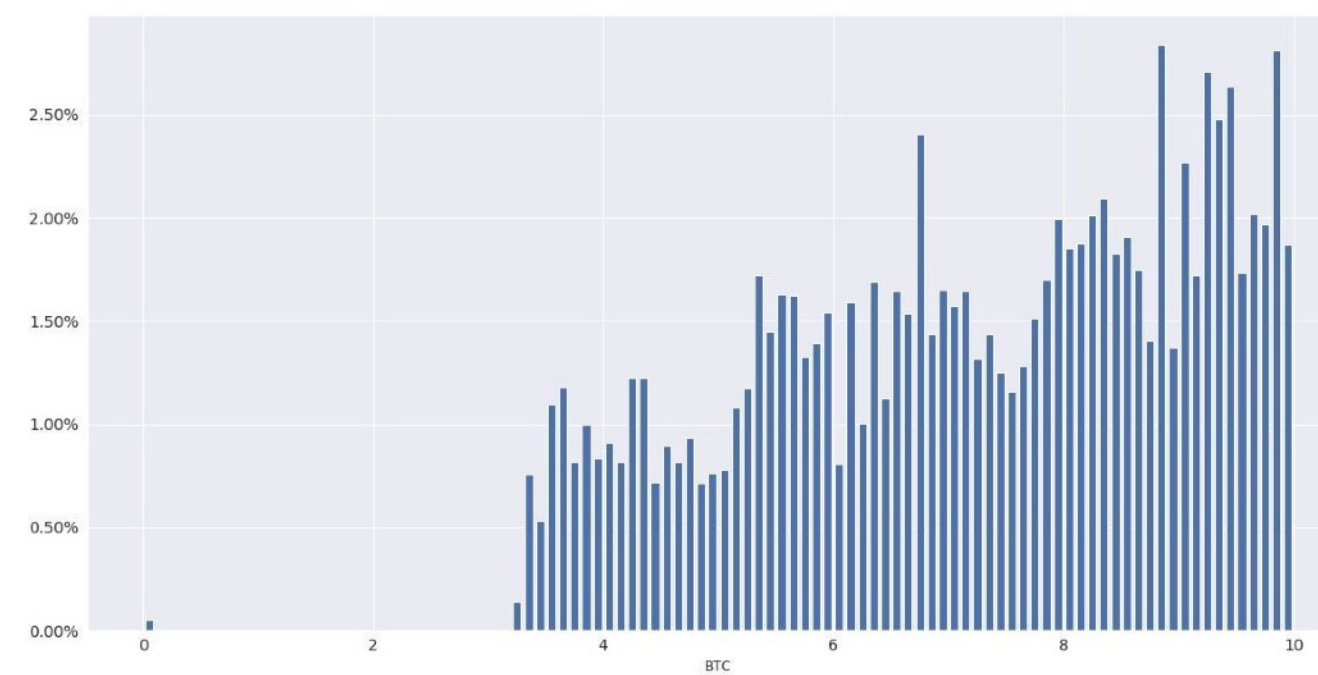
LBank shows increasing volume percentage for larger trade sizes. It reverses the decaying trend from all the well-known exchanges.



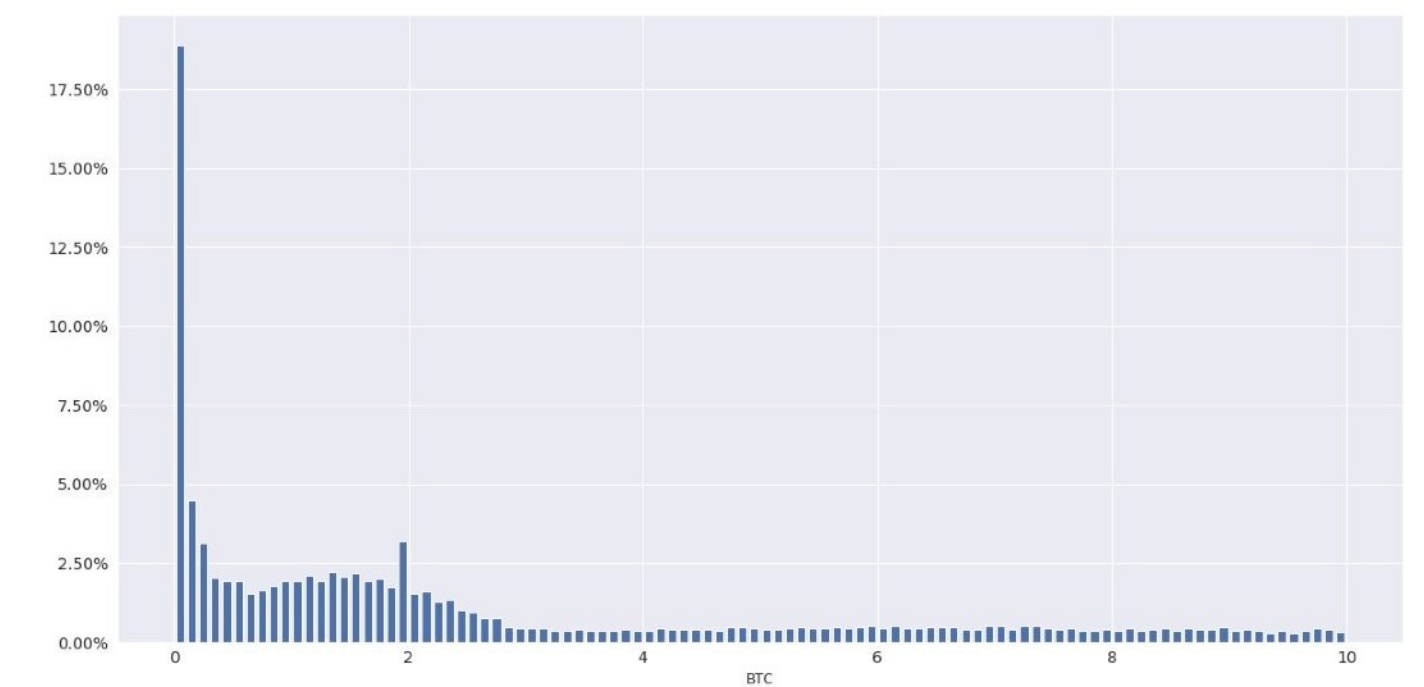
LBank (\$127M*)



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Exrates (\$35M*)

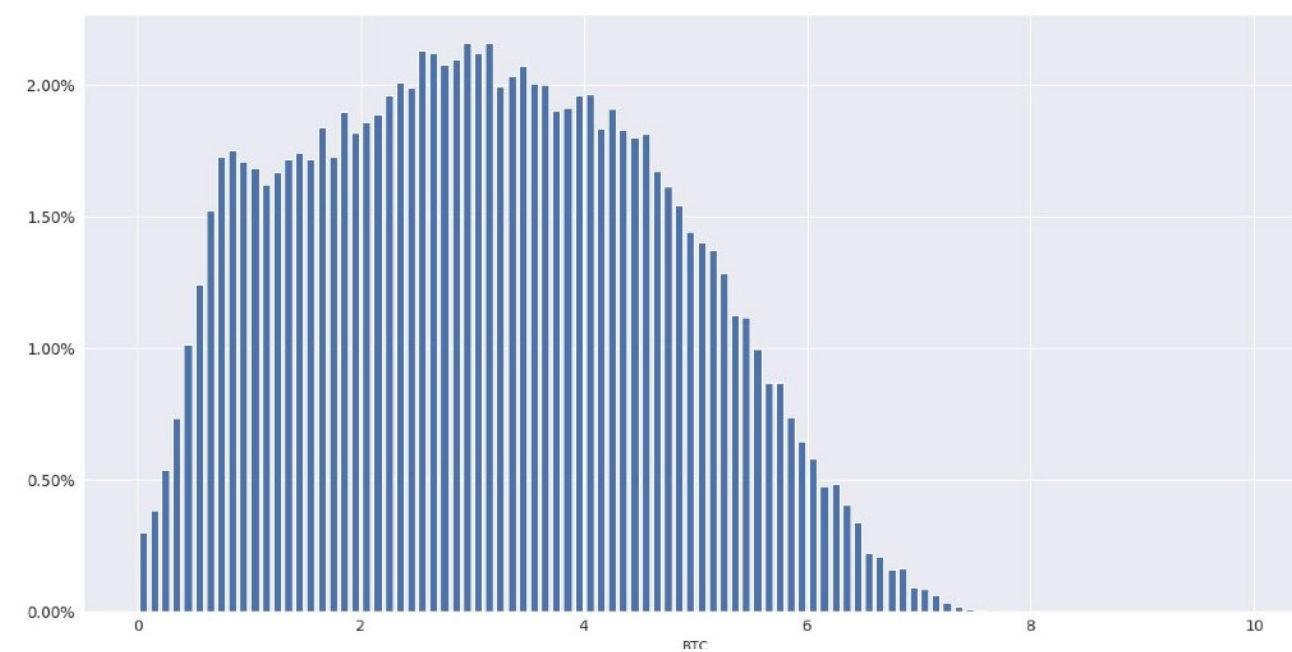


OKEx (\$152M*)

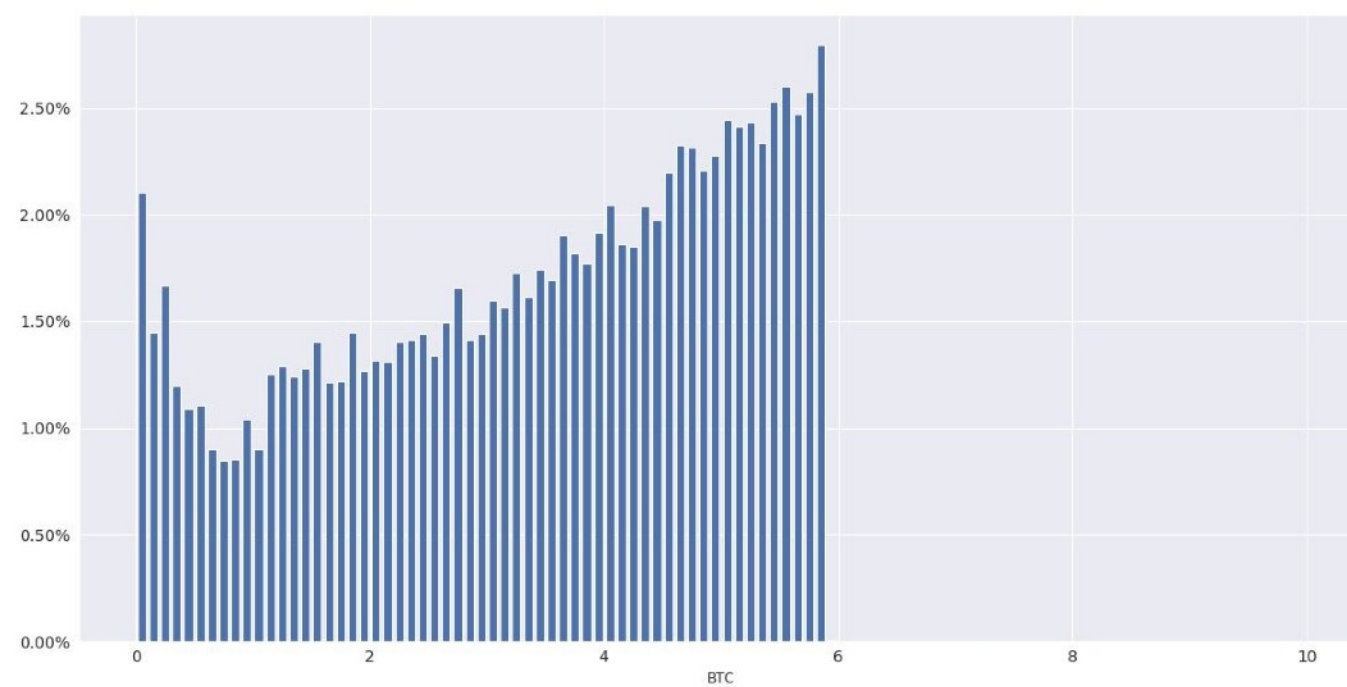


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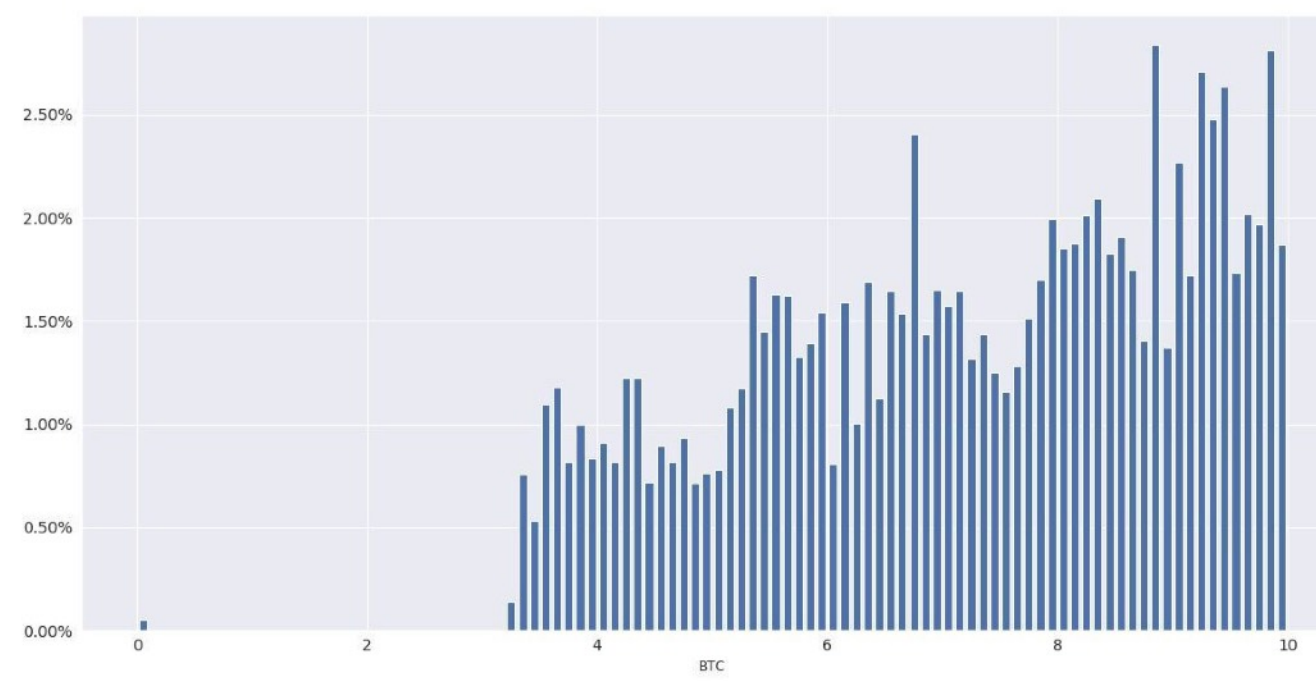


CoinBene (\$480M*)

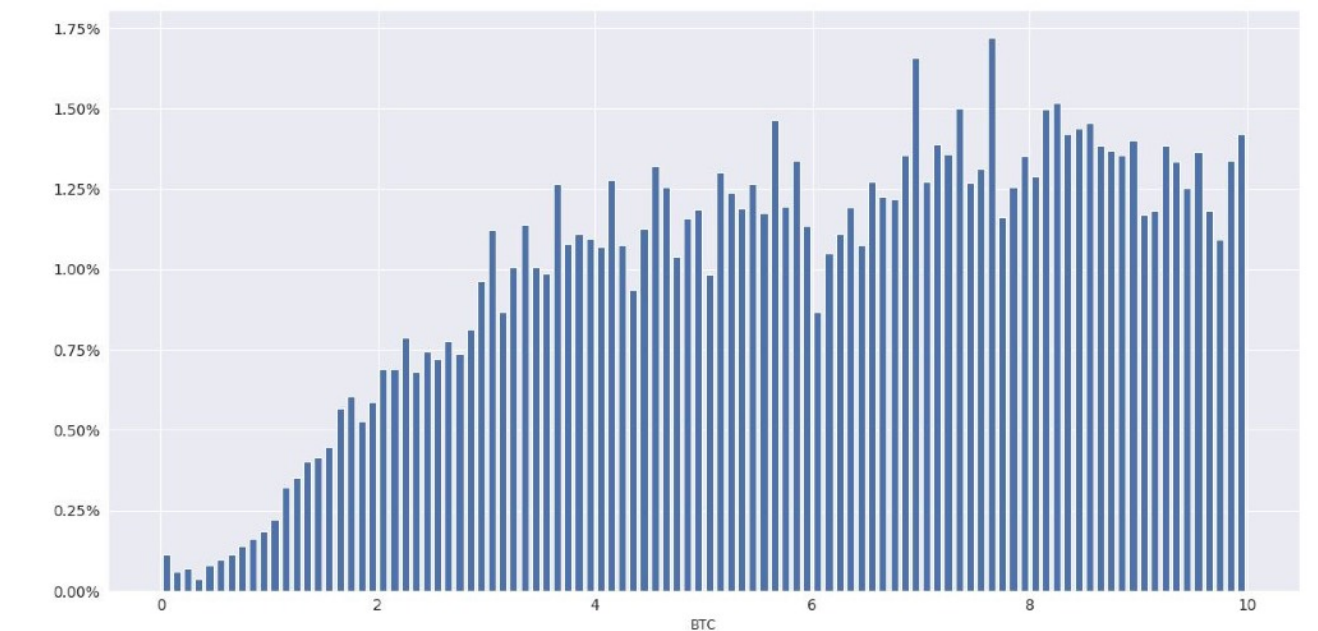


BitForex (\$241M*)

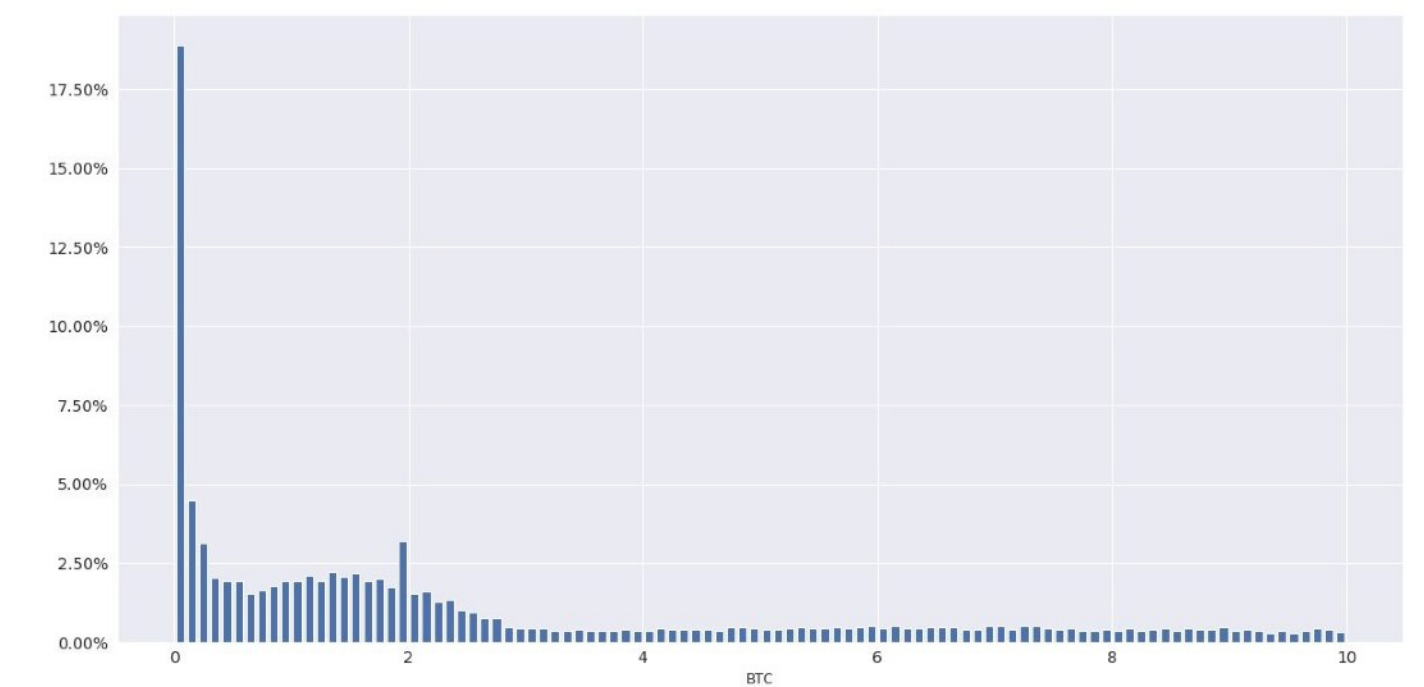
BitForex has an inexplicable cliff of trade volume percentage right before 6 bitcoin trade sizes.



Exrates (\$35M*)



LBank (\$127M*)

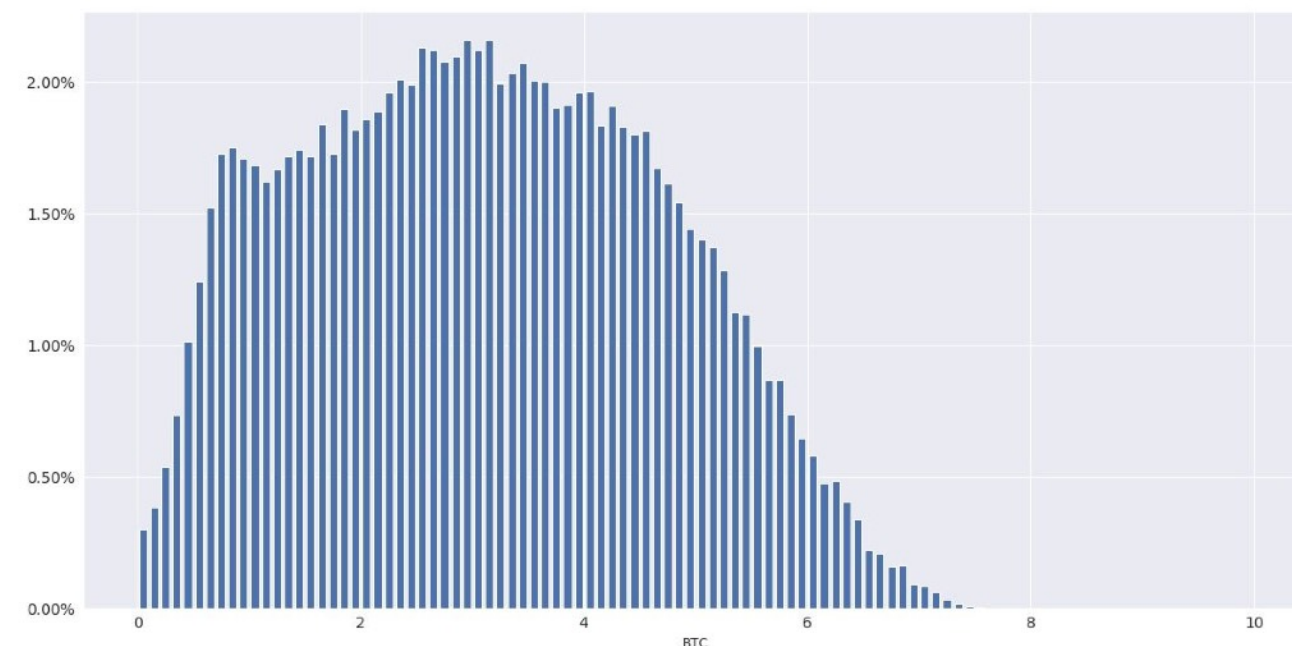


OKEx (\$152M*)



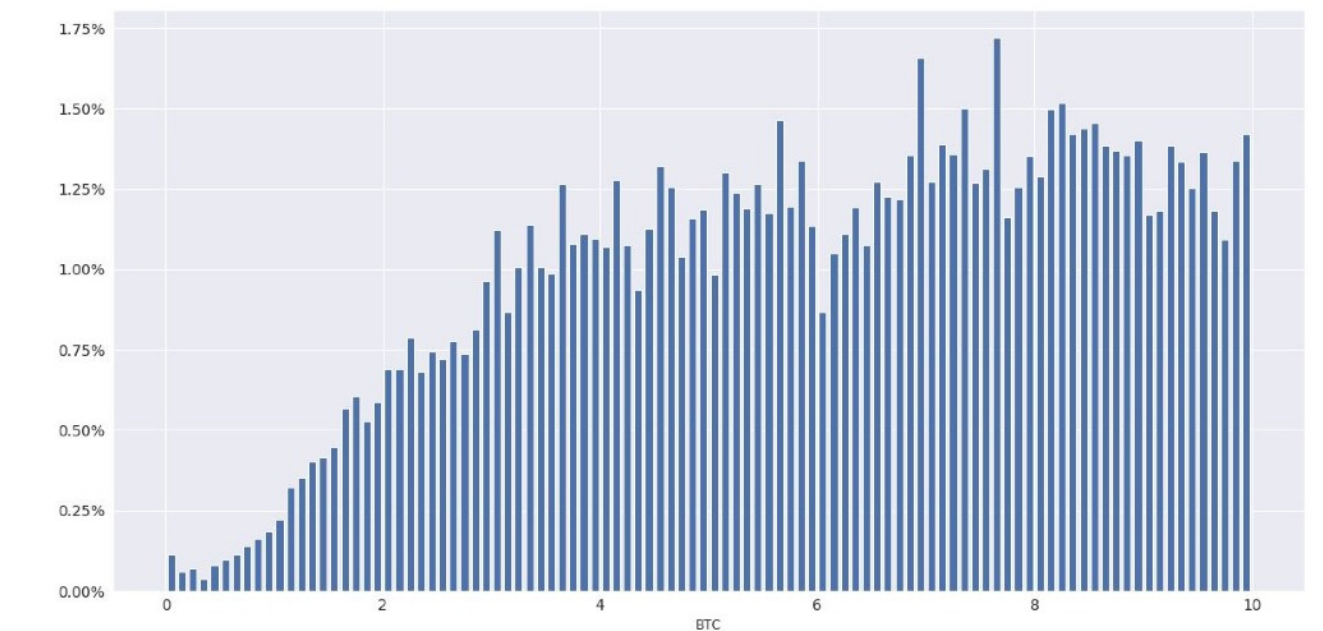
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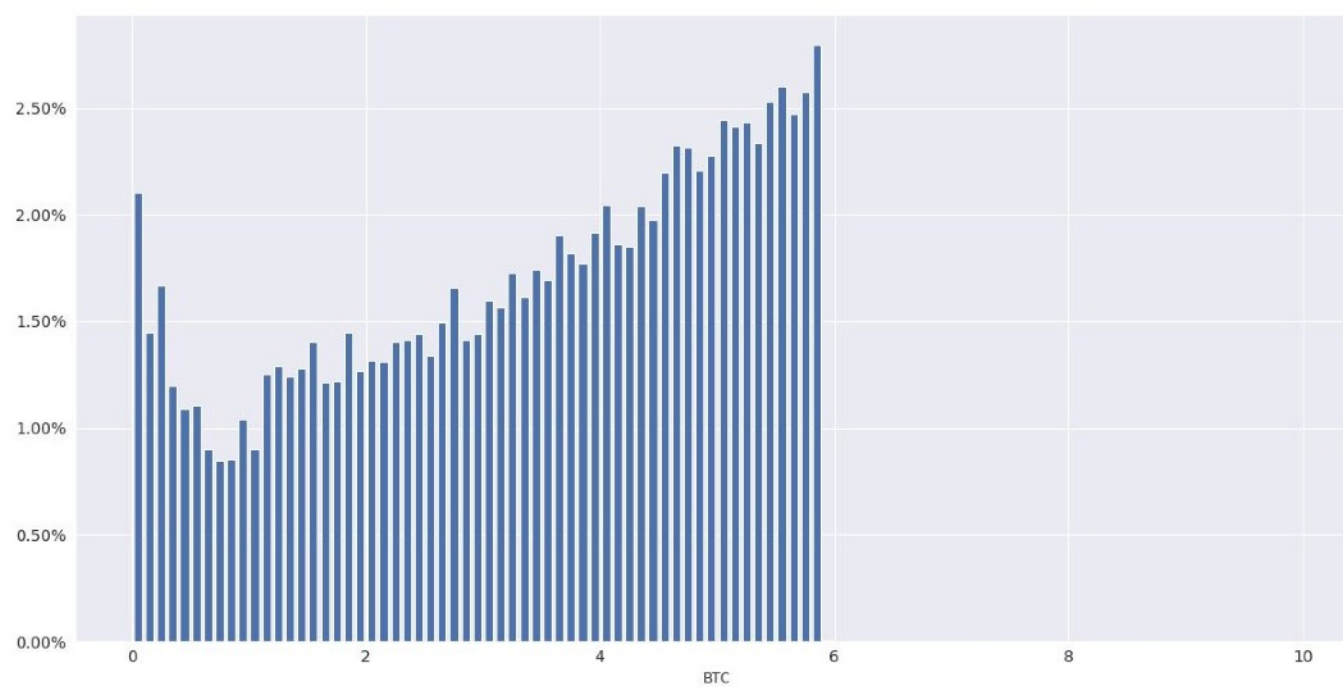


CoinBene (\$480M*)

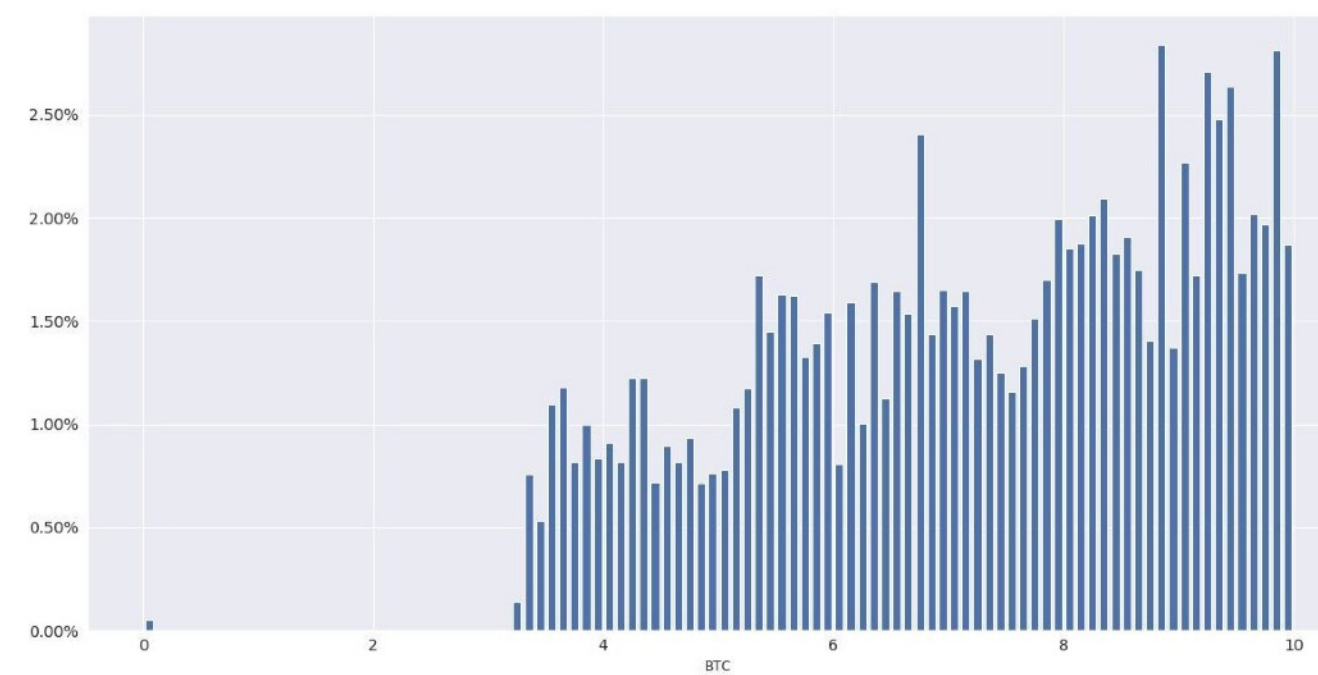
Exrates has substantially no trades smaller than 3 bitcoin.



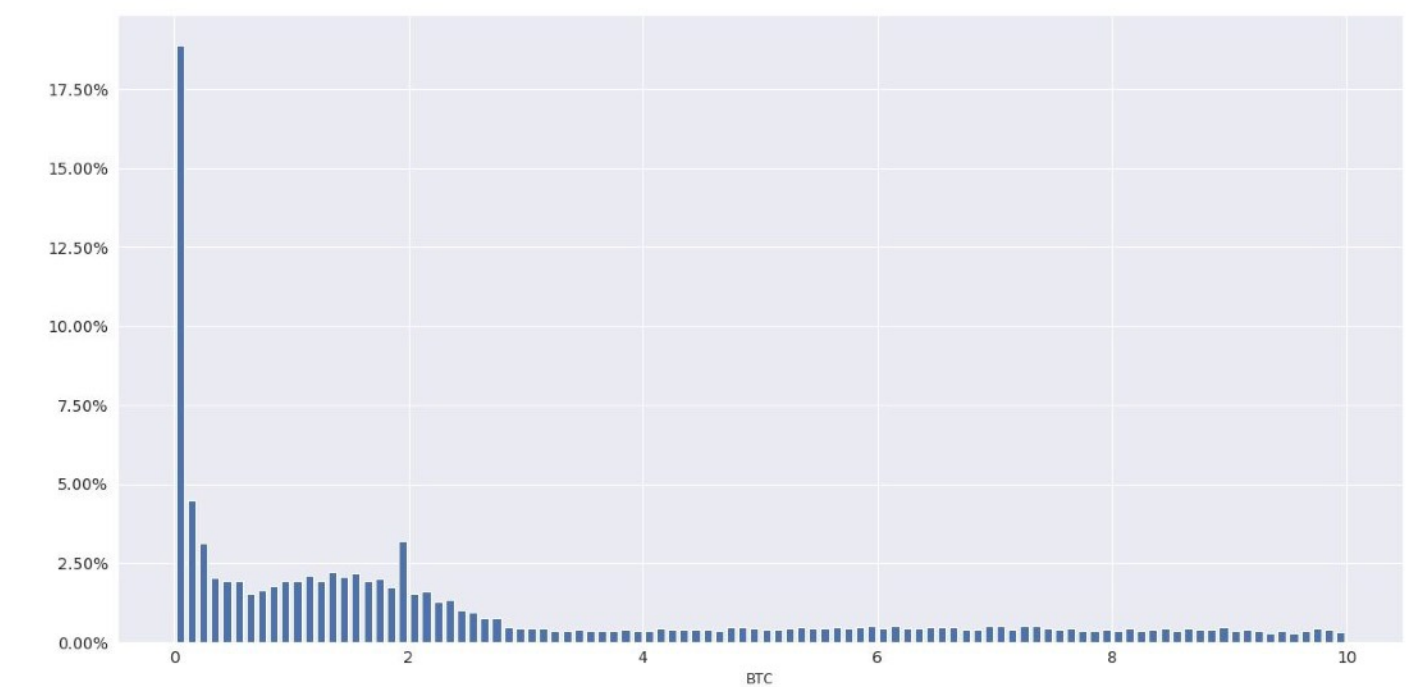
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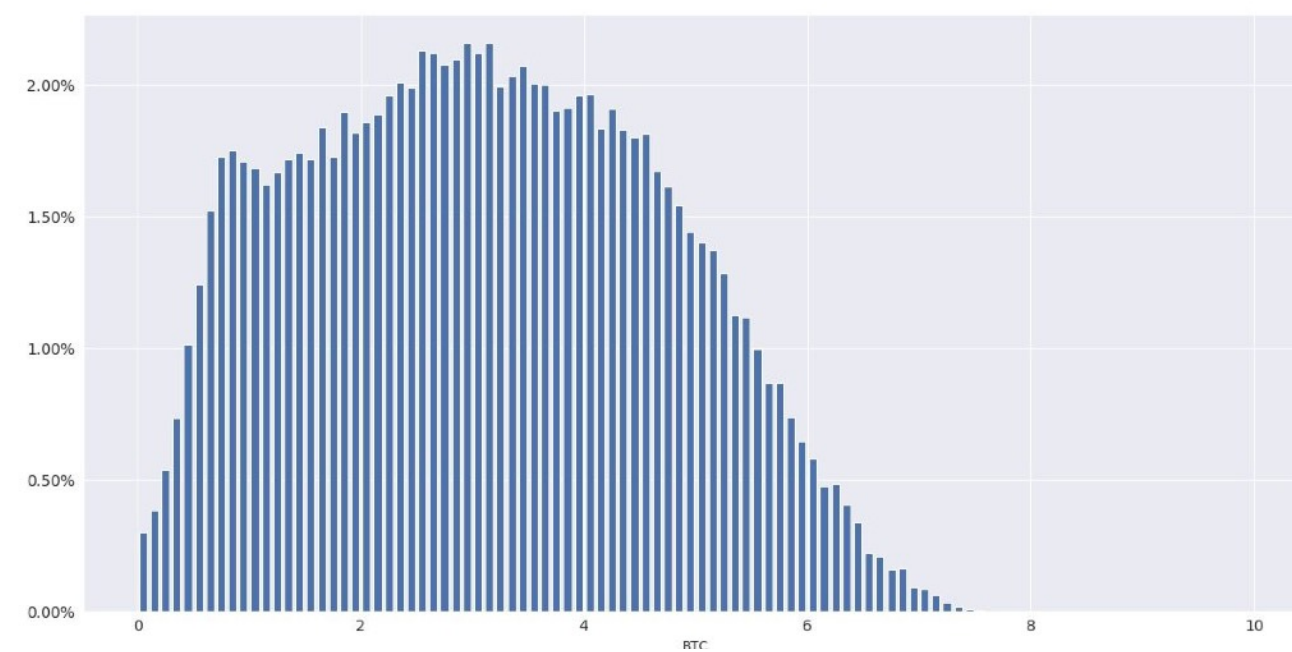


OKEx (\$152M*)



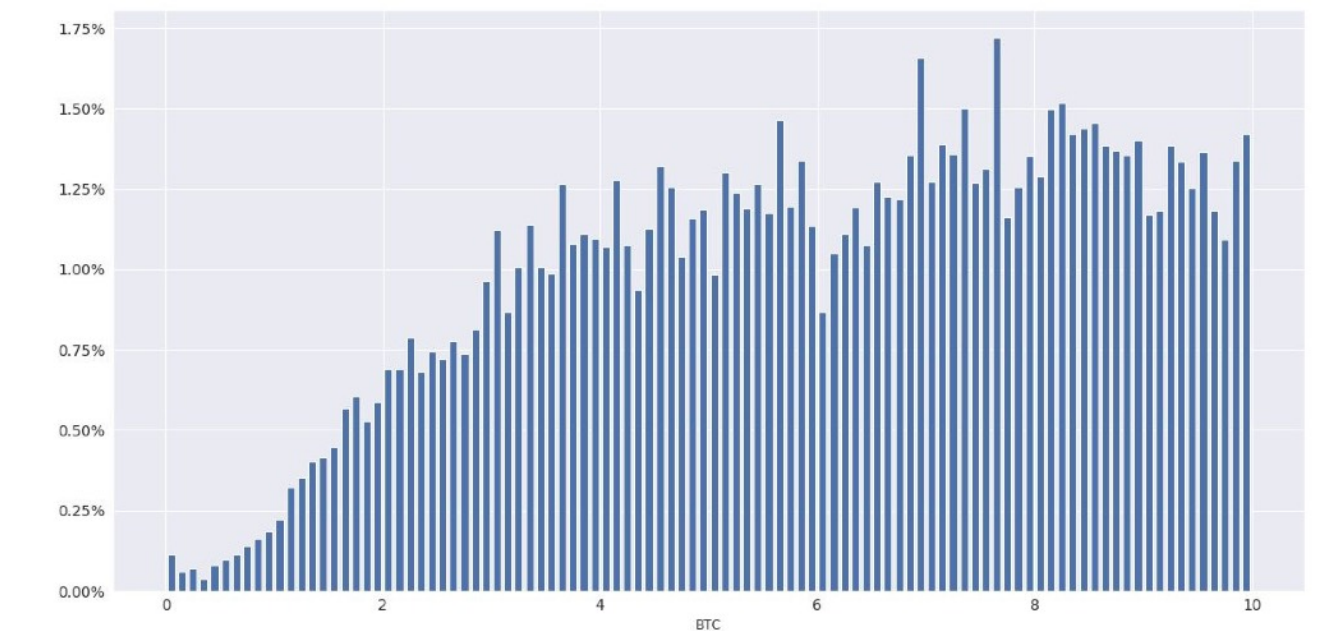
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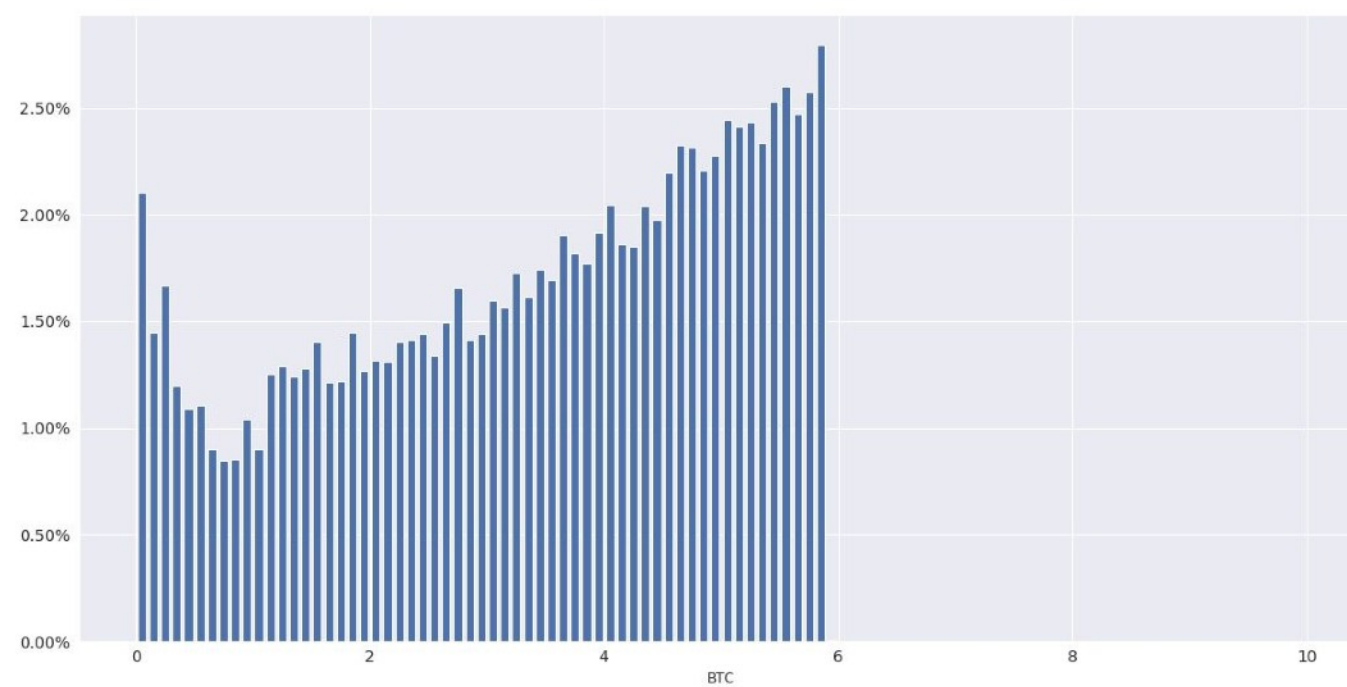


CoinBene (\$480M*)

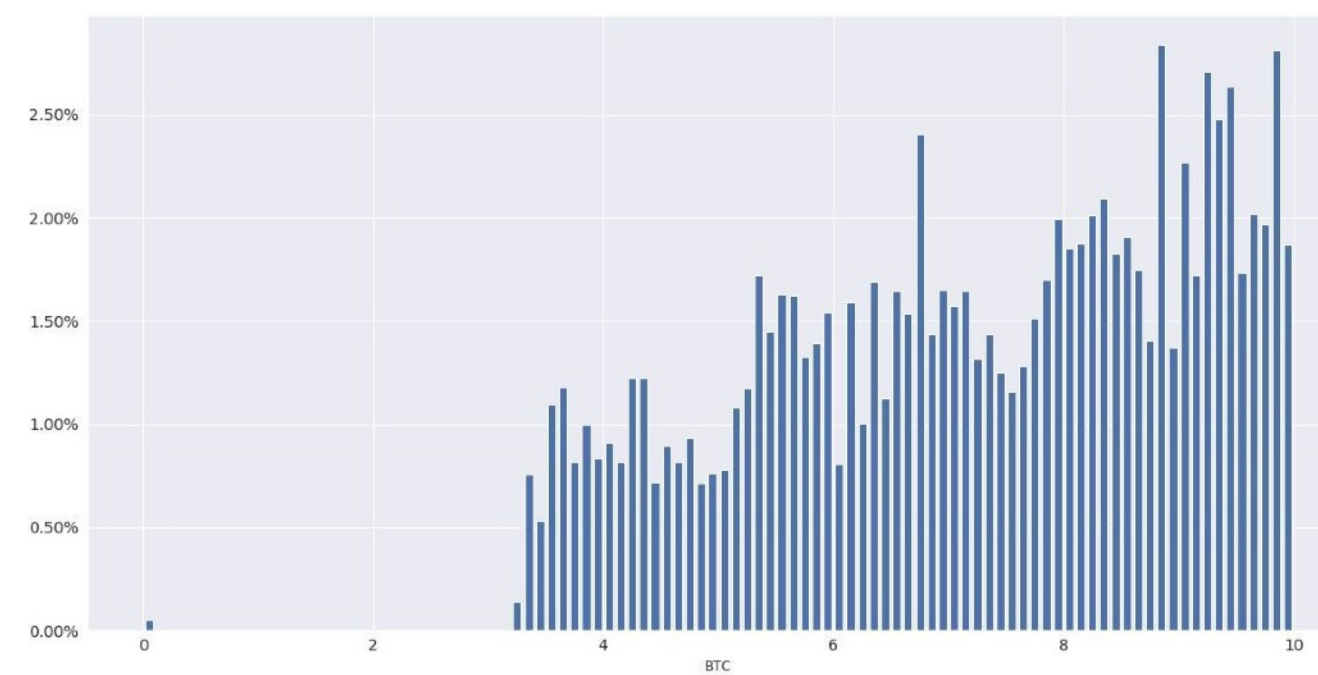
OKEx's warning sign is the "flat-line" volume percentage trend after 3 bitcoin, which shows no signs of stopping even at 10 bitcoin.



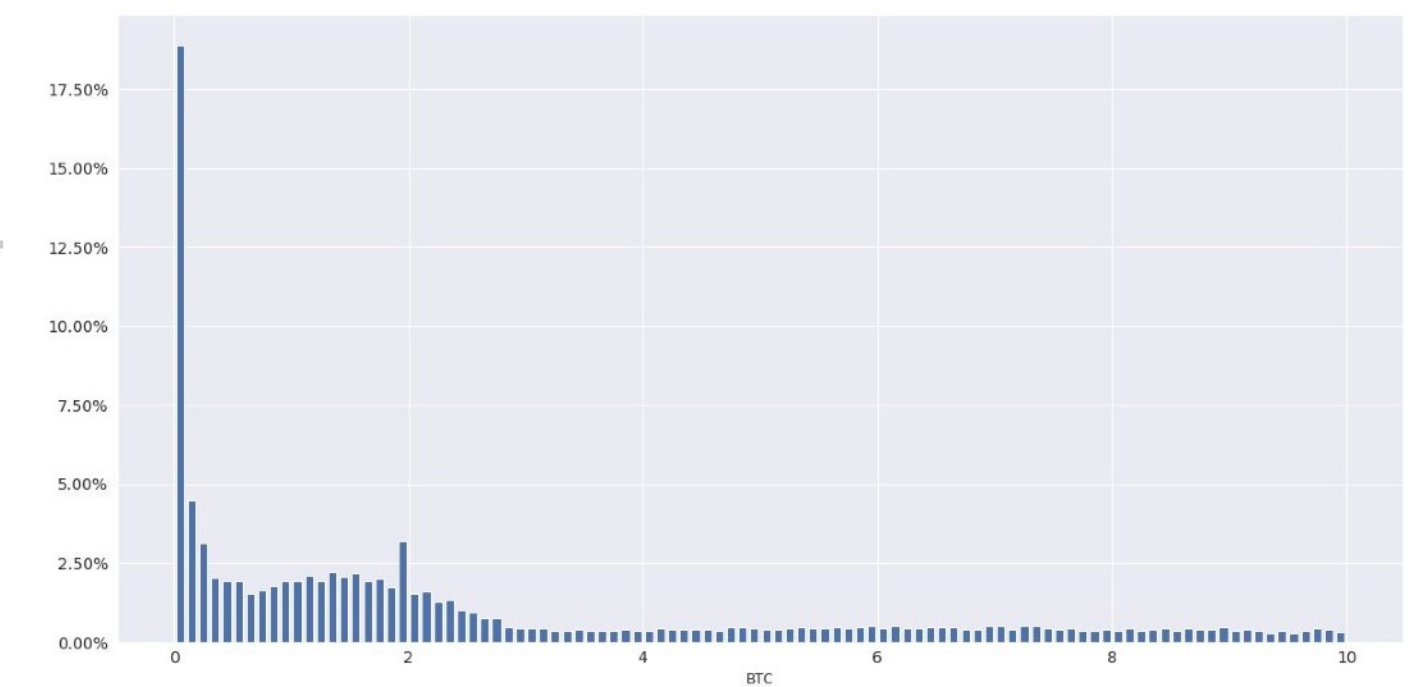
LBank (\$127M*)



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Exrates (\$35M*)

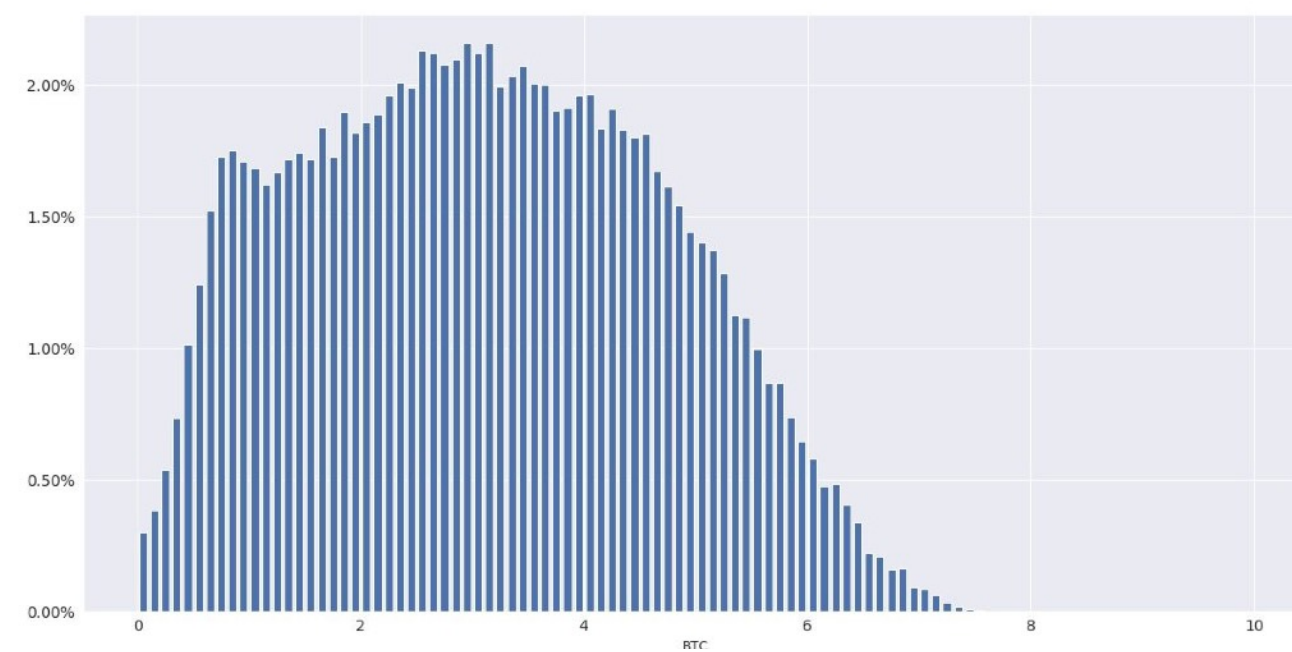


OKEx (\$152M*)

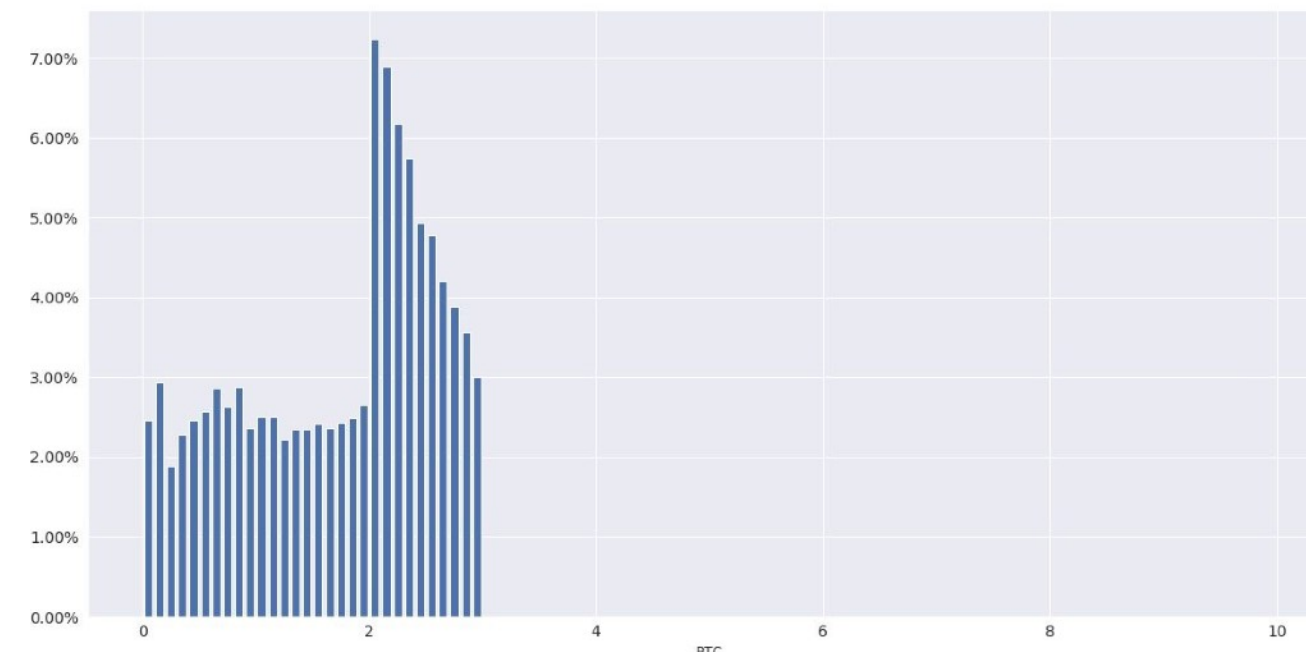


Trade Size Histograms For Suspect Exchanges

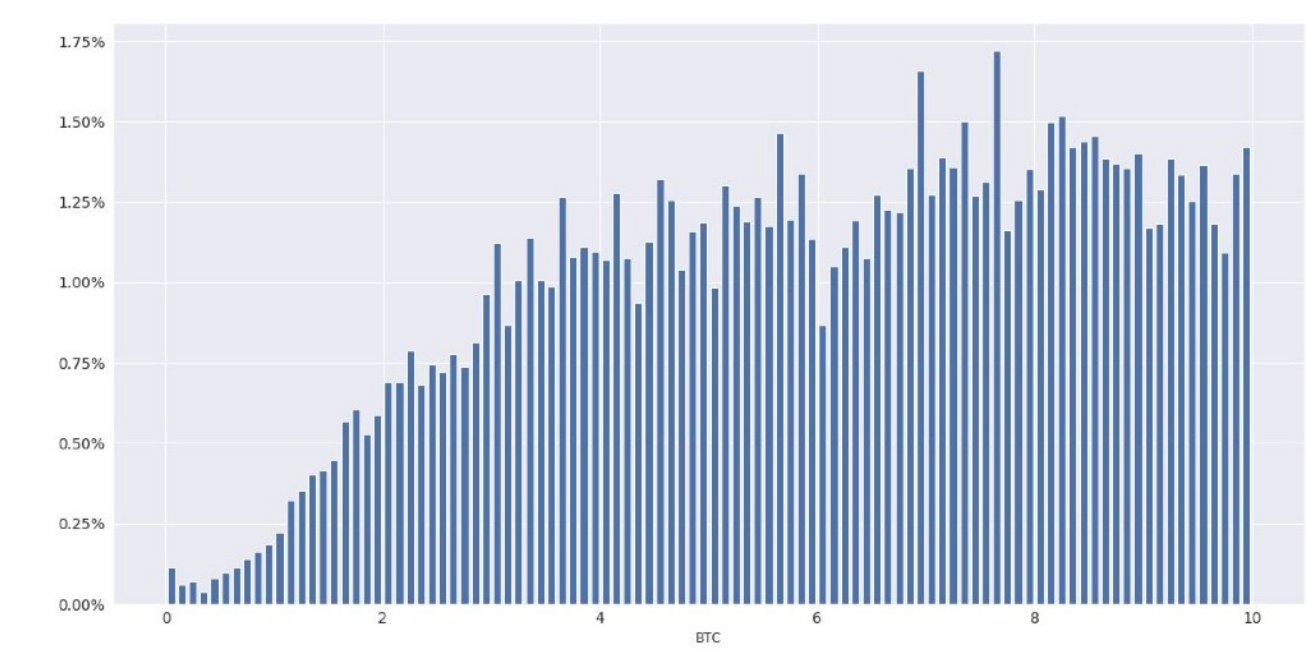
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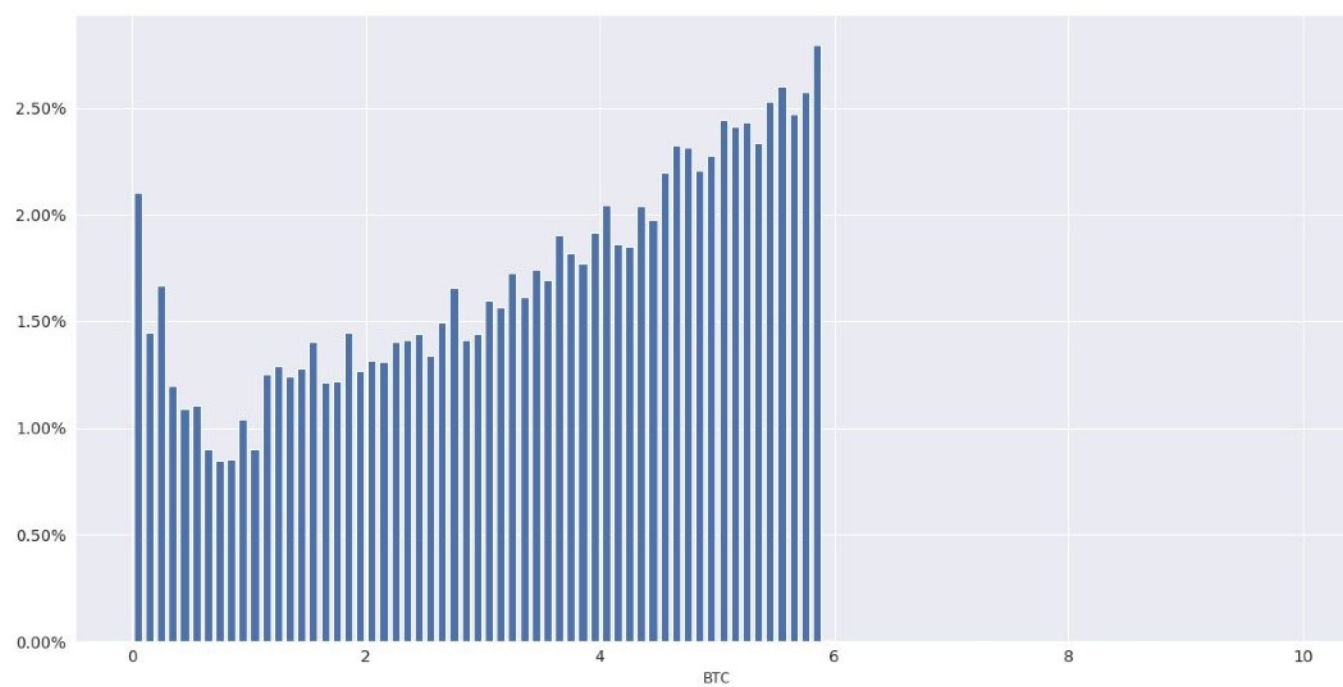
CoinBene (\$480M*)



IDAX (\$163M*)

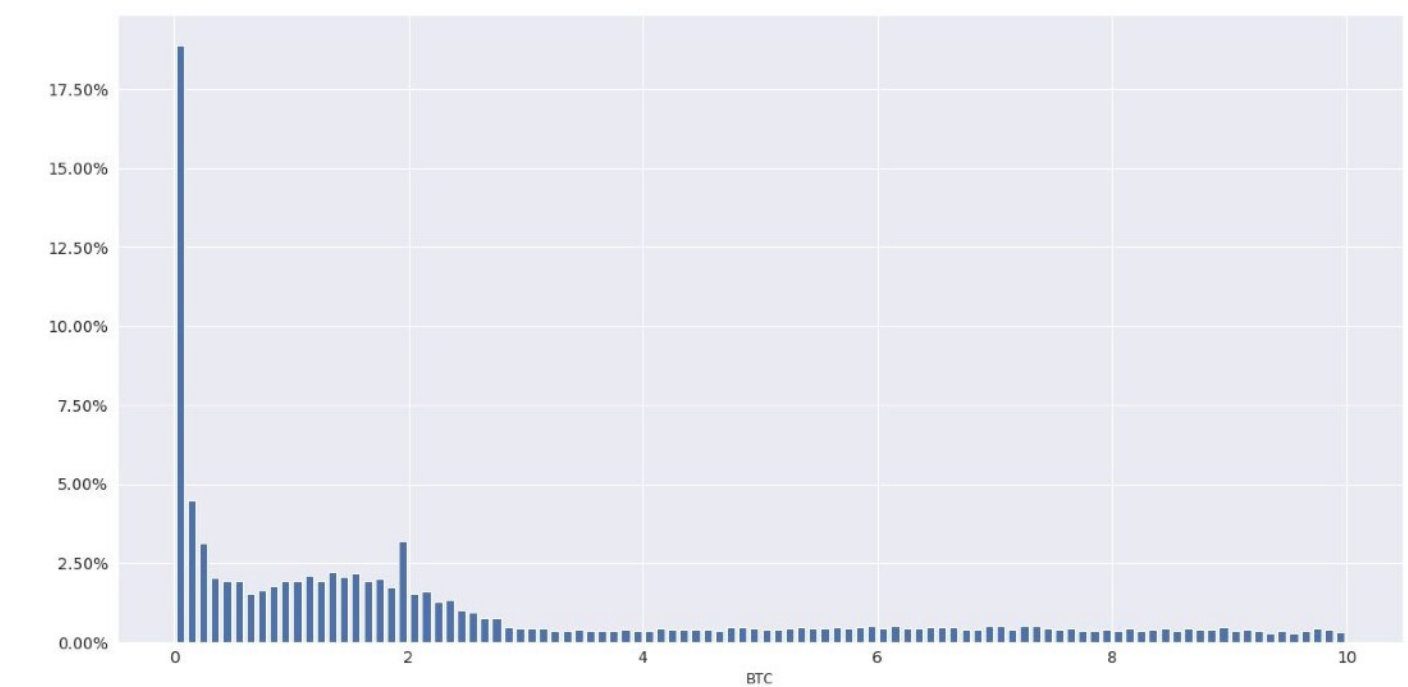


LBank (\$127M*)



BitForex (\$241M*)

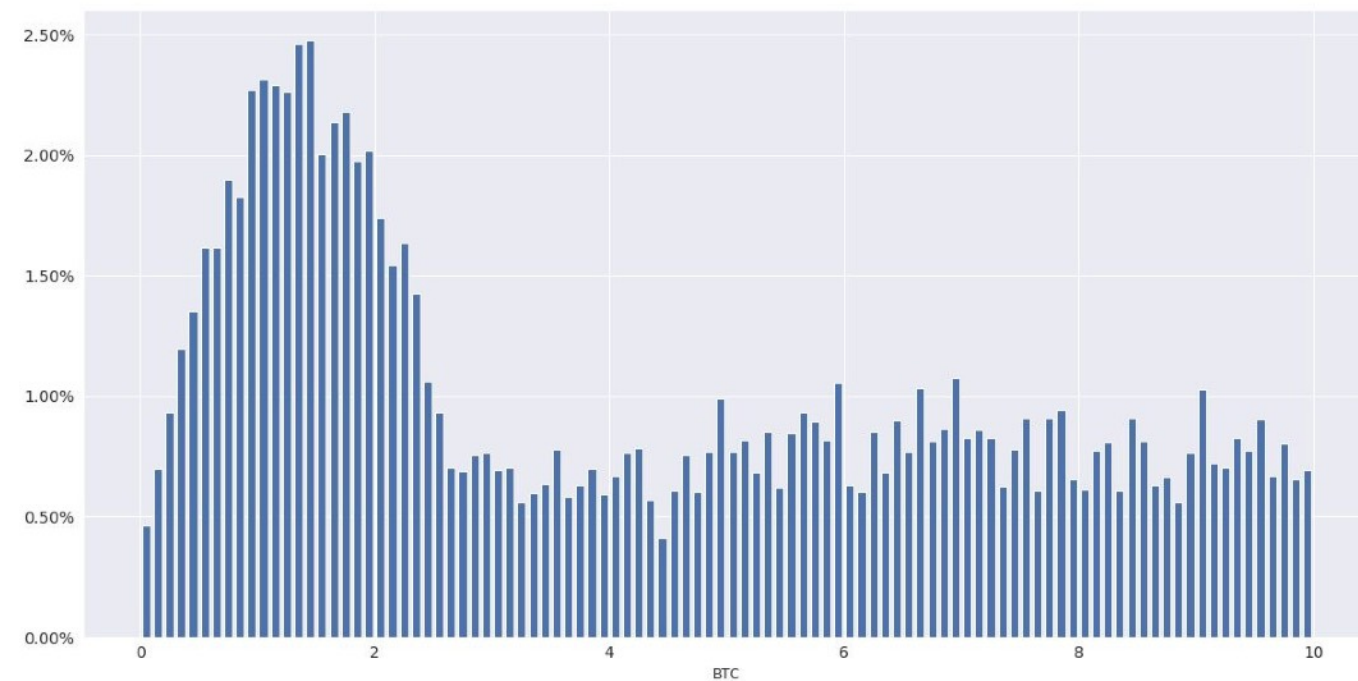
IDAX's histogram appears to have multiple artificial trade distribution patterns overlapped.



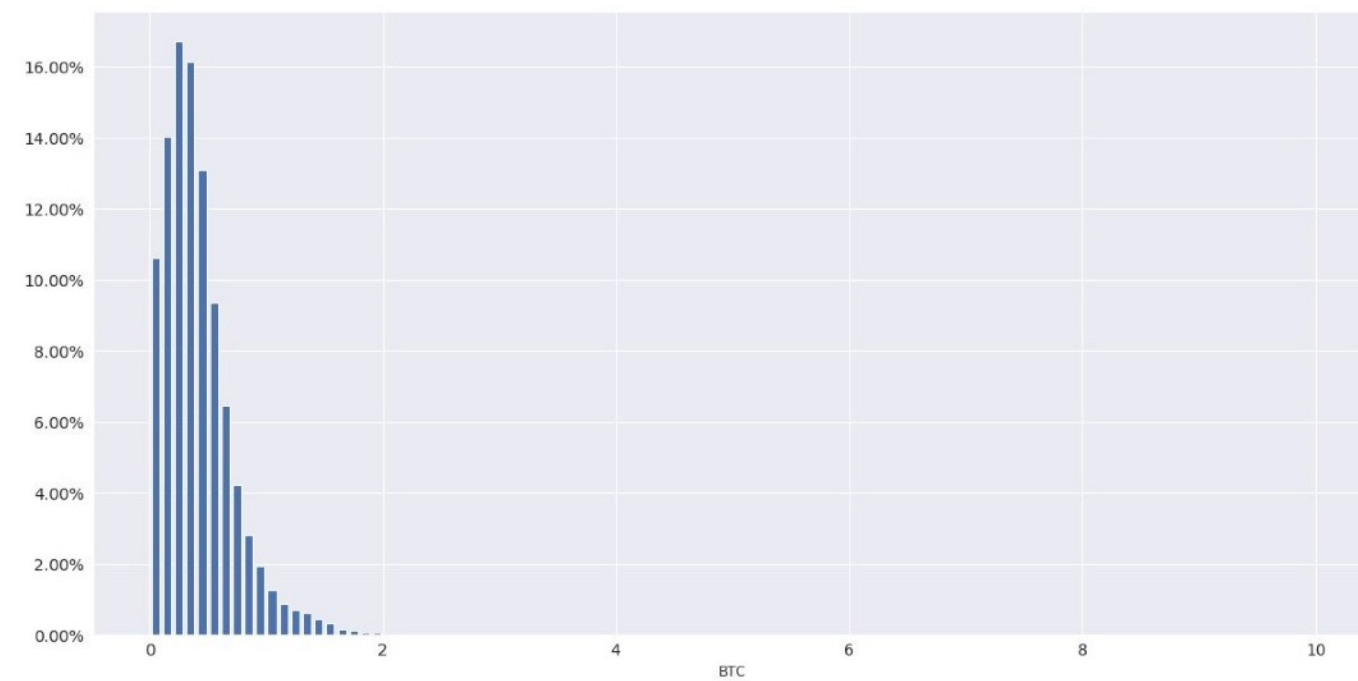


More Trade Size Histograms For Suspect Exchanges

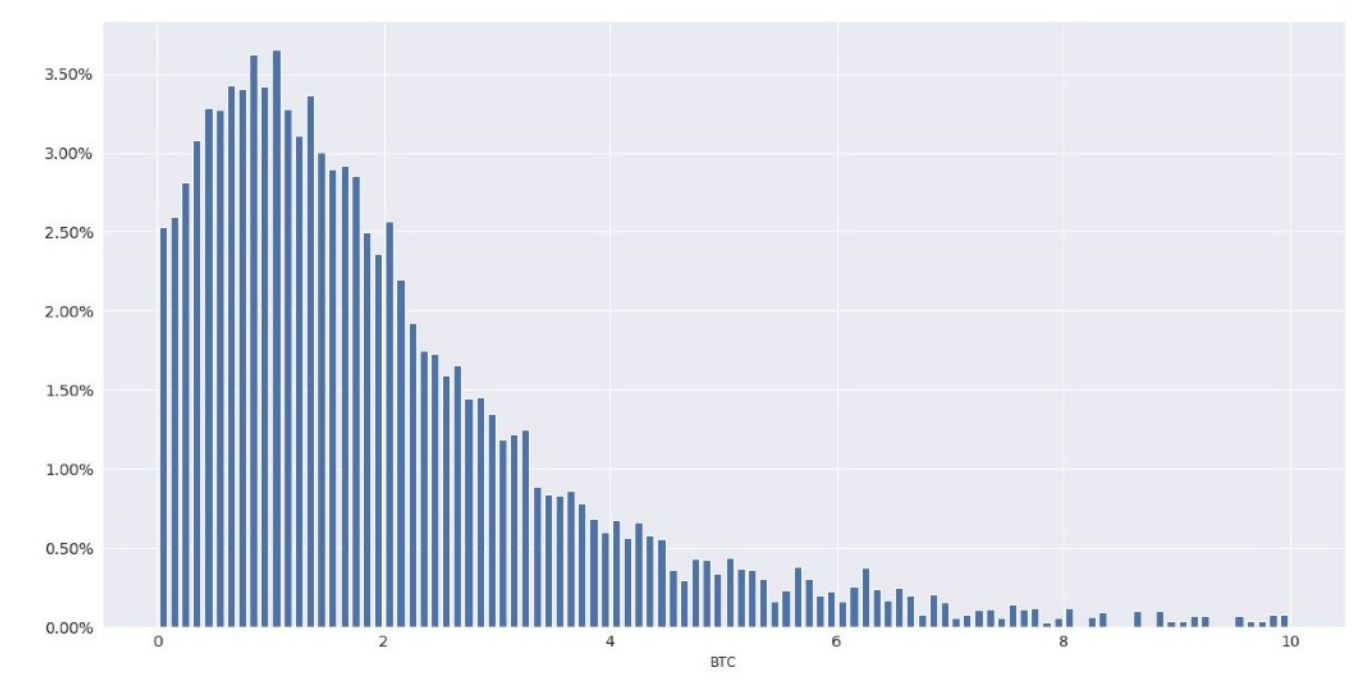
Trade Size Histograms for exchanges with suspicious volume look completely different, and showcase patterns that are both idiosyncratic and highly suspicious.



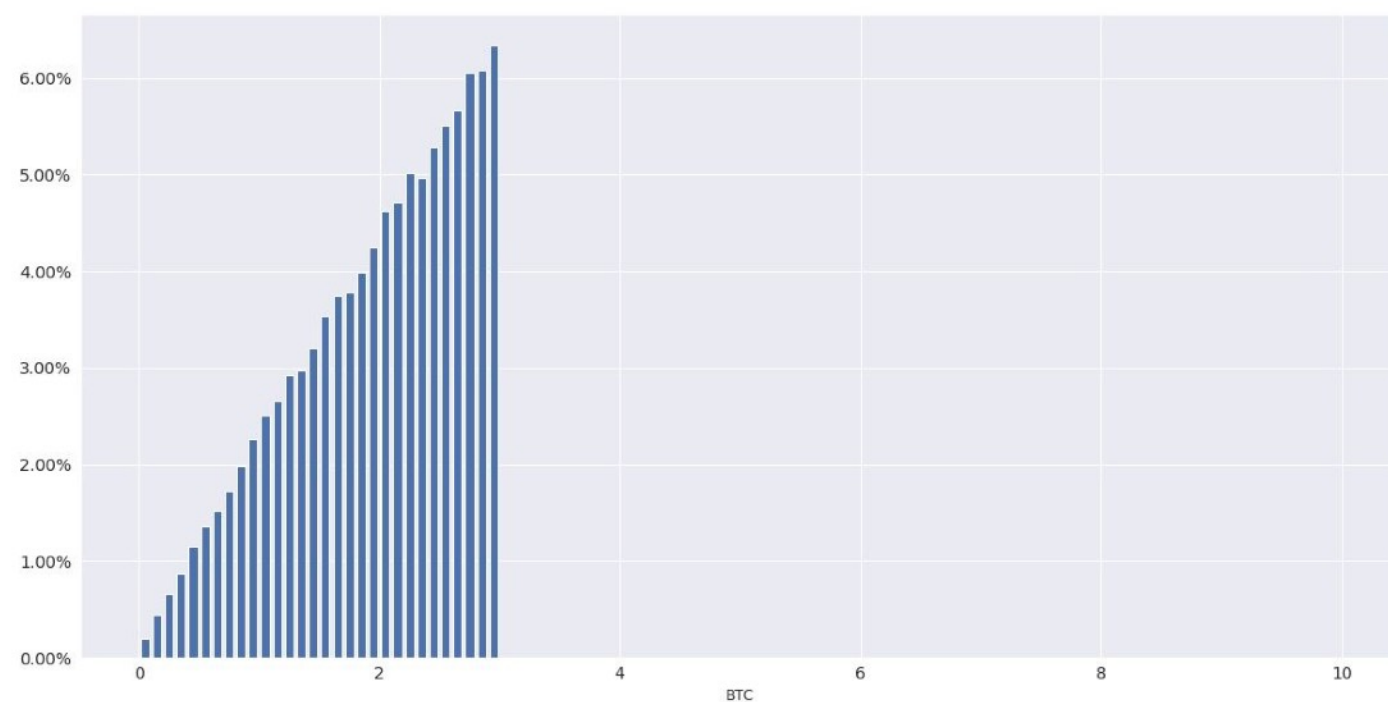
BitMart (\$106M*)



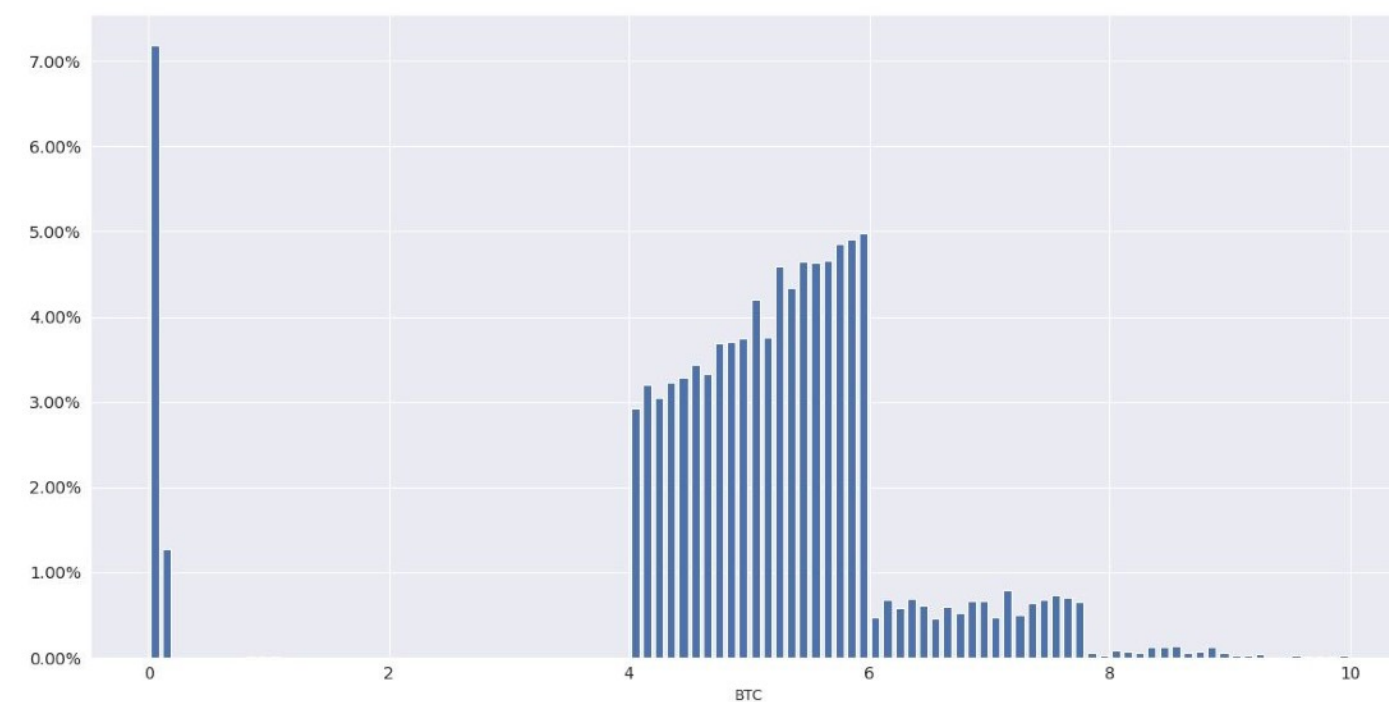
ZBG (\$225M*)



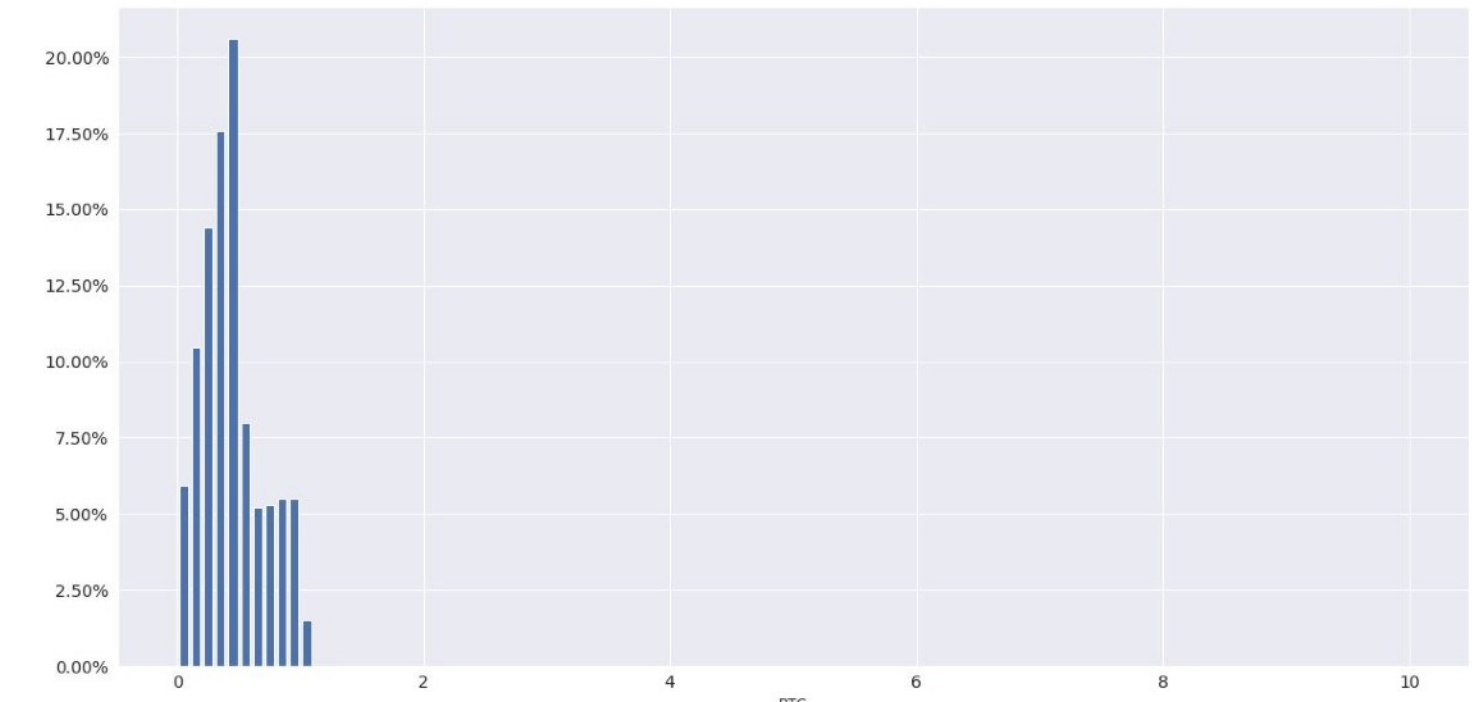
CoinTiger (\$97M*)



SIMEX (\$97M*)



Coinsuper (\$82M*)

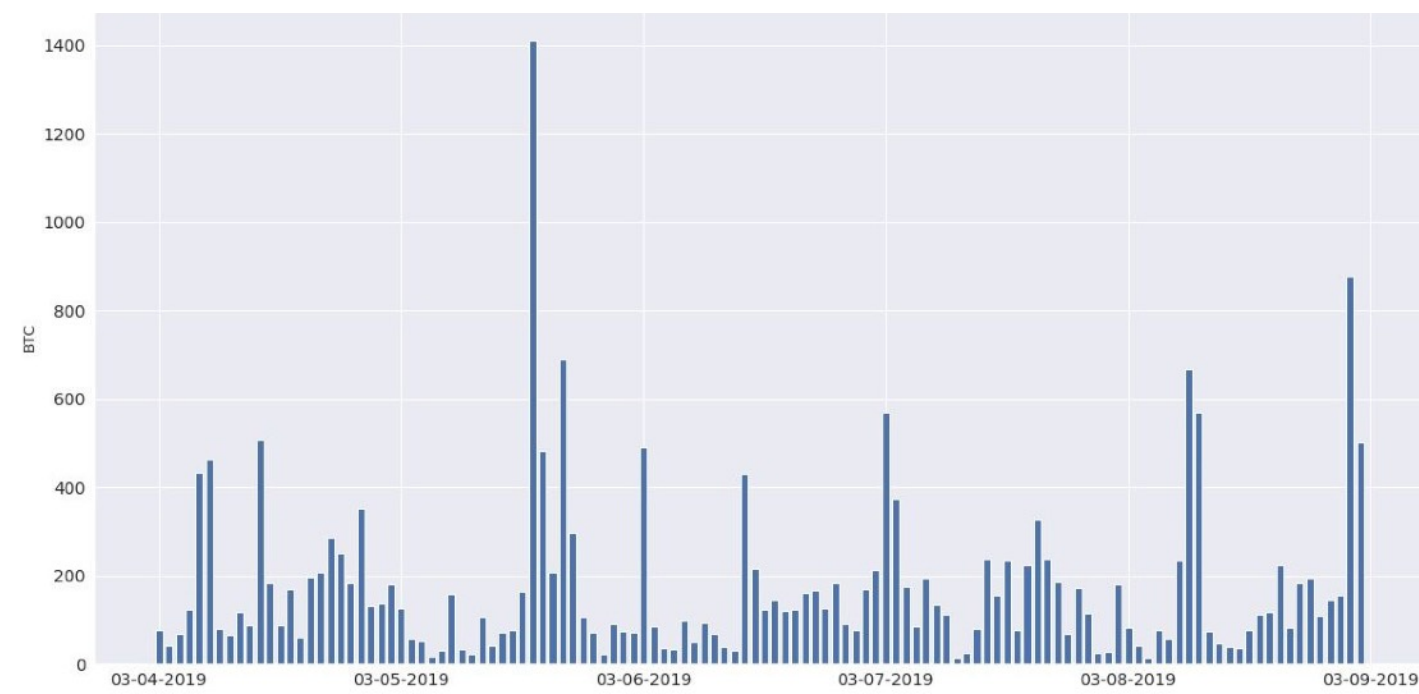


Bit-Z (\$152M*)

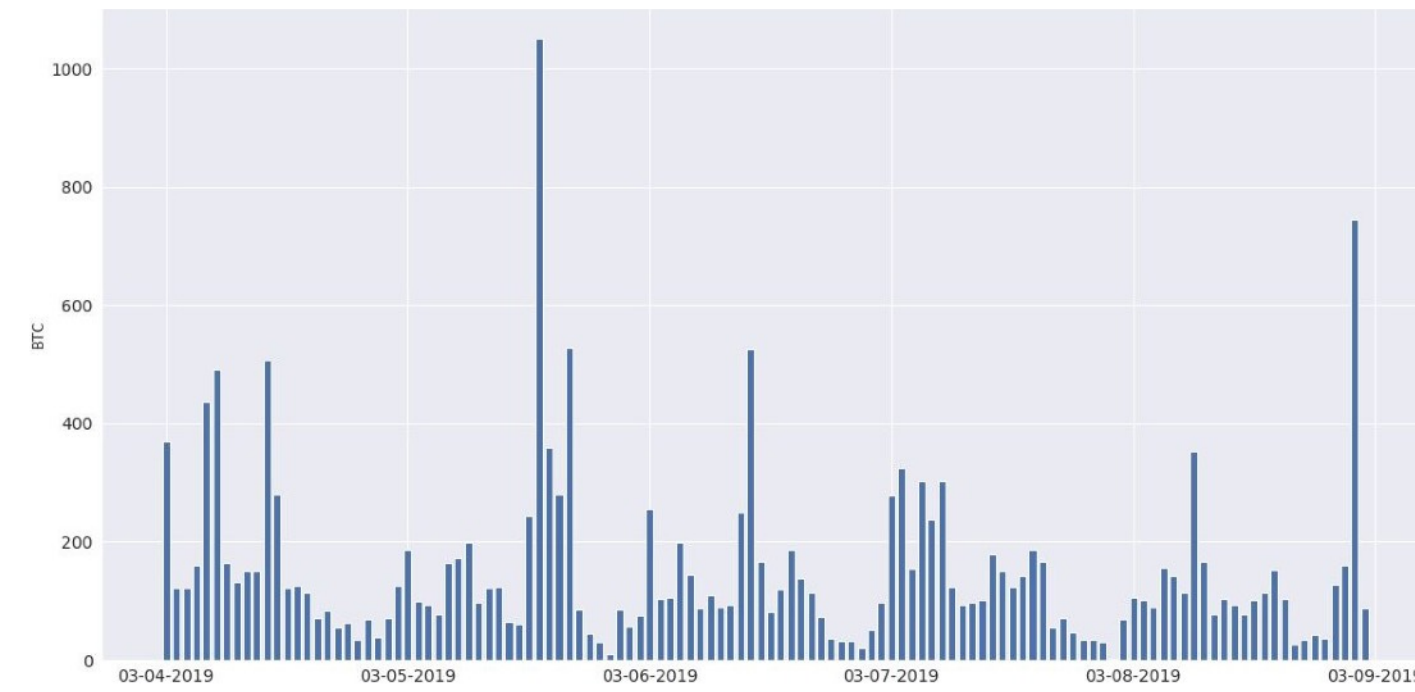


Volume Spike Alignment Provides Another Vector Of Analysis

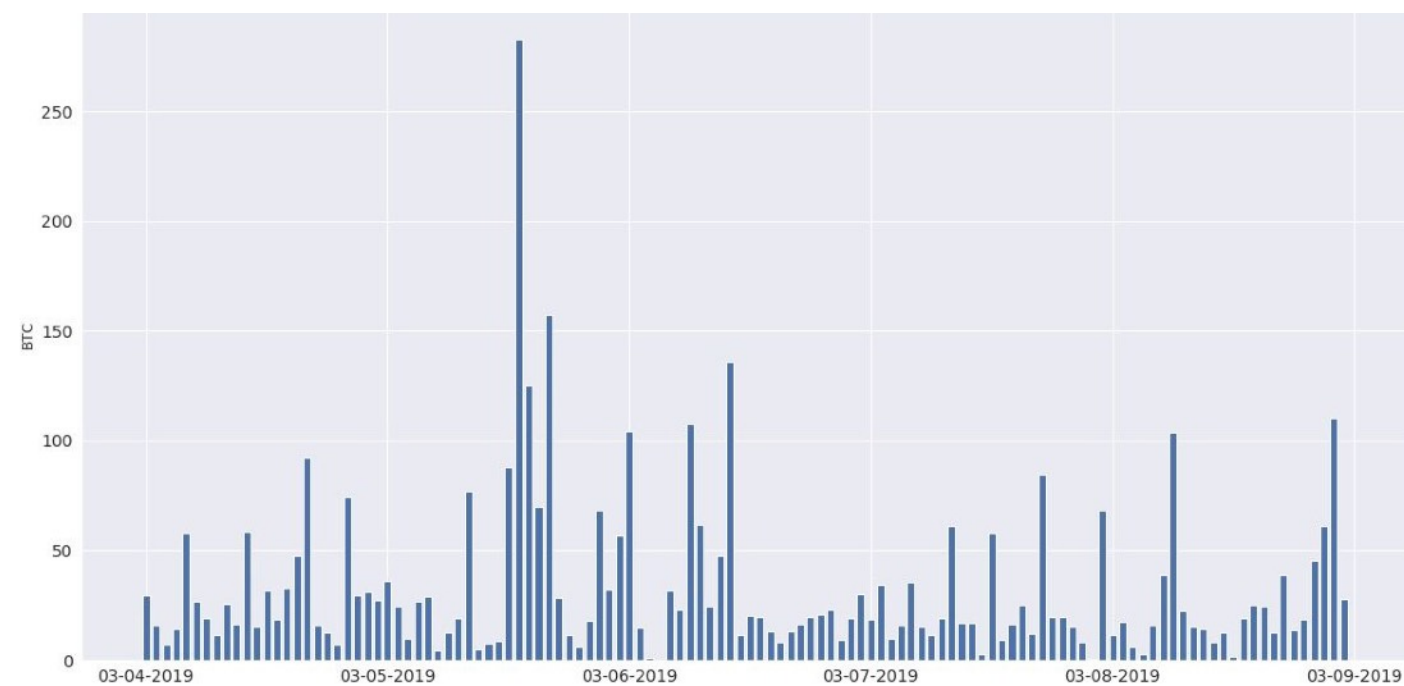
In a globally integrated market like bitcoin, you would expect exchange volume to rise and fall at the same time across all exchanges. It does for well-known exchanges. Notably, volume spikes align at literally the same hour for each of the exchanges below.



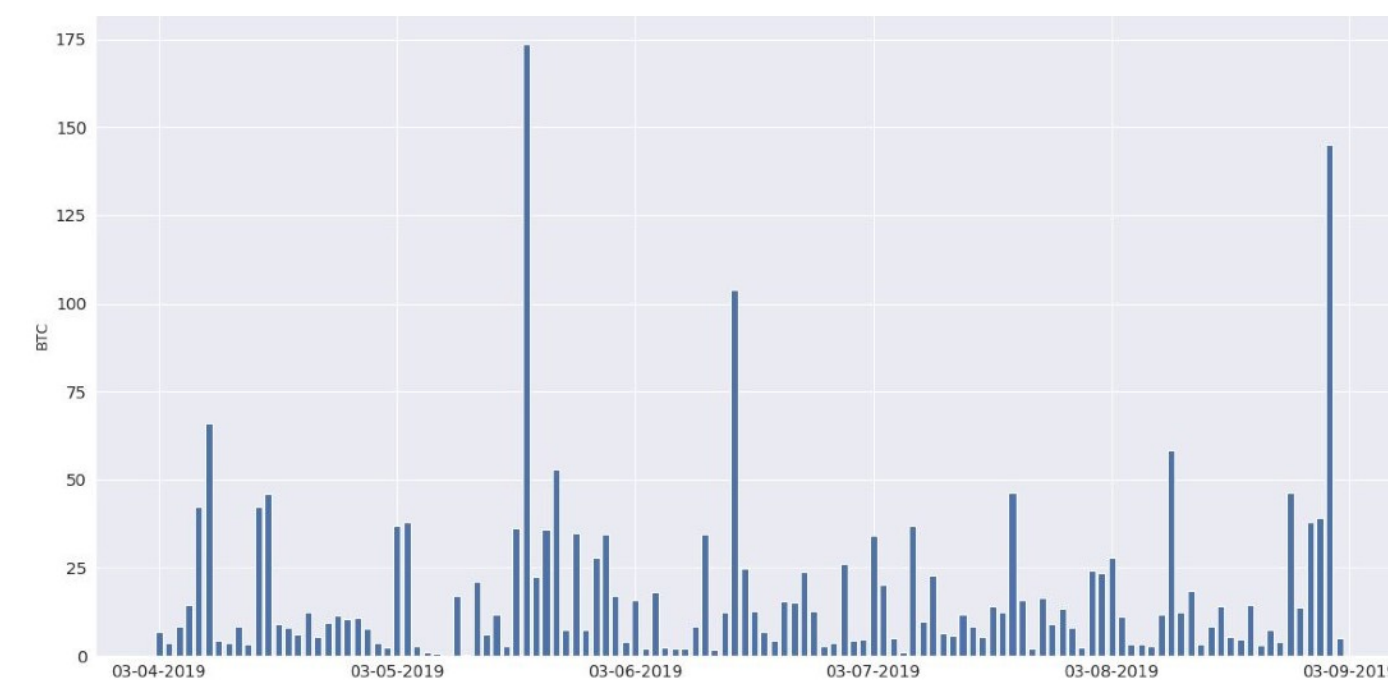
Kraken (\$31M*)



bitFlyer (\$13M*)



Bittrex (\$5M*)

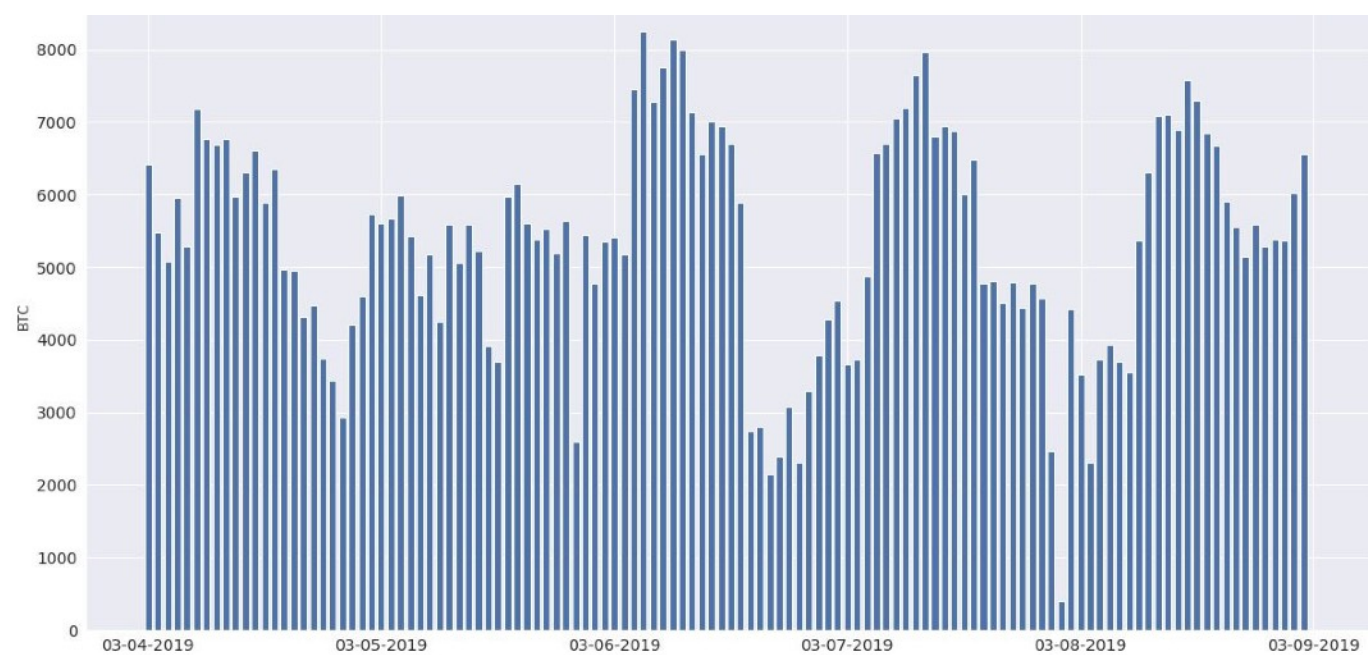


Poloniex (\$1.4M*)

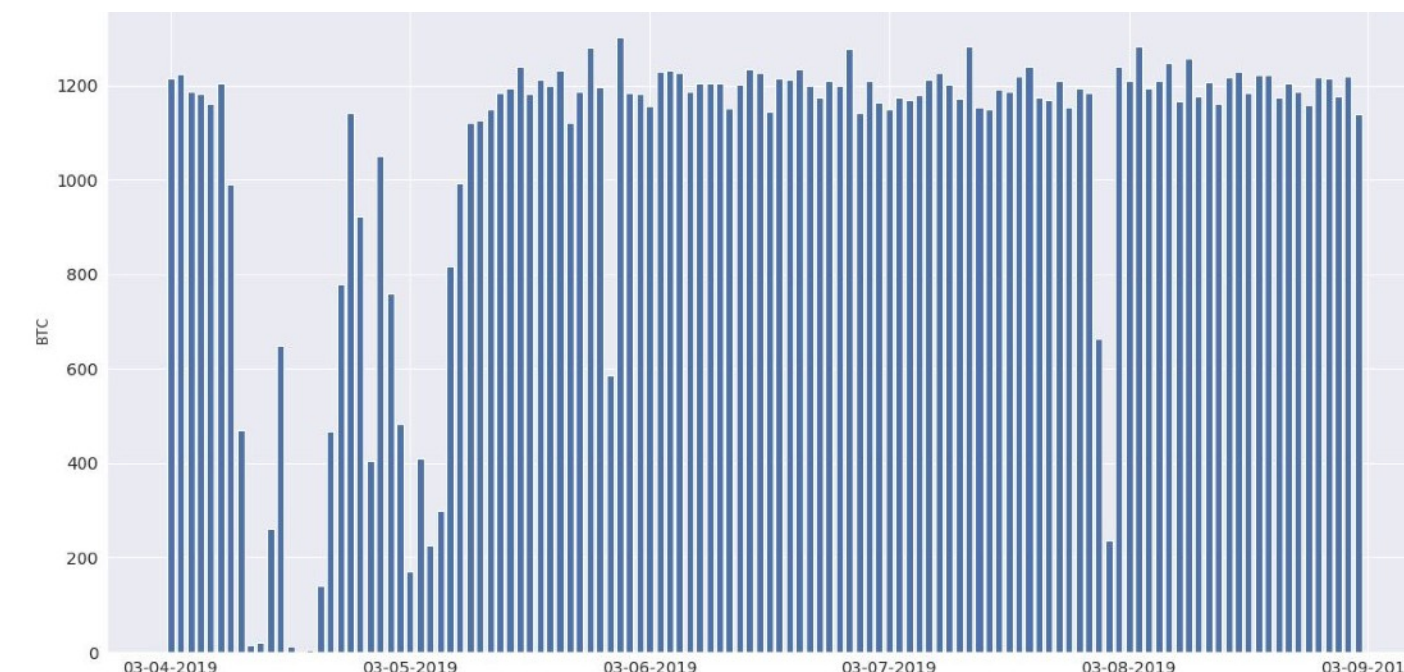


Volume Spike Alignment Provides Another Vector Of Analysis

Many other exchanges, however, fail this test, showing disconnected and/or random patterns. Some of them maintain constant volumes over time while others rise and fall at different times than any other market.



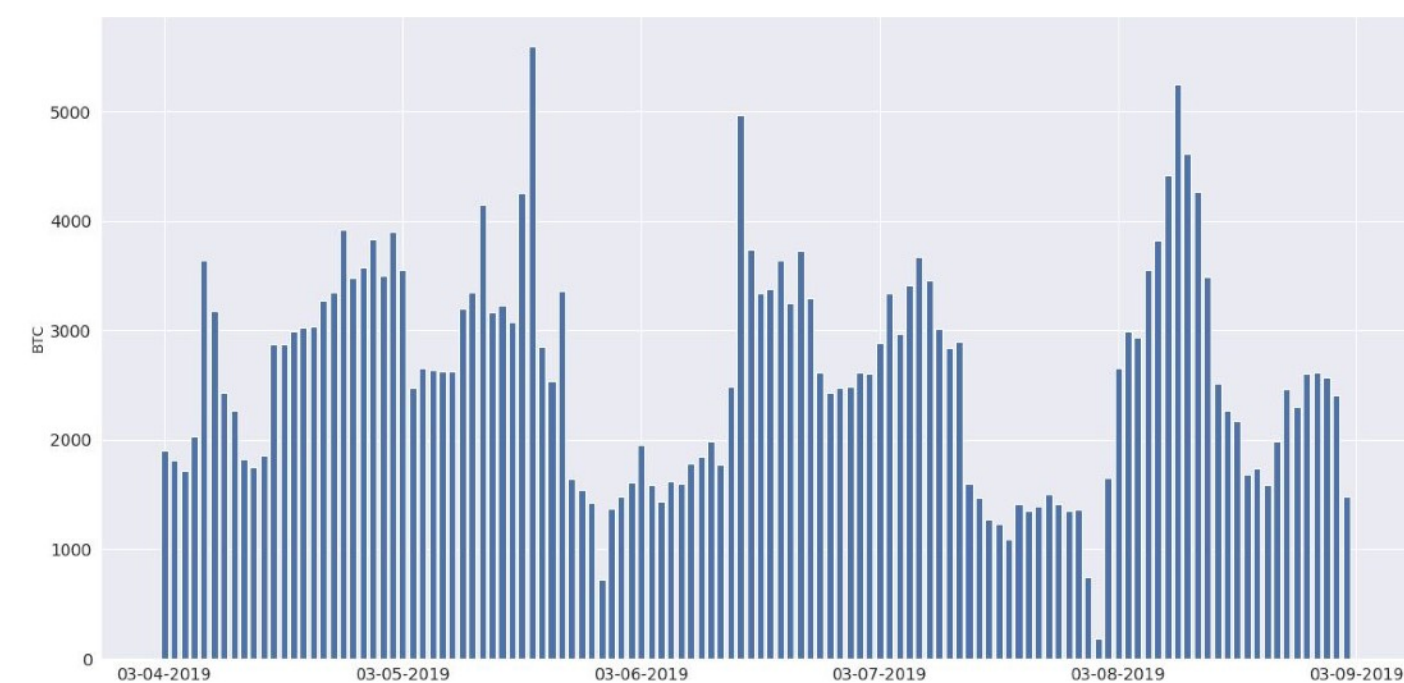
CoinBene (\$480M*)



Simex (\$97M*)



BitMart (\$106M*)

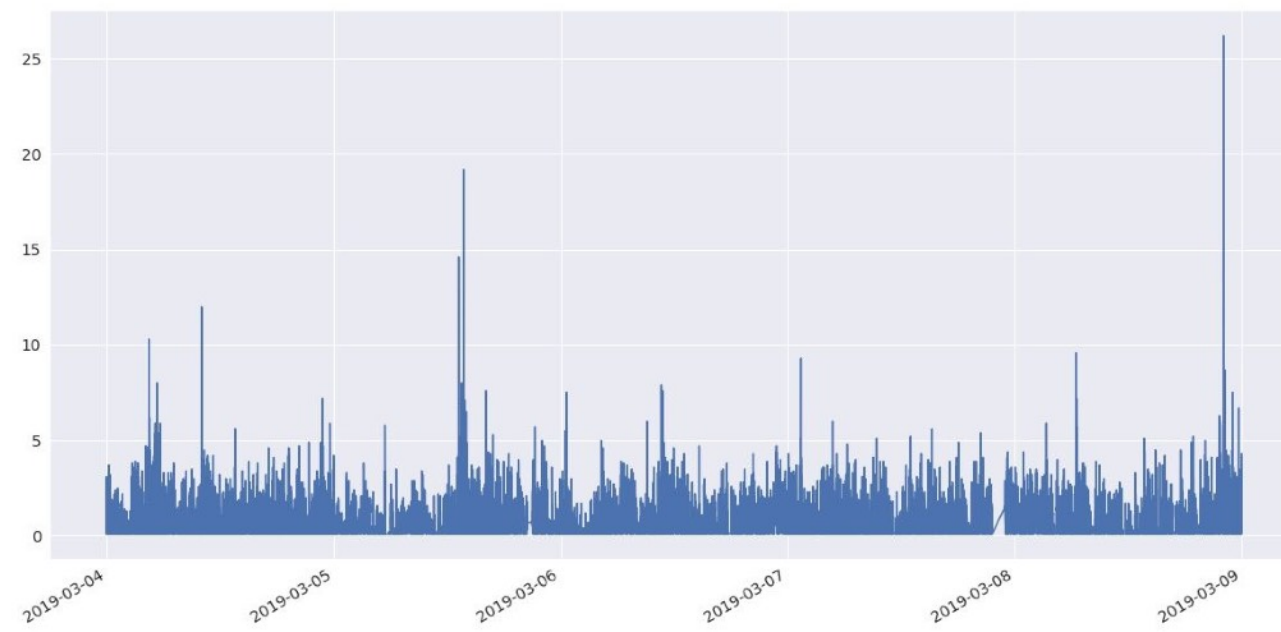


BitForex (\$241M*)

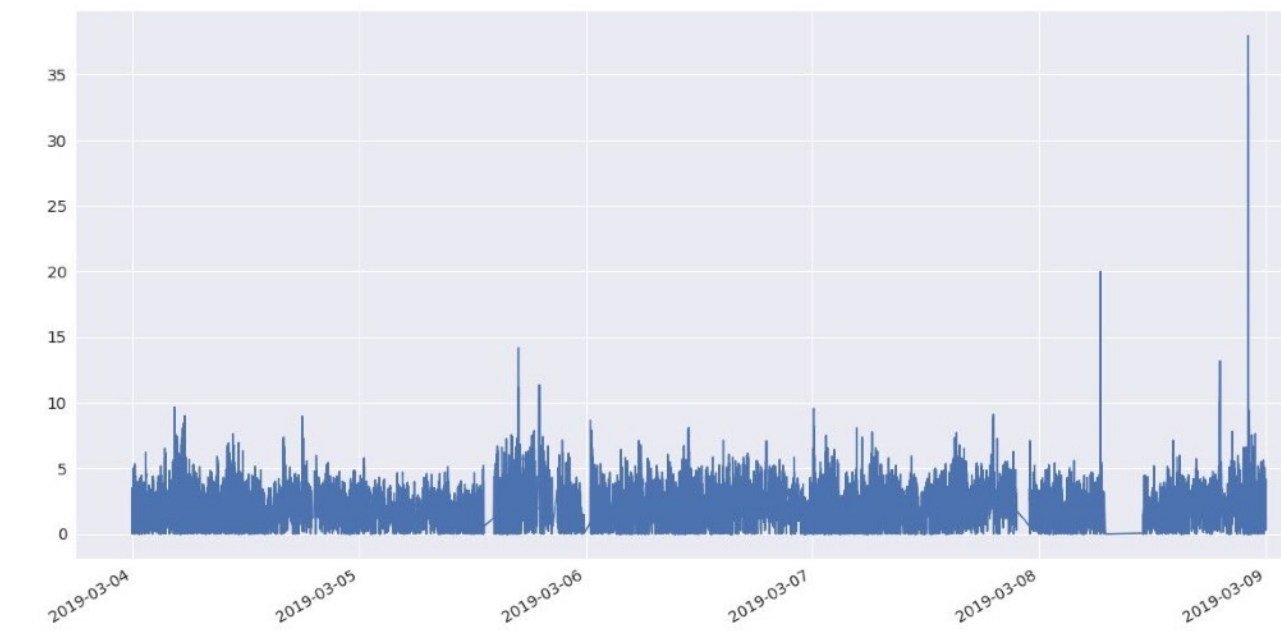


Spread Patterning Analysis Provides A Third Vector Of Analysis

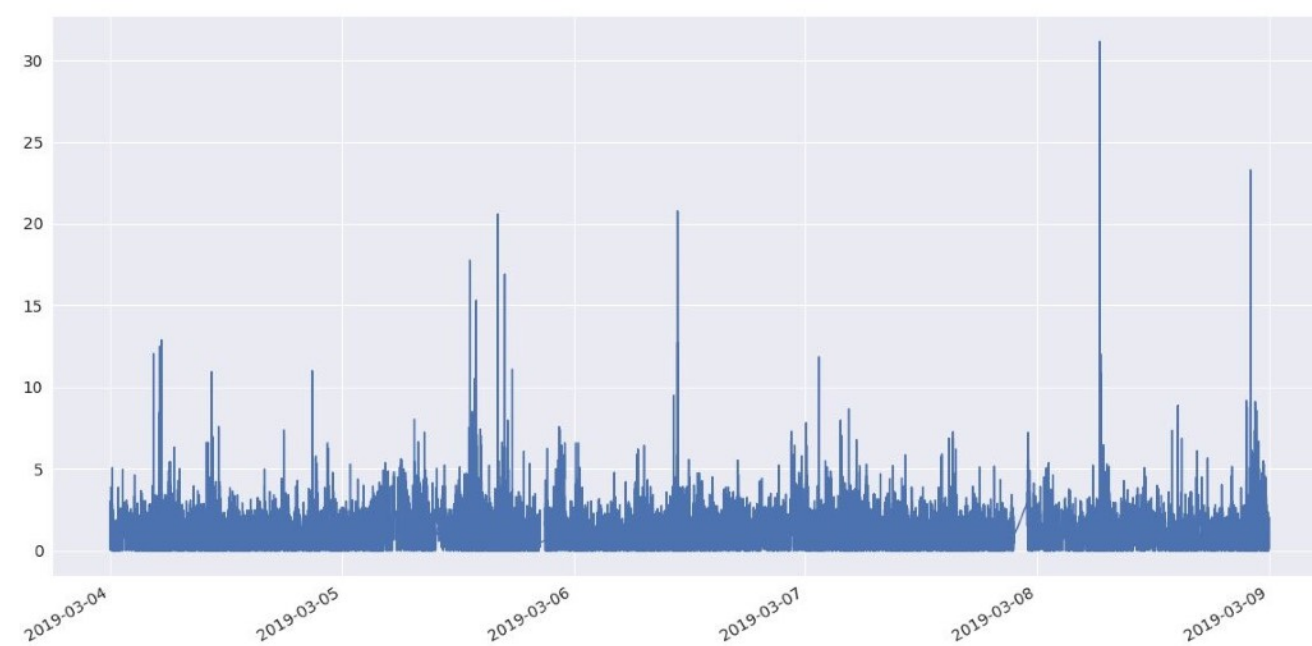
Spreads on well-known exchanges show a consistent pattern, anchoring on zero with random variability, and then spiking periodically to reflect momentary surge in volatility and change of the order book.



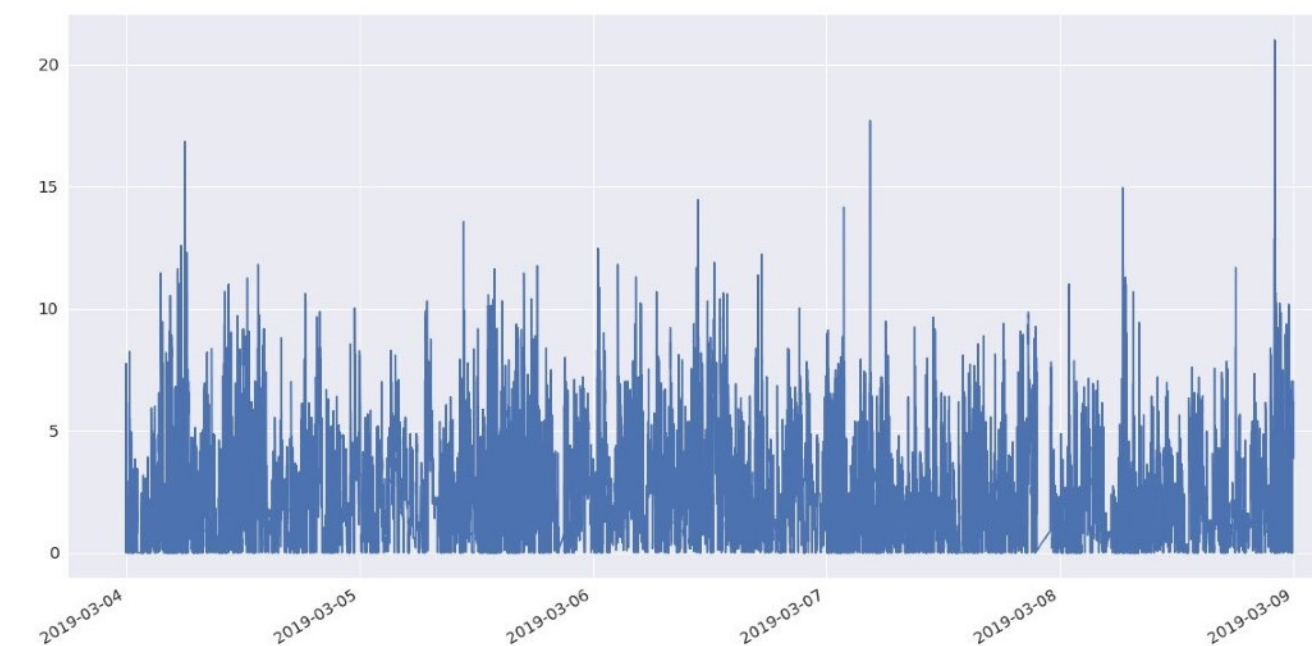
Kraken (\$31M*)



bitFlyer (\$13M*)



Bitstamp (\$31M*)



Poloniex (\$1.4M*)



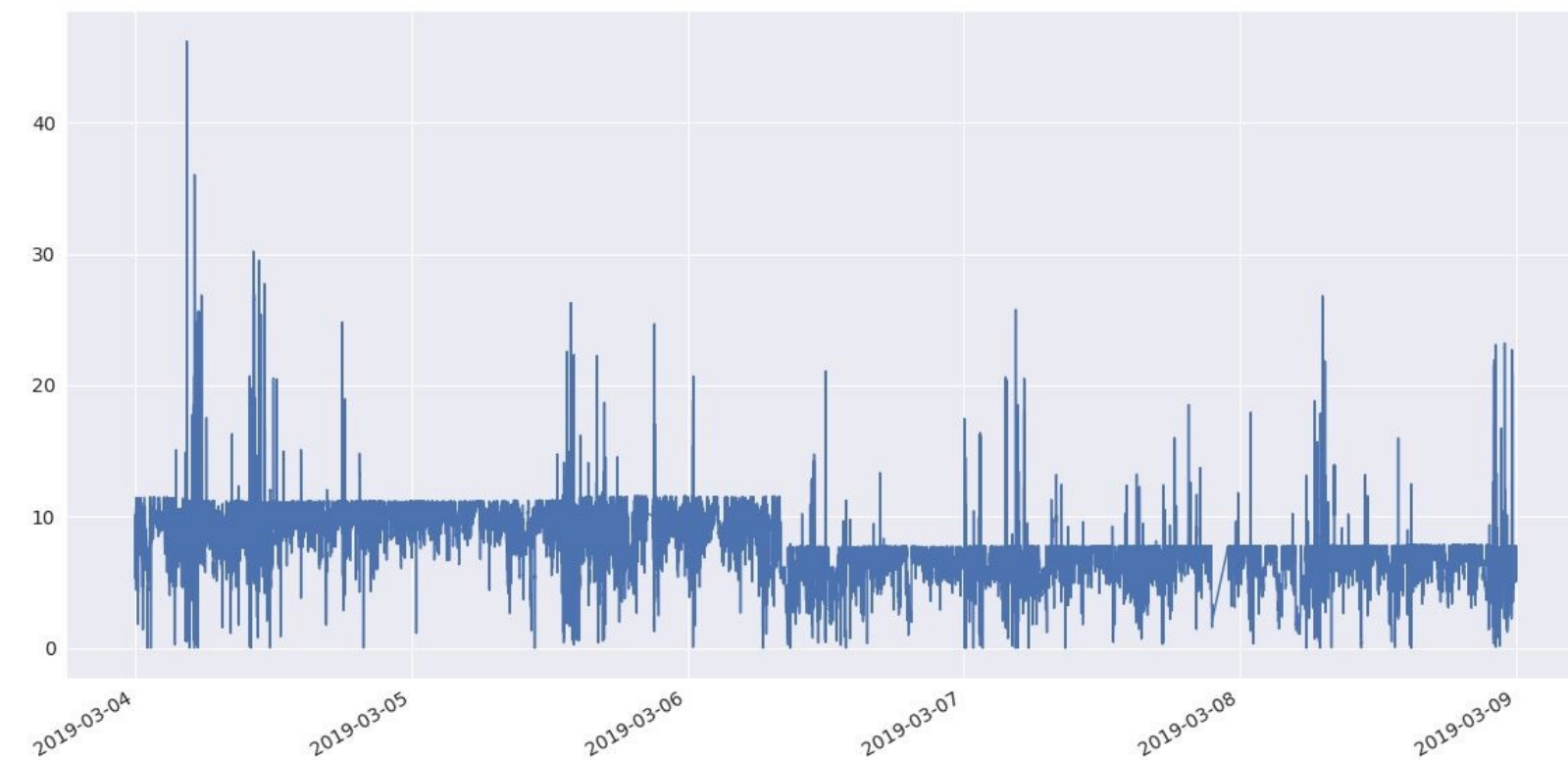
Spread Patterning Analysis Provides A Third Vector Of Analysis

Spreads on suspicious exchanges exhibit a variety of anomalous patterns, including central tendencies that hover around an unusual fixed amount, or spreads that stay fixed for extended periods.

LBank's spread fluctuates over time, but reverts to a central tendency of about \$10, while claiming roughly 5x Coinbase's daily volume. There is no economic explanation for this high spread anchor if LBank is a real, competitive marketplace.



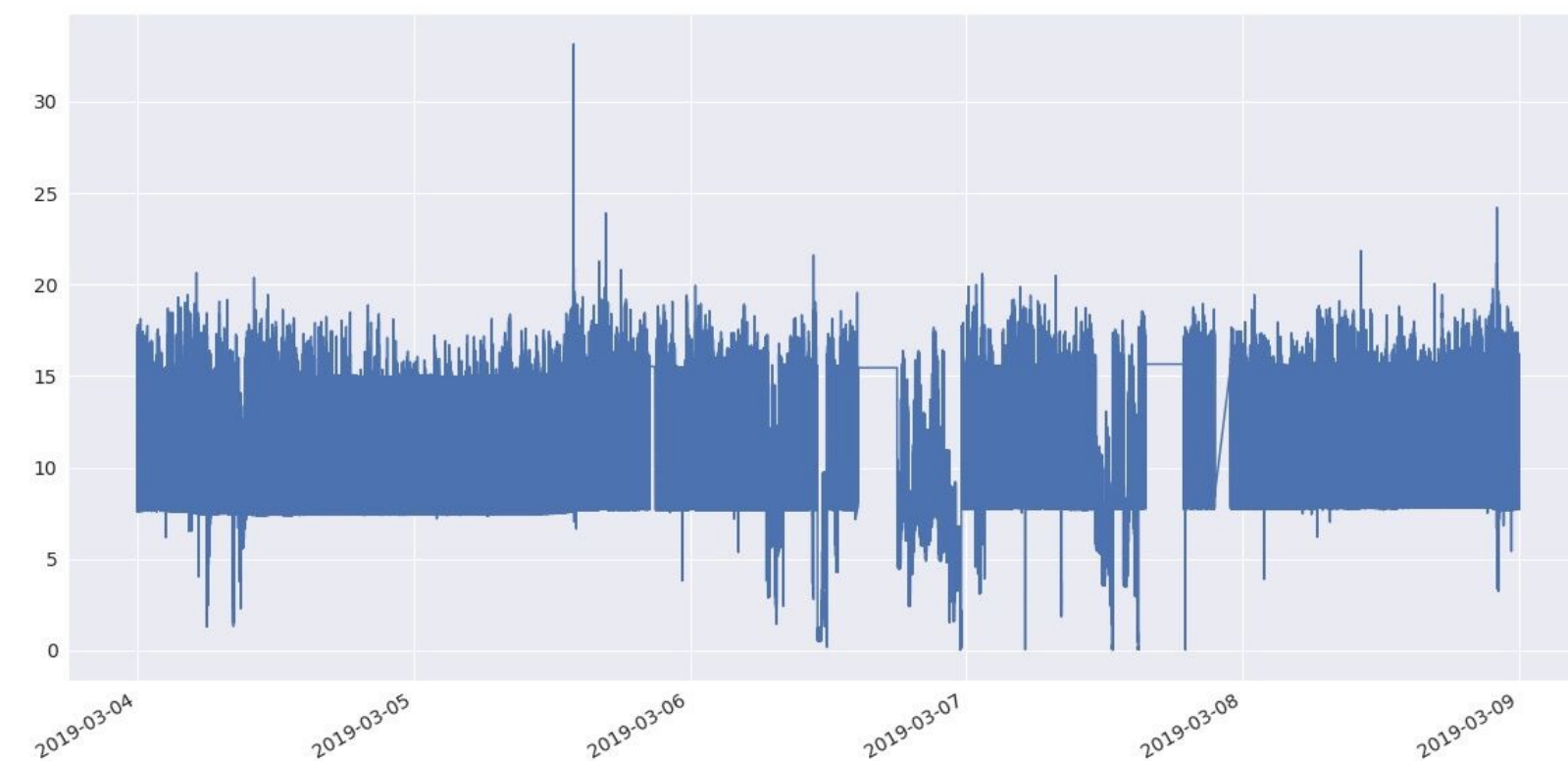
LBank
(\$127M*)



IDCM's spreads fluctuate between \$8 and \$15, almost exclusively. There is no reason an exchange with more daily volume than Coinbase would refuse to drop below a \$8 spread almost entirely.



IDCM
(\$45M*)

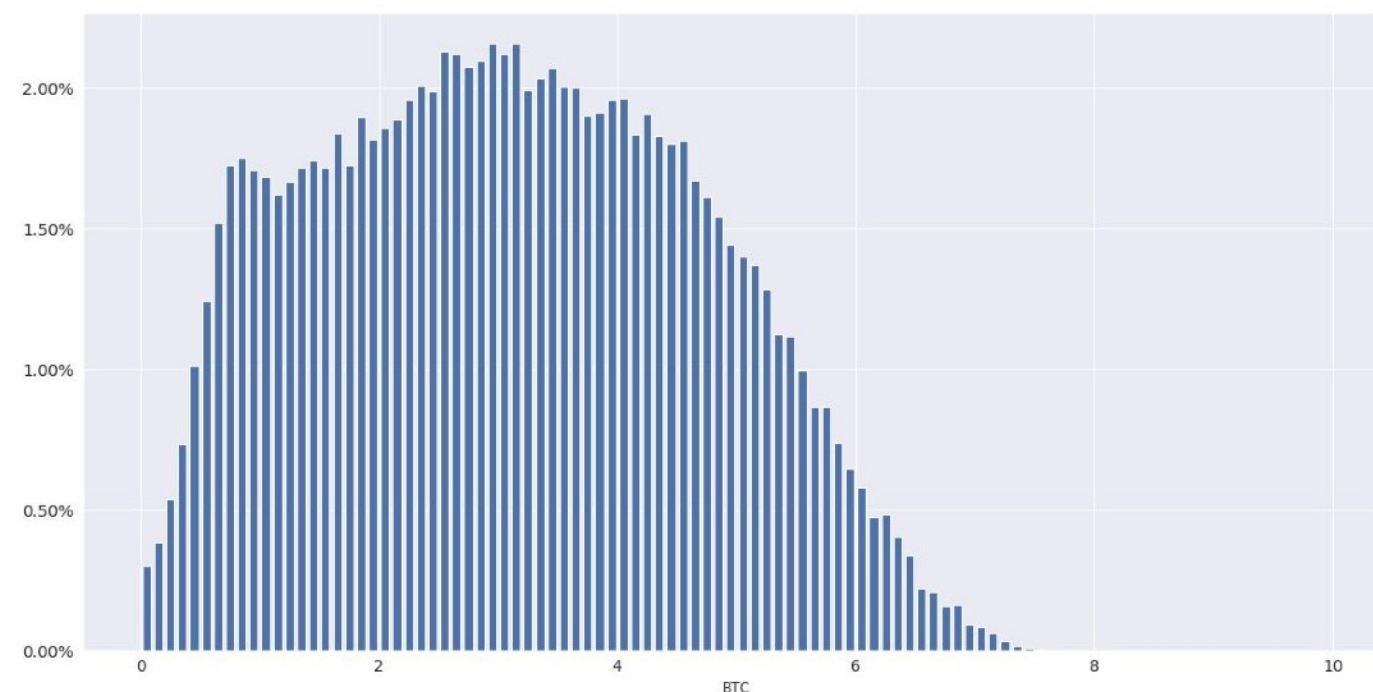




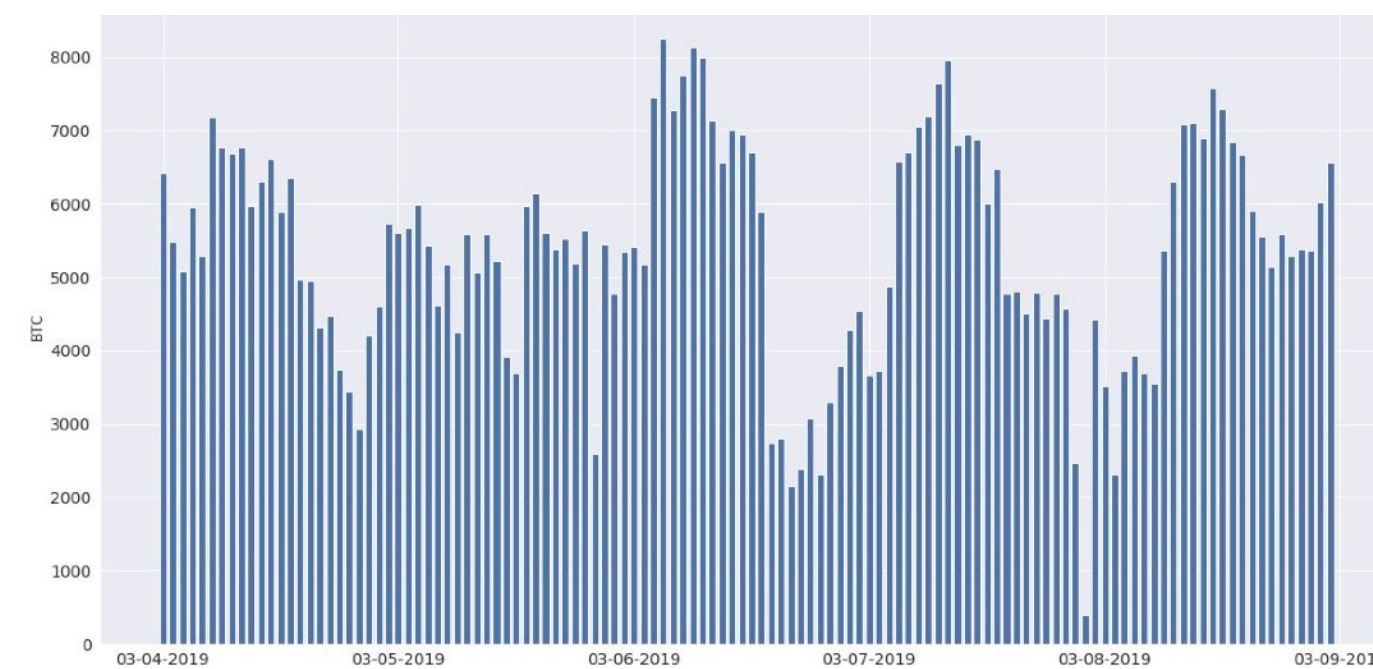
Applying All Three Analyses: CoinBene

Now that we know three ways we can spot exchanges with fake volume, let's look at a few of the top exchanges holistically. CoinBene claims the highest ADV (\$480M) of any bitcoin spot exchange.

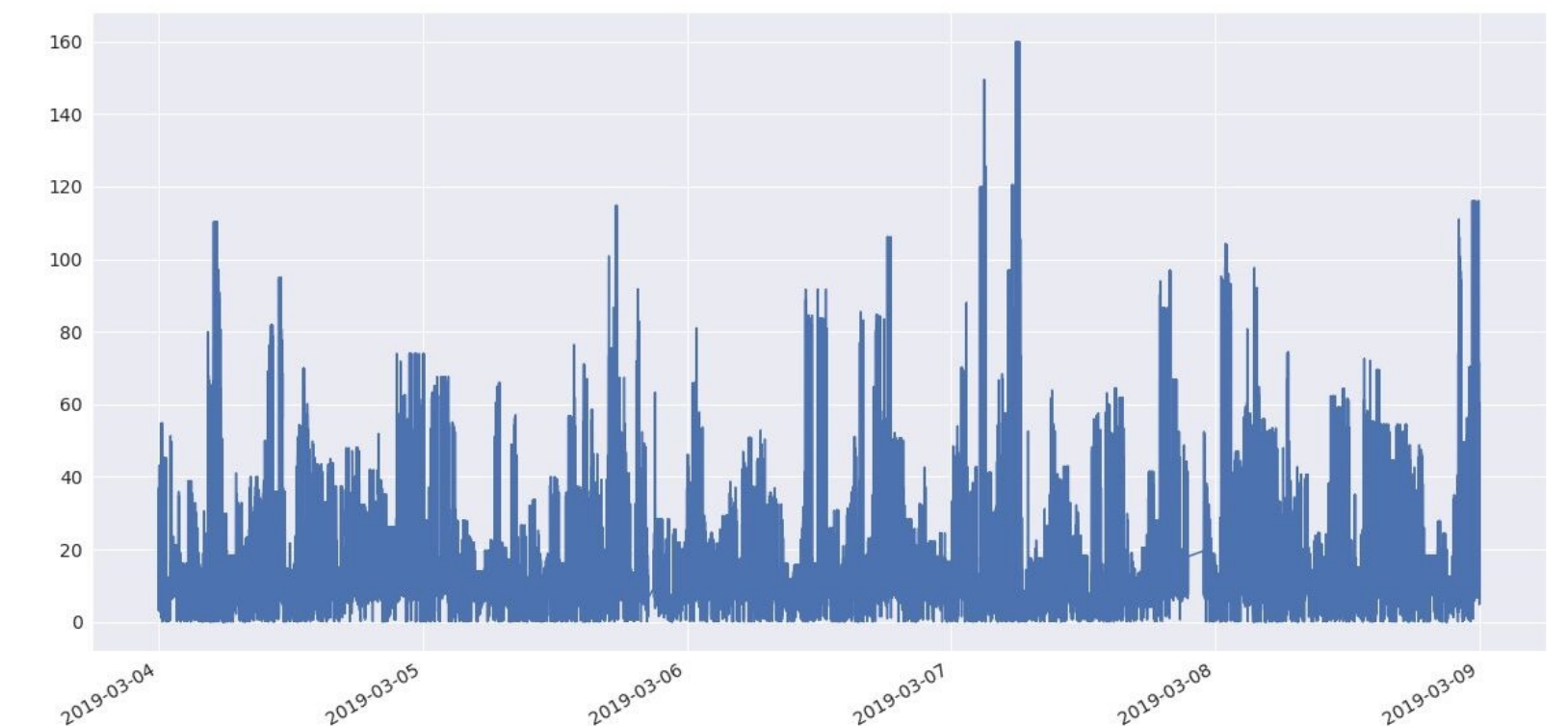
Trade Size Histogram shows an odd bell curve-like distribution. It also has no peaks at whole bitcoin quantities.



There aren't any notable volume spikes and the peaks do not align with any other market. Hourly volume also rarely falls meaningfully close to zero, unlike the pattern exhibited by well-known exchanges.



CoinBene's average and peak spreads are unreasonably high, upwards of \$100. This is only plausible in a thin market, which contradicts CoinBene's claim of high volume.



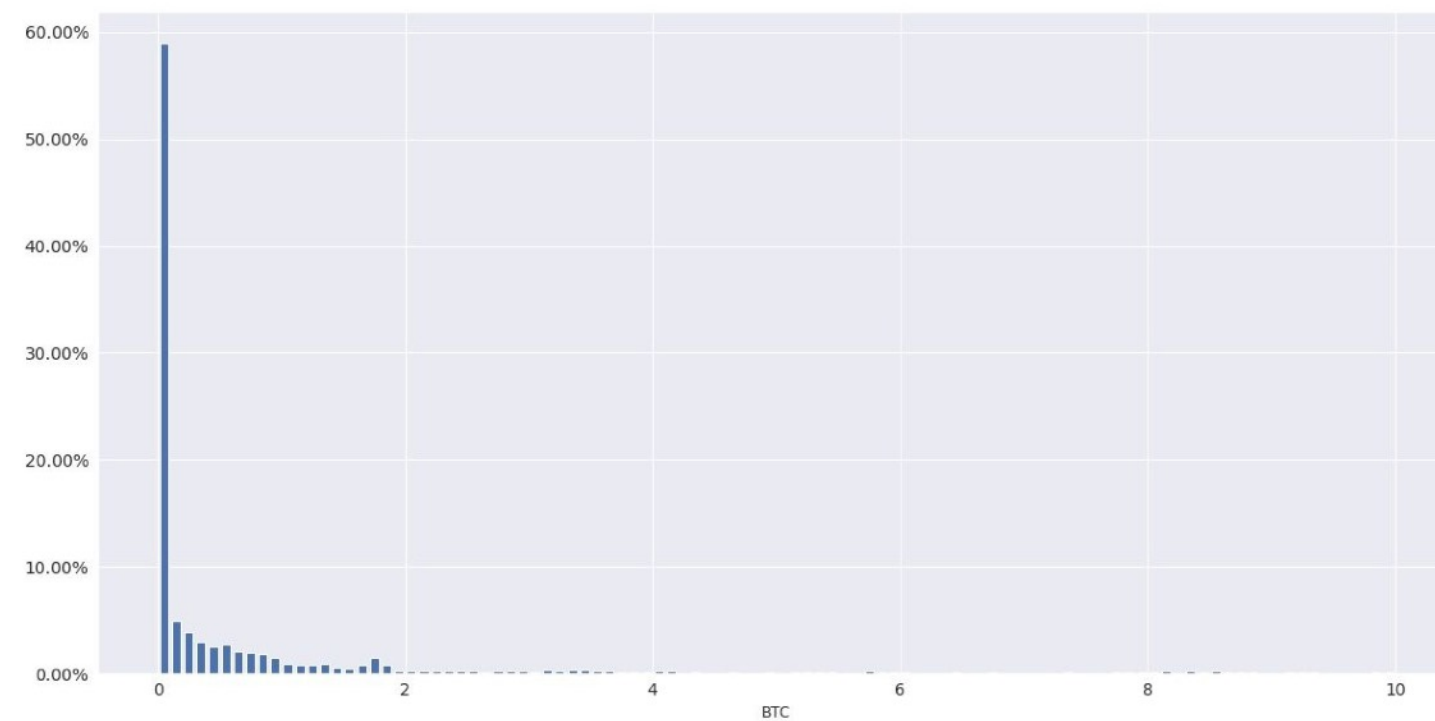
CoinBene fails all three data analyses. We believe its volume is fabricated.



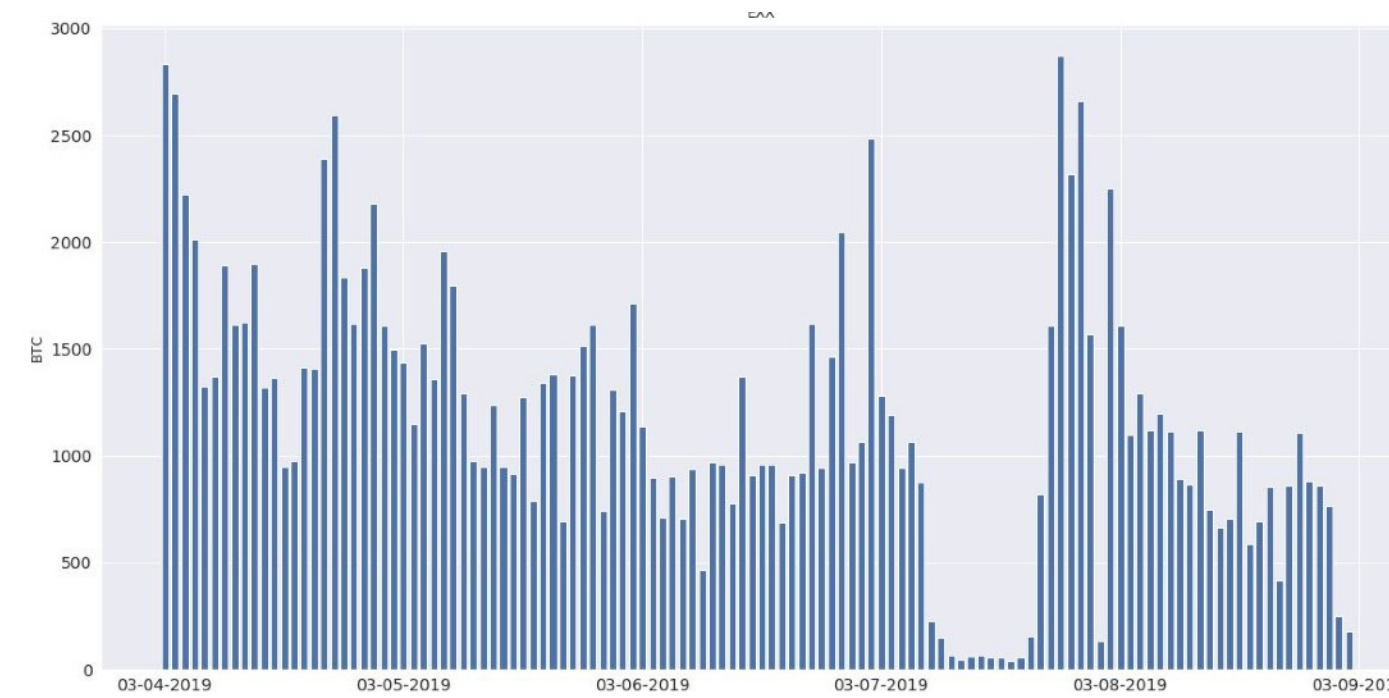
Applying All Three Analyses: EXX

Let's look at another exchange. EXX has a reported ADV of \$247M.

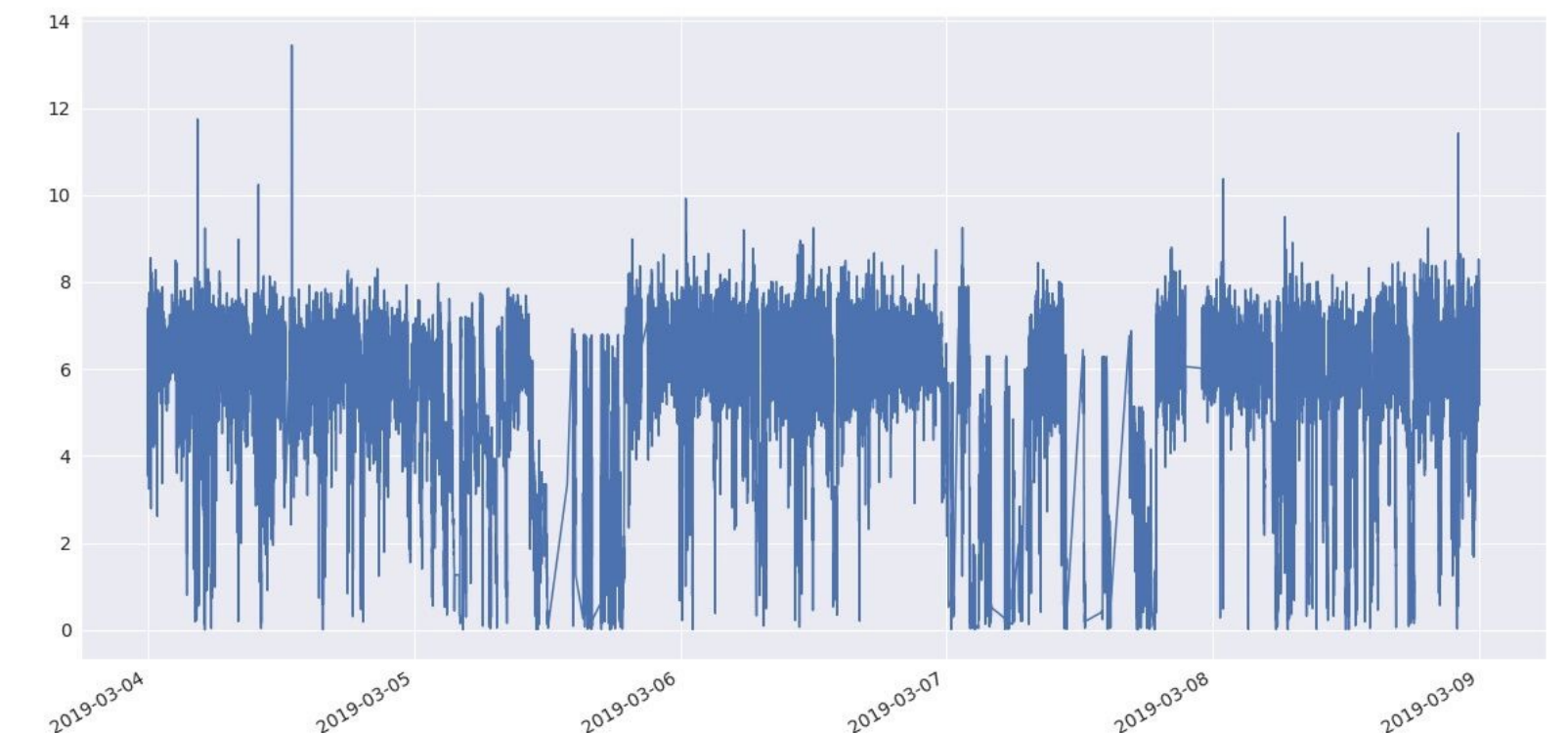
Trade Size Histogram shows highly concentrated volume on 0-0.1 BTC (over 50%) and does not show any spikes of volume on round numbers.



Volume spikes do not align with any other market. There's also an odd U-shaped valley of volume mid-week.



EXX's spread converges to around \$6, never goes above \$12, and rarely goes to \$0. For an exchange with such high volume, this seems unlikely unless the market is truly very thin.



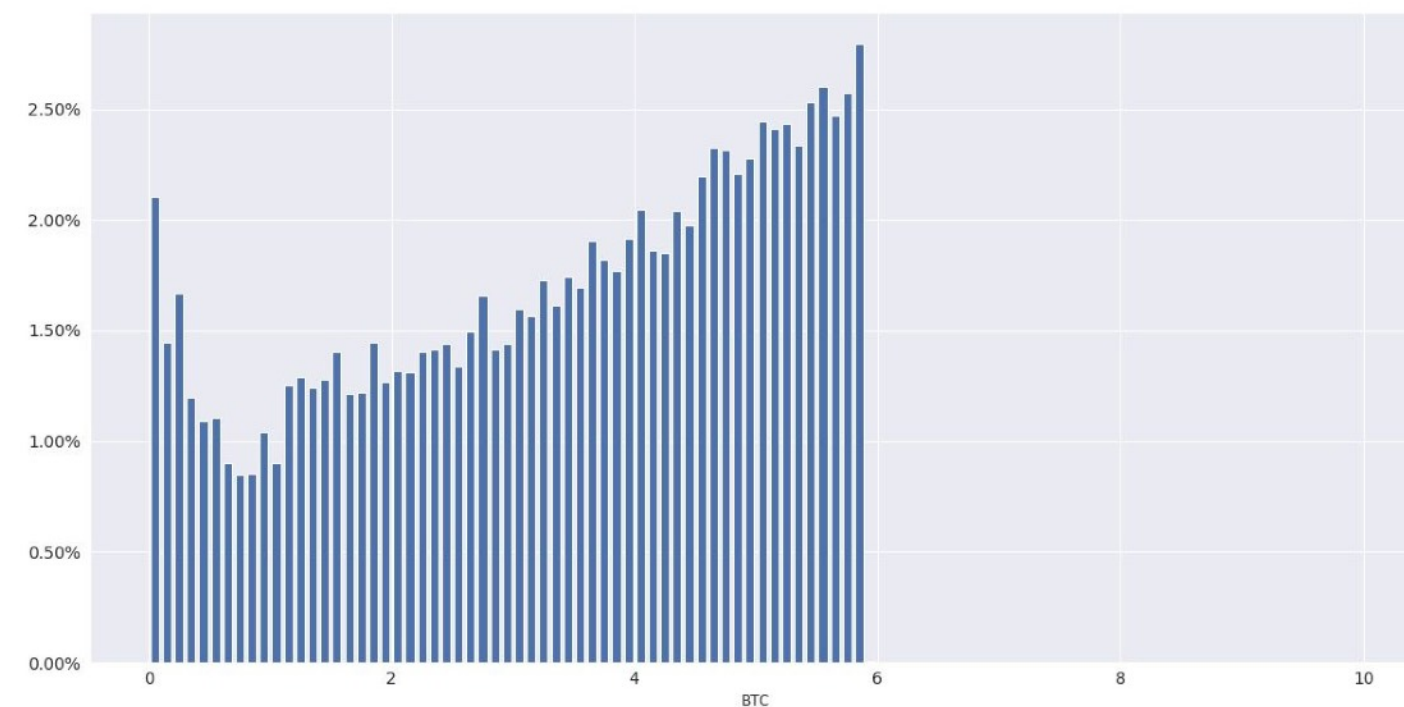
EXX, another of the top exchanges by ADV, again fails all three data analyses. We believe its volume is fabricated.



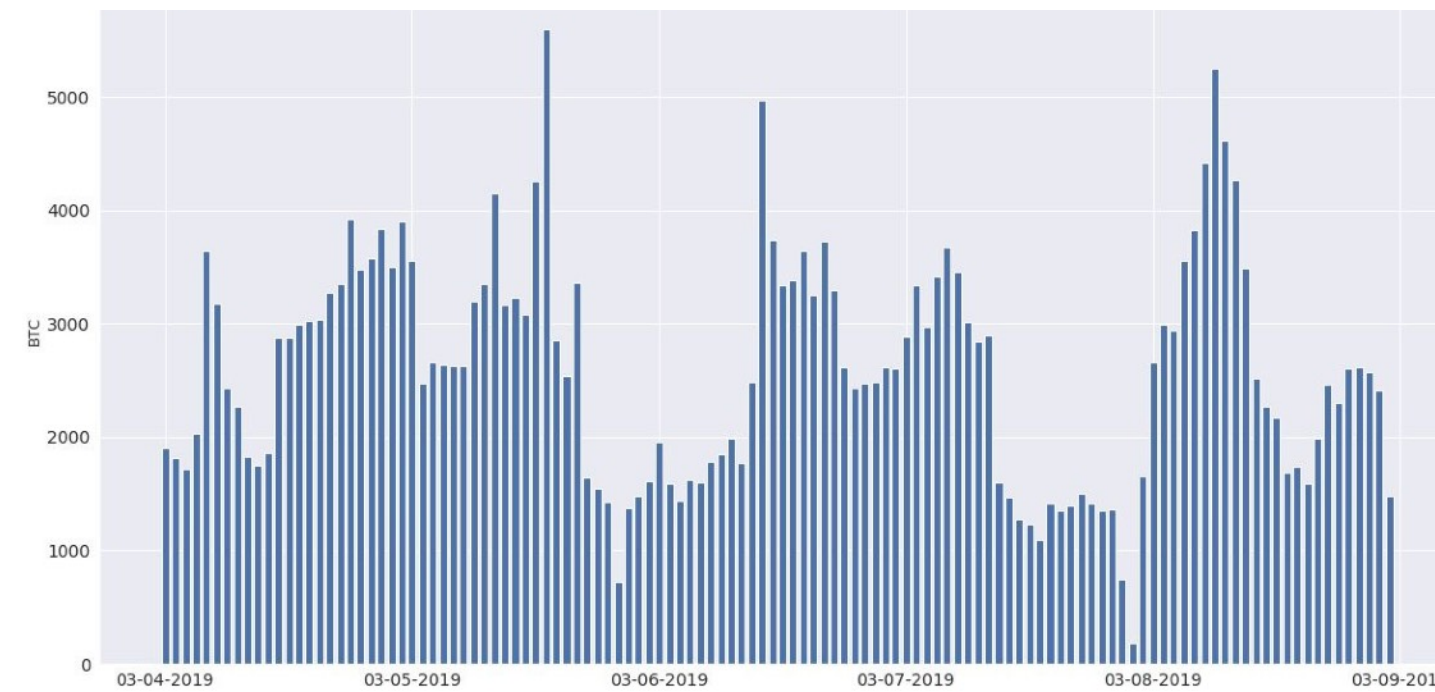
Applying All Three Analyses: BitForex

Let's look at one last exchange. BitForex has an ADV of \$241 M.

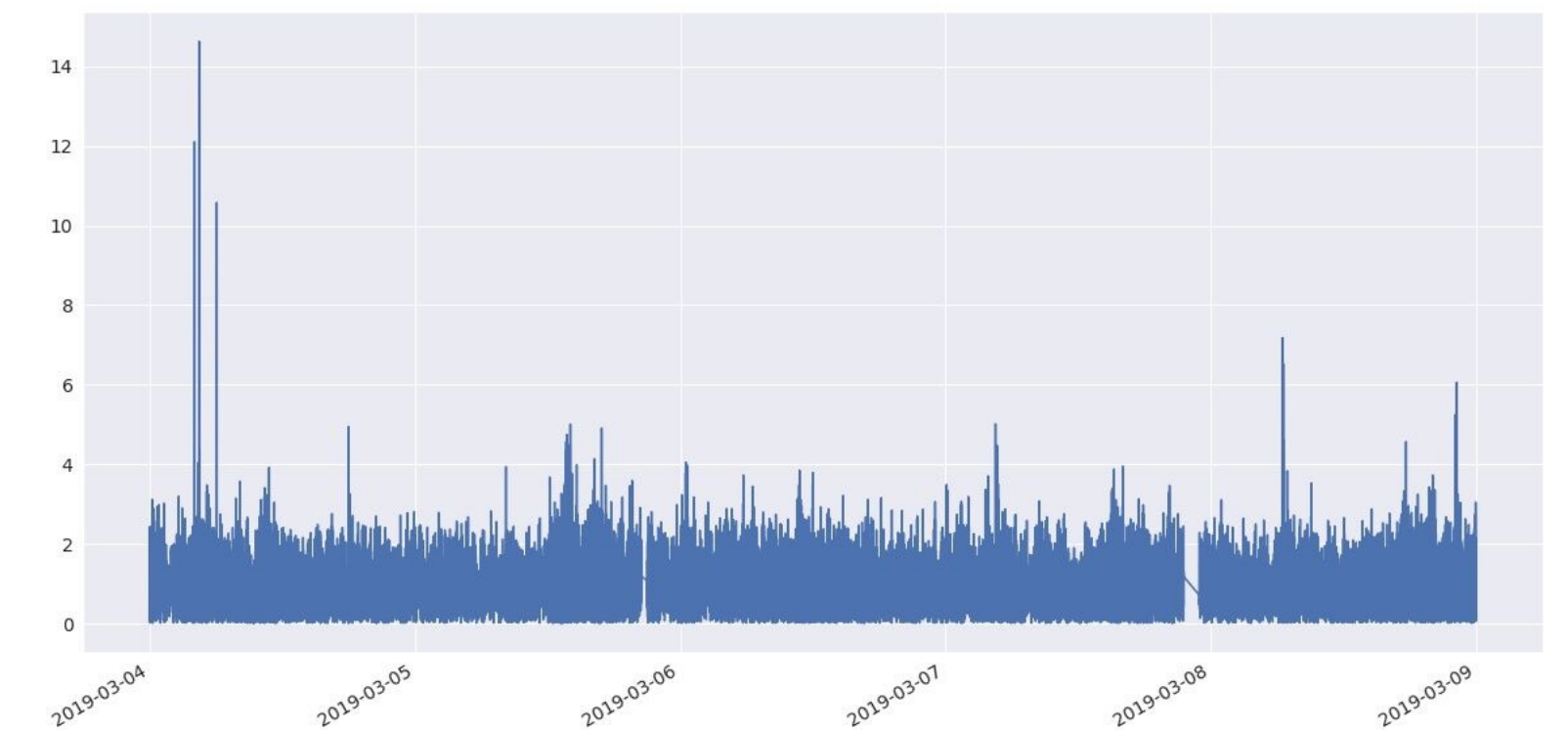
The Trade Size Histogram rises as the quantity of bitcoin traded increases. It then drops abruptly right before 6 bitcoin.



Similar to previous suspicious exchanges, BitForex does not have true spikes—only peaks—and the peaks do not align with any other market.



Spreads on BitForex vary fairly reasonably. They are low and return to 0 or close to 0. There isn't an obvious reason to question the spread variability.



BitForex, the fifth largest exchange by reported ADV, fails two of the three data analyses. We believe the volume is fabricated.

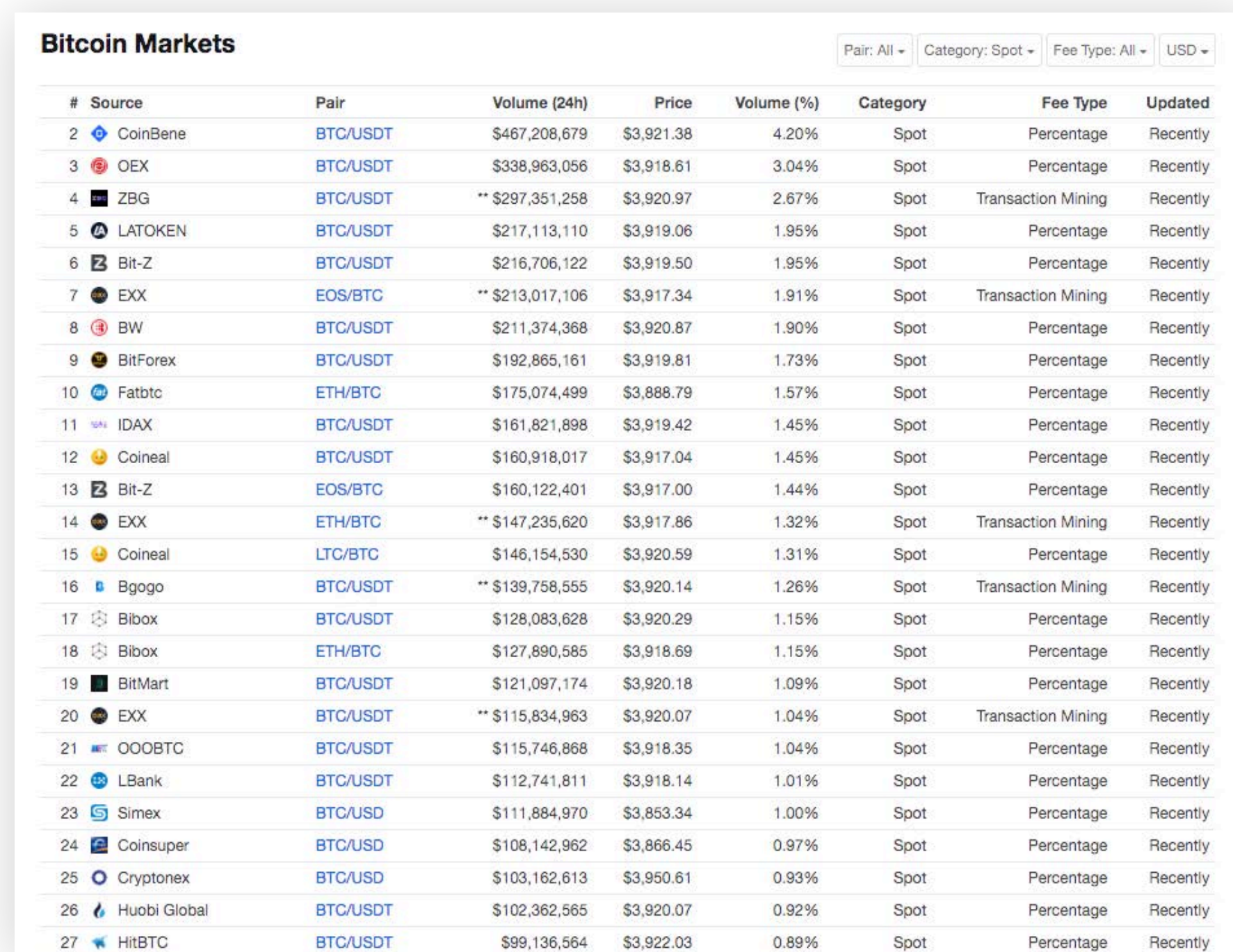


Across the Board, We Find Exchanges That Fail One or More of These Tests.

Why Would Exchanges Exaggerate Volume?

Volume inflation is familiar to any self-reported league table (dark pools, etc.). But in crypto, the incentive to inflate volume is pernicious and strong: Exchanges that appear at the top of the lists used by leading media organizations can attract listing fees (often millions of dollars) from ICOs and alt coins.

Where Would You Look To Trade Or List?



#	Source	Pair	Volume (24h)	Price	Volume (%)	Category	Fee Type	Updated
2	CoinBene	BTC/USDT	\$467,208,679	\$3,921.38	4.20%	Spot	Percentage	Recently
3	OEX	BTC/USDT	\$338,963,056	\$3,918.61	3.04%	Spot	Percentage	Recently
4	ZBG	BTC/USDT	**\$297,351,258	\$3,920.97	2.67%	Spot	Transaction Mining	Recently
5	LATOKEN	BTC/USDT	\$217,113,110	\$3,919.06	1.95%	Spot	Percentage	Recently
6	Bit-Z	BTC/USDT	\$216,706,122	\$3,919.50	1.95%	Spot	Percentage	Recently
7	EXX	EOS/BTC	**\$213,017,106	\$3,917.34	1.91%	Spot	Transaction Mining	Recently
8	BW	BTC/USDT	\$211,374,368	\$3,920.87	1.90%	Spot	Percentage	Recently
9	BitForex	BTC/USDT	\$192,865,161	\$3,919.81	1.73%	Spot	Percentage	Recently
10	Fatbtc	ETH/BTC	\$175,074,499	\$3,888.79	1.57%	Spot	Percentage	Recently
11	IDAX	BTC/USDT	\$161,821,898	\$3,919.42	1.45%	Spot	Percentage	Recently
12	Coineal	BTC/USDT	\$160,918,017	\$3,917.04	1.45%	Spot	Percentage	Recently
13	Bit-Z	EOS/BTC	\$160,122,401	\$3,917.00	1.44%	Spot	Percentage	Recently
14	EXX	ETH/BTC	**\$147,235,620	\$3,917.86	1.32%	Spot	Transaction Mining	Recently
15	Coineal	LTC/BTC	\$146,154,530	\$3,920.59	1.31%	Spot	Percentage	Recently
16	Bgogo	BTC/USDT	**\$139,758,555	\$3,920.14	1.26%	Spot	Transaction Mining	Recently
17	Bibox	BTC/USDT	\$128,083,628	\$3,920.29	1.15%	Spot	Percentage	Recently
18	Bibox	ETH/BTC	\$127,890,585	\$3,918.69	1.15%	Spot	Percentage	Recently
19	BitMart	BTC/USDT	\$121,097,174	\$3,920.18	1.09%	Spot	Percentage	Recently
20	EXX	BTC/USDT	**\$115,834,963	\$3,920.07	1.04%	Spot	Transaction Mining	Recently
21	OOBTC	BTC/USDT	\$115,746,868	\$3,918.35	1.04%	Spot	Percentage	Recently
22	LBank	BTC/USDT	\$112,741,811	\$3,918.14	1.01%	Spot	Percentage	Recently
23	Simex	BTC/USD	\$111,884,970	\$3,853.34	1.00%	Spot	Percentage	Recently
24	Coinsuper	BTC/USD	\$108,142,962	\$3,866.45	0.97%	Spot	Percentage	Recently
25	Cryptonex	BTC/USD	\$103,162,613	\$3,950.61	0.93%	Spot	Percentage	Recently
26	Huobi Global	BTC/USDT	\$102,362,565	\$3,920.07	0.92%	Spot	Percentage	Recently
27	HitBTC	BTC/USDT	\$99,136,564	\$3,922.03	0.89%	Spot	Percentage	Recently

“Cryptocurrency Exchanges Are Making Millions from Just Listing Coins”

- Bitcoin.com, March 12, 2018

“The market price to list a crypto token on an exchange is \$1 million for a reasonably regarded token, to \$3 million for an opportunity to get quick liquidity.”

- Autonomous Next, April 3, 2018



Only Ten Exchanges Have Actual Volume

Just 10 of the 81 top exchanges are revealed to have actual volume**



\$110M*



\$38M*



\$31M*



\$31M*



\$27M*



\$14M*



\$8M*



\$6M*



\$5M*



\$1.4M*

* Average Daily Volume. Data Source: Kaiko. March 4-8, 2019

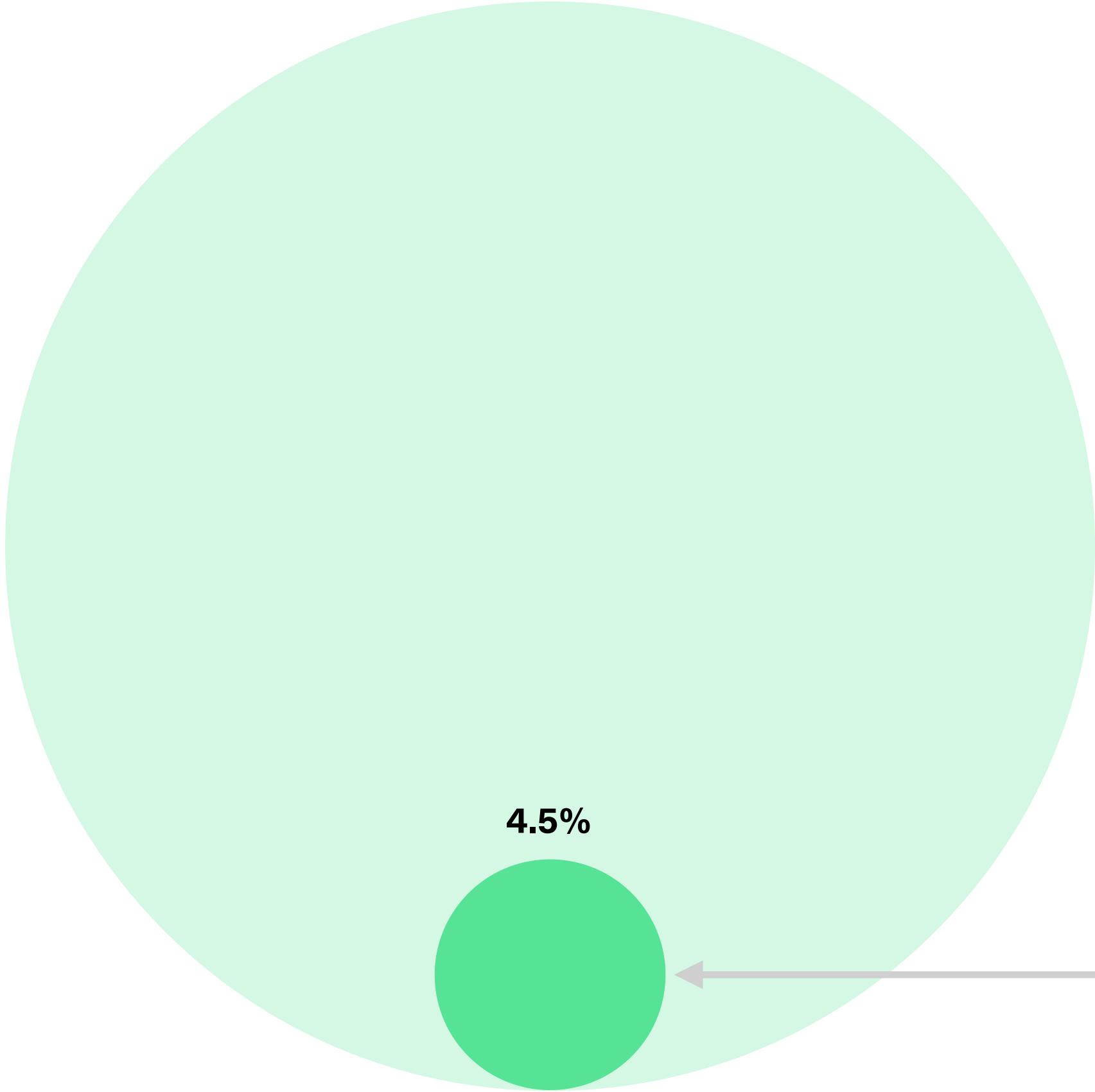
** Korean exchanges were excluded from this analysis because they are an isolated market that trades at different prices due to capital restrictions. One other exchange we examined—CEX.IO—passed our tests and appears to be reporting real volume, but it was too small (less than \$1M ADV) to include in this group.



Total Volume Is Considerably Less Than Reported

Reported Volume: ~\$6B

Source: Coinmarketcap. March 4-8, 2019.



Actual Volume: \$273M

Source: Kaiko. March 4-8, 2019.





But It Is Healthy Given Bitcoin's Market Cap

Considering its market capitalization, Bitcoin's actual trade volume is reasonable when compared to analogs like gold. In fact, the counterfactual—imagining that the reported volume (\$6B) is entirely real—would be concerning, as it would imply that 8.6% of all bitcoin was changing hands every day.

	Market Cap	Spot Volume	Daily Turnover
Gold	~\$6.7T*	\$37B**	0.55%
Bitcoin	~\$70B	\$270M	0.39%

* Estimate of the value of all existing gold from [Golden Eagle Coins](#), March 16, 2019 (assumes spot price of \$1,302.13)

** Gold spot volume from [Marketwatch](#), Nov 20, 2018.

The SEC Has Indicated That Bitcoin's Absolute Trade Volume Is Not A Concern

The “Overdahl Letter,” submitted as a comment letter regarding the Winklevoss Bitcoin Trust application, argued that the SEC has approved ETFs in the past with underlying holdings that had lower average daily volume (ADV) than the amount of bitcoin trading each day on the proposed pricing exchange for the trust (the Gemini exchange, which had \$4.2M ADV at the time). The SEC’s responded that Gemini’s ADV in the “absolute sense” was not an issue.

ETF Ticker	Name	Underlying Type	Average Underlying \$ADV (\$MM)
NGE	Global X MSCI Nigeria ETF	INTL	0.2
ICOL	iShares MSCI Colombia Capped ETF	INTL	2.3
PAK	Global X MSCI Pakistan ETF	INTL	2.4
VNM	VanEck Vectors Vietnam ETF	INTL	2.8
XMPT	VanEck Vectors CEF Municipal Income ETF	CEF	3.0
PCEF	PowerShares CEF Income Composite Portfolio	CEF	3.1
QAT	iShares MSCI Qatar Capped ETF	INTL	3.3
EPHE	iShares MSCI Philippines ETF	INTL	3.4
GREK	Global X MSCI Greece ETF	INTL	3.6
PZI	PowerShares Zacks Micro Cap Portfolio	SM CAP	3.7
GXG	Global X MSCI Colombia ETF	INTL	3.7
YYY	Yield Shares High Income ETF	CEF	3.9
ENZL	iShares MSCI New Zealand Capped ETF	INTL	4.1

SEC’s response: *“The issue here is not that the Gemini Exchange has low trading volume in an absolute sense but, rather, that the Trust would value its holdings using the Gemini Auction price, even though there is no basis in the record to find that the Gemini Auction represents a significant portion of the worldwide bitcoin trading.”*

Source: Comment letter (“Overdahl Letter”) submitted to the SEC by James A. Overdahl of the Delta Strategy Group on May 12, 2017, in reference to Bats BZX Exchange’s Proposed Rule Change to List and Trade Shares Issued by the Winklevoss Bitcoin Trust (File No. SR-BatsBZX-2016-30).

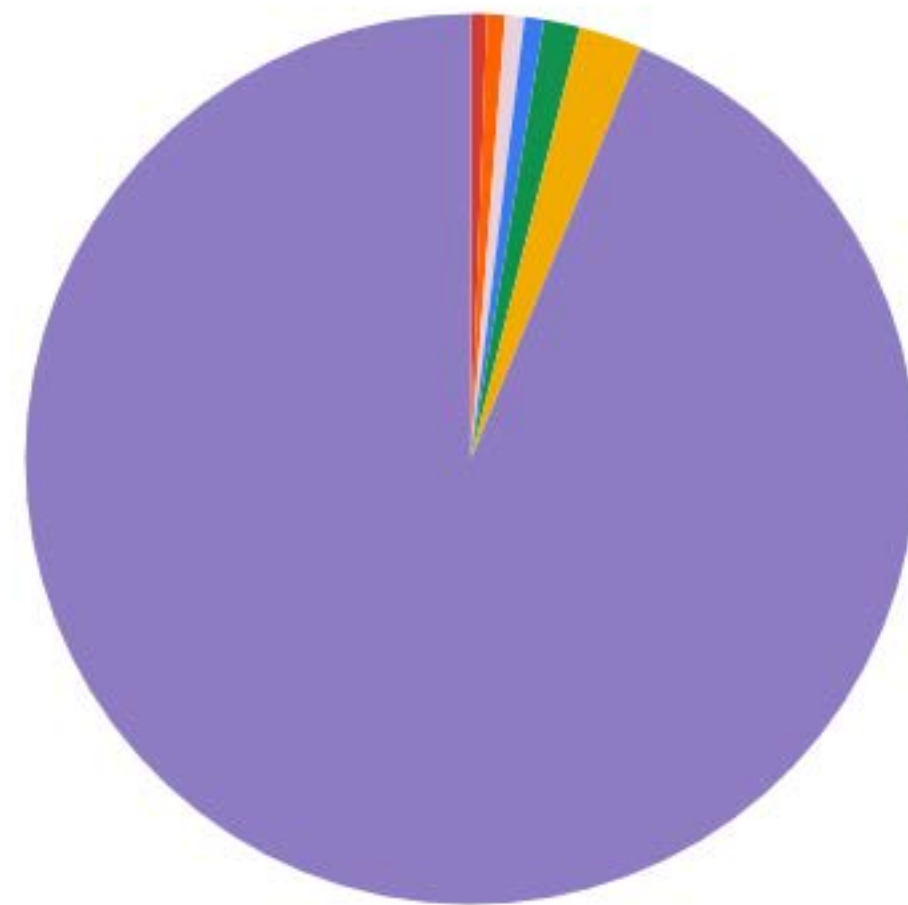


Volume Is More U.S. Focused Than Is Widely Perceived

Nearly 30% of spot bitcoin volume takes place on U.S.-domiciled exchanges, compared to just 1% of reported volume.

Reported Exchange Volume By Domicile

- UK: 0.58%
- Taiwan: 0.66%
- Korea: 0.70%
- Japan: 0.70%
- US: 1.30%
- Malta: 2.29%
- Unclear: 93.77%

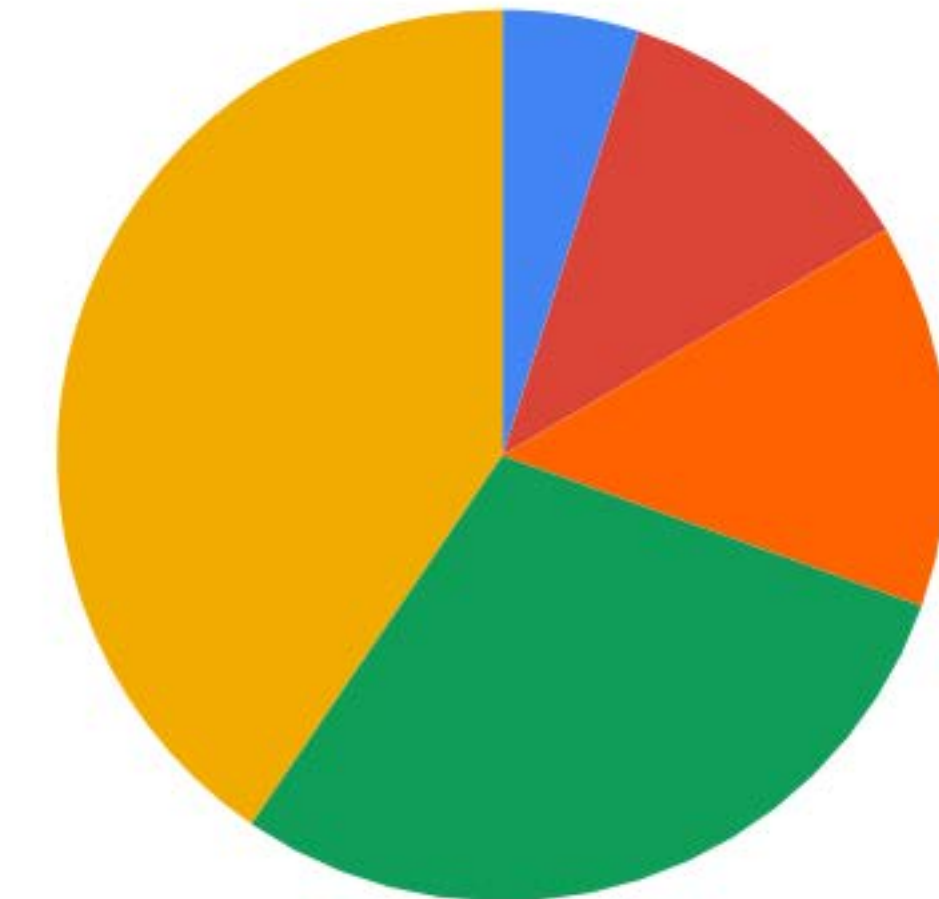


US: 1%

Source: Coinmarketcap. March 4-8, 2019.

Actual Exchange Volume By Domicile

- Japan: 4.96%
- UK: 11.58%
- Taiwan: 13.94%
- US: 29.05%
- Malta: 40.47%



US: 29%

Source: Kaiko. March 4-8, 2019.



The Futures Market Is Significant

Together, the CME bitcoin futures volume (\$85M) and the CBOE bitcoin futures volume (\$6M) represent nearly as much ADV as the largest bitcoin spot market Binance (\$110M).

\$110M

Largest Spot Exchange (Binance)

Source: Kaiko. March 4-8, 2019.

\$91M

Bitcoin Futures (CME & CBOE)

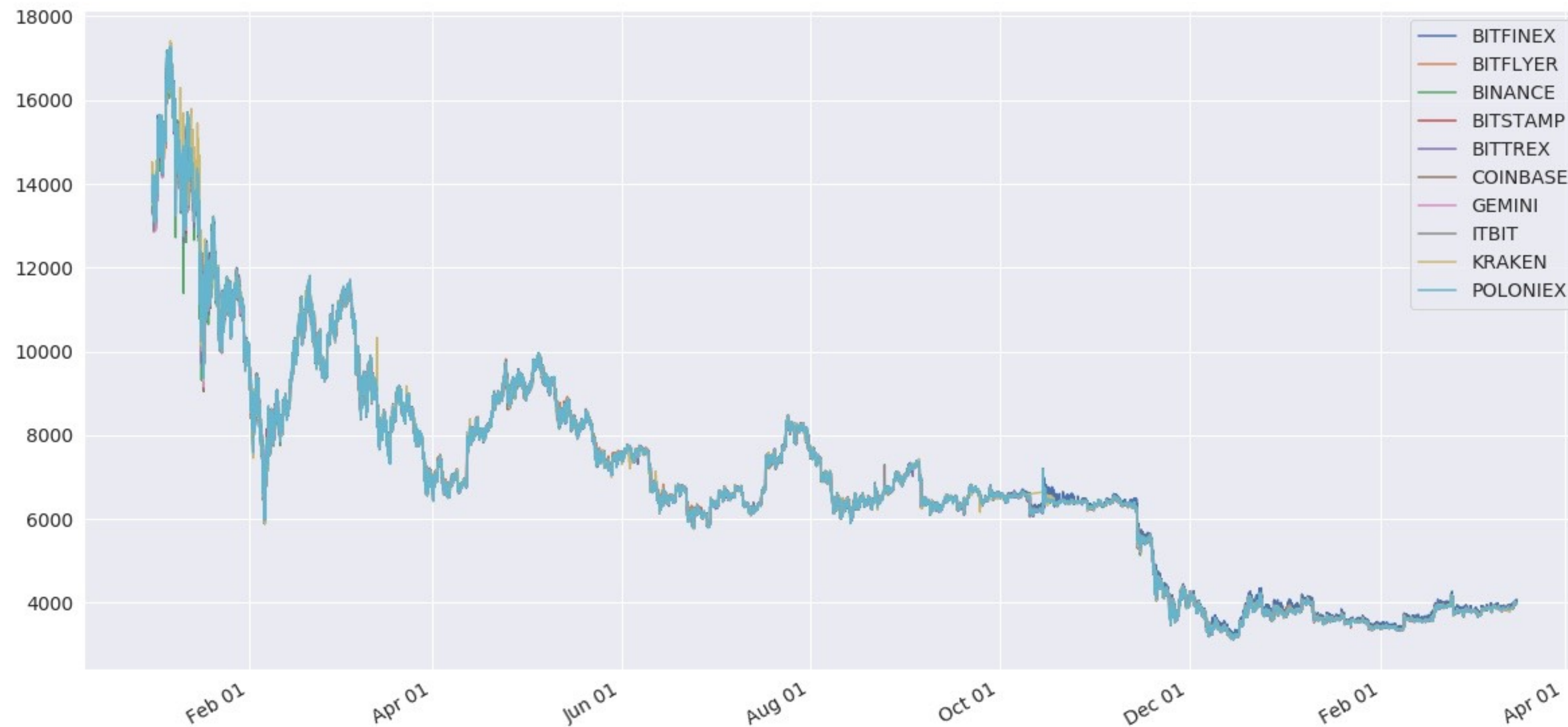
Sources: Chicago Mercantile Exchange (2/28/19), Chicago Board Options Exchange (3/15/19)

The Bitcoin Market Is More Orderly and Efficient Than Is Commonly Understood.



The 10 Exchanges Trade Extremely Tightly

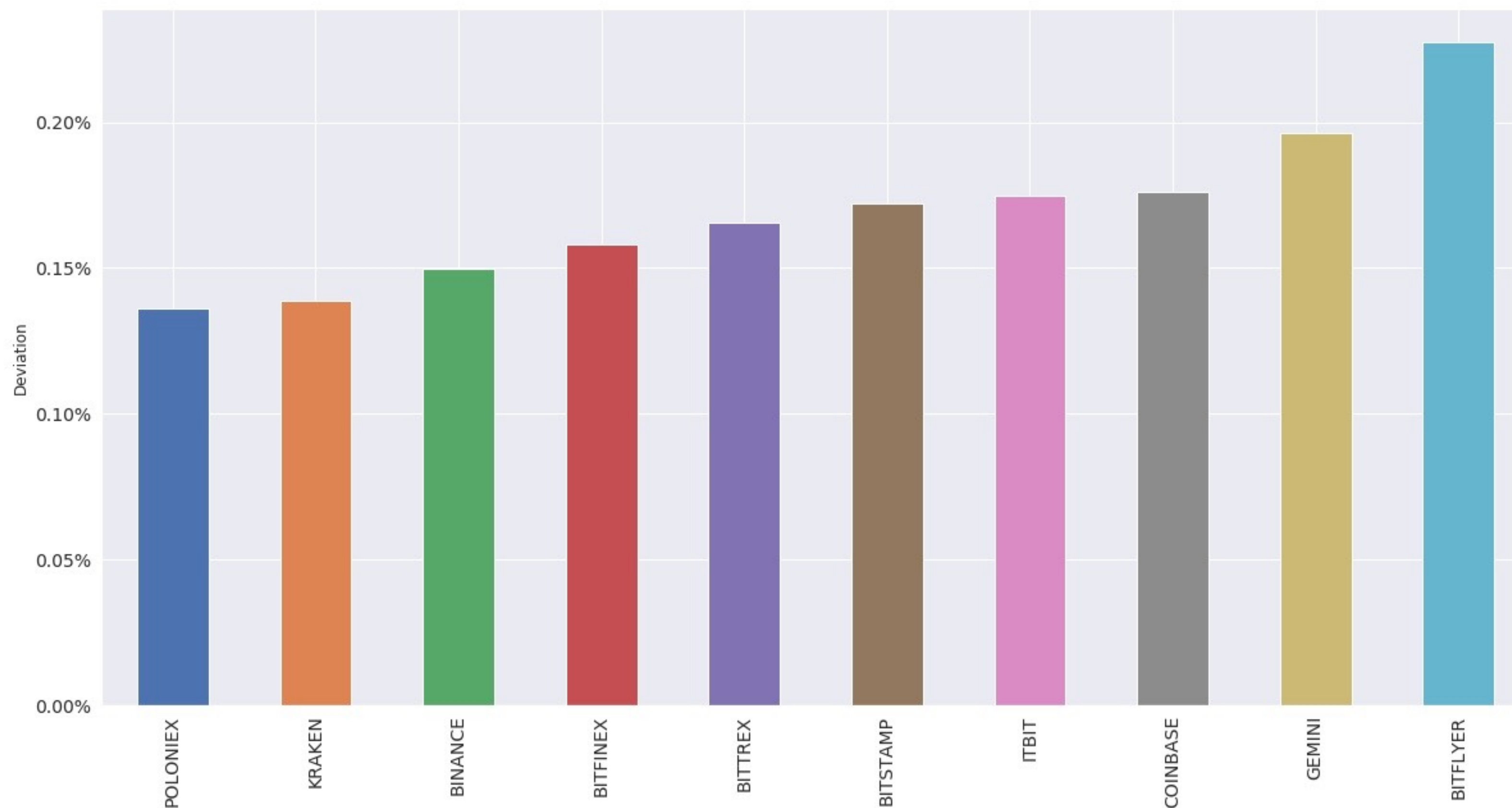
The 10 exchanges trade as a uniform, highly connected market. They form a singular price.





The 10 Exchanges Trade Extremely Tightly

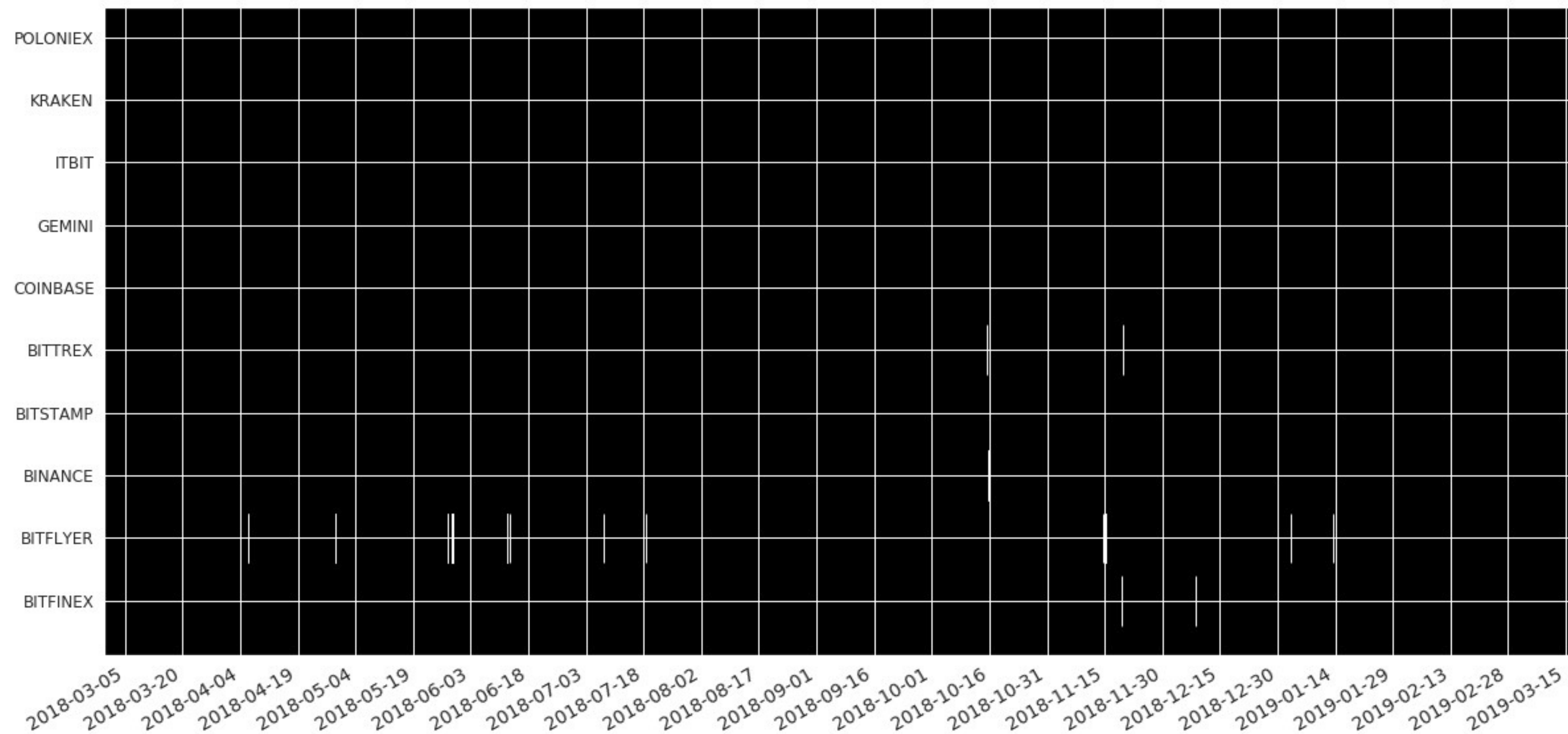
Average deviations from the aggregate price for the ten exchanges is well within the expected arbitrage band when you account for exchange-level fees (~30 basis points), volatility and hedging costs. Arbitrage is operating well.





Sustained Deviations Are Extremely Rare

Sustained deviations (defined as deviations $>1\%$ that last more than 100 seconds) appear as single white lines on the graph below. The graph demonstrates that the ten exchanges trade at a single unified price.





There Is A Common Institutional Understanding Of The True Nature Of The Actual Market

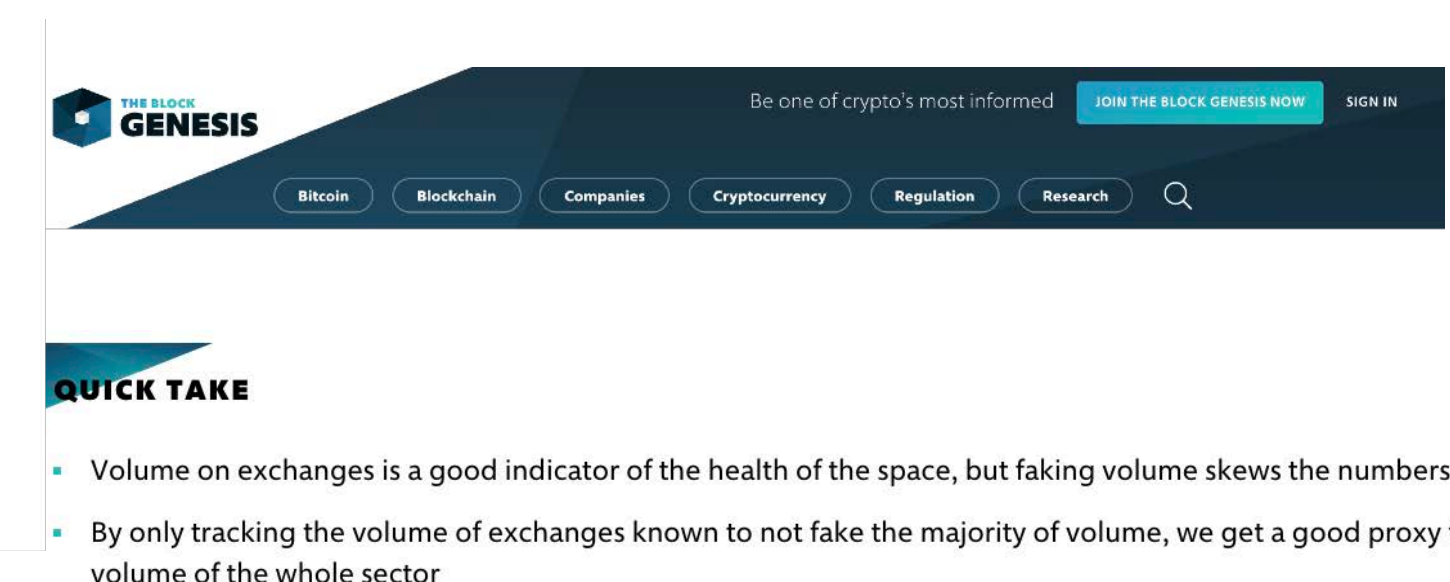
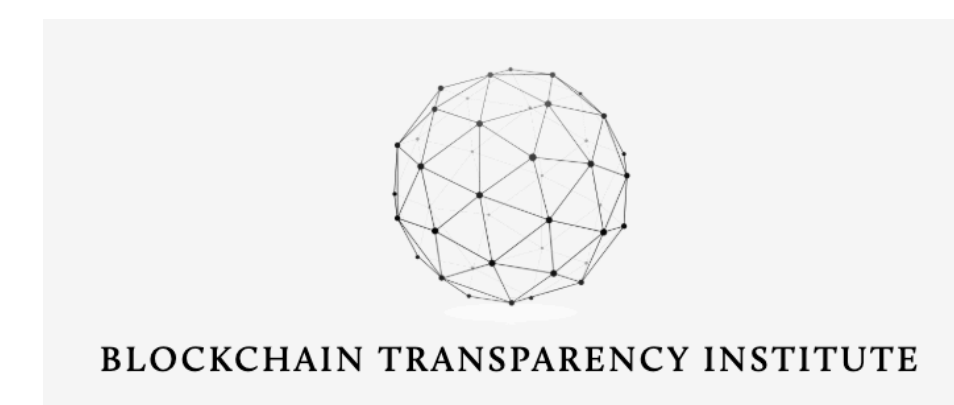
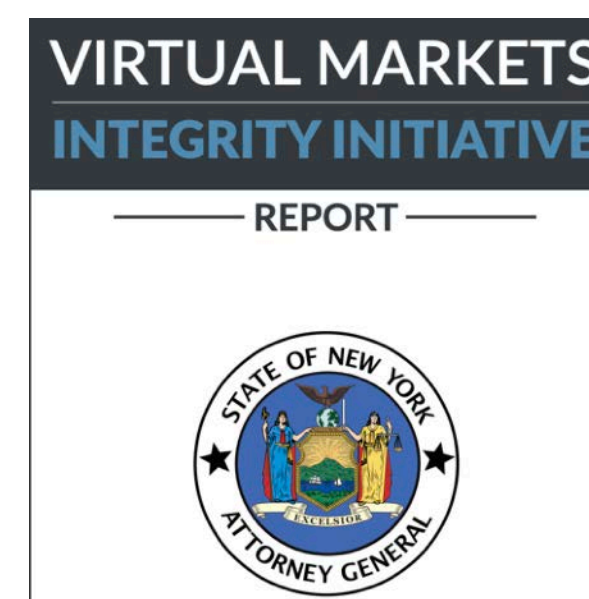
- While mainstream media sites carry the higher “reported volume” data, industry participants broadly know the truth.
- For example, every regulated crypto product that has launched — whether in the U.S. or Europe — has drawn prices either entirely from or, in the case of XBT Provider, almost entirely from a subset of the 10 exchanges highlighted in this presentation as “real.”*



* XBT Provider has a unique pricing methodology that draws from a portion of six named exchanges. Five of those six named exchanges are part of the ten exchanges. The sixth, OKCoin, is not.

There Is A Common Institutional Understanding Of The True Nature Of The Real Market

- Other entities that have investigated the question of non-economic and/or fake volume have arrived at similar conclusions as Bitwise.
- When the New York Attorney General (NYAG) reached out to exchanges as part of its Virtual Markets Integrity Initiative, the 10 real exchanges highlighted in this report dominated the list of 13 exchanges that the NYAG reached out to.
- The Blockchain Transparency Institute has investigated non-economic and/or fake volume at length, and has identified 56 exchanges it suspects of having fake volume. None of those exchanges are among the ten exchanges.
- Others media-level investigations into the space have arrived at similar conclusions.

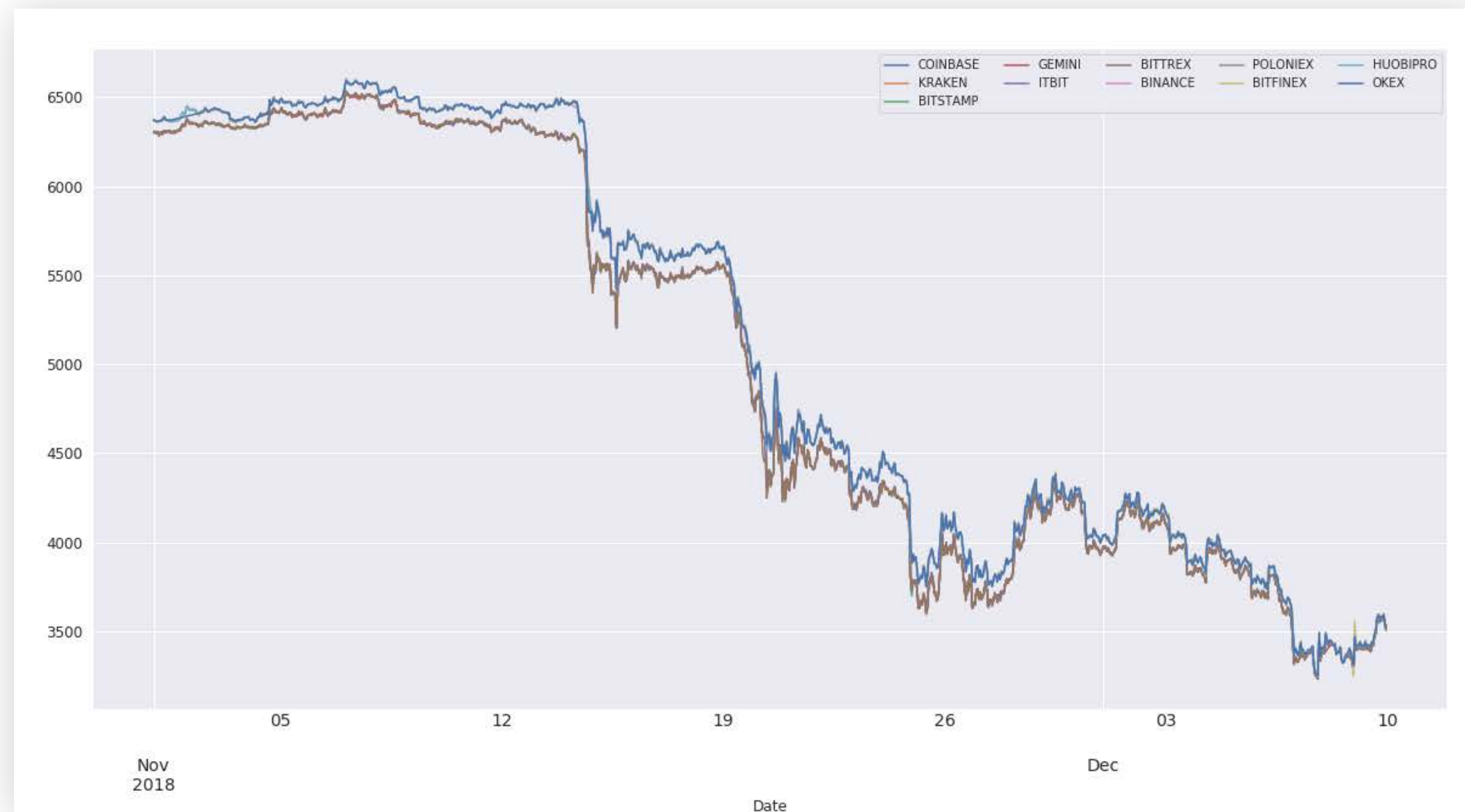


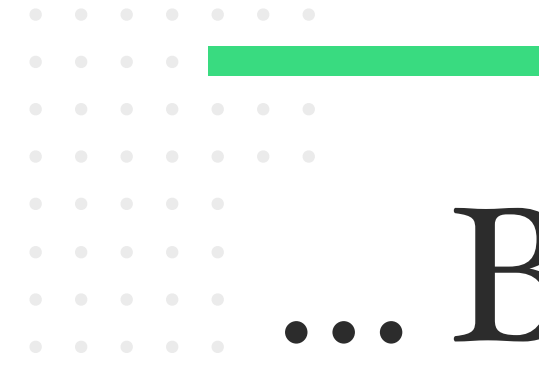
Sources: 1) State of New York Attorney General, "Virtual Markets Integrity Initiative Report," September 18, 2018; 2) [Blockchain Transparency Institute Exchange Advisory List](#); 3) Crypto Integrity on Medium, "Fake Volume In Cryptocurrency Markets - February report," March 8, 2019; 4) TheBlockCrypto, "Analysis of Crypto Traded Volumes Indicates A Bleak Trend: Down 80% Across The Market," March 11, 2018.



Common Misconception: USD and Tether (USDT) Markets Appear To Trade At Different Prices...

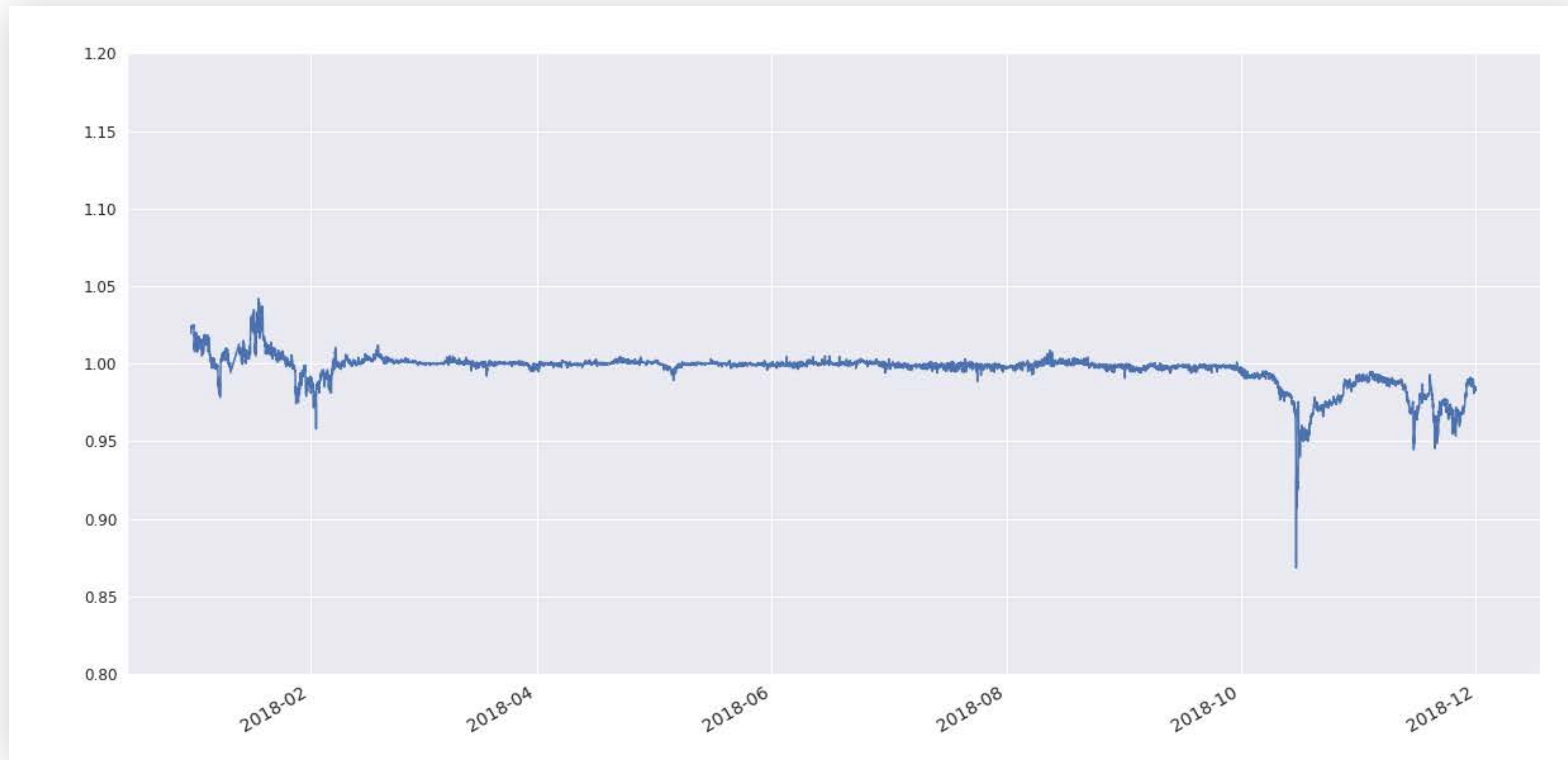
Markets that trade BTC paired against the stablecoin Tether (USDT) appear to trade at a persistent premium to BTC-USD markets. You see these apparent dislocations on popular public web sites like CoinMarketCap, which often show highly variable prices.

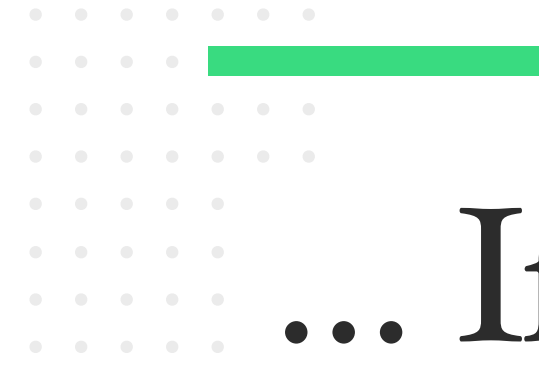




... But Tether Trades At A Variable Price ...

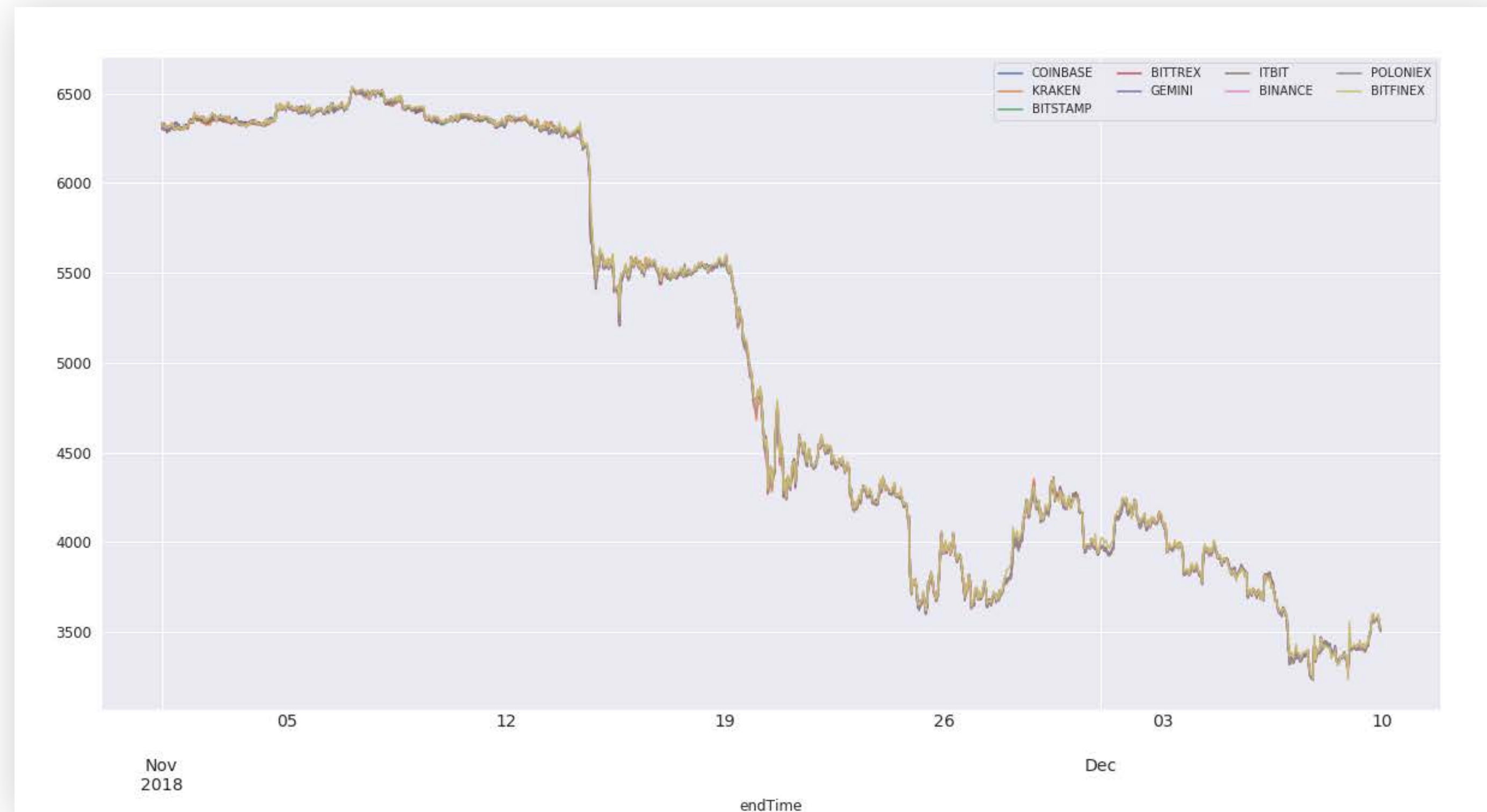
USDT is a stable coin that is designed to trade at a stable price of \$1. But in practice, its price varies (sometimes significantly). The globally integrated bitcoin market incorporates this into its prices.





... If You Adjust for USDT Price Fluctuations They Trade In Line

If you treat Tether for what it really is — a currency that fluctuates against the value of the U.S. dollar — prices for BTC/USD and BTC/USDT pairs line up exactly.



The Bitcoin Market Is More Regulated and
Surveilled Than Is Commonly Understood.

We acknowledge that we're using the term "regulated" loosely here. We are not implying that bitcoin spot exchanges are "regulated markets" or that they are on an equal legal status with national securities exchanges or futures exchanges, but rather that the 10 bitcoin spot exchanges highlighted earlier interface with other forms of regulation.

FinCEN Has Required Crypto Exchanges To Register As Money Services Businesses (MSB) Since 2013

FinCEN's responsibility is to safeguard the financial system from being abused by criminals and terrorists, with a focus on combating money laundering. It refers to cryptocurrencies as "virtual currency."



Department of the Treasury Financial Crimes Enforcement Network

Guidance

FIN-2013-G001

Issued: March 18, 2013

Subject: Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies

Clarification: *"[A] exchanger is an MSB under FinCEN's regulations, specifically, a money transmitter, unless a limitation to or exemption from the definition applies to the person."*

Definition: *"An exchanger is a person engaged as a business in the exchange of virtual currency for real currency, funds, or other virtual currency."**

* Source: <https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf> March 18, 2013.



MSBs Have A Long List Of Obligations

- Identifying people with ownership stakes or controlling roles in the MSB.
- Establishing a formal Anti-Money Laundering (AML) policy in place with documentation, training, independent review, and a named compliance officer.
- Having strict customer identification and verification policies and procedures.
- Filing Suspicious Activity Reports (SARs) for suspicious customer transactions.
- Filing Currency Transaction Reports (CTRs) for cash-in or cash-out transactions greater than \$10,000.
- Maintaining a five-year record of currency exchanges greater than \$1,000 and money transfers greater than \$3,000.



A BitLicense Is Needed For Exchanges Doing Business in New York

To operate in New York, virtual currency businesses must register with the New York State Department of Financial Services (NYSDFS) and receive a BitLicense, which enforces strict operating standards. Five of the ten spot bitcoin exchanges are registered with NYSDFS and hold a BitLicense.



coinbase

 GEMINI

POLONIEX

 bitFlyer

itBit



The BitLicense Has An Even Longer List Of Obligations

- Submission of audited financial statements including income statements, statement of assets/liabilities, insurance, and banking.
- Capitalization requirements set at NYDFS's discretion.
- Full reserves of custodian assets — selling / encumbering prohibited.
- Fingerprints and photographs of employees with access to customer funds.
- Qualified Chief Information Security Officer and annual penetration testing / audits.
- Documented business continuity and disaster recovery plan, independently tested annually.
- Independent exam by NYFDS.



Regulatory Status Of the 10 Exchanges

Exchange	MSB	BitLicense
Binance		
Bitfinex	X	
bitFlyer	X	X
Bitstamp	X	
Bittrex	X	
Coinbase Pro	X	X
Gemini	X	X
itBit	X	X
Kraken	X	
Poloniex	X	X

Nine out of the ten exchanges—every exchange besides Binance—is registered as a Money Services Business with FinCEN.

The BitLicense is more optional because it's enforced by a NY state regulator and certain exchanges have decided not to do business in NY due to the operational and compliance burden. Still, five out of ten exchanges have BitLicenses.

Most of these exchanges have raised significant venture capital or been acquired by large, established companies. They have significant public profiles, well-known senior executives, and large offices in major metropolitan areas.



Sophisticated Market Surveillance Tools And Protocols Are Emerging At The 10 Exchanges

Exchange	Market Surveillance Tools	Since
Binance	N/A	N/A
Bitfinex	Irisium Market Surveillance	Mar 13, 2018
bitFlyer	N/A	N/A
Bitstamp	Irisium Market Surveillance	Nov 28, 2018
Bittrex	N/A	N/A
Coinbase Pro	Internal, "Coinbase Trade Surveillance Program" led by Peter Elkins, former head of market surveillance at NYSE	July 4, 2018
Gemini	Nasdaq SMARTS	April 25, 2018
itBit	N/A	N/A
Kraken	N/A	N/A
Poloniex	NICE Actimize	Feb 27, 2019

Five out of the ten exchanges—Binance, Bitstamp, Coinbase Pro, Gemini, and Poloniex—have formal market surveillance tools in place that help detect market manipulations such as spoofing and wash trading through the real-time and historical analysis of trades, order books, and other market information.



Market Manipulation

KEY FINDINGS

The bitcoin market and Bitwise's specific proposal are uniquely resistant to manipulation, and the regulated and surveilled futures market is significant.

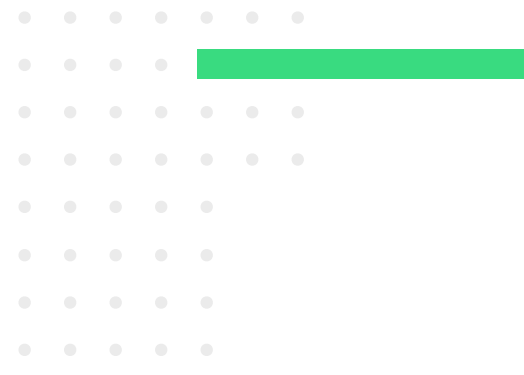
The Bitwise Bitcoin ETF Trust Application Satisfies the Conditions of Exchange Act 6(B)(5) by Both a) Demonstrating That the Underlying Bitcoin Market and the Trust's NAV Process Is Uniquely Resistant To Market Manipulation, and B) Demonstrating That the Listing Exchange Has a Surveillance Sharing Agreement in Place With a Regulated Bitcoin Futures Market of Significant Size.



Table of Contents: Market Manipulation

- 01** — **What Are the Core Concerns Surrounding Market Manipulation and Fraudulent Behavior?**
- 02** — **What Unique Features of the Bitwise Bitcoin ETF Trust Proposal Are Worth Considering?**
- 03** — **How Has the Bitcoin Market Evolved Over the Past 18 Months?**
- 04** — **Why Does Bitwise Believe the Bitcoin Market Is Uniquely Resistant To Market Manipulation?**
- 05** — **Why Does Bitwise Believe the Listing Exchange Has a Surveillance Sharing Agreement in Place With a Regulated Market of Significant Size?**

What Are the Core Concerns Surrounding Market Manipulation and Fraudulent Behavior?



The SEC has documented its concerns about bitcoin, market manipulation, and fraudulent behavior with remarkable clarity, particularly in two documents:

- 1) **Staff Letter:** Staff Letter on Fund Innovation and Cryptocurrency-related Holdings — January 18, 2018
- 2) **Winklevoss Order:** Order Setting Aside Action by Delegated Authority and Disapproving A Proposed Rule Changes related to the Winklevoss Bitcoin Trust (Release No. 34-83723; File No. SR-BatsBZX-2016-30) — July 26, 2018



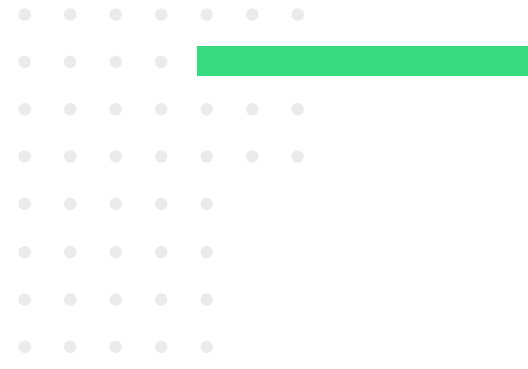
Staff Letter: Engaging on Fund Innovation and Cryptocurrency-related Holdings

January 18, 2018

SECURITIES AND EXCHANGE COMMISSION
(Release No. 34-83723; File No. SR-BatsBZX-2016-30)

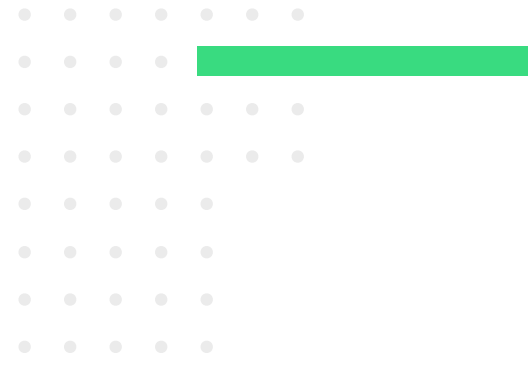
July 26, 2018

Self-Regulatory Organizations; Bats BZX Exchange, Inc.; Order Setting Aside Action by Delegated Authority and Disapproving a Proposed Rule Change, as Modified by Amendments No. 1 and 2, to List and Trade Shares of the Winklevoss Bitcoin Trust



The Commission has outlined two, and only two, possible approaches to satisfying Exchange Act 6(b)(5). You must either show:

- 1) **Unique Resistance:** That the bitcoin market is uniquely resistant to market manipulation and fraudulent activity
- 2) **Surveillance Sharing:** That the listing exchange has entered into a surveillance sharing agreement with a regulated market of significant size



The Commission has indicated that either factor alone can be sufficient.

Historically, however, the existence of a surveilled market has been the primary consideration, as the Commission laid out when discussing its past approval of gold bullion ETFs in the Winklevoss Order:

[E]ven though the Commission found that the over-the-counter market for gold was “extremely deep and liquid,” the Commission’s approval of the first precious metal ETP expressly relied on an agreement to share surveillance information between the listing exchange and a significant, regulated market for gold futures.

We intend to show that this situation is analogous to bitcoin: That the bitcoin market (and Bitwise’s specific proposal) is protective against manipulation, and critically, that there is a significant, regulated and surveilled market for bitcoin futures.

What Unique Features of the Bitwise Bitcoin
ETF Trust Proposal Are Worth Considering?



The Bitwise Bitcoin ETF Trust Proposal Is Extremely Straight-Forward

The Bitwise Bitcoin ETF Trust provides direct exposure to bitcoin priced off the equivalent of a crypto consolidated tape. We draw prices from 10 crypto exchanges representing substantially all of the trading volume in the spot bitcoin market.



The Bitwise Bitcoin ETF Trust Proposal Is Extremely Straight-Forward

The Bitwise Bitcoin ETF Trust provides direct exposure to bitcoin priced off the equivalent of a crypto consolidated tape. We draw prices from **10 crypto exchanges** representing substantially all of the trading volume in the spot bitcoin market.

The use of a large number of exchanges mitigates against idiosyncratic exchange risk, as the failure of any individual exchange will not materially impact pricing for the fund. In addition, drawing on multiple exchanges allows Bitwise to calculate its net asset value (NAV) in a manner that significantly deters manipulation, as explained later.



The Bitwise Bitcoin ETF Trust Proposal Is Extremely Straight-Forward

The Bitwise Bitcoin ETF Trust provides direct exposure to bitcoin priced off the equivalent of a crypto consolidated tape. We draw prices from 10 crypto exchanges **representing substantially all of the** trading volume in the spot bitcoin market.

Bitwise's pricing methodology captures substantially all spot bitcoin trading volume. As a result, any attempts at manipulation must involve a majority of global bitcoin volume. This makes manipulation substantially difficult to both conduct and profit from.

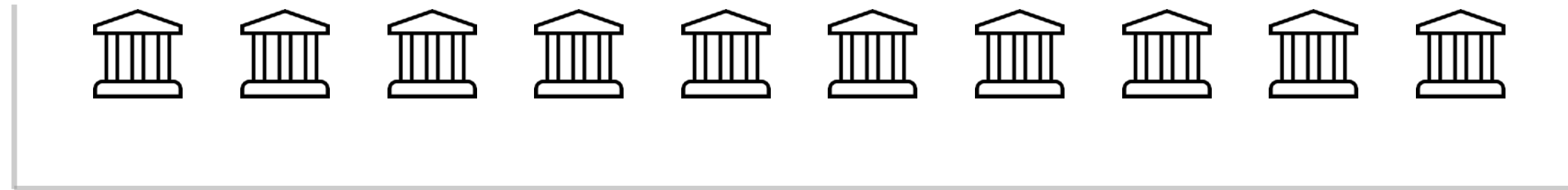
Bitwise Captures Substantially All Spot Bitcoin Volume And Draws Prices From A Larger Number Of Exchanges Than Previous Filings

EXCHANGES AND VOLUME CAPTURED BY VARIOUS ETP FILINGS											
Venue	ADV		Bitwise	SolidX/Van Eck	Winklevoss	Grayscale	ProShares	Direxion	GraniteShares	REX	First Trust
Binance	\$110,503,361		X								
Bitfinex	\$38,062,554		X								
Kraken	\$31,856,337		X			X					
Bitstamp	\$31,624,942		X			X					
Coinbase Pro	\$27,140,255		X			X					
bitFlyer	\$13,539,802		X								
Gemini	\$8,119,736		X		X						
itBit	\$5,586,520		X			X					
Bittrex	\$5,145,777		X			X					
Poloniex	\$1,461,753		X								
CME Bitcoin Futures	\$84,882,216						X	X	X	X	X
CBOE Bitcoin Futures	\$6,124,826						X	X	X	X	X
Over-the-Counter	Unknown / Self-Reported			X							



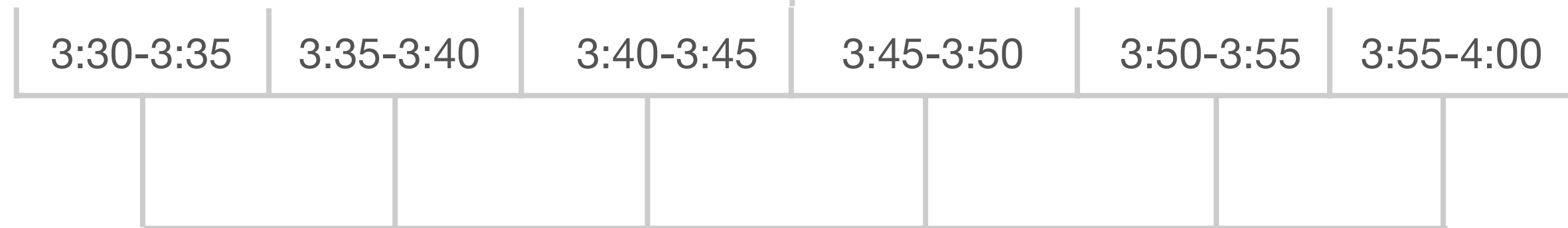
How Does Bitwise Calculate The NAV Of The Fund?

Take Ten Exchanges



Capture Trade Prices And Sizes

**Examine Six Five-Minute Periods
Leading Up to 4:00pm ET**



**Take An Equal-Weighted Average Of The Volume-Weighted Median Price
Of These Six Five-Minute Periods**



Why Does This Matter?

The use of a large number of exchanges makes market manipulation more difficult in a well-arbitrated and fractured market, as a malicious actor would need to manipulate multiple exchanges to impact the NAV.

Take Ten Exchanges

**Examine Six Five-Minute Periods
Leading Up to 4:00pm ET**

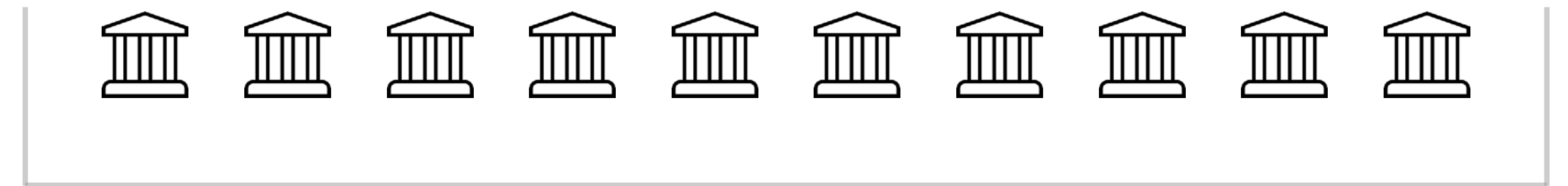




Why Does This Matter?

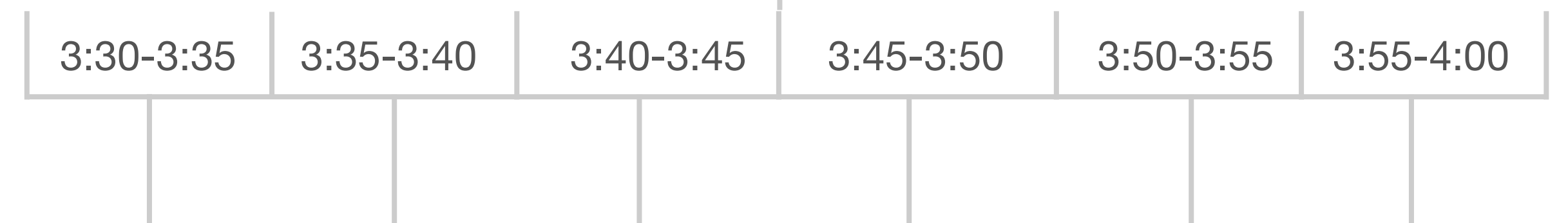
Capturing substantially all of the spot trading volume in bitcoin further increases the difficulty, since significantly more capital would be required in any attempt to influence the NAV, and attempts to profit from that manipulation would be difficult.

Take Ten Exchanges



Capture Trade Prices And Sizes

**Examine Six Five-Minute Periods
Leading Up to 4:00pm ET**



**Take An Equal-Weighted Average Of The Volume-Weighted Median Price
Of These Six Five-Minute Periods**

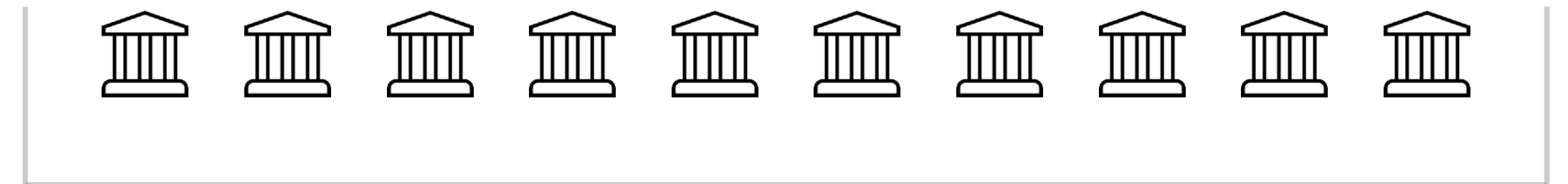


Why Does This Matter?

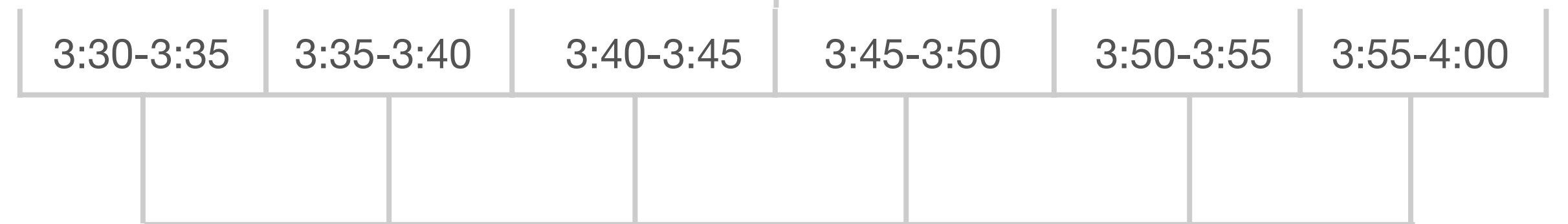
Using six consecutive five-minute segments over a thirty-minute period means malicious actors would need to sustain efforts to manipulate the market over an extended period of time, or would need to replicate efforts multiple times, potentially triggering review.

This extended period also supports Authorized Participant (AP) activity by capturing volume over a longer time period, rather than forcing APs to mark an individual close or auction.

Take Ten Exchanges



Capture Trade Prices And Sizes



Examine Six Five-Minute Periods Leading Up to 4:00pm ET

Take An Equal-Weighted Average Of The Volume-Weighted Median Price Of These Six Five-Minute Periods



Why Does This Matter?

The use of a median price eliminates the ability of outlier prices to impact the NAV, as it systematically excludes those prices from the NAV calculation.

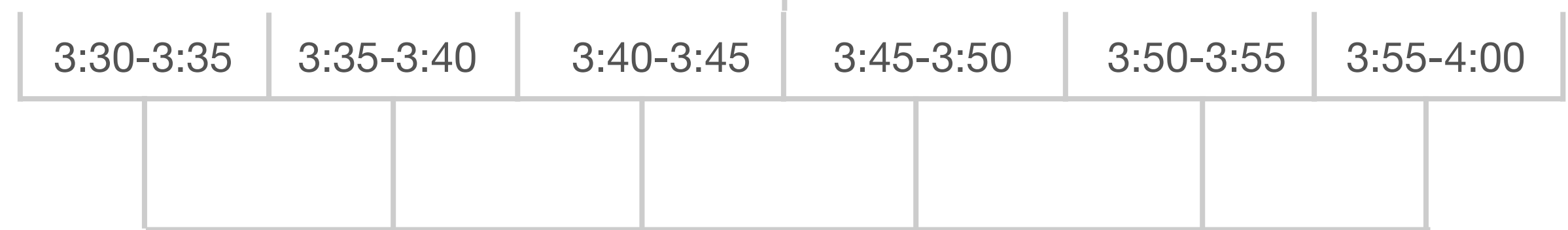
The use of a volume-weighted median (as opposed to a traditional median) protects against attempts to manipulate the NAV by executing multiple low-dollar trades; any manipulation attempt would have to involve a majority of global spot bitcoin volume in a five-minute window to have an effect.

Bitwise's methodology is similar to the settlement pricing methodology for CME futures, which has documented protection against the impact of pricing variance.*

Take Ten Exchanges



Examine Six Five-Minute Periods Leading Up to 4:00pm ET



Capture Trade Prices And Sizes

Take An Equal-Weighted Average Of The Volume-Weighted Median Price Of These Six Five-Minute Periods

* For a detailed analysis on how a volume-weighted median pricing approach both theoretically and empirically protects against potential manipulation, please see "Analysis of the CME CF Bitcoin Reference Rate and CME CF Bitcoin Real Time Index" by Andrew Paine and William J. Knottenbelt of the Imperial College Centre for Cryptocurrency Research and Engineering, November 14, 2016. Please note that the data used in this study comes from early 2016, an immature phase of the bitcoin market's development, prior to the launch of futures and the entry of large market makers into the space, and therefore is noisier than present day data. Nonetheless, despite this noise, Paine and Knottenbelt are able to show the protective qualities of the volume-weighted median pricing approach. Our approach differs in that we draw from a larger number of exchanges and shorten the time window from 1-hour to 30-minutes. We believe this shorter window maintains the protective qualities while improving the timeliness of the NAV price.



One Final Step: A Chance To Review

ETF NAVs are priced at 4pm ET, but are not officially struck until later in the day (often by 5:30pm ET and almost always by 8:00pm ET). The pause between 4pm ET and 5:30pm ET (or 8:00pm ET) provides an opportunity to algorithmically detect, flag, investigate, and correct unusual pricing should it occur.

Take Ten Exchanges



Capture Trade Prices And Sizes

3:30-3:35 3:35-3:40 3:40-3:45 3:45-3:50 3:50-3:55 3:55-4:00

**Examine Six Five-Minute
Periods Leading Up to
4:00pm ET**

**Take An Equal-Weighted Average Of The Volume-Weighted Median Price
Of These Six Five-Minute Periods**



Detail: How Does Using A Volume-Weighted Median Price Protect Against Manipulation Of The NAV?

Scenario 1

Trade Number	Exchange	Trade Size	Trade Price
1	A	100	\$4,000
2	B	100	\$4,000
3	C	100	\$4,000
4	A	100	\$4,000
5	B	100	\$4,000
6	C	100	\$4,000
7	A	100	\$4,000
8	B	100	\$4,000
9	C	100	\$4,000
10	D	200	\$4,400

- Imagine that ten trades occur during one five-minute window, at the sizes and prices outlined on the left. Imagine also that the true global price of bitcoin at this time is \$4,000.
- Suppose that someone is able to manipulate the last trade for 200 bitcoin on Exchange D, driving the price up 10% to \$4,400.
- A traditional Volume-Weighted Average Price (VWAP) calculation would solve for the mean, meaning it would incorporate the manipulated trade. In fact, it would give it 2X the weight of other trades due to its larger size.
- As a result, the traditional VWAP price in this example would be \$4,072.73, 1.8% above the true global price of \$4,000.00
- The Volume-Weighted Median Price, however, ignores the outlier price entirely. It is simply \$4,000.00.
- The use of a Volume-Weighted Median Price means you cannot manipulate the price by contributing a single outlier trade; you must manipulate the majority of global spot bitcoin volume in a five-minute window to have any influence on the NAV.

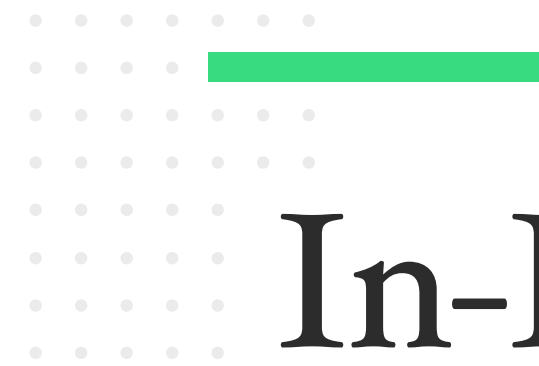


Detail: How Does Using A Volume-Weighted Median Price Protect Against Manipulation Of The NAV?

Scenario 2

Trade Number	Exchange	Trade Size	Trade Price
1	A	100	\$4,000
2	B	100	\$4,000
3	C	100	\$4,000
4	D	100	\$4,000
5	E	100	\$4,000
6	F	10	\$4,400
7	G	10	\$4,400
8	H	10	\$4,400
9	I	10	\$4,400
10	J	10	\$4,400
11	J	10	\$4,400

- Imagine a new set of eleven trades, at the sizes and prices outlined on the left. Imagine again that the true global price of bitcoin at this time is \$4,000.
- Suppose that a high-frequency trader is able to manipulate the price higher on a handful of exchanges, and posts six small trades for 10 bitcoin each at an elevated price of \$4,400 on those exchanges.
- A traditional median price methodology would land on the elevated price of \$4,400, since there are six small trades at that size against five larger trades at the real price of \$4,000.
- The Volume-Weighted Median Price, however, still lands on \$4,000, since there are 500 bitcoin traded at that price versus just 60 bitcoin at the manipulated price.
- The use of a Volume-Weighted Median Price means you must manipulate the majority of global spot bitcoin volume in a five-minute window to have any influence on the NAV.



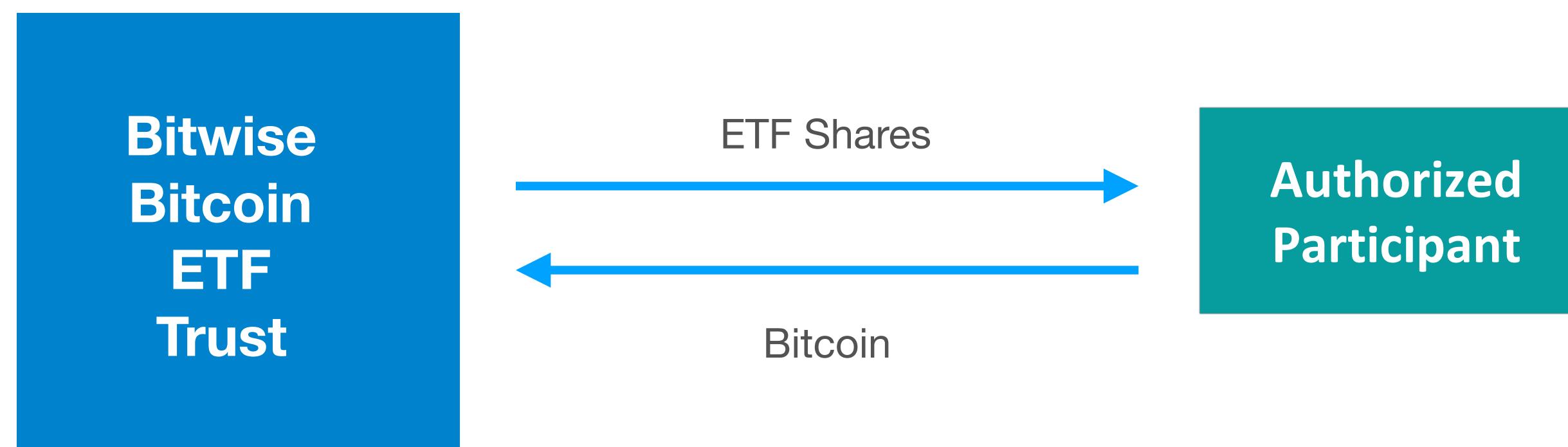
In-Kind Creations & Redemptions Provide Additional Protection

The Bitwise Bitcoin ETF Trust processes all creations and redemptions in-kind.

The in-kind creation/redemption mechanism means that shareholders of the Bitwise Bitcoin ETF Trust are not harmed even in the event that the NAV price were to be somehow severely manipulated (an event we do not think is possible).

Bitwise additionally proposes to accrue and be paid its management fee in bitcoin, thereby completely insulating shareholders of the Trust from any direct harm from NAV-based manipulation.

We explain the mechanism this protection provides on the next slide.





In-Kind Creations & Redemptions Provide Additional Protection

Let's imagine that the Trust holds 100,000 bitcoin and has 10 million shares outstanding. That means each share holds a pro-rata ownership stake of 0.01 bitcoin. Let's further assume that the true global value of bitcoin is \$4,000 throughout this analysis. That means each share is worth \$40.00

Now imagine that someone is able to artificially and temporarily manipulate the NAV price such that the reported NAV drops to \$38.00 (implying a \$3,800 bitcoin price) even though the true global price for bitcoin remains at \$4,000.

In a cash create scenario, this would disadvantage shareholders of the fund. Imagine that an Authorized Participant did a cash create in this scenario for an additional 10 million shares. With the NAV at \$38.00, they would only have to send \$380 million in cash to the Trust. When the trust went to buy bitcoin, it would pay \$4,000/bitcoin, meaning it would only be able to purchase 95,000 bitcoin. The trust would be left with 20 million shares outstanding but only 195,000 bitcoin, meaning each share would have a pro-rata ownership stake of 0.00975 bitcoin and a value of \$39.00. Shareholders are clearly harmed in this scenario.

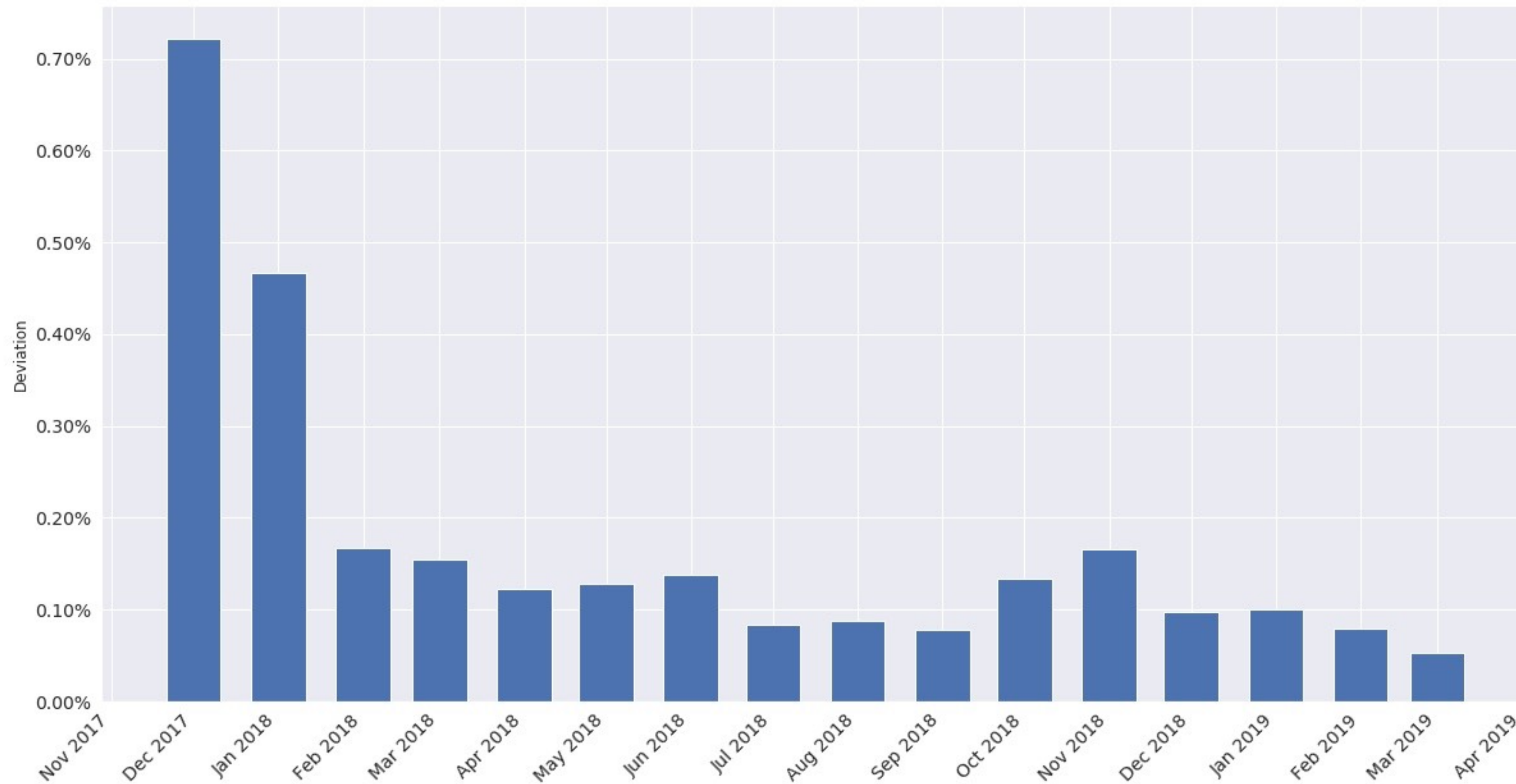
In an in-kind create scenario, the Authorized Participant must deliver 100,000 bitcoin to create 10 million shares of the fund. As a result, the trust is left with 20 million shares and 200,000 bitcoin, meaning each share still has a pro-rata ownership stake of 0.01 bitcoin and a value of \$40.00. Shareholders are not harmed.*

How Has the Bitcoin Market Evolved Over the Past 18 Months?



Arbitrage On Exchanges Has Improved Significantly

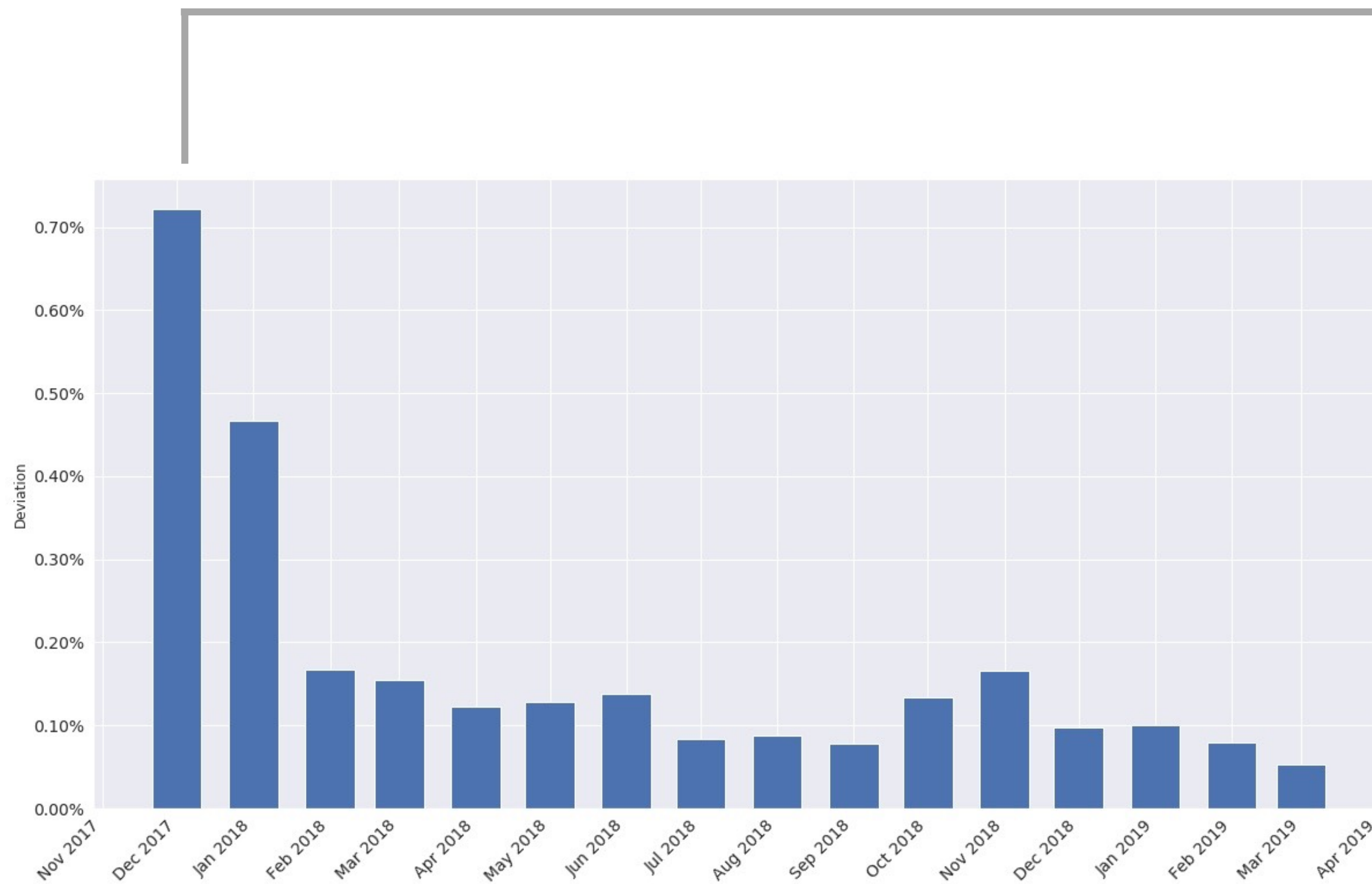
The graph below examines the aggregate monthly average price deviation of the ten exchanges over the past year.





Why Is This The Case? Factor 1: The Launch of Futures

The graph below examines the aggregate monthly average price deviation of the ten exchanges over the past year.



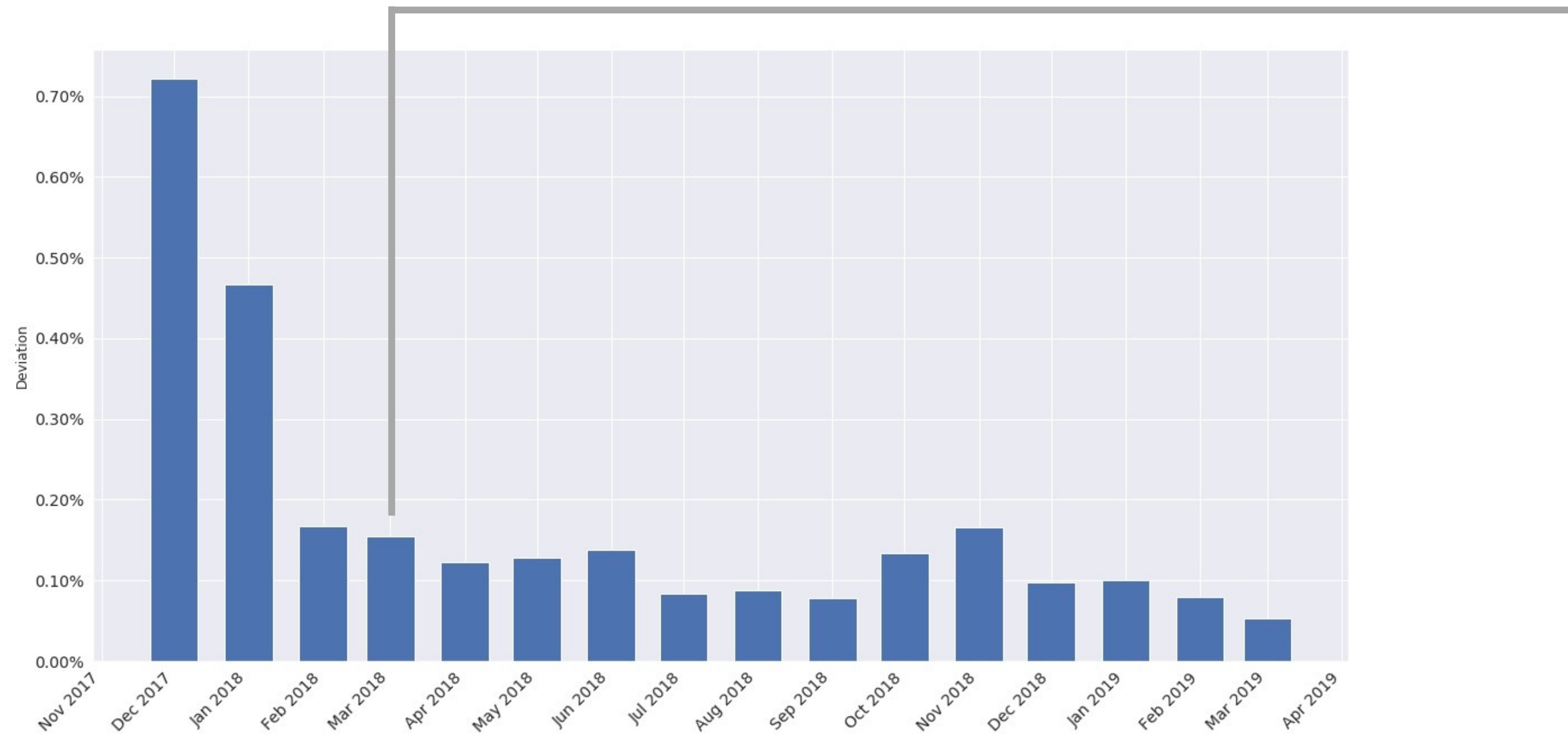
The launch of bitcoin futures on the Chicago Board Options Exchange on December 10, 2017, and on the Chicago Mercantile Exchange on December 17, 2017, fundamentally transformed the bitcoin market, creating a two-sided market and easy hedging for the first time.

The importance of this event was explored in the Federal Reserve Bank of San Francisco's May 7, 2018, Economic Letter — "[How Futures Trading Changed Bitcoin Prices.](#)" It noted, among other things, that bitcoin's all-time price peak coincided precisely with the launch of the CME futures. The FRBSF does not believe this was a coincidence.



Why Is This The Case? Factor 2: The Entry of Institutional Market Makers

The graph below examines the aggregate monthly average price deviation of the ten exchanges over the past year.

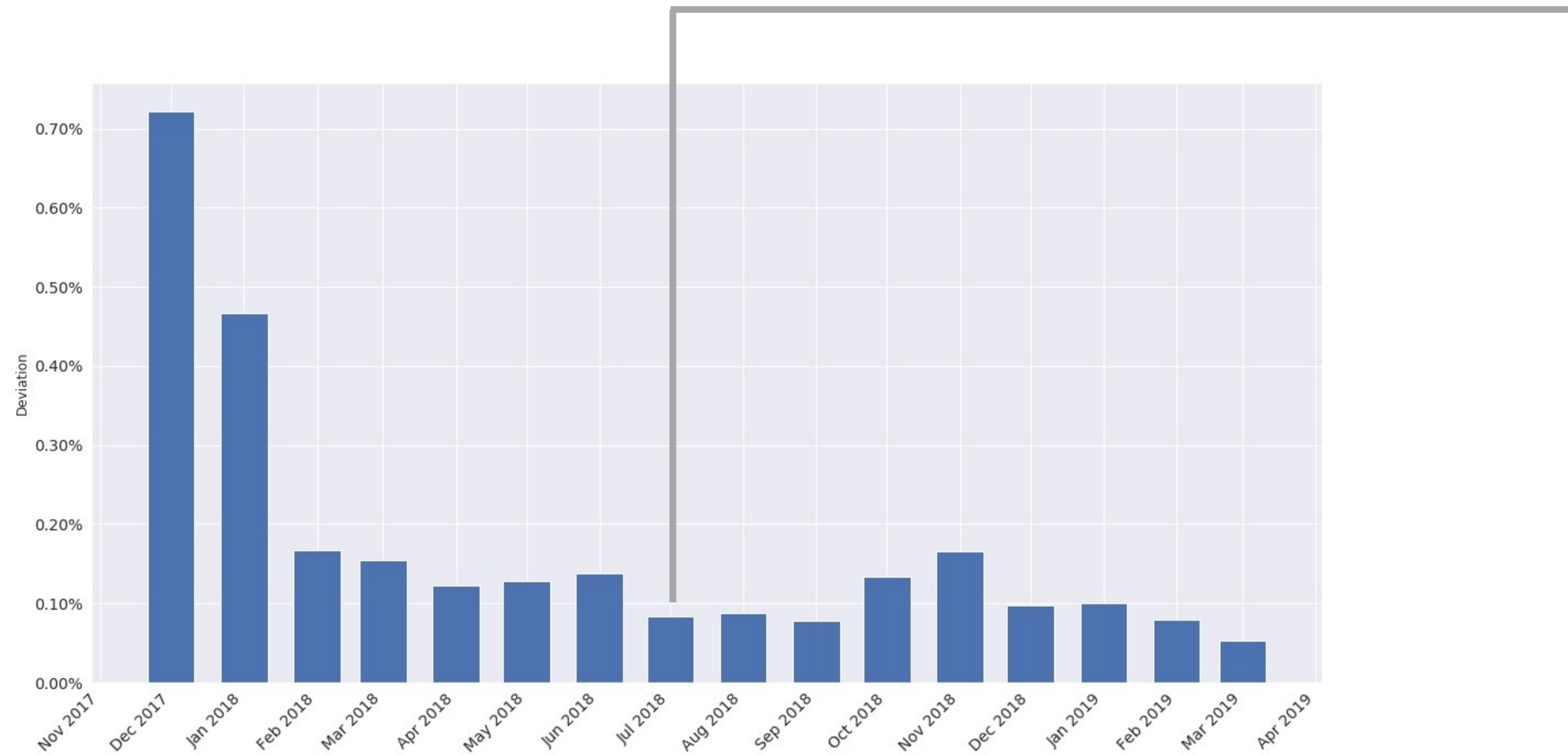


The next major event was the entry of a large number of sophisticated market makers into the bitcoin market further in early 2018. Jane Street, for instance — a leading ETF market maker and one of the largest proprietary trading firms in the world — publicly entered the bitcoin market on March 16, 2018.



Why Is This The Case? Factor 2: The Entry of Institutional Market Makers

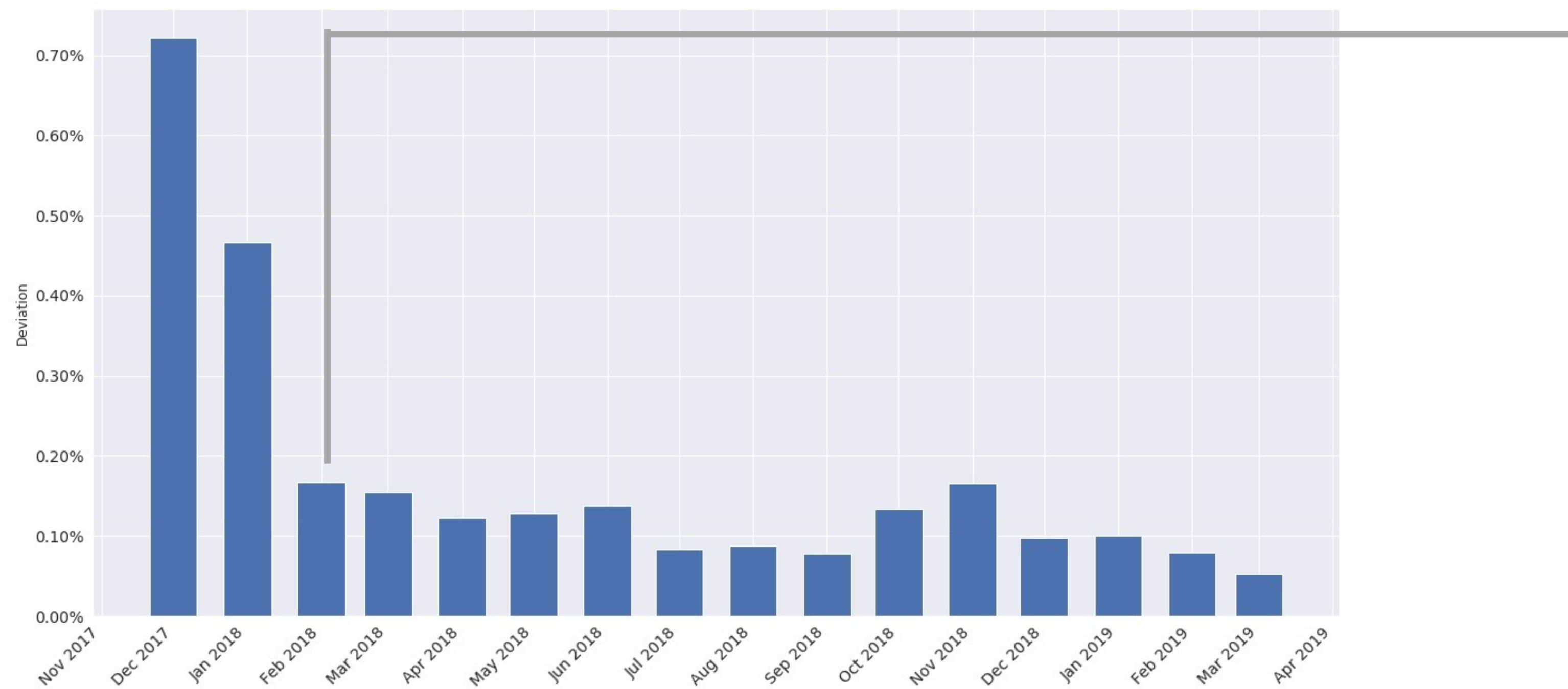
The graph below examines the aggregate monthly average price deviation of the ten exchanges over the past year.



In the ensuing months, a number of other market makers followed suit. Flow Traders, for instance — Europe’s largest ETF market maker — began making markets in the Swedish bitcoin ETN on July 5, 2018. By summer 2018, most major market makers were either present in the bitcoin market or actively exploring the space.

Why Is This The Case? Factor 3: The Launch Of Institutional Bitcoin Lending

The graph below examines the aggregate monthly average price deviation of the ten exchanges over the past year.



A final factor was the development of a large and efficient short lending market in bitcoin. Although modest lending activity took place in 2017, it did not exist at scale until the February 27, 2018, launch of Genesis Global Capital. Genesis would go on to process over \$1.1 billion in crypto loans in 2018, approximately 60% of which were for bitcoin. That volume grew throughout the year. (Source: CoinDesk)



We Have Reached The Point Of Diminishing Returns For Improvements In Efficiency

- The launch of futures, the development of lending and the arrival of major market makers combined to dramatically improve the efficiency of the bitcoin market in 2018, creating a dynamic, institutional-quality, two-sided market for the first time.
- Today, average spreads on the 10 real spot exchanges range from 0.01% and 0.10%, and are constrained from falling lower largely due to exchange fees and tick sizes. Of note, Coinbase Pro and Bitfinex have a single tick as their median spread—\$0.01 and \$0.10 respectively.
- Arbitrage between these ten exchanges is virtually perfect, as demonstrated, with no sustained deviations between prices.
- While future developments, including the proposed launch of a U.S. ETF, may be incrementally beneficial to the market, the spot bitcoin market today operates with an efficiency that matches or exceeds that of other major markets.

Why Do We Believe That the Bitcoin Market Is
Uniquely Resistant To Market Manipulation?

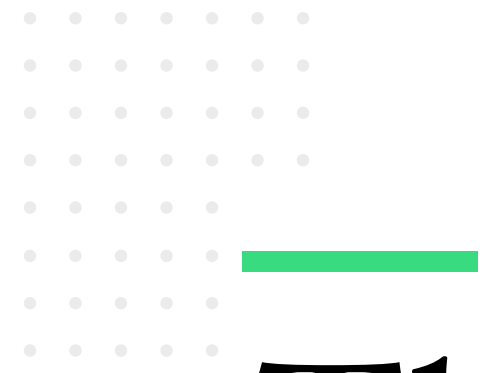


Bitcoin is the first *digital* commodity in the history of the world.

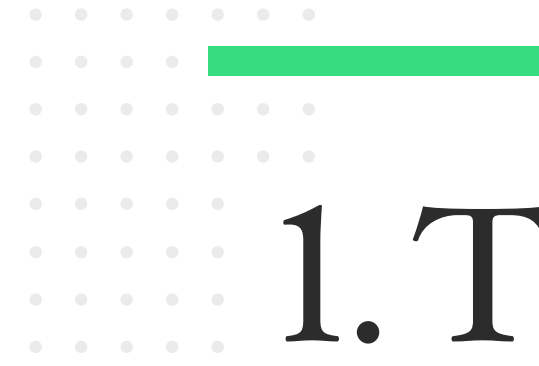


The digital nature of bitcoin makes it unique compared to other commodities in three important ways.

- 1) **Fungibility:** Unlike other commodities (like oil, wheat or even gold), there are no varieties, purities or geographical versions of bitcoin. A bitcoin is a bitcoin.
- 2) **Transportability:** Bitcoin has no physical manifestation. As a result, it can be instantly transported from one location to another, anywhere in the world, at a cost approaching zero.
- 3) **Exchange Tradability:** Most commodities trade over-the-counter or rely on representative, derivative futures contracts because they lack the characteristics listed above. Bitcoin is unique in that it trades directly on exchange, allowing for open price discovery.



These unique features allow the bitcoin market to be uniquely resistant to manipulation in critical ways.



1. The Fact That Bitcoin's Price Is Set On The Open Market Makes It Resistant To Manipulation

The largest market manipulation scandals in history have occurred in markets (including commodity markets) that rely on coordinated fix pricing. Unlike many commodities, Bitcoin's price is set on the open market.

* The London Interbank Offered Rate (LIBOR) Scandal of 2012*

Large financial institutions colluded to systematically manipulate the pricing of the LIBOR interest rate, which is used as a benchmark rate for mortgages, corporate loans, government bonds, credit cards and more. (Source: [Wikipedia](#))

* The Global Forex Scandal of 2013

Seven banks were fined a total of \$10 billion by seven different enforcement agencies across the U.S., the U.K. and Switzerland for manipulating foreign exchange benchmark rates, including the popular 16:00 WM/Reuters rate. (Source: [Wikipedia](#))

* The Gold Fix Scandal of 2014

Barclays PLC was fined \$44 million for the failure of internal controls that allowed a trader to manipulate the daily London gold fix (which sets the price for exchange-traded gold products). (Source: [Reuters](#))

* The Australian Bank Bill Swap Rate Scandal (ASIC Scandal) of 2016

Three Australian banks were fined for manipulating the Australian Bank Bill Swap Rate (effectively the LIBOR of Australia). Total fines exceeded \$100 million AUD. (Source: [Nine Finance](#))

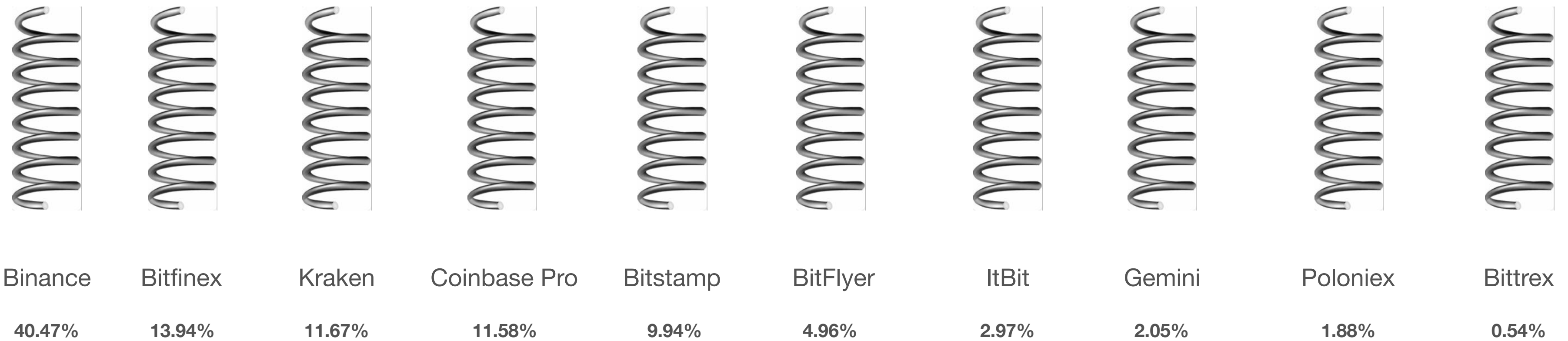
II. The Fact That Bitcoin Is Fungible And Transportable Means Bitcoin Trades As A Single Market With Effective Arbitrage In Place, Providing Resistance To Manipulation

- The fungibility and transportability of bitcoin create a nearly perfect environment for arbitrage between different trading venues.
- Earlier in this presentation, Bitwise demonstrated that this arbitrage exists and that temporary price dislocations on individual exchanges are rapidly arbitrated away by global market participants.
- As a result, there is a global price for bitcoin and any attempt to manipulate the market must overcome the majority of global liquidity.
- This makes both manipulating the market and profiting from that manipulation uniquely difficult.





III. The Fact That Bitcoin Is Fungible And Transportable Has Allowed A Distributed Market To Emerge, Providing Resistance To Manipulation



Percent of Volume

The spot bitcoin market is highly fractured amongst ten exchanges, and no exchange has a majority share. This contributes to bitcoin's unique resistance to market manipulation, as any attempt to manipulate the market must either be coordinated synchronously across multiple exchanges or must involve a significant spike of volume on a single exchange (an action that would trigger review in Bitwise's NAV process).

Why Do We Believe NYSE Arca Has
Surveillance Sharing Agreements in Place With a
Regulated Market of Significant Size?



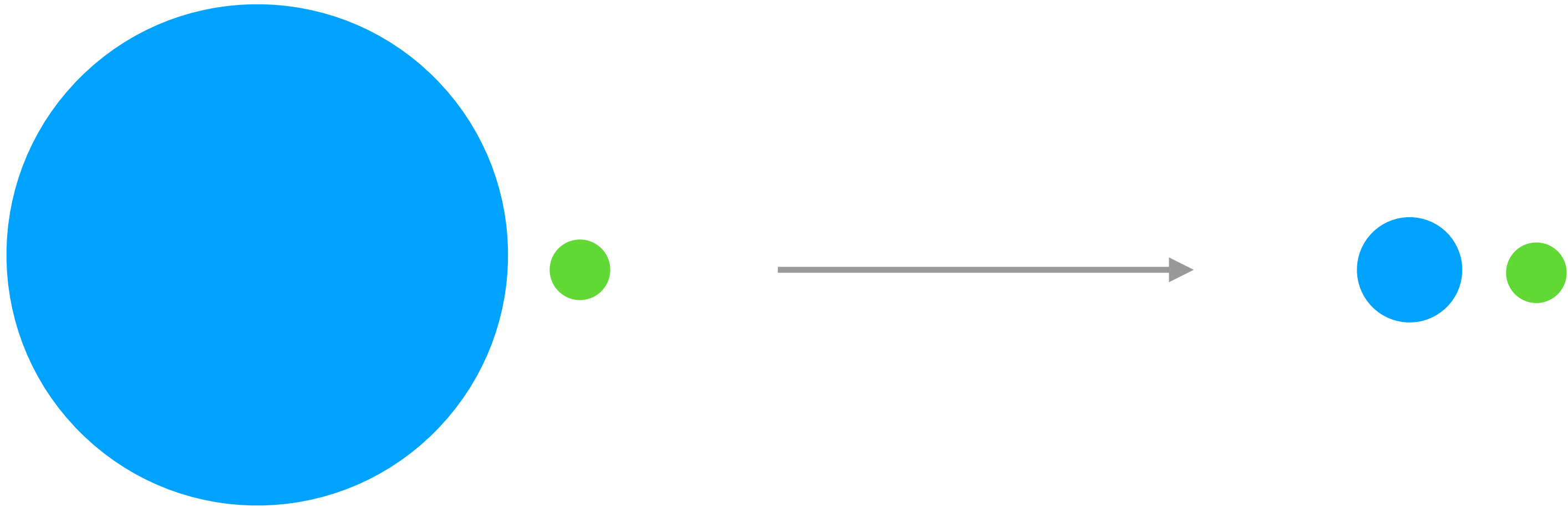
The Commission Laid Out Both The Need For And The Definition Of A Surveilled Market Of Significant Size Very Clearly In The Winklevoss Order

Need For: “[For the] commodity-trust ETPs approved to date for listing and trading, there has been in every case at least one significant, regulated market for trading futures on the underlying commodity—whether gold, silver, platinum, palladium, or copper—and the ETP listing exchange has entered into surveillance-sharing agreements with, or held Intermarket Surveillance Group membership in common with, that market.”

Definition Of: “[T]he Commission interprets the terms “significant market” and “market of significant size” to include a market (or group of markets) as to which (a) there is a reasonable likelihood that a person attempting to manipulate the ETP would also have to trade on that market to successfully manipulate the ETP, so that a surveillance-sharing agreement would assist the ETP listing market in detecting and deterring misconduct, and (b) it is unlikely that trading in the ETP would be the predominant influence on prices in that market.”



The Spot Market For Bitcoin Is Smaller Than People Think; The Futures Market Is Commensurately More Significant



Reported Spot Volume: ~\$6B

Futures Volume: \$91M*

Source: Coinmarketcap. Time period: March 4-8, 2019

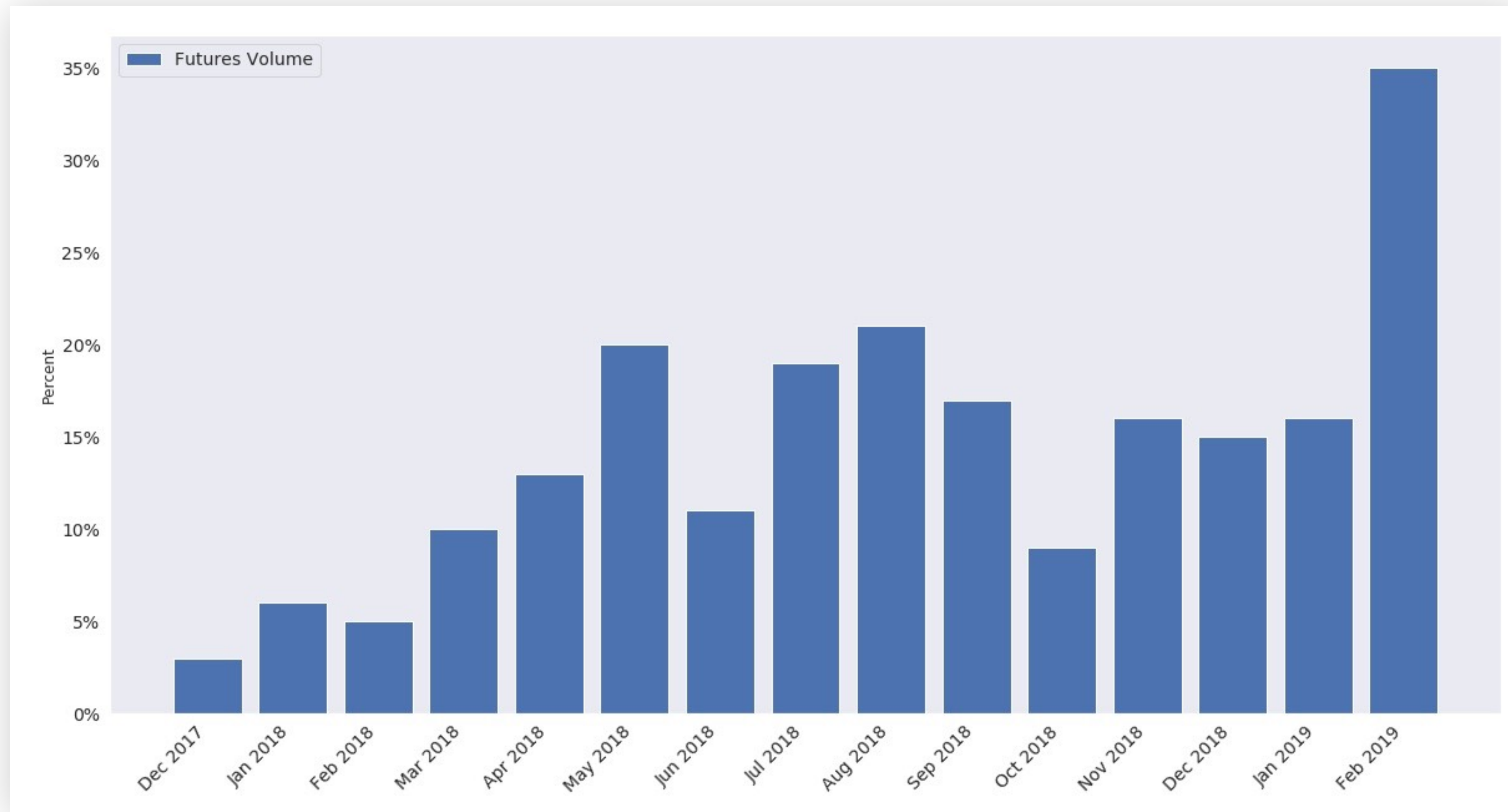
Actual Spot Volume: \$273M

Futures Volume: \$91M*

Source: Kaiko. Time period: March 4-8, 2019



Futures Volume Expressed As A Percentage Of Global Spot Volume



CME Data Source: Chicago Mercantile Exchange. Data as of 2/28/19

CBOE Data Source: https://markets.cboe.com/us/futures/market_statistics/historical_data/. Data as of 3/15/19

The CME Futures Market Is Nearly As Big As The Largest Bitcoin Spot Market

- The table to the right highlights where CME and CME futures would rank when compared with the 10 exchanges that account for substantially all of global spot bitcoin volume.
- Both the CME and the CBOE are members of the Intermarket Surveillance Group, along with NYSE Arca, the proposed listing exchange for the Bitwise Bitcoin ETF Trust.*

Global Spot Bitcoin Volume		
Exchange	Daily Volume	Location
Binance	\$110,503,361	Malta
CME	\$84,882,216	US
Bitfinex	\$38,062,554	Taiwan
Kraken	\$31,856,337	US
Bitstamp	\$31,624,942	Europe
Coinbase Pro	\$27,140,255	US
bitFlyer	\$13,539,802	Japan
Gemini	\$8,119,736	US
CBOE	\$6,124,826	US
itBit	\$5,586,520	US
Bittrex	\$5,145,777	US
Poloniex	\$1,461,753	US

Exchange ADV Source: Kaiko. March 4-8, 2019

* Note: CBOE has elected to stop offering new futures contracts in June 2019. We expect CBOE's volume to migrate to the CME contract.

The CME Futures Price Is Derived From Exchanges That Contribute To The Bitwise NAV Methodology



The screenshot shows the CME Group website's header with navigation links: TRADING, CLEARING, REGULATION, DATA, TECHNOLOGY, EDUCATION, and ABOUT. Below the header is a large banner featuring a Bitcoin logo on a blue circuit background. The main content area is titled "CME CF Bitcoin Reference Rate & CME CF Bitcoin Real-Time Index". The text below the title explains that the CME CF Bitcoin Reference Rate (BRR) and CME CF Bitcoin Real-Time Index (BRTI) are standardized rates and spot price indices with independent oversight, accelerating the professionalization of bitcoin trading. It mentions that CME CF Crypto Currencies Indices have been generating BRR and BRTI rates since November 2016, with several bitcoin exchanges and trading platforms providing pricing data, including Bitstamp, Coinbase, itBit, and Kraken. A "View in" dropdown menu is visible on the right, listing options for English, 简体中文, 繁體中文, 日本語, and 한국어. At the bottom, a dark blue bar displays the current values: CME CF Bitcoin Reference Rate at \$3871.44 (last updated 07 Mar 2019 10:01 am CT) and CME CF Bitcoin Real-Time Index at \$3861.50 (last updated 07 Mar 2019 16:38:52 pm CT).

Index	Value	Last Updated
CME CF Bitcoin Reference Rate (BRR)	\$3871.44	07 Mar 2019 10:01 am CT
CME CF Bitcoin Real-Time Index (BRTI)	\$3861.50	07 Mar 2019 16:38:52 pm CT

All four of these exchanges contribute to Bitwise's NAV methodology.



Arbitrage Between The CME Futures Price And The Global Spot Price Is Firmly Established



Global Spot Price Source: Kaiko. March 8, 2019.

CME Futures Price Source: Chicago Mercantile Exchange. March 8, 2019.



The Commission Has Said There Is A “Reasonable Likelihood” That A Surveillance Sharing Agreement With A Significant Derivatives Market Would Assist In Detecting And Deterring An Attempt To Manipulate The Bitcoin Market

“The key standard the Commission is applying here, however, is not that a futures or derivatives market is required for every commodity-trust ETP, but that—when the spot market is unregulated—the requirement of preventing fraudulent and manipulative acts may possibly be satisfied by showing that the ETP listing market has entered into a surveillance-sharing agreement with a regulated market of significant size in derivatives related to the underlying asset. **That is because, where a market of significant size exists with respect to derivatives on the asset underlying a commodity-trust ETP, the Commission believes that there is a reasonable likelihood that a person attempting to manipulate the ETP by manipulating the underlying spot market would also have to trade in the derivatives market in order to succeed, since arbitrage between the derivative and spot markets would tend to counter an attempt to manipulate the spot market alone.** Thus, the Commission believes that there is a reasonable likelihood that a surveillance-sharing agreement with that derivatives market would assist the ETP listing market in detecting and deterring an attempt to manipulate the commodity-trust ETP.” [Emphasis Added]

Source: “Order Setting Aside Action by Delegated Authority and Disapproving a Proposed Rule Change, as Modified by Amendments No. 1 and 2, to List and Trade Shares of the Winklevoss Bitcoin Trust,” Securities and Exchange Commission, July 26, 2018.

Will the Proposed ETF Be the Predominant
Influence on Prices in This Market?



The Bitwise Bitcoin ETF Trust Is Unlikely To Be The Predominant Driver Of Bitcoin Prices

The Commission noted that it wanted to see a market where “it is unlikely that trading in the ETP would be the predominant influence on prices in that market.” It is impossible to predict future inflows to the proposed Trust. To provide some comparable data, however, Bitwise examined total net inflows in the first year of existence for two types of ETFs: Commodity ETFs that were first to market in the U.S. and blockchain ETFs.

TOTAL NET FLOWS OF COMPARABLE ETFS IN THEIR FIRST YEAR ON THE MARKET

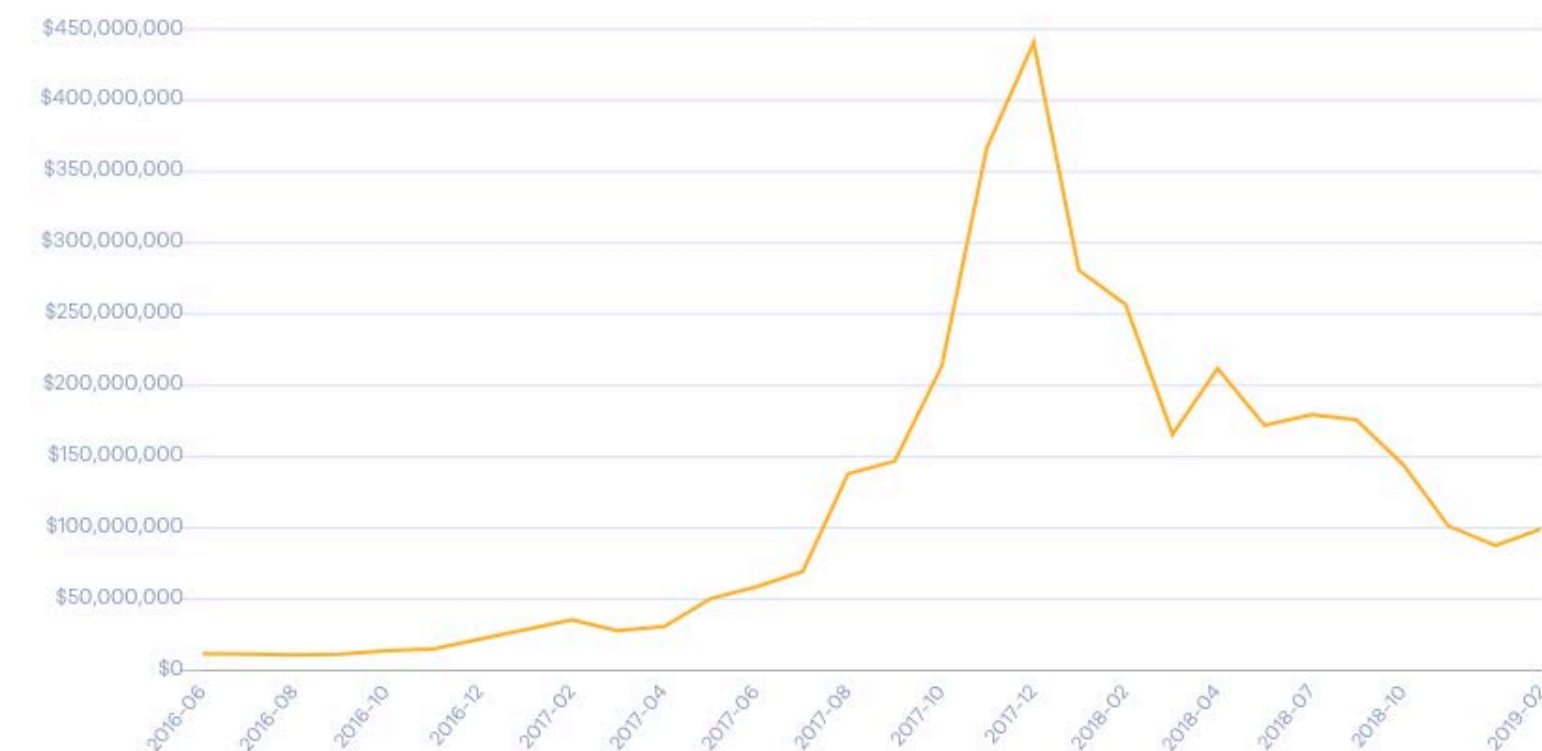
Fund	Ticker	Inception Date	Year 1 Flows (\$USm)	Comparison
SPDR Gold Shares	GLD	11/18/04	3,010	Commodity ETP
iShares Silver Trust	SLV	4/21/06	1,730	Commodity ETP
ETFS Physical Platinum Shares	PPLT	1/8/10	645	Commodity ETP
ETFS Physical Palladium Shares	PALL	1/8/10	603	Commodity ETP
United States Copper Index Fund	CPER	11/15/11	2	Commodity ETP
Amplify Transformational Data Sharing ETF	BLOK	1/16/18	143	Blockchain ETF
Reality Shares Nasdaq NexGen Economy ETF	BLCN	1/17/18	91	Blockchain ETF
First Trust Indxx Innovative Transaction & Process ETF	LEGR	1/24/18	40	Blockchain ETF
Innovation Shares NextGen Protocol ETF	KOIN	1/30/18	8	Blockchain ETF
REX BKCM ETF	BKC	5/16/18	5*	Blockchain ETF
Average			628	

*This ETF was liquidated in January 2019 due to a lack of interest.

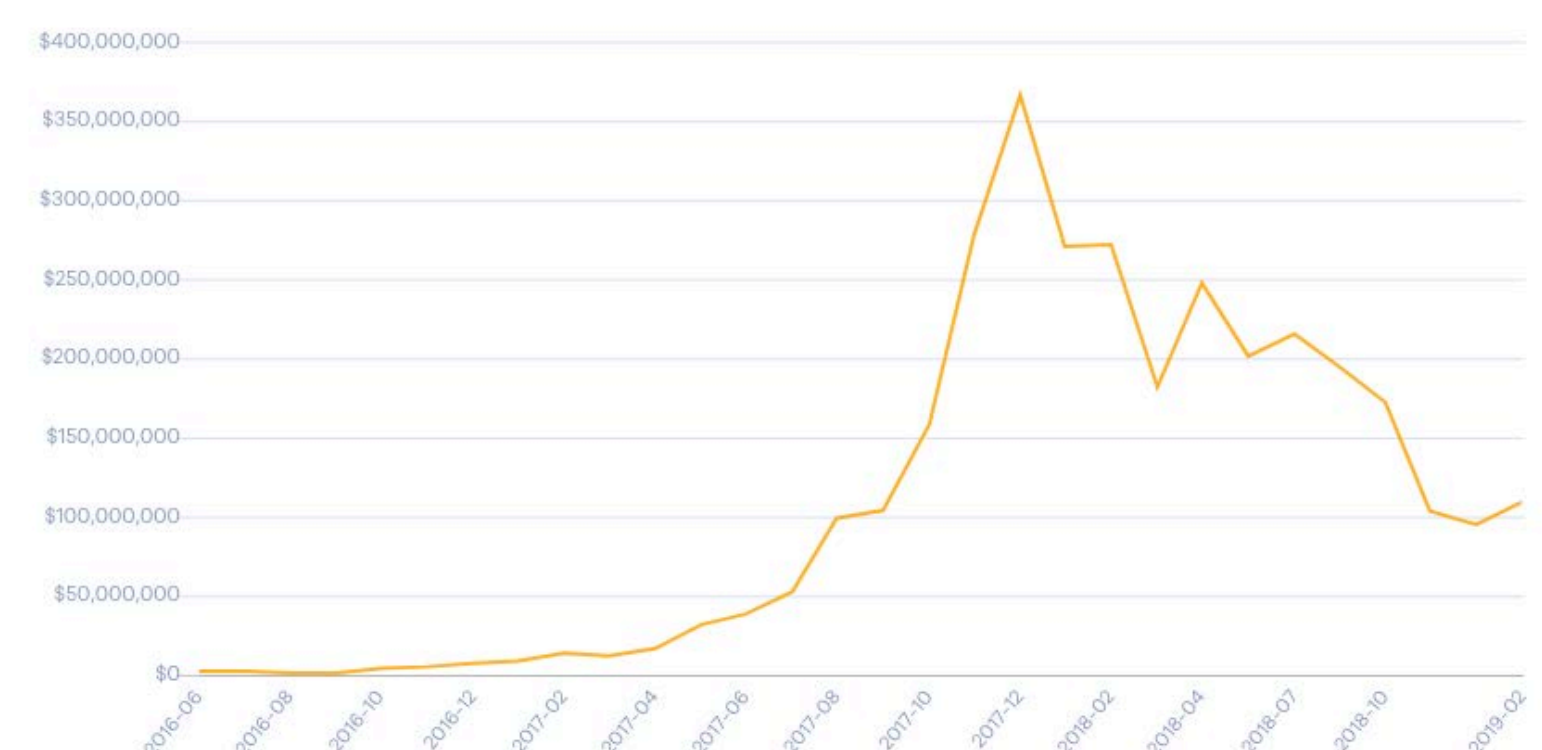
Each CoinShares Bitcoin ETN Attracted Approximately \$50 Million In Assets In Year 1

- Another relevant metric is the CoinShares Bitcoin Tracker One (COINXBT:SS) ETN and CoinShares Tracker Euro (COINXBE:SS) ETN, which listed on Nasdaq Stockholm on May 18, 2015 and October 5, 2015, respectively.
- Both provide exposure to the price movement of bitcoin: One is denominated in dollars and the other in euros.
- Bitcoin Tracker One took approximately 12 months to cross \$50 million in assets, and peaked at just under \$400 million in assets, according to XBT Providers.
- Bitcoin Tracker Euro took approximately 14 months to cross \$50 million in assets, and peaked at just above \$350 million in assets, according to XBT Providers.
- Assets and trading volume have trended down in recent months in line with the market.

**Bitcoin Tracker One (COINXBT:SS)
Assets Under Management (\$USD)**



**Bitcoin Tracker Euro (COINXBE:SS)
Assets Under Management (\$USD)**



Source: [CoinShares.com](https://www.coinshares.com). Data as of March 17, 2019



The Bitcoin Market Is Large Enough To Support All Reasonable Expectations Of Growth For The Trust

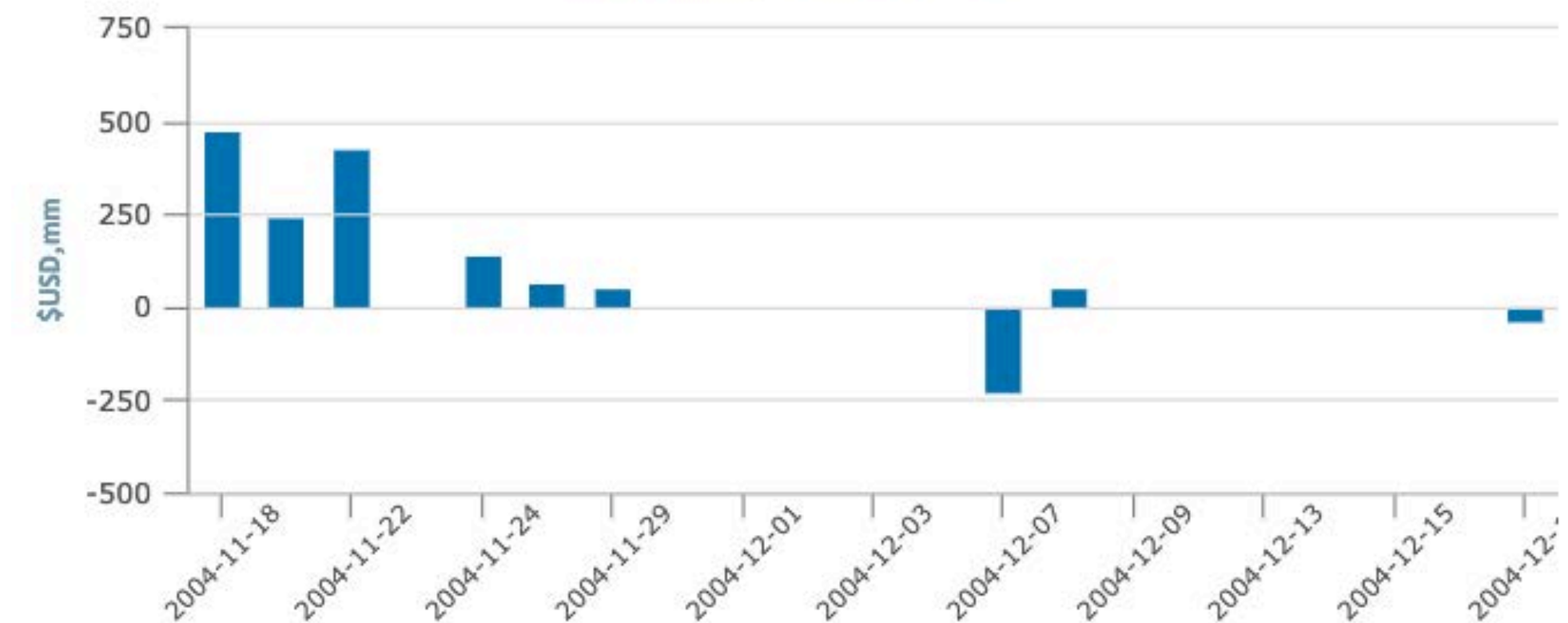
- As a novel ETF, the proposed Bitwise Bitcoin ETF Trust is likely to attract attention and assets.
- History presents a range of year one inflows for comparable products between \$2 million and \$3 billion, with a median result on the lower end of that range.
- Over the course of the year, a spot market that is trading \$273 million per day can easily absorb \$3 billion in total inflows.

What About Extreme Edge Cases Like GLD?

- GLD was the fastest growing new ETF of all time. The fund pulled in \$469 million its first day on the market, and more than \$1 billion over its first three days. This is more than 2X larger than any other ETF, and orders of magnitude larger than the average result.
- A similar result in bitcoin would have a meaningful impact on the market. While the volume would reflect organic demand, it is worth considering if it could temporarily overwhelm the exchange market.
- We think this is an extremely unlikely outcome. The gold market is significantly larger and more established than bitcoin, with an estimated market cap of \$6.7 trillion vs. roughly \$70 billion for bitcoin.*
- Moreover, conditions have changed in the ETF market. At the time of GLD's launch, new ETFs were instantly made available on most brokerage and advisory platforms. Today, those platforms have detailed due diligence and approval processes that smooth out asset growth.



GLD Daily Fund Flows



Source: [ETF.com](https://www.ETF.com). Data shows daily flows from 11/18/04 through 12/17/05.

* Estimate of the value of all existing gold: <https://www.goldeneaglecoin.com/Guide/value-of-all-the-gold-in-the-world> (as of 3/16/19; assumes spot price of \$1,302.13). Bitcoin market capitalization is from Bitwise as of March 16, 2019.



Conclusion

- The SEC laid out its conditions for how a proposed bitcoin ETF could satisfy the requirements of Exchange Act 6(b)(5).
- Those conditions hinged on showing either that the underlying bitcoin market (and the specific proposal) was uniquely resistant to market manipulation or that the listing exchange has a surveillance sharing agreement in place with a regulated market of significant size.
- Either of those conditions could be sufficient to allow approval; we have attempted to demonstrate that this ETF application meets both.
- We have demonstrated that the bitcoin market is an extremely well-arbitrated market, with a proven ability to ignore outlier prices, and that both the fundamental market structure and our specific NAV calculation methodology provide unique protections against potential efforts to manipulate that market.
- Critically, we have also shown that the CME bitcoin futures market is a regulated market of significant size, nearly equal in size to the largest single spot bitcoin exchange.
- All available data from similar ETF launches suggests it is highly unlikely that the proposed Trust will become the predominant driver of prices in the market.



How Does Bitwise Satisfy Concerns Around Custody?

KEY FINDINGS

Custody is a solved problem in crypto, with multiple regulated, insured, third-party custodians present in the market.

The Bitwise Bitcoin ETF Trust Proposes Using a Regulated, Insured, Third-Party Custodian To Store its Bitcoin.



Table of Contents: Custody

- 01 — **What Makes Custodying Bitcoin Unique?**
- 02 — **How Does Custody Work in Crypto?**
- 03 — **Why Are There So Many Examples of Crypto Exchanges Being Hacked?**
- 04 — **Are There Regulated, Insured, Third-Party Custodians for Bitcoin?**
- 05 — **How Do You Audit and Verify Custodied Assets?**
- 06 — **How Are Similar Assets Custodied in Existing Exchange-Traded Funds?**

What Makes Custodying Bitcoin Unique?



What makes custodying bitcoin unique?

Bitcoin is a **digital instrument** where **possession is ownership.**

The digital nature of bitcoin creates unique challenges, exposing holders to cyber-related threats.

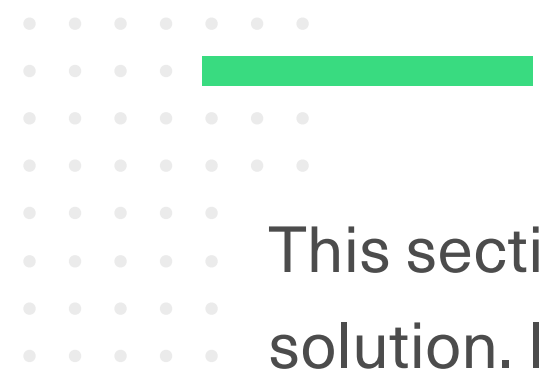
Regulated custodians solve for these challenges by transforming bitcoin storage from a digital problem to a physical one.

There are widely established procedures for custodying precious goods where possession is ownership.

Gold is the best-known example in ETFs, and directly analogous to bitcoin custody.



How Does Custody Work In Crypto?



This section of the presentation aims to provide only a general overview of the most basic steps involved in setting up a crypto custody solution. It is not meant as an exhaustive examination of that process. There are significant operational complexities and other real-world challenges that complicate this process, which are beyond the scope of this document. We do not suggest investors attempt this process on their own.

The goal is only to demystify the general concept.

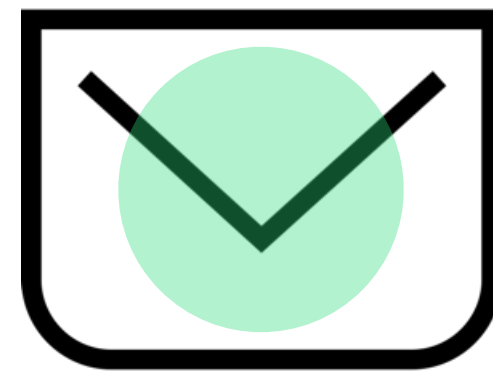
Additionally, this section does not intend to represent the approach the Bitwise Bitcoin ETF Trust takes to custodying client assets. As an institutionally oriented asset manager, Bitwise intends to custody assets with a regulated, insured, third-party custodian. Their procedures go well beyond those outlined here. We subject these custodians to extraordinary levels of due diligence and continually monitor the landscape for evolving best practice to ensure we stay on the leading edge of the crypto custody process.



How does custody work in crypto?



**Private
Key**



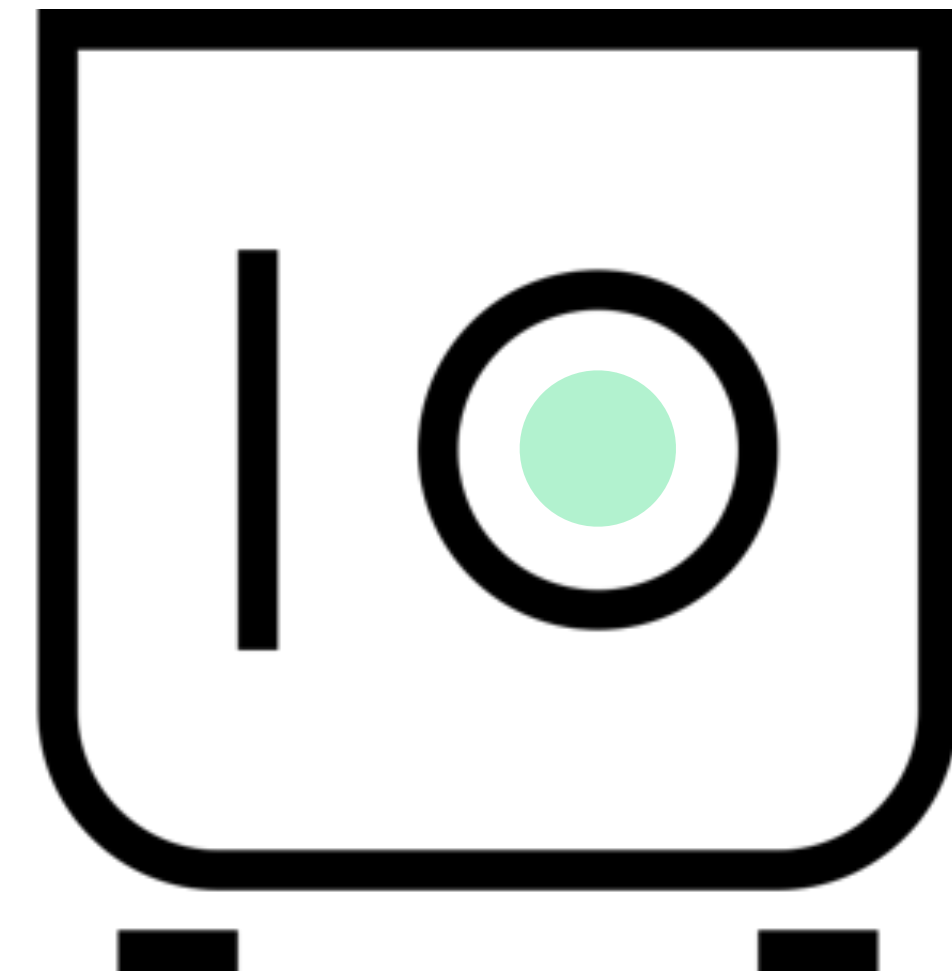
**Public
Key**

- Bitcoin is a cryptographically secured digital asset. It uses “public key cryptography” to keep track of who owns what.
- Public key cryptography revolves around the creation of two related “keys”: a public key and a private key.
- These “keys” are digital codes: strings of letters and numbers.
- One way to think of the public key is as a P.O. Box address. Everyone can see it, and anyone can send bitcoin to it.
- The private key is like the key to that P.O. Box. Only the owner has the “private key” and can open the P.O. Box and access what’s inside.
- If you hold the private key, you own the bitcoin at the corresponding public key address.
- Custodying bitcoin, therefore, means safeguarding the private key.



How does custody work in crypto?

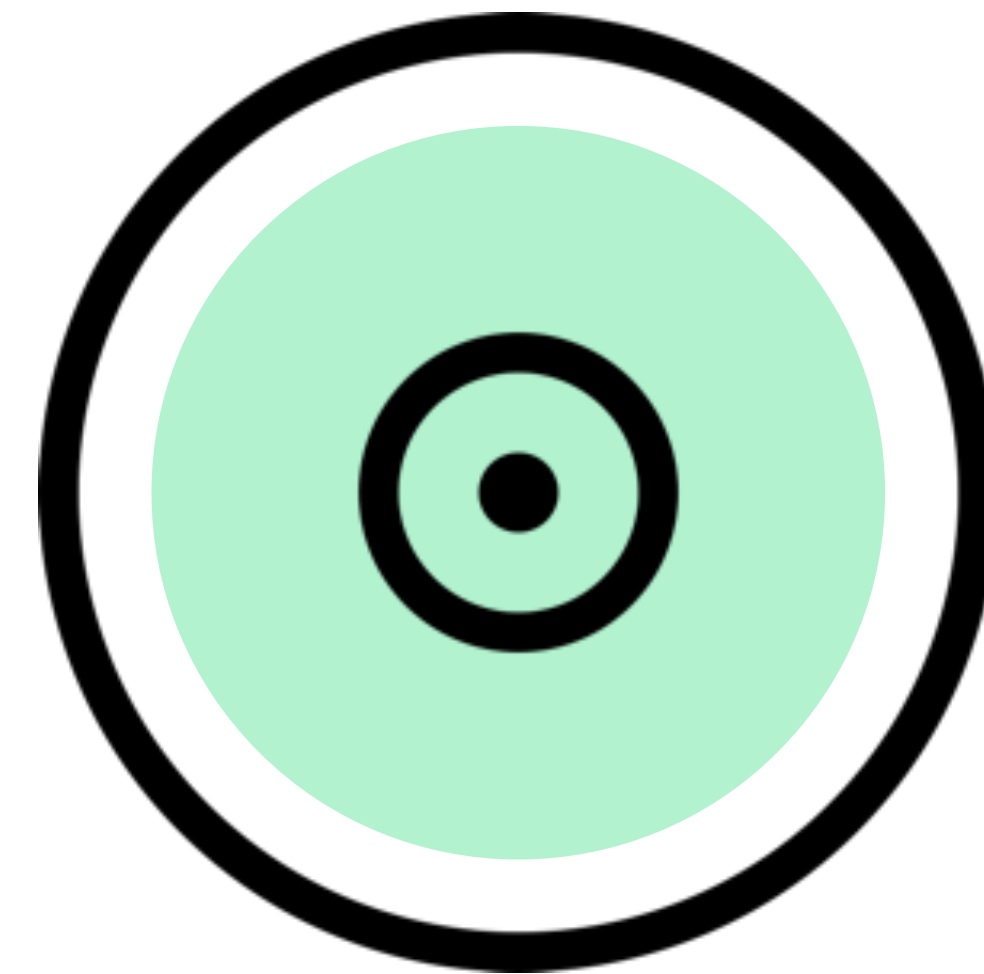
- The digital nature of bitcoin is what makes custody a challenge.
- It is generally easier to deliver strong security guarantees in the physical world than the digital world.
- The primary challenge in safely custodying bitcoin, therefore, is to transform custody from a “digital” challenge to a “physical” one.
- You do this by creating private keys on a device that has never been connected to the internet and storing them offline. The crypto community calls this “cold storage.”
- There is a well-established process for handling the cold storage of private keys. It has been tested over many years, pre-dates cryptoassets, and is critical to the functioning of large parts of modern society, including the internet, the government’s secure communications processes, point-of-sale terminals, and more.





Step 1: Download a clean operating system

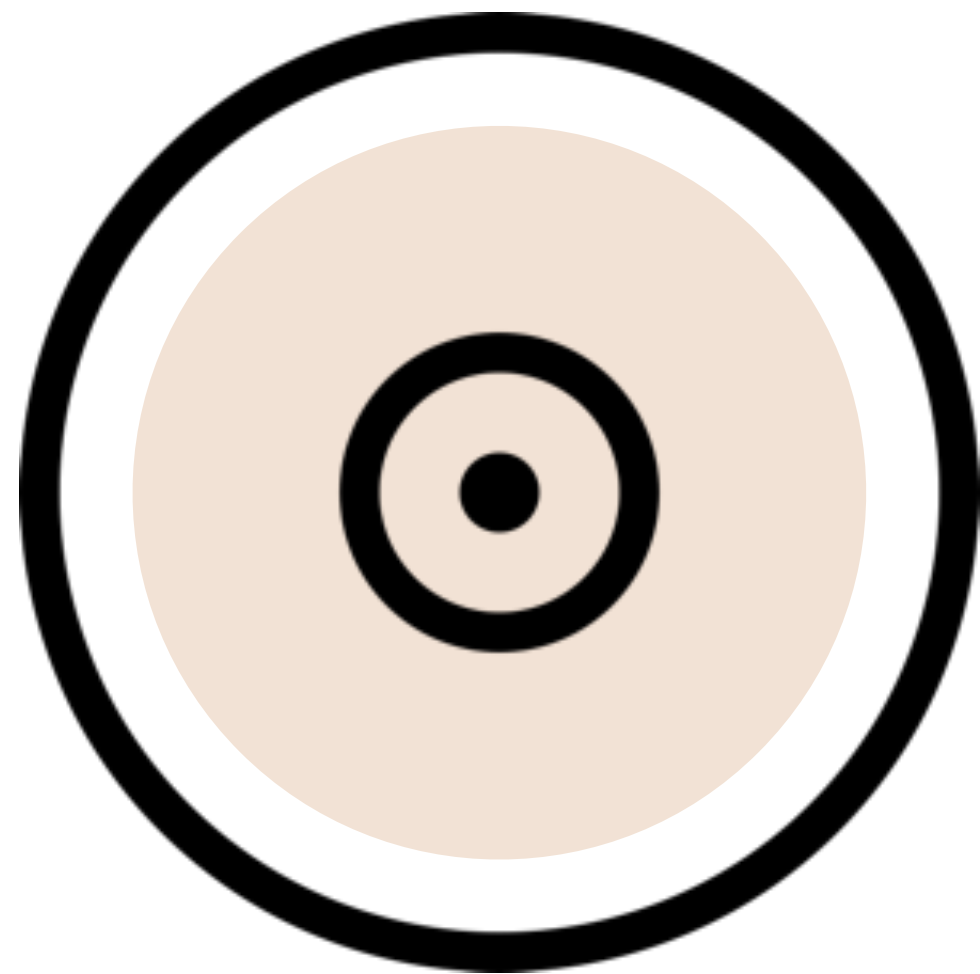
- The simplified version of the process begins with downloading and burning a clean operating system (OS) onto a new CD.
- You want to use an open-source operating system (typically Linux), downloaded from a canonical source that has broad support in the software community.
- Even though you use a canonical source for your download, best practice suggests you wait at least 24 hours and monitor social media channels to ensure the download source has not been hacked.



Operating System Disc



Step 2: Download a clean bitcoin “wallet”



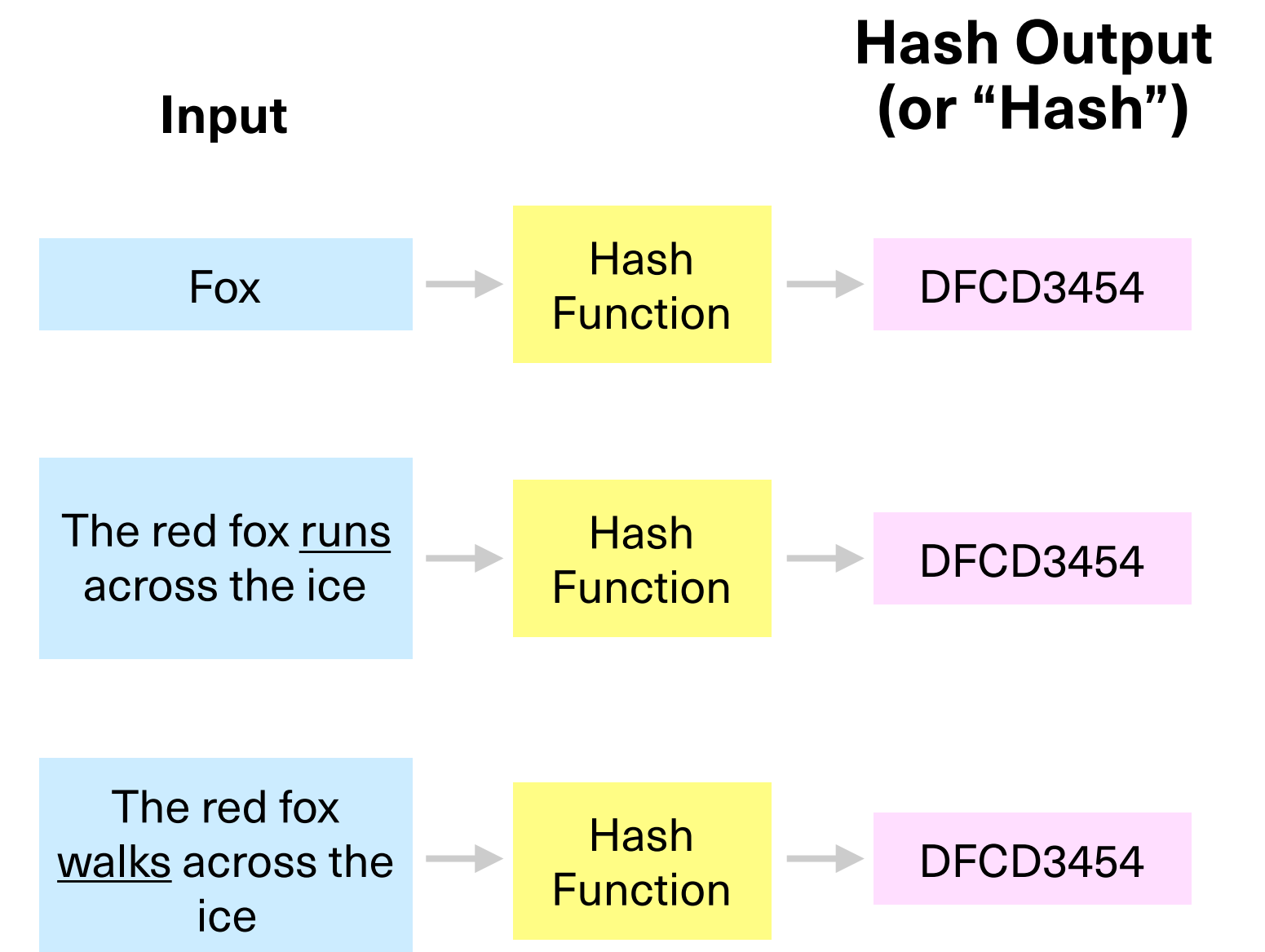
Bitcoin Wallet Disc

- You now need to download and burn onto a separate new CD a special type of software called a “bitcoin wallet.”
- A bitcoin wallet is a software program that can generate unique pairs of public and private keys, allowing you to send, receive, and store bitcoin.
- You will want to download this software program from one of the canonical bitcoin wallet providers.
- Even though you use a canonical source for your download, best practice suggests you wait at least 24 hours and monitor social media channels to ensure the download source has not been hacked.



Step 3A: Conduct a data-driven check to prove all downloaded software is clean

- You then use a data-driven check to guarantee that both the new operating system and the bitcoin wallet are clean.
- This data-driven check relies on a cryptographic function called a “hashing function.” It works like a one-way mathematical meat-grinder. Input any series of letters and numbers and it will output a specific, unique and fixed-length digital code.
- Changing the input — even minutely — leads to a completely different output.
- The best-known hashing algorithm is the “SHA-256” algorithm. To show how it works effect, consider the different outputs you get when you “hash” two similar words — “Crypto” and “crypto.”
Crypto: df12b8f89b61274c73291296ec828eab61202f5863680ec6003682821d77fd31
crypto: da2f073e06f78938166f247273729dfe465bf7e46105c13ce7cc651047bf0ca4
- Importantly, you cannot reverse engineer a hash. Given a particular output, you cannot recover the input.



Original illustration by David Göthberg, Sweden.
Released by David as public domain.



Step 3B: Complete your data-driven check to prove the software is clean

- The SHA-256 hashing algorithm provides a powerful way to prove that your new, downloaded copy of the Linux OS and of the bitcoin wallet software are clean.
- Software providers maintain and publish the official “SHA-256 hash” of their software for exactly this purpose. As standard practice, they run the entire codebase of the canonical, clean version of their software through the SHA-256 hashing algorithm when it is created, and publish the result online.
- To prove that your downloaded copy is clean, you simply “hash” your downloaded version and compare the output with the official SHA-256 hash found online.
- If they match, you know that every letter of the codebase you downloaded is identical with the canonical program ... aka that it is “clean.”





Step 4: Purchase a new laptop

- The next step is the purchase of a new laptop.
- Best practice involves buying a bulk-standard, commoditized laptop from a randomized retail store.
- You might wonder: Why not a specialized laptop? The answer is that a specialized laptop would be a target for tampering.
- By contrast, Hewlett-Packard sells roughly 55 million computers per year. It would be not be feasible to tamper with a meaningful fraction of them, so using a bulk standard laptop minimizes tampering threats.

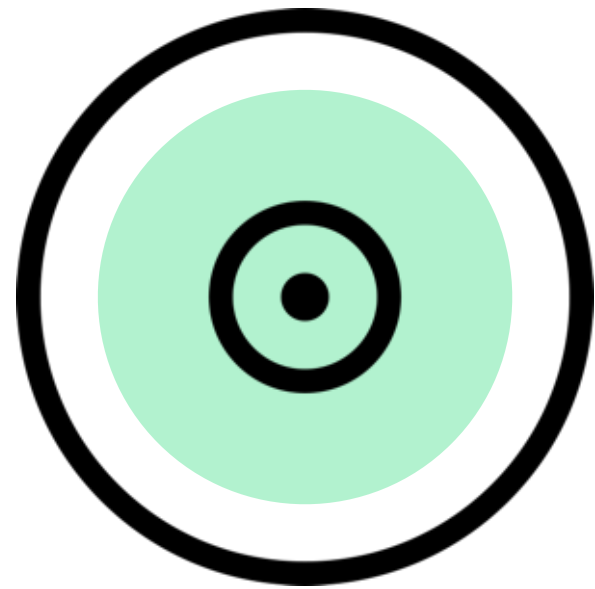
New Laptop



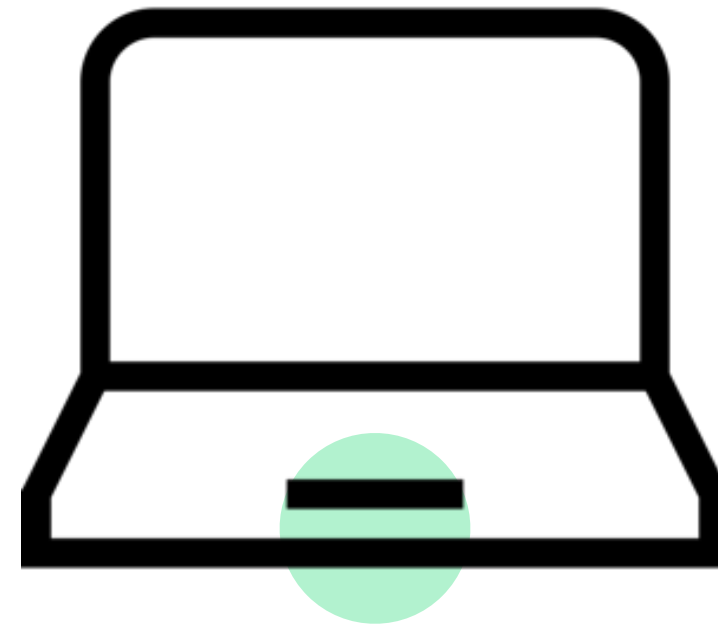


Step 5: Create your “cold storage” computer

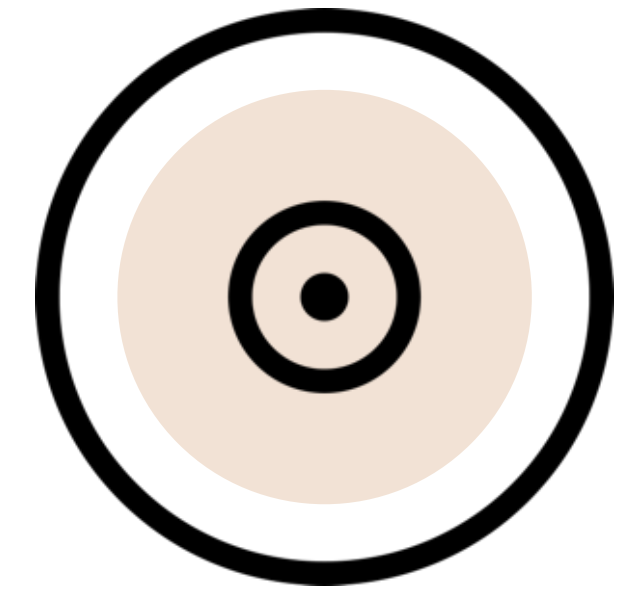
Operating System Disc



New Laptop



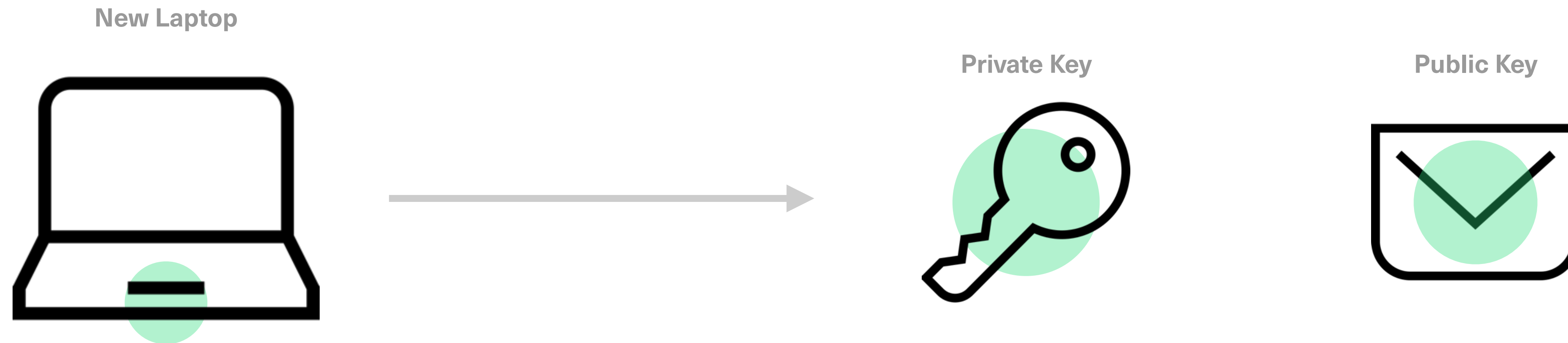
Bitcoin Wallet Disc



- You'll use the new laptop you purchased as your “cold storage” computer. For extra precaution, you remove any communication and long-term data storage — wifi, modems, hard drives, speakers, etc. The goal is to make it impossible to connect this computer to the internet and to remove any potential cyberattack vector.
- You hard boot the computer from your clean copy of Linux and install the clean bitcoin wallet software.
- You now have an “offline computer” that has never been (and can never be) connected to the internet. It is ready to hold bitcoin in cold storage.



Step 6: Use your cold storage computer to generate public and private keys

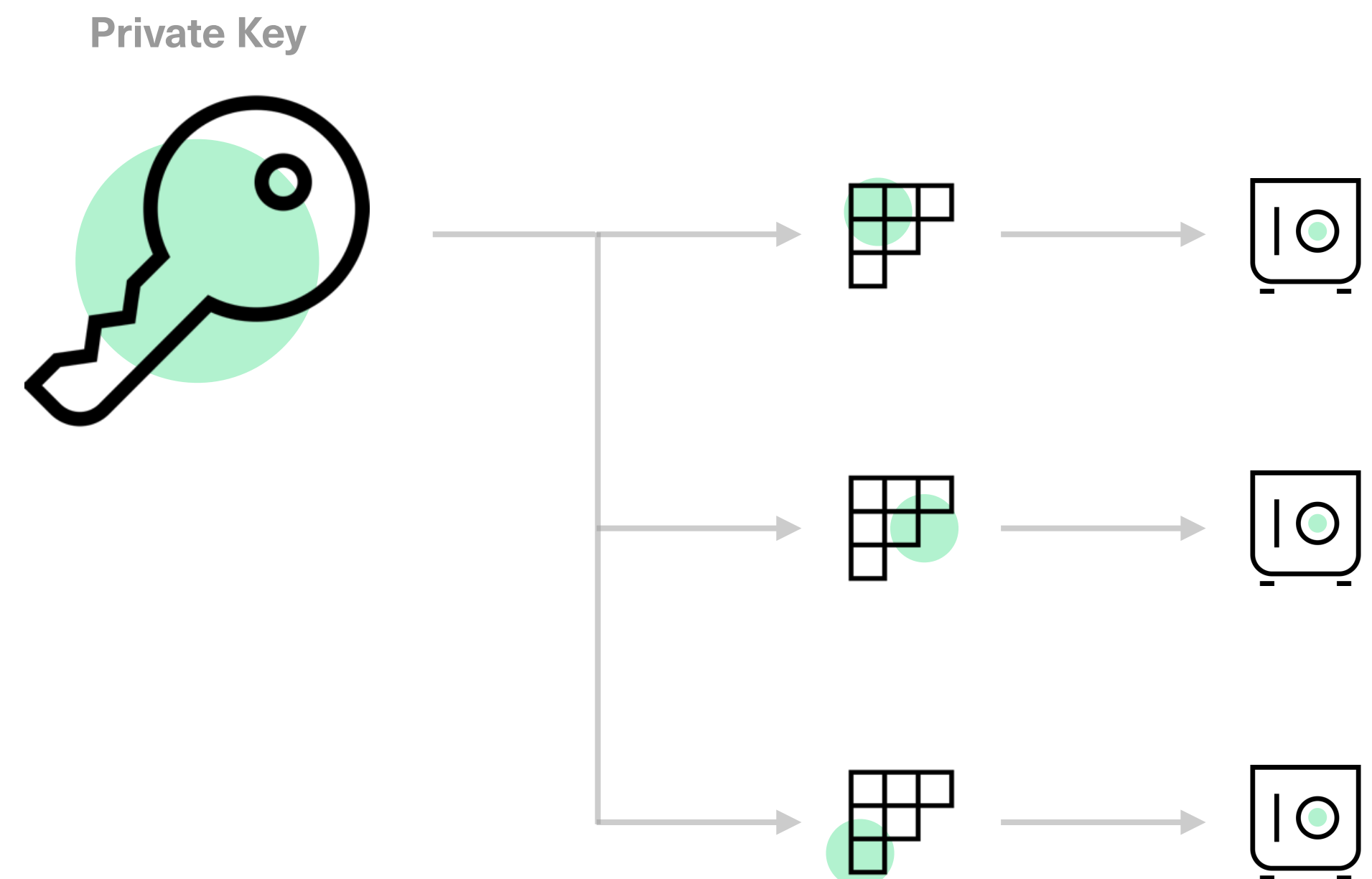


- You now use the bitcoin wallet software on your offline computer to create a new public and private key pair.
- You use the public key as the address for people to send you bitcoin.
- You use the private key only when you want to send (or sell) bitcoin, or to audit the account (as explained later).



Step 7: Shard the private key to protect against rogue activity and create redundancy

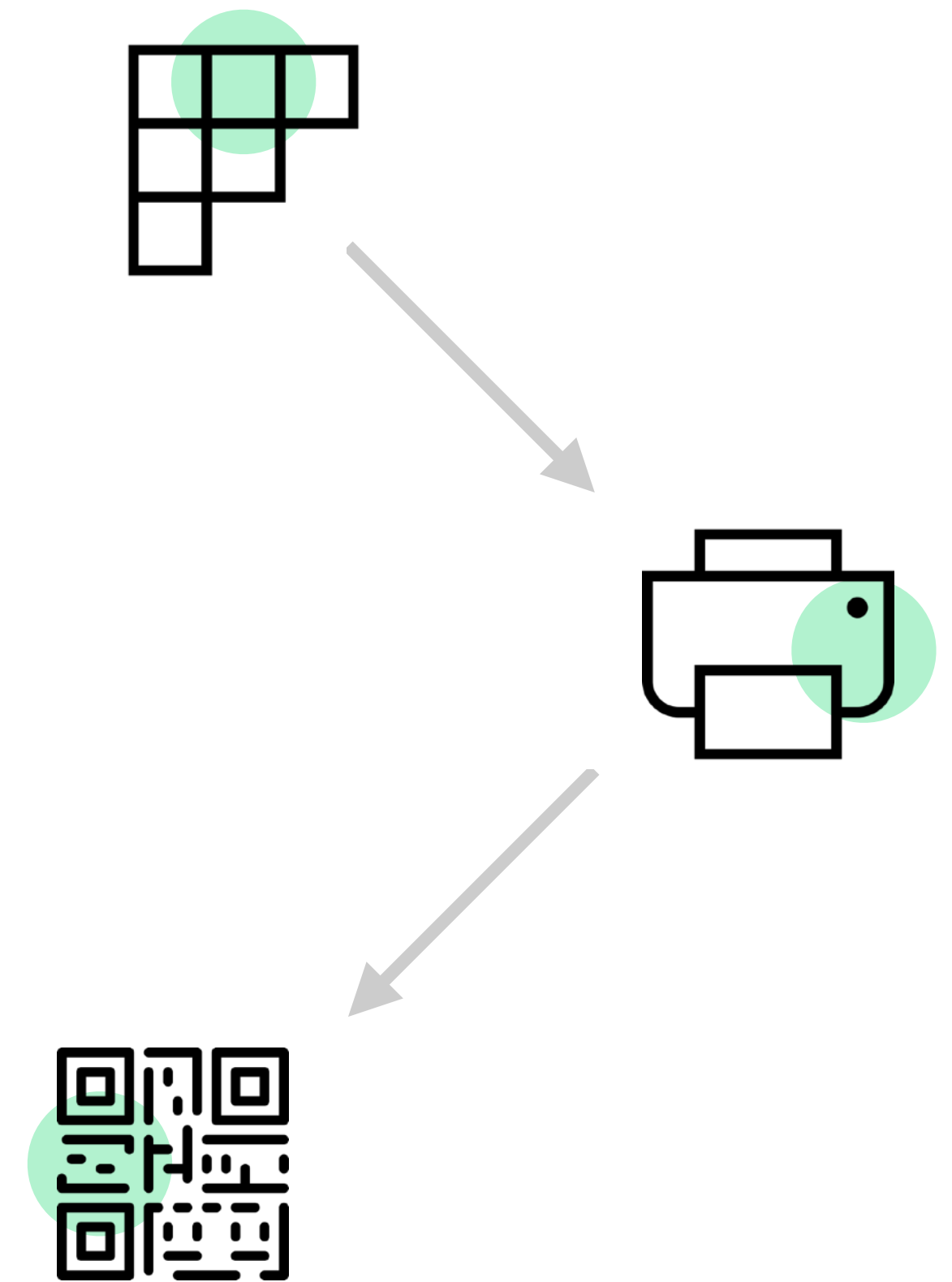
- For extra security, you shard (or subdivide) the private key into multiple pieces.
- You store those pieces in different bank vaults and grant access to the vaults to different individuals. Some even store keys on different continents for extra redundancy.
- To use the key, you require some combination of the sharded pieces to come together — say, 3 of 10 shards.
- This creates both security and redundancy. It prevents a single individual from having access to the digital assets, and greatly reduces the risk of loss from natural disasters, terrorism, or physical theft, since key shards are stored in different locations.





What does a private key shard look like?

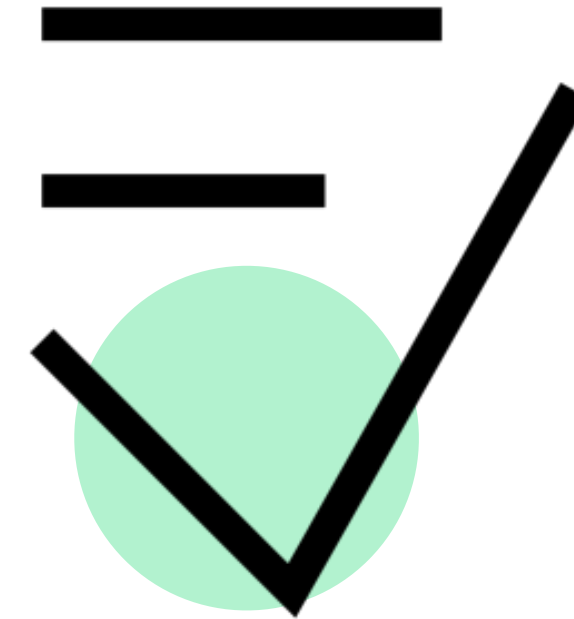
- Private keys (and their shards) are strings of letters and numbers.
- You can store private key shards on various mediums such as USB drives, SD cards, or physical paper. One such method is to print a physical manifestation of each key shard, often as a QR code.
- To re-assemble a key from its shards, you can read the QR codes from an offline computer.
- Once the private key is reassembled, you can use it to “sign” a transaction to send (or sell) bitcoin.
- You can then export your transaction from the offline computer and broadcast it to the Bitcoin network.
- The signed transaction does not reveal the private key in any way.





You must monitor/audit the entire process in a key signing ceremony

- The process for generating and storing public/private key pairs is highly sensitive.
- To ensure it is done properly, custodians generate keys in a highly documented and audited process called a “key signing ceremony.”
- A key signing ceremony involves many people - technicians, lawyers, auditors, etc. - who ensure and document that the proper process was followed.
- Key signing ceremonies take place in highly secured locations that are carefully scrutinized for any security breach, physical or cyber.
- The technical processes typically take place inside a Faraday cage to block electromagnetic interference.
- The entire process is video-taped, audited, and often takes multiple hours. The process is typically conducted on a quarterly/semi-annual/annual basis.



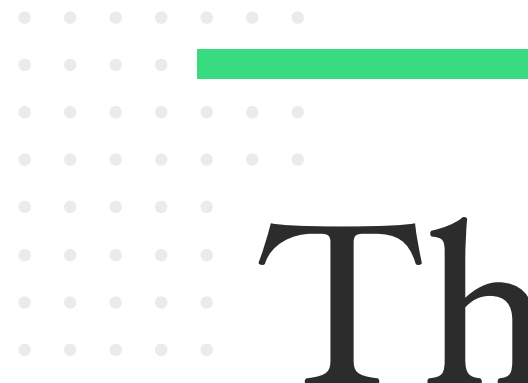
This is a well-established process that supports much more than crypto

- Importantly, public/private key cryptography is not just something that exists for cryptoassets.
- It actually underpins large swaths of the world's technical, financial, and information architecture.
- Not surprisingly, therefore, the processes for safely generating and custodying private keys are well-established and stress-tested.
- The internet domain name system administered by ICANN, for instance, which controls the core of the internet, is based on public/private key cryptography.
- ICANN has quarterly “key signing ceremonies” to generate the root private keys. It also has highly detailed processes for custodying those keys.
- You can watch online videos of these ceremonies if you want.



Source: The Guardian, February 28, 2014.

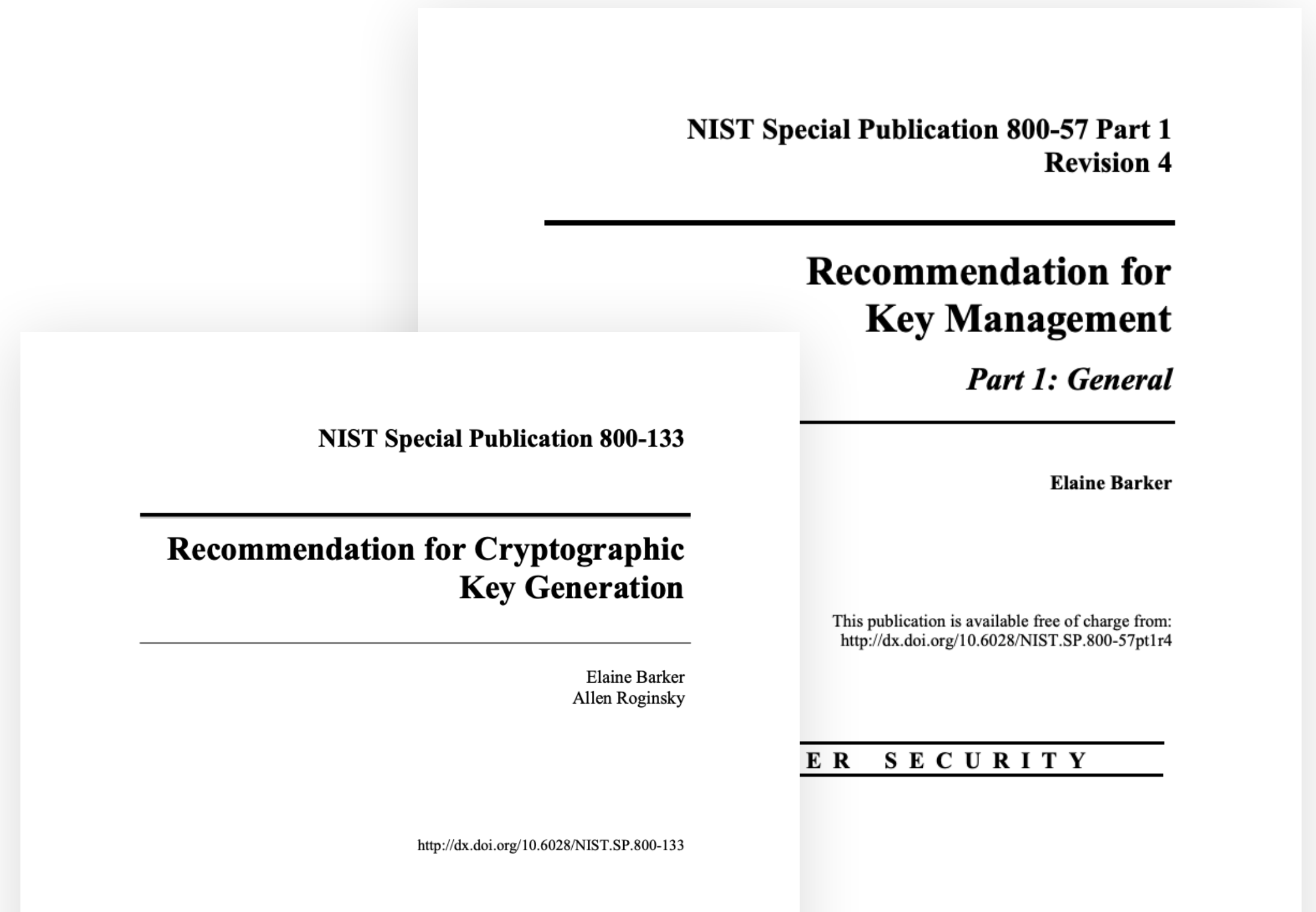
A screenshot of a news article on The Guardian website. The article is titled "Meet the seven people who hold the keys to worldwide internet security" and is categorized under "Internet". The author is James Ball (@jamesrbuk). The article text begins with "It sounds like the stuff of science fiction: seven keys, held by individuals from all over the world, that together control security at the core of the web. The reality is rather closer to The Office than The Matrix". Below the text is a photograph of seven golden keys arranged in a star-like pattern. The website header includes navigation links for News, Opinion, Sport, Culture, Lifestyle, and More, along with a search bar and a "Support The Guardian" button. A sidebar on the right promotes "Support The Guardian's model for open, independent journalism" and lists "most viewed in US" articles.

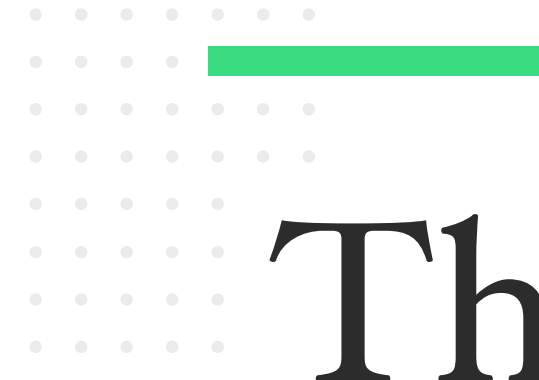


This is a well-established process that supports much more than crypto

- Public/private key cryptography is also widely used by the U.S. government, including (but not limited to) by the intelligence community.
- The U.S. Department of Commerce's National Institute of Standards and Technology (NIST) has special publications outlining the appropriate processes for the safe creation, storage and custody of public/private key pairs, including generalized outlines of how to run a secure key signing ceremony.
- You can review these documents online. The most relevant documents are numbers 800-133 and 800-57 (shown to the right).
- The processes recommended by NIST mirror (or understate) the processes used by modern crypto custodians.

Source of images: Computer Security Resource Center, National Institute of Standards and Technology, U.S. Department of Commerce.





This is a well-established process that supports much more than crypto

Source: Visa.

- Point-of-sale commercial transactions powered by entities like Visa are also underpinned by public/private key cryptography.
- While these commercial entities do not provide the same level of disclosure of their internal processes as the U.S. government, you can find generic overviews of their data encryption and key management methods online.
- These processes are identical to the processes used by the government, ICANN and modern crypto custodians.



VISA BEST PRACTICES

5 October 2009

Visa Best Practices for Data Field Encryption Version 1.0

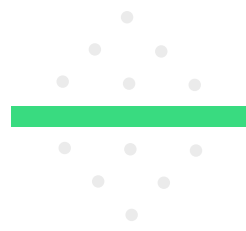
Point of Sale to Acquirer Domain

Security Goals

1. Limit cleartext availability of cardholder data and sensitive authentication data to the point of encryption and the point of decryption.
2. Use robust key management solutions consistent with international and/or regional standards.
3. Use key-lengths and cryptographic algorithms consistent with international and/or regional standards.
4. Protect devices used to perform cryptographic operations against physical/logical compromises.
5. For business processes, use an alternate account or transaction identifier that requires the primary account number to be utilized after authorization, such as processing of recurring payments, customer loyalty programs or fraud management.

Environment

- *Visa Best Practices for Data Field Encryption* pertain to systems used to acquire payment transactions in physical locations such as:



Summary

1. There is nothing new or magical about public/private cryptography or the processes required to safely custody private keys.
2. In fact, public/private key cryptography today supports huge swaths of the modern world, including most of the internet, commerce, and the government.
3. The processes used to safely create and custody private keys are well-established, stress-tested, and have been executed successfully countless times with very high stakes.

Why Are There So Many Examples Of Crypto Exchanges Being Hacked?



Exchange hacks get headlines but are not relevant to the question of institutional custody

- According to Autonomous Research , there have been 56 documented hacks of cryptocurrency exchanges, initial coin offerings or other digital currency platforms since 2011. This may understate things. (See table to the right.)
- At least \$1.63 billion in customer assets has been stolen; most of this has not been recovered.
- While unfortunate, these hacks are not relevant to the question of bitcoin custody at an institutional level.
- None of the assets stolen were kept in “cold storage”; in almost all instances, funds were stolen from exchange “hot wallets” connected to the internet.
- The Bitwise Bitcoin ETF Trust will not interact with exchanges. All creations and redemptions will be done in-kind, and all assets will be held in cold storage at a regulated, insured, third-party custodian.

Swiped

Some of the biggest hacks on cryptocurrency exchanges and platforms

EXCHANGE/ PLATFORM	ORIGIN	DATE OF HACK	VALUE OF COIN LOSS, IN MILLIONS
Coincheck	Japan	Jan. 2018	\$535
Mt. Gox	Japan	Jan. 2014	\$450
BitGrail	Italy	Feb. 2018	\$170
Bitfinex	Hong Kong	Aug. 2016	\$77
NiceHash	Slovenia	Dec. 2017	\$70
DAO	Germany	April 2016	\$55
Coinrail	South Korea	June 2018	\$40
Youbit	South Korea	April 2017	\$35
Parity	U.K.	July 2017	\$32
Bithumb	South Korea	June 2018	\$32
Bancor	Israel	July 2018	\$24

Note: DAO was created by German-based Slock.it.

Sources: Autonomous Research, staff reports

Source: Wall Street Journal, “Cryptocurrency Exchanges Are Being Hacked Because It’s Easy,” July 16, 2018.

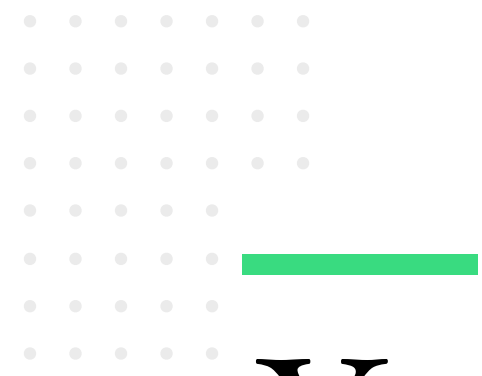
What about QuadrigaCX?

- In one recent case, the exact opposite allegedly occurred: The CEO of the Canadian crypto exchange, QuadrigaCX, is said to have died without disclosing the private keys needed to access the exchange's cold storage wallets.
- If true, the \$136 million held in those wallets will be lost forever.
- This kind of loss is not possible with modern, regulated, third-party custodians. There are simple processes in place for backup and redundancy (as explained earlier in the section focused on sharded keys).
- It is surprising, to say the least, that QuadrigaCX did not have these processes in place. It's so surprising that some believe the CEO's death was staged.
- Regardless, the case is not relevant to the proposed Bitwise Bitcoin ETF Trust. It does, however, accidentally showcase the power of cold storage custody.

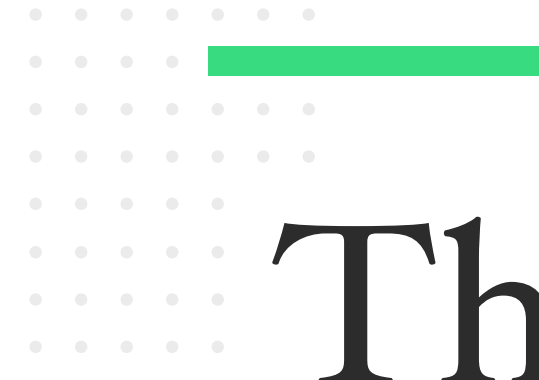
The screenshot shows the top of the Wall Street Journal website. The masthead includes the title 'THE WALL STREET JOURNAL', the date 'February 25, 2019', and navigation links for 'U.S. Edition', 'Print Edition', and 'Video'. A search bar is visible on the right. Below the masthead is a navigation menu with categories like 'Home', 'World', 'U.S.', 'Politics', 'Economy', 'Business', 'Tech', 'Markets', 'Opinion', 'Life & Arts', 'Real Estate', and 'WSJ. Magazine'. A row of featured articles is displayed, including 'MARKETS: Resurgence in Cyclical Stocks Pushes Dow Industrials Toward ...', 'INTERACTIVES: Fashion on the Oscars Red Carpet', and 'MARKETS: Kraft Heinz Was a Classic Bet for Warren Buffet. Then It Soured.'. Below this is a large advertisement for 'Schwab's Exclusive Gain/Loss Analyzer' showing a 79.4% gain/loss ratio. The main article headline is 'A Crypto-Mystery: Is \$136 Million Stuck or Missing?' with a sub-headline: 'Customer holdings are trapped in an electronic vault after founder's reported death, but researchers aren't so sure'.

Source: The Wall Street Journal, February 25, 2018

Are There Regulated, Insured, Third-Party
Custodians For Bitcoin?



Yes. The Bitwise Bitcoin ETF Trust intends to use a regulated, insured, third-party custodian to custody its assets. This has been the gold standard for investment products for decades; we believe it should be the gold standard in crypto as well.



The crypto custody market has evolved rapidly in recent years

There are now a large number of regulated, insured, third-party crypto custodians operating in the U.S.

Name	2017		2018		2019 (Expected)		Regulatory Structure
	Regulated	Insured*	Regulated	Insured*	Regulated	Insured*	
Kingdom Trust	X		X	X	X	X	South Dakota Trust Company
Gemini	X		X	X	X	X	New York Limited Purpose Trust Company
itBit	X		X		X	(X)	New York Limited Purpose Trust Company
Coinbase Custody			X	X	X	X	New York Limited Purpose Trust Company
BitGo			X		X	X	South Dakota Trust Company
Fidelity Digital Assets					(X)	X	Pursuing New York Limited Purpose Trust Company
Xapo					(X)		Pursuing New York Limited Purpose Trust Company
Anchorage					(X)	(X)	Pursuing multiple options
DACC					(X)	(X)	Pursuing multiple options

* This overview is based on Bitwise's analysis of the existing landscape and discussions with each institution, as well as public disclosures from each custody company. "Insured" means that the Custodian has disclosed some amount of insurance against theft, loss, fraud, or natural disaster causing a loss of the digital assets held in custody. Custodians (not just in crypto but in all asset classes) typically do not insure the full amount of assets held in custody, but maintain insurance ratios that are commensurate with the level of risk.

Insurance has also evolved rapidly, and is now commonplace for crypto custodians

- Few crypto custodians offered meaningful insurance as little as 12 months ago. Today, it is commonplace.
- BitGo, Coinbase Custody, Fidelity, Gemini, Kingdom Trust all have insurance in place.
- Lloyd's of London, AIG, Allianz, Chubb, and XL Group are among more than a dozen providers currently underwriting crypto insurance.
- Costs are falling rapidly and policies are being standardized.
- The evolution of this market suggests that insurance companies are gaining increasing comfort in evaluating and quantifying the risks in crypto custody.
- Custodians (not just in crypto but in all asset classes) typically do not insure the full amount of assets held in custody, but maintain insurance ratios that are commensurate with the level of risk.



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Cryptocurrencies

Crypto Startup Offers Insurance Against Quadriga Wallet Dilemma

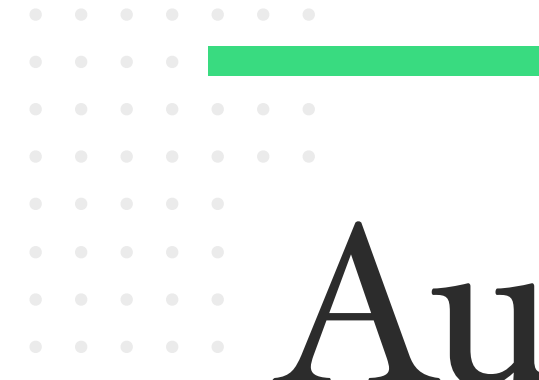
By [Olga Kharif](#)
February 19, 2019, 6:00 AM MST

- ▶ BitGo's policy covers losses of up to \$100 Million from hacks
- ▶ Other custodians offer insurance on web-linked accounts



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How Do You Audit And Verify Custodied Assets?

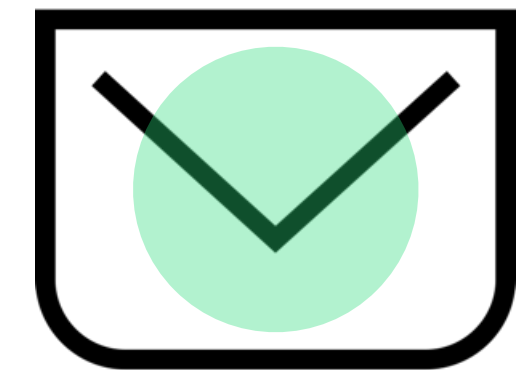


Audit is simpler and more specific in crypto than most other assets

- The nature of public/private key cryptography makes audit very simple for crypto.
- Anyone can see the amount of bitcoin held at a particular public key address. It is “public.”
- The challenge, then, is to verify that the custodian holds the private key that controls a given public key address.
- To test this, an auditor can ask the custodian to sign at least one encoded message using the private key.
- If the auditor can unlock the message using the public key, it proves that the custodian is in possession of the private key.
- The process is well-understood by established auditors. Deloitte, KPMG, BDO USA, and Cohen & Co. are all currently auditing private crypto funds.



**Private
Key**



**Public
Key**



How do you prove exclusive ownership of a private key?

- The biggest challenge in the audit process is to prove that the custodian has *exclusive* ownership of a private key. This process is handled in two ways.
- First, through provenance: From the thoroughly audited and auditable key signing ceremony to the present moment, there are established processes designed to ensure exclusive control of a private key.
- Second, through “cycling”: Custodians can periodically move assets to a new public/private key pair, re-setting custody of the private key. This provides an extra level of protection by reducing the length of the provenance chain.
- These processes are the same ones used to ensure exclusive key ownership in other settings. ICANN, for instance, cycles key ownership/generation on a quarterly basis.
- This is a well-established problem with well-established solutions.

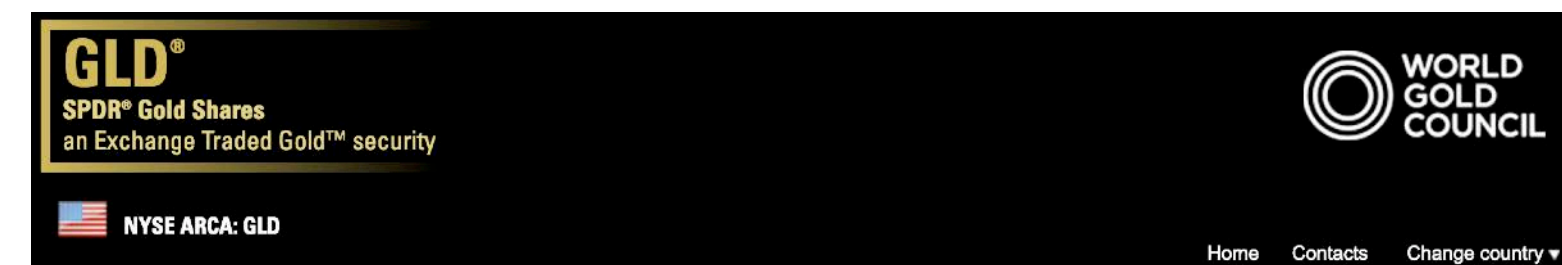


How Are Assets Similar To Bitcoin Custodied In Exchange-Traded Funds?



Custody for precious metal ETFs is remarkably similar to bitcoin

- Following the transformation of bitcoin storage from a digital to a physical problem, the custody challenge is remarkably similar to that of precious metals like gold.
- Assets—in the former case gold, in the crypto case private key shards (stored, for instance, as QR code printouts)—must be safely custodied in a physical location.
- Of note, the extra security and redundancy offered by sharded private keys mitigates against certain risks that are disclosed in precious metal offering documents: i.e., the risk that gold stored in a single vault can be lost, damaged, stolen, or destroyed.
- The custody processes and risk disclosures for the proposed Bitwise Bitcoin ETF Trust will share many similarities with existing precious metal ETFs, with both crypto-specific improvements and considerations.



Gold custody FAQs

Following are responses to frequently asked questions concerning the custody of the gold transferred to the Trust. For further information about the custody of the Trust's gold, including information about the duties and obligations of the Custodian of the Trust's gold and certain risks associated with the custody of the Trust's gold, please refer to the Trust's most recent Annual Report on Form 10-K and most recent Prospectus filed with the Securities and Exchange Commission. For your convenience, the Trust's website (www.spdrgoldshares.com) provides links to the Trust's most recent Annual Report and Prospectus.

15. **Who is the custodian of the Trust's gold?**
16. **Where is the Trust's gold physically held?**
17. **How is gold transferred to or withdrawn from the Trust?**
18. **Who are the Trust's Authorized Participants and what is their function?**
19. **What is an unallocated account?**
20. **What is an allocated account?**
21. **When is gold not held in the Trust's allocated account?**
22. **Is the gold insured?**
23. **What standards must be met by the gold transferred to the Trust?**
24. **Is the Trust's gold ever traded, leased or loaned?**
25. **When does the Custodian employ subcustodians for the holding of the Trust's gold?**
26. **What effect would the insolvency of the Custodian have on the Trust's allocated account and the Trust's unallocated account?**
27. **When can the Trustee or the Sponsor remove or replace the Custodian or hire additional custodians?**

Source: World Gold Council, February 28, 2019.



How Does Bitwise Satisfy Concerns Around Valuation?

KEY FINDINGS

Bitcoin trades at a unified global price, and established procedures exist for valuing and managing hard forks, air drops, and other situations.

The Bitwise Bitcoin ETF Trust Application Uses
Transparent, Rules-Based Procedures To Handle
all Valuation-Related Questions.



Table of Contents: Valuation

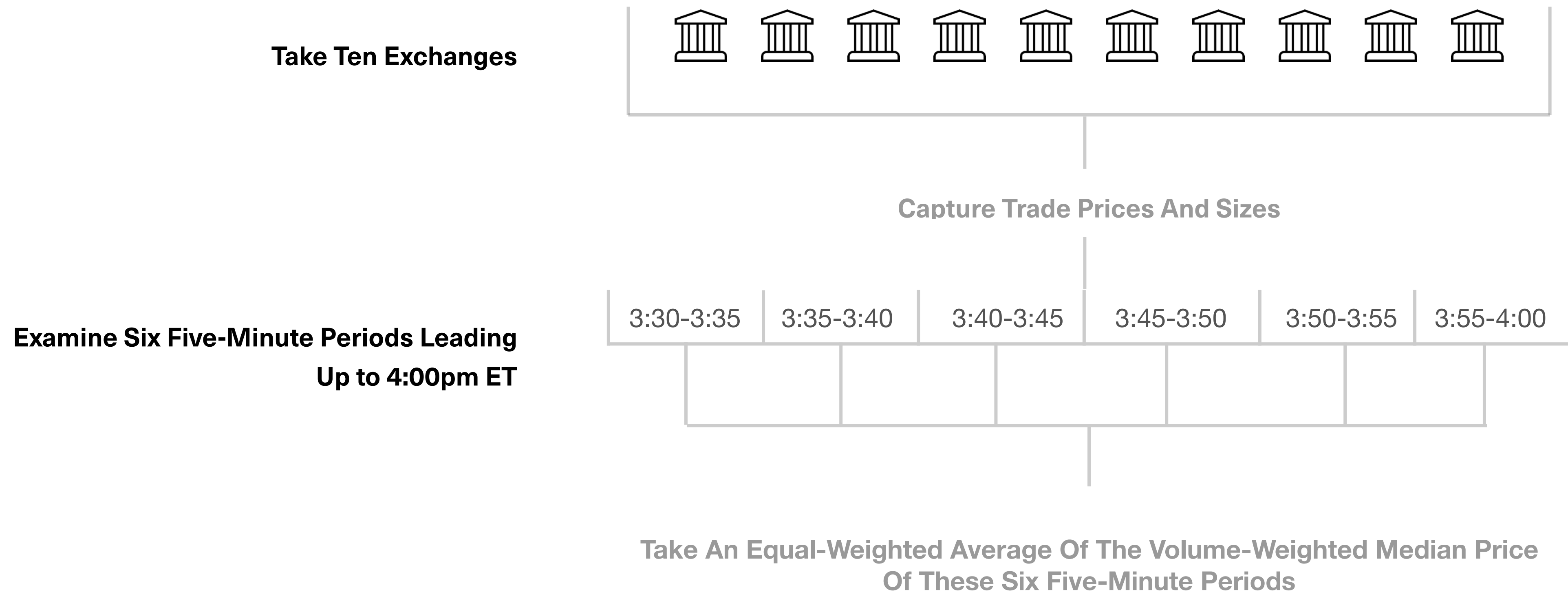
- 01 — **How Will the Daily Net Asset Value of the Trust Be Calculated?**
- 02 — **How Will the Intraday Indicative Value (IIV) of the Trust Be Calculated?**
- 03 — **How Will Bitwise Handle Hard Forks and Air Drops That Impact the Bitcoin Blockchain?**

How Will the Daily Net Asset Value of the Trust Be Calculated?



The Trust's Net Asset Value Calculation Methodology Is Explored In-Depth Earlier In This Presentation

The generalized outline is repeated below for convenience.



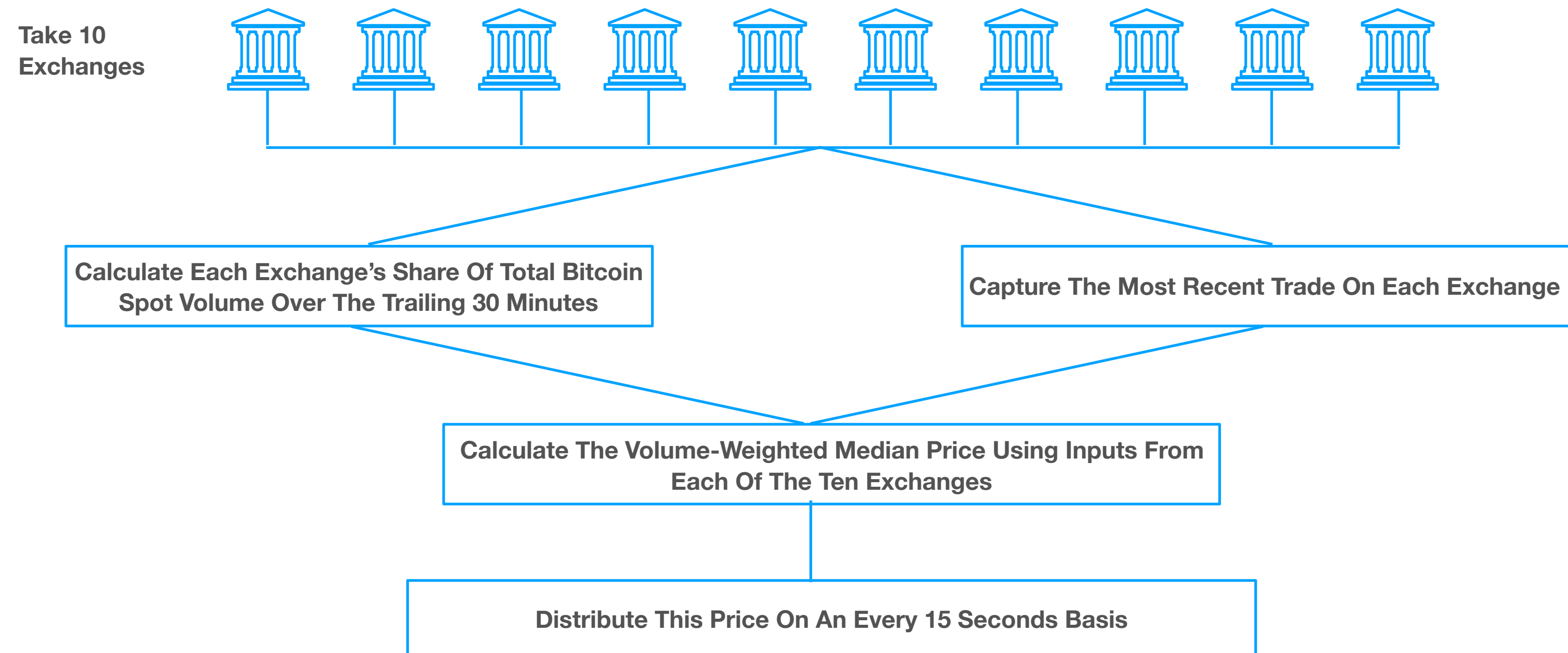
How Will the Intraday Indicative Value (IIV) of the Trust Be Calculated?



The Intraday Indicative Value and the Indicative Index Value

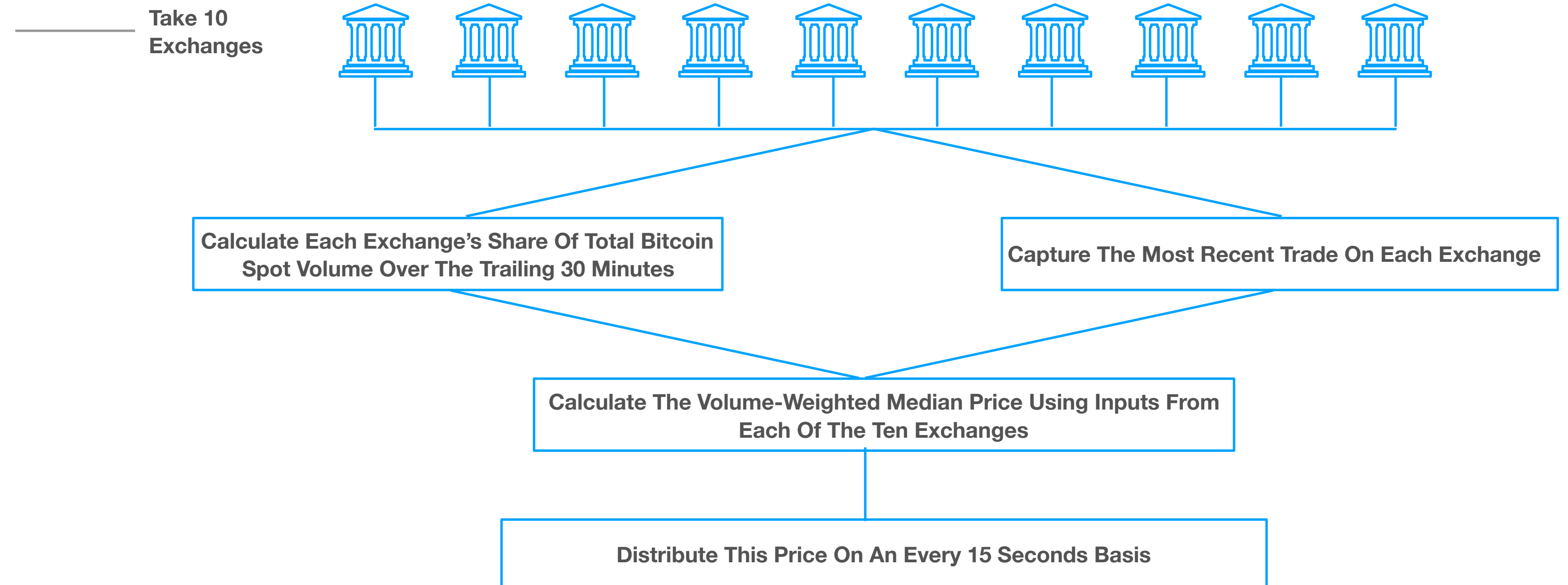
- In addition to the daily NAV, the Bitwise Bitcoin ETF Trust will be supported by the publication of an intraday indicative value (IIV) every 15 seconds of every trading day. This value is also commonly called the “intraday Net Asset Value” (INAV) and sometimes the “indicative operative portfolio value” (IOPV).
- The listing exchange or a data provider calculates, maintains and distributes the IIV.
- The S-1 for the Bitwise Bitcoin ETF Trust explains that the IIV will be calculated by taking the prior day’s NAV and updating it using an “Indicative Index Value” calculated by Bitwise.
- The following slides explain how Bitwise will calculate that Indicative Index Value throughout the trading day.

The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time



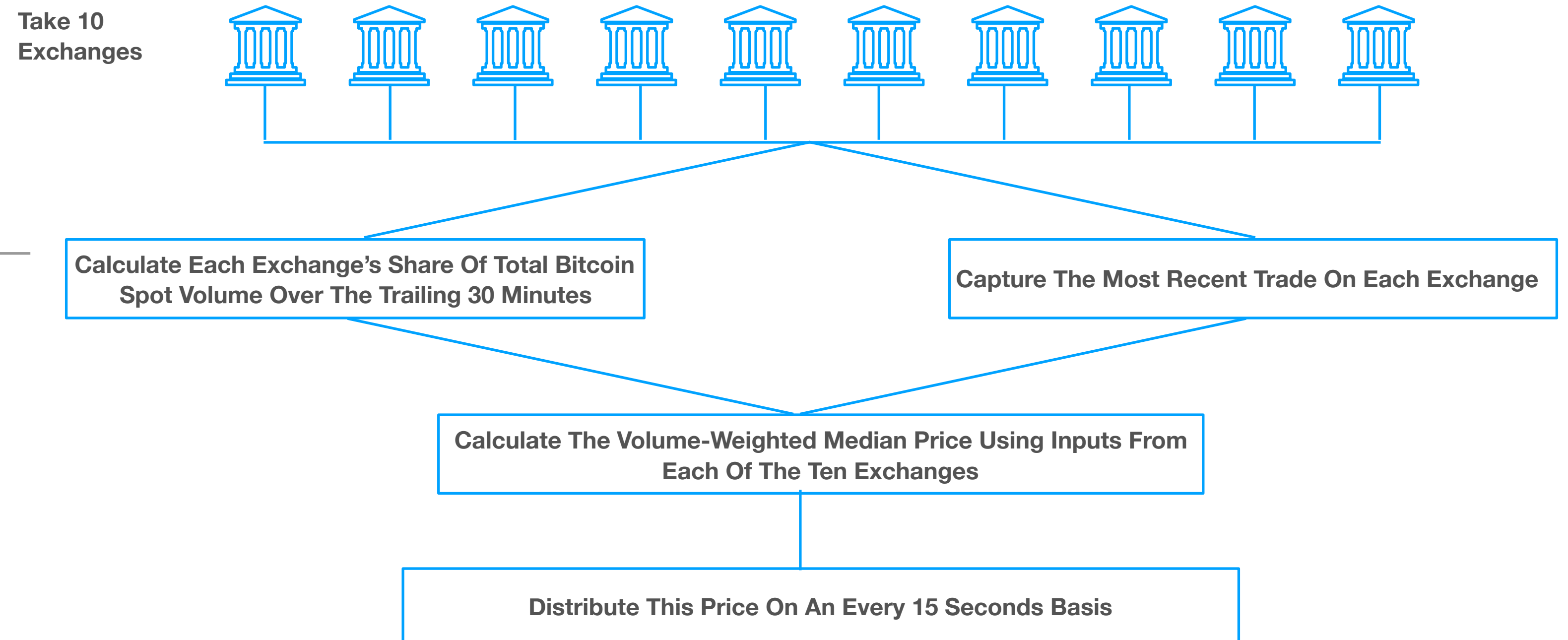
The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time

The use of 10 different exchanges mitigates against idiosyncratic exchange risk and against pricing disruptions should any individual exchange suffer a halt, hack or data error.

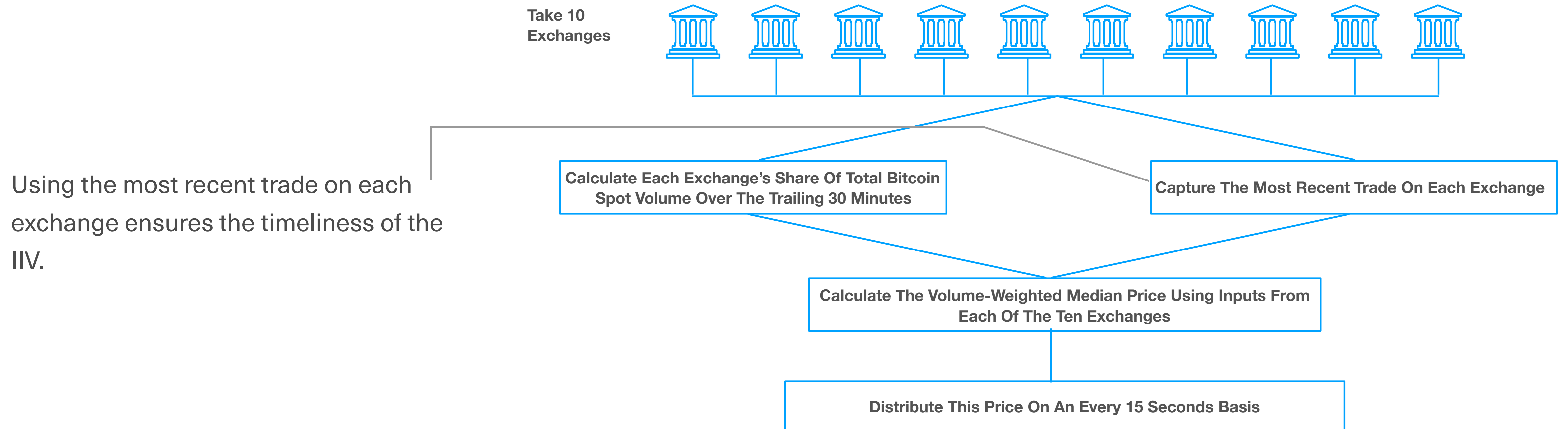


The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time

Using contributory weights based on the trailing thirty-minute volume rather than last trade size or volume over a very short time period protects against attempts to manipulate the IIV by capturing more volume.



The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time

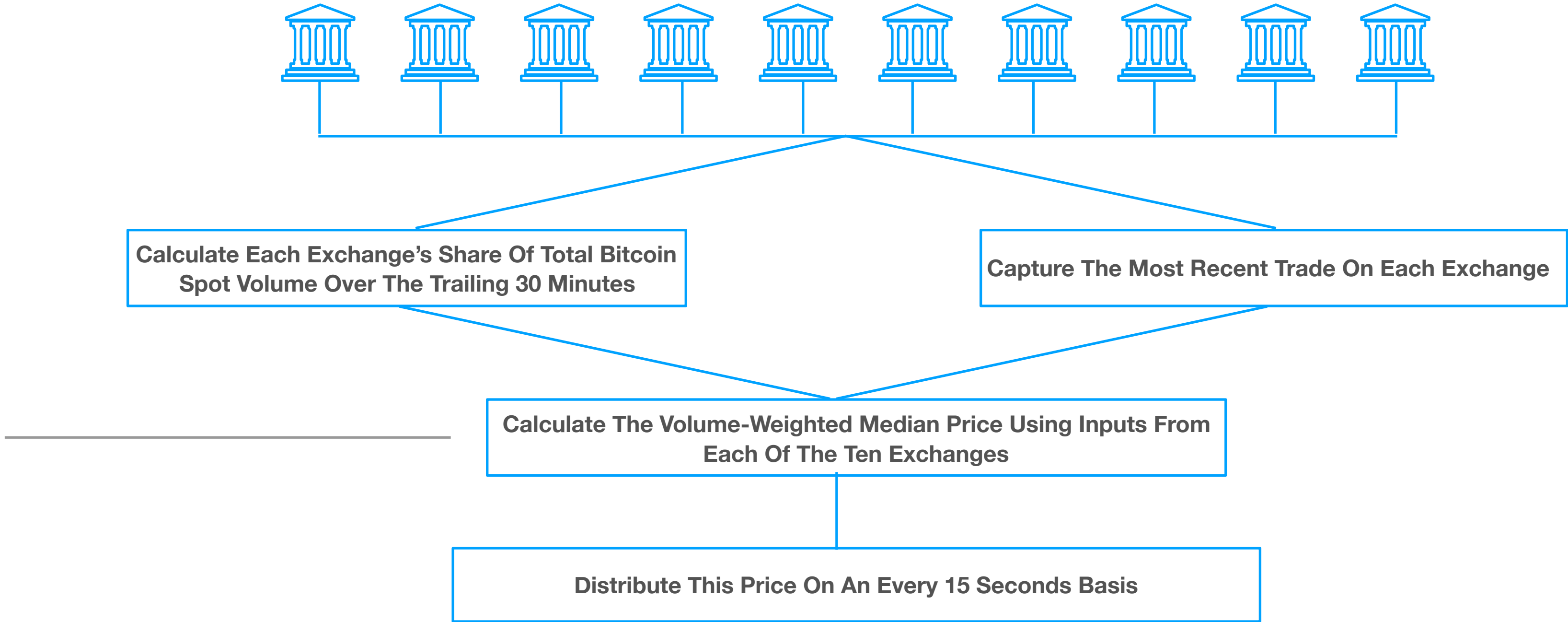




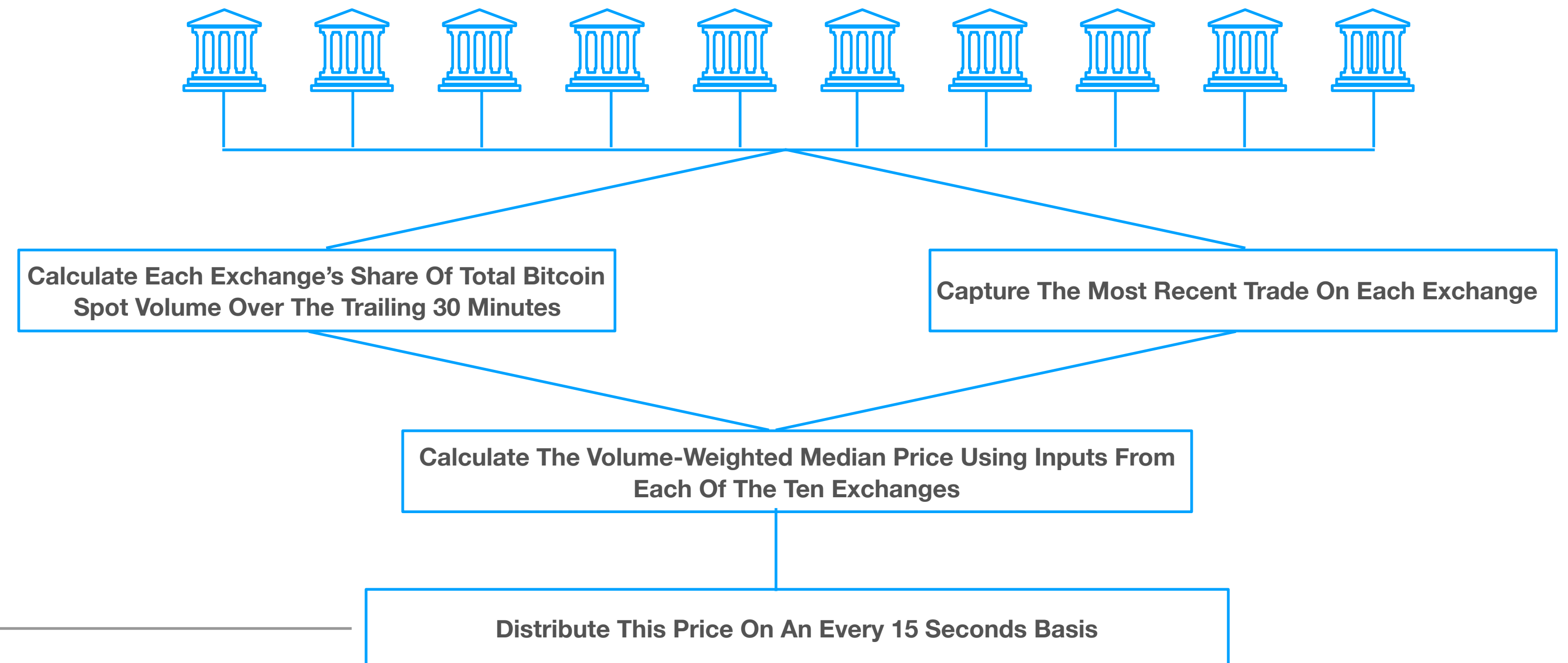
The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time

The use of a median price eliminates the ability of outlier prices to impact the NAV, as it systematically excludes those prices from the NAV calculation.

The use of a volume-weighted median (as opposed to a traditional median) protects against attempts to manipulate the price by executing multiple low-dollar trades.



The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time



It is our expectation that the IIV of the fund will closely track the globally integrated bitcoin price as reflected on the 10 exchanges.



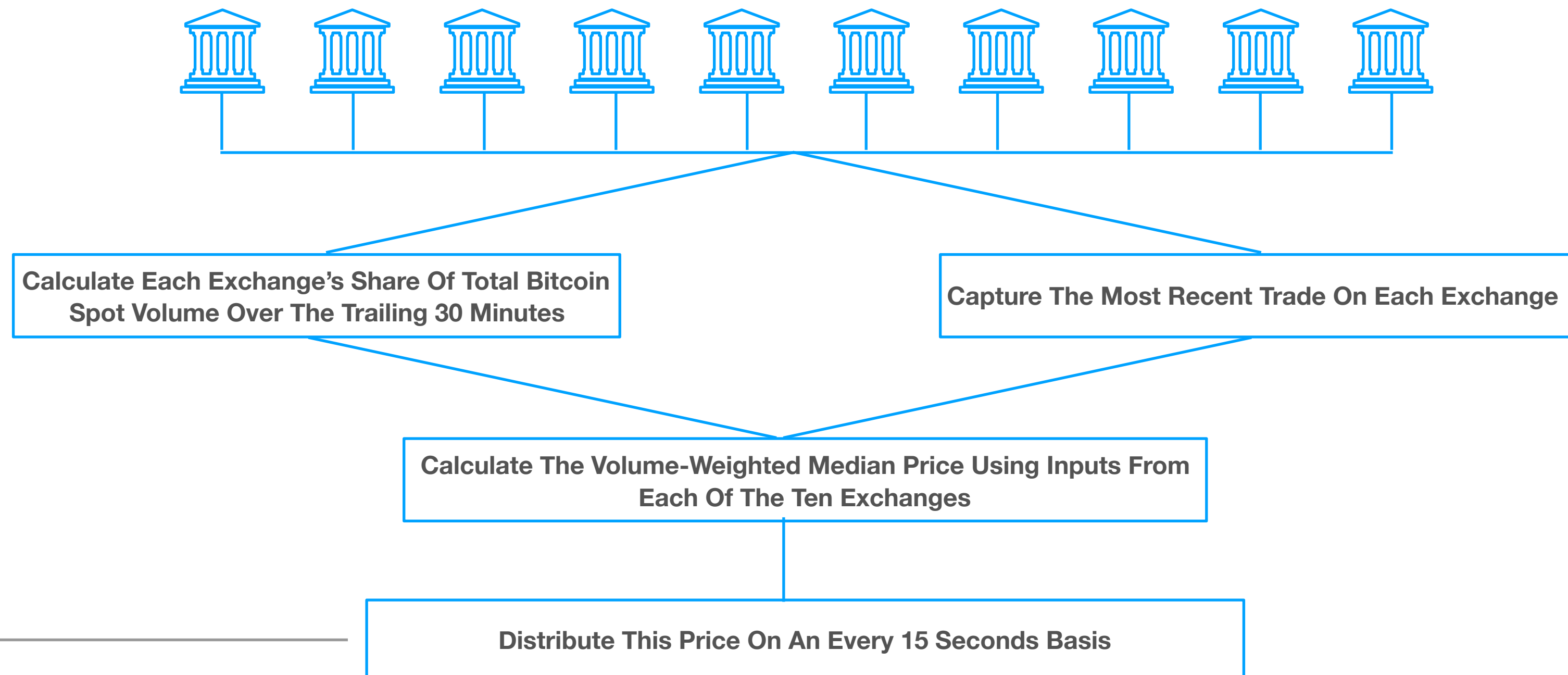
The Indicative Index Value Methodology Uses A Similar Approach As The NAV, But Brought Into Real Time

The IIV may differ from the NAV due to the NAV's use of a trailing 30-minute, segmented, and volume-weighted median price, compared to the IIV's use of real-time prices.

Bitwise does not believe this will create confusion in the marketplace, as Authorized Participants are the only investors who interact with the NAV, and Bitwise will communicate its NAV calculation methodology clearly.

There are many instances in the ETF market where the IIV and the NAV are subtly different, whether due to the calculation methodology, market hours overlap or other factors. Bitwise has seen no negative impact on trading, liquidity or other factors for ETFs in this situation.

Notably, the [CME futures market relies on and distributes](#) both a "Reference Rate" and a "Real-Time Rate." The Reference Rate uses a methodology similar to the Trust's NAV methodology, is struck once per day, and is the price at which CME's bitcoin futures settle. The Real-Time Rate uses current market conditions and plays a similar role to the IIV. Bitwise believes the market is able to understand and evaluate the differences between the two rates.



How Will Bitwise Handle Hard Forks and Air Drops That Impact the Bitcoin Blockchain?



Definition: Hard Fork

- **Hard Forks:** Technically, a “hard fork” occurs any time a blockchain makes an upgrade to its software protocol that is significant enough that blocks subsequently processed using the prior version of the software are not valid. It is the blockchain equivalent of upgrading your computer’s operating system in such a way that your old applications no longer work.

In most instances, hard forks are unanimous: All of the miners on a given blockchain will upgrade. In this case, the related cryptoasset will continue with no interruption.

In some situations, however, the community surrounding a given blockchain will disagree on the best path forward. Some will want to upgrade the protocol, while others will not. In this case, the blockchain can split in two, with two different versions of the protocol, two different blockchains and two different cryptoassets. These two blockchains will have a shared history but separate futures.

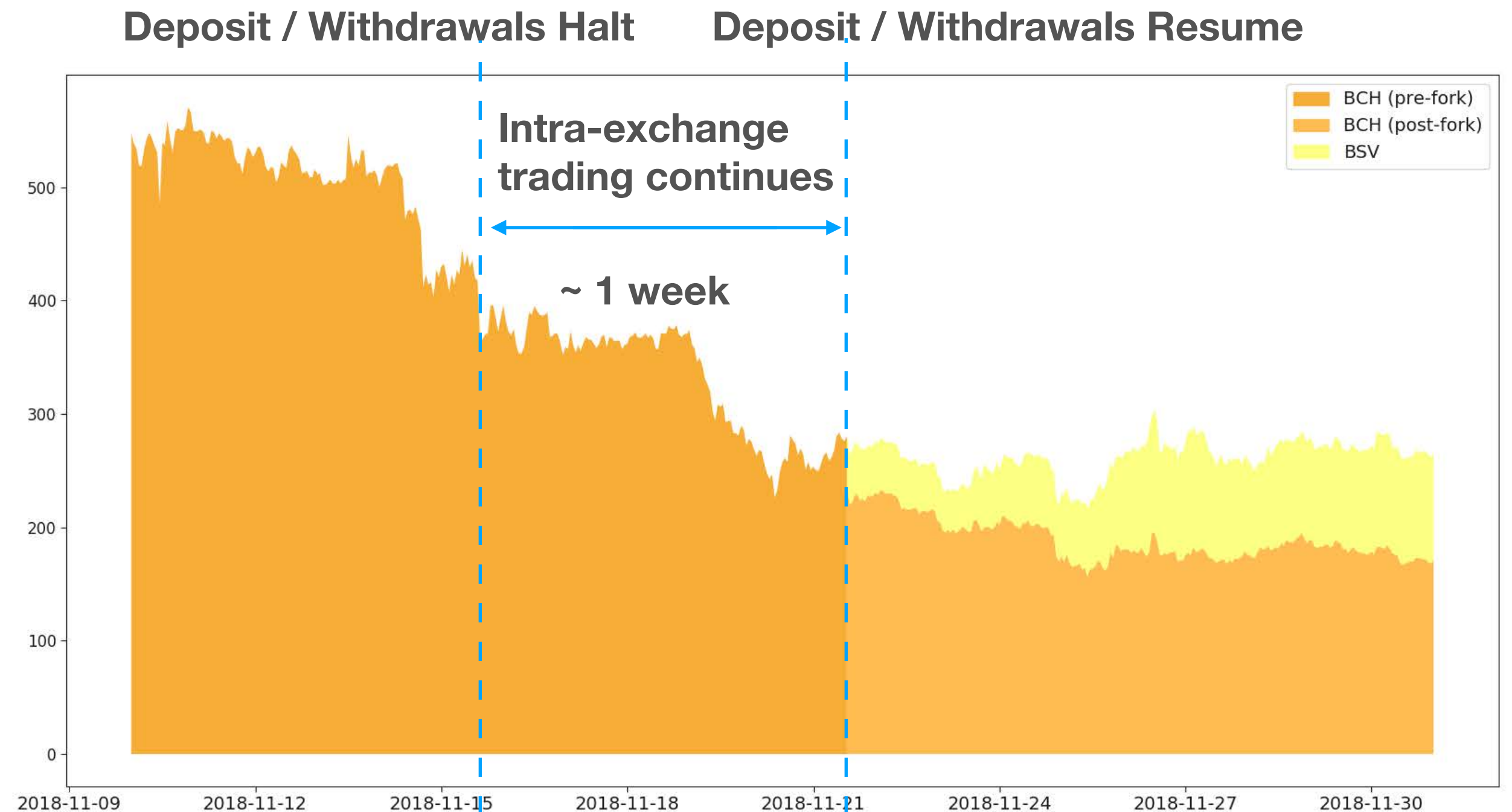
When this happens, anyone who held the cryptoasset before the fork now holds both of the new cryptoassets, with one linked to each blockchain. Colloquially, this situation is what most people mean when they say “hard fork,” and is the relevant topic for discussion.



How Does The Trust Handle Hard Forks?

An Example

- The most recent significant hard fork occurred in November 2018, when the Bitcoin Cash blockchain forked into two blockchains: One retained the name Bitcoin Cash, while the other came to be called Bitcoin SV.
- Bitwise was managing multiple private cryptoasset index funds at the time, some of which had positions in bitcoin cash, and so has direct experience with handling and valuing forked assets as they occur.



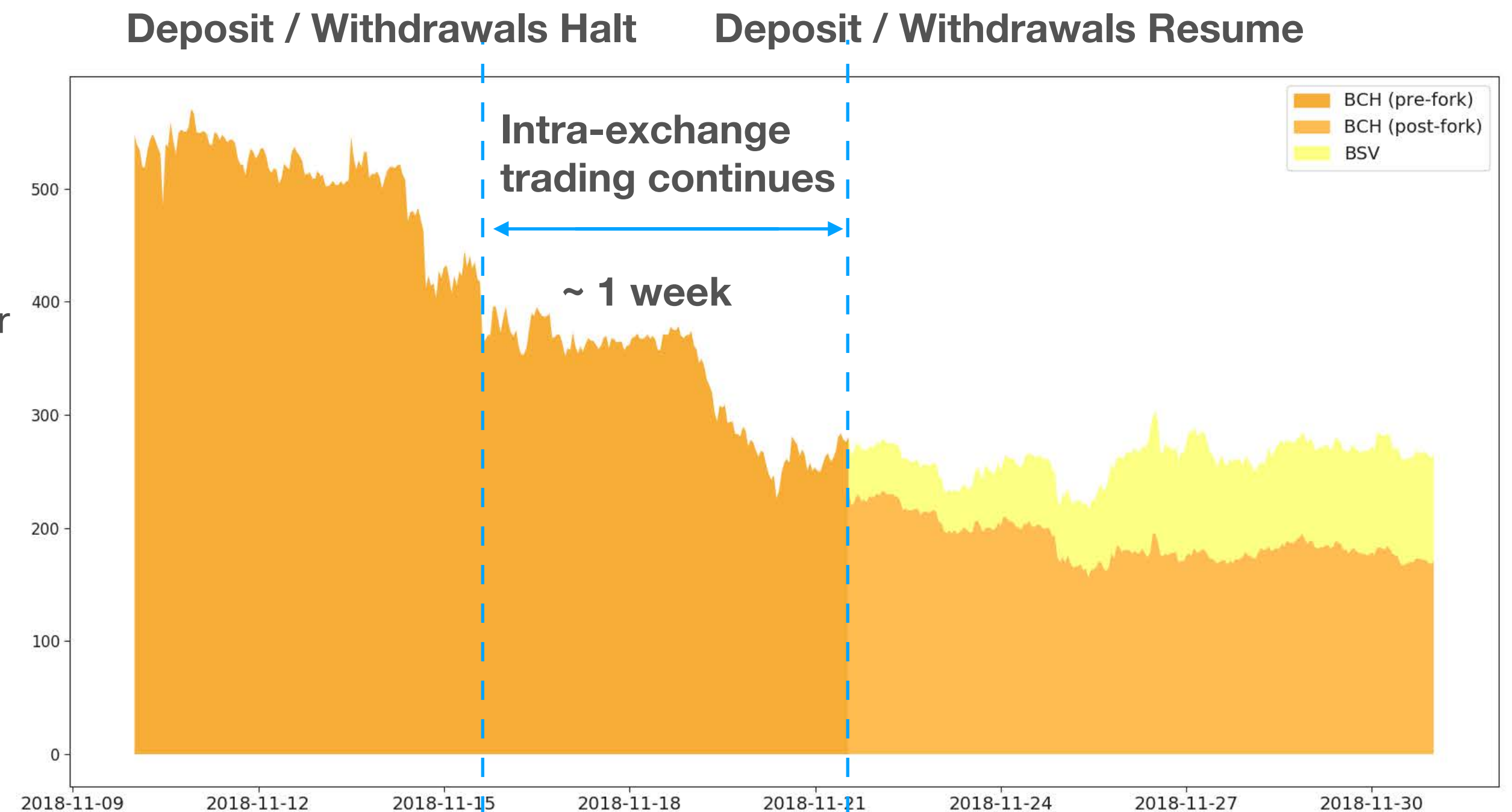
**BCH Hard Fork
(Nov 15)**



How Does The Trust Handle Hard Forks?

An Example

- When a hard fork happens, exchanges halt deposits and withdrawals for both halves of the fork.
- Often, however, they continue to allow trading by participants within their exchange ecosystem. Sometimes, they allow trading in the single (pre-fork) coin, and sometimes they allow separate trading of each new coin.
- Exchanges will then allocate ownership to individuals once the dust settles and they are able to resume deposits and withdrawals.



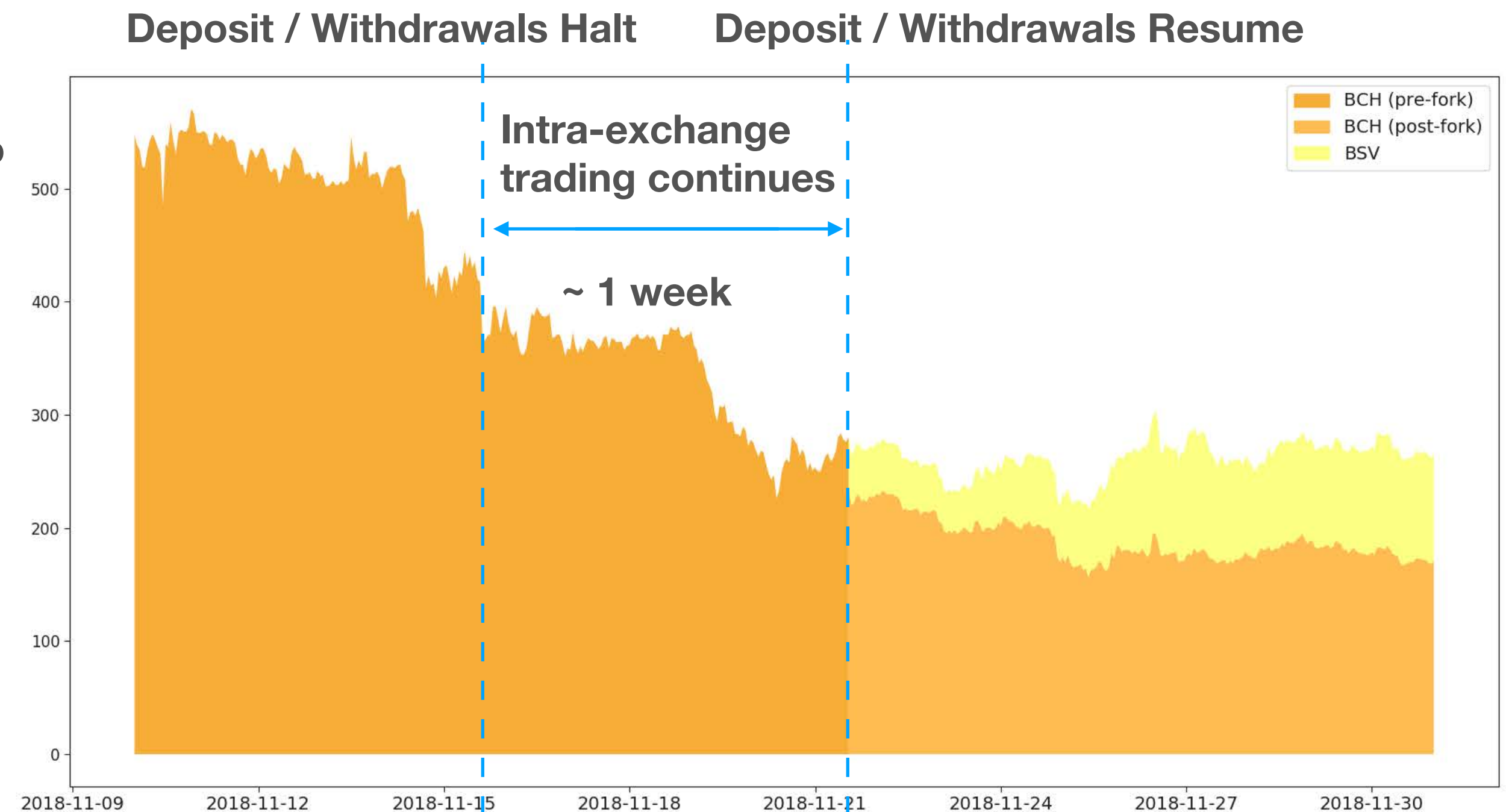
**BCH Hard Fork
(Nov 15)**



How Does The Trust Handle Hard Forks?

An Example

- Bitwise does not recognize the existence of a newly forked coin until two or more exchanges enable deposits and withdrawals of that coin.
- Until that point, Bitwise uses its standard pricing methodology, drawing either the single coin price (on exchanges that haven't separated the coin) or the aggregate price (on exchanges that have).
- Once deposits and withdrawals are enabled, new prices are established for each coin.



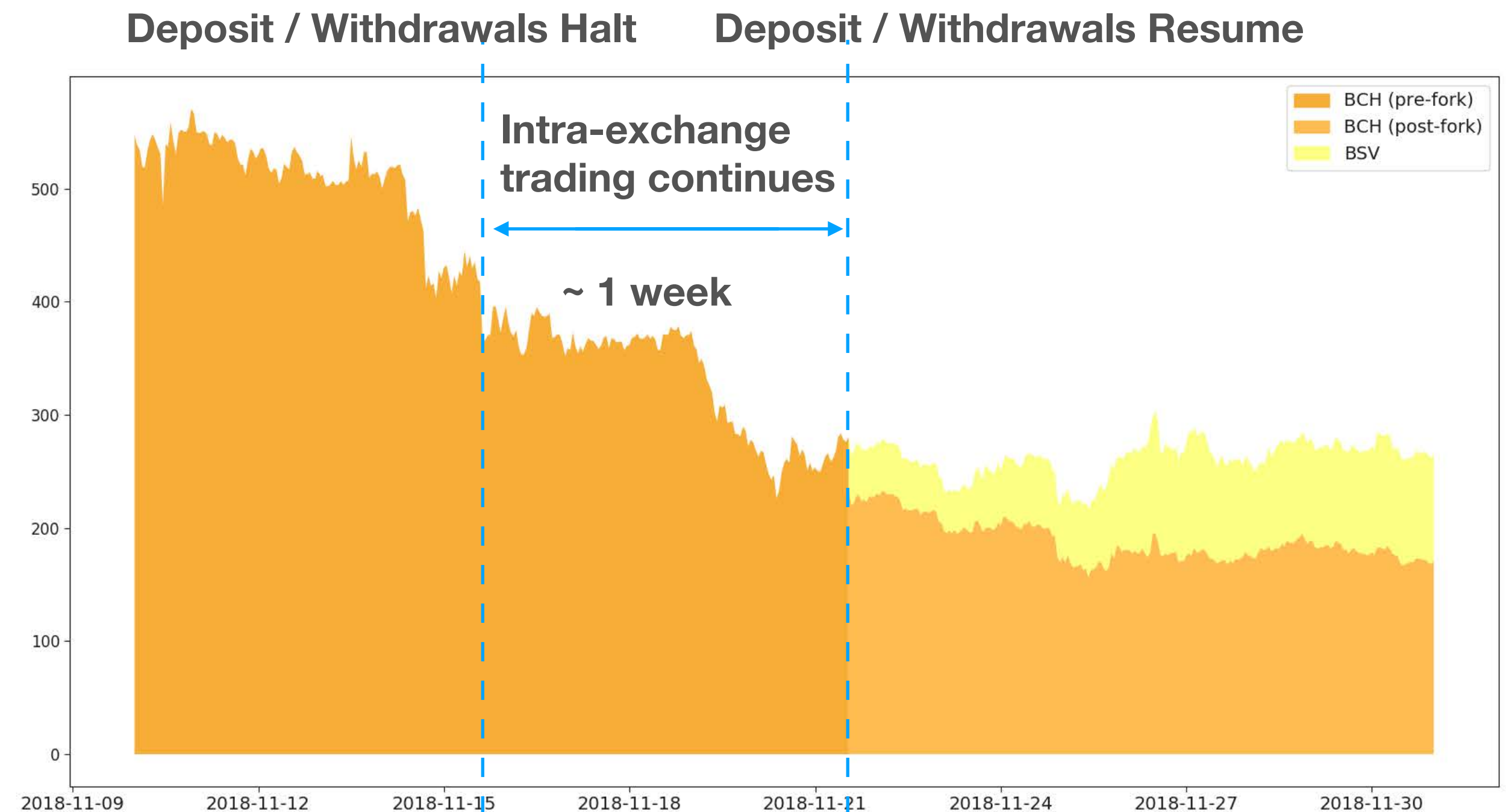
**BCH Hard Fork
(Nov 15)**



How Does The Trust Handle Hard Forks?

An Example

- At this point, Bitwise calculates the market capitalization of each coin.
- The coin with the larger market capitalization is deemed to be the continuation of the original blockchain, and the lesser coin is deemed the forked coin.
- The Trust will as soon as possible distribute the forked coin in-kind to Bitwise, as agent for the shareholders, and Bitwise will sell the forked coin and distribute the proceeds to the Trust's shareholders.



**BCH Hard Fork
(Nov 15)**



Air Drops Are Different From Hard Forks

- **Definition:** An airdrop occurs when a new or emergent cryptoasset is granted to holders of an existing cryptoasset for free on a one-off or even a repeated basis. The developers of the new cryptoasset may execute an airdrop to seed interest in and gain a higher profile for their new asset.
- Importantly, unlike hard forks, air drops are not native developments of bitcoin. It is an external promotion, similar to if Burger King had a promotion for all Porsche owners; one would not consider the Burger King promotion to be an internal return driver of the Porsche.
- Historically, the value of airdrops has been de minimis at the time they were announced (whether they became valuable later in their life cycle is not relevant).
- Critically (and this is a factor often overlooked) claiming an airdrop most often requires proving ownership of private keys by signing a generated message with your keys. Put differently, it requires agency and involves risk.
- As such, the Bitwise Bitcoin ETF Trust does not intend to claim airdrops, nor will Bitwise incorporate their theoretical value (if any) into the fund's NAV or associated index calculations.



How Does Bitwise Satisfy Concerns Around Liquidity & Arbitrage?

KEY FINDINGS

The bitcoin market is sufficiently liquid, well-organized and developed to support liquidity and effective arbitrage in an ETF.

The bitcoin market is extremely efficient, with sufficient liquidity and market depth to support an ETF. Market makers and hedging tools are well established, and available data suggest the ETF should trade close to fair value.



Table of Contents: Liquidity & Arbitrage

- 01 — **Is the Bitcoin Market Sufficiently Liquid To Support an ETF?**
- 02 — **Are There Professional Market Makers Operating in the Bitcoin Market That Could Support a Bitcoin ETF?**
- 03 — **Are There Adequate Hedging Tools in Place for These Market Makers to Fully Support the ETF?**

Is the Bitcoin Market Sufficiently Liquid To
Support an ETF?



Order Book Depth Can Easily Support Creation Activity

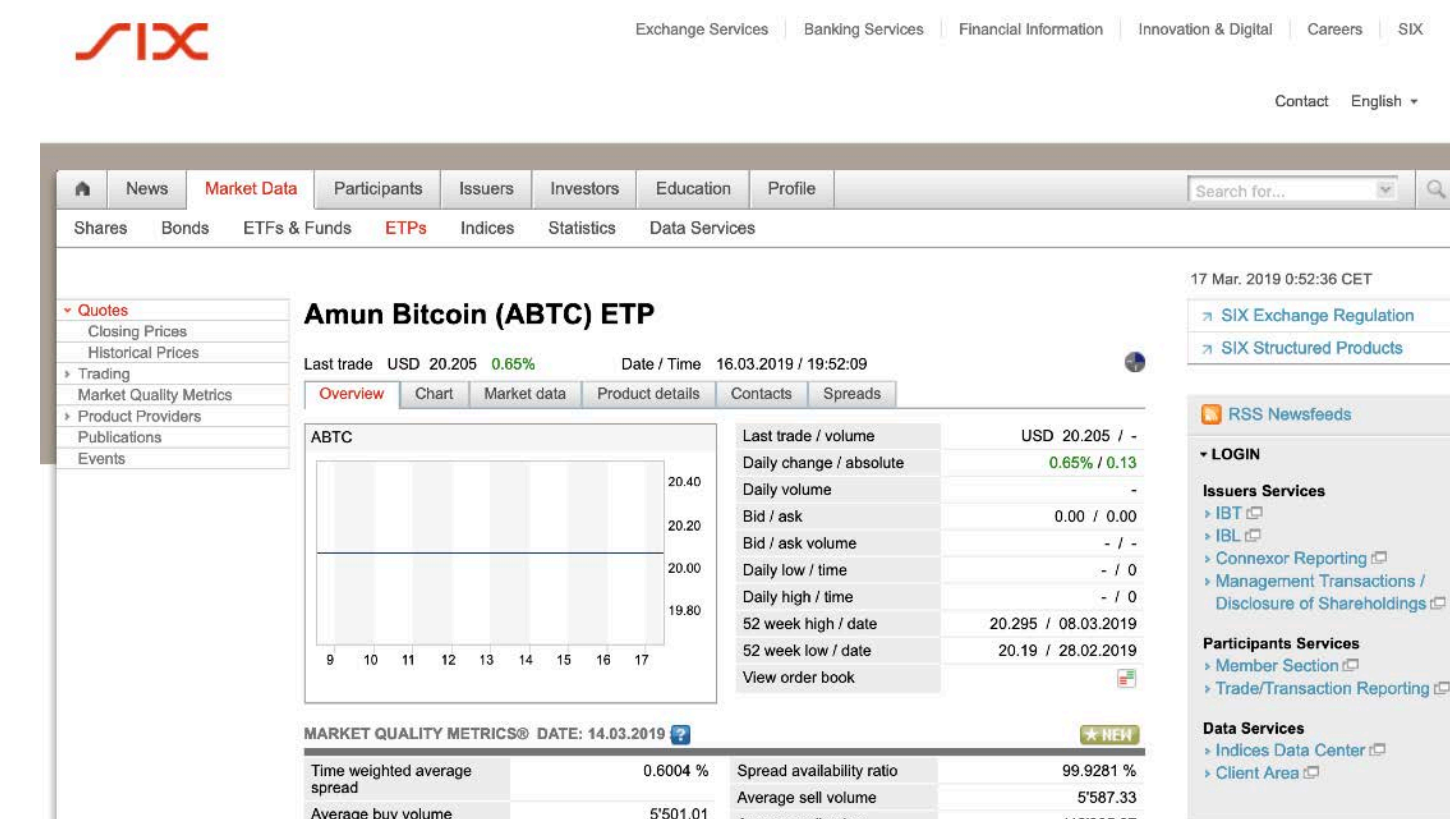
- ETF creations and redemptions are done in “baskets,” which typically start at a value of approximately \$2.5 million.
- Authorized Participants (APs) are tasked with accumulating that amount of the underlying asset(s), which they can then deliver to the ETF issuer in exchange for an equal value of shares of the ETF (based on the ETF’s NAV).
- Though APs are sophisticated traders, we examined the market impact that the most naive strategy — “sweeping the book” on our 10 exchanges — would have on the market.
- We found that even this naive trading approach would have led to reasonable executions in the past for orders of up to \$5 million.
- In practice, APs would likely achieve much tighter executions by “working their orders” over a period of time.
- In addition, Bitwise’s NAV methodology captures prices over a 30-minute period, giving APs a longer window in which to execute their trades and further supporting their efforts to deliver liquidity.
- With daily bitcoin spot volume of more than \$270 million, and liquid futures contracts available to facilitate hedging, APs should be able to handle even very significant primary market activity in the ETF.

Order Size	Average Slippage
\$100,000	0.04%
\$500,000	0.09%
\$1,000,000	0.14%
\$2,000,000	0.26%
\$5,000,000	0.60%

Bitcoin ETPs Listed On Major Foreign Markets Trade At Consistently Tight Spreads And Near Fair Value



Source: Nasdaq Nordic. 3/16/19



Source: Six Swiss Exchange. 3/16/19

- The Bitcoin Tracker One ETP from XBT Providers launched on Nasdaq Nordic on March 18, 2015.
- The ETN trades at extremely tight spreads (often quoted at \$0.01) and in-line with fair value,
- According to Bloomberg, its average closing premium-over-NAV for the 52 weeks ending March 15, 2019, was -0.02%.

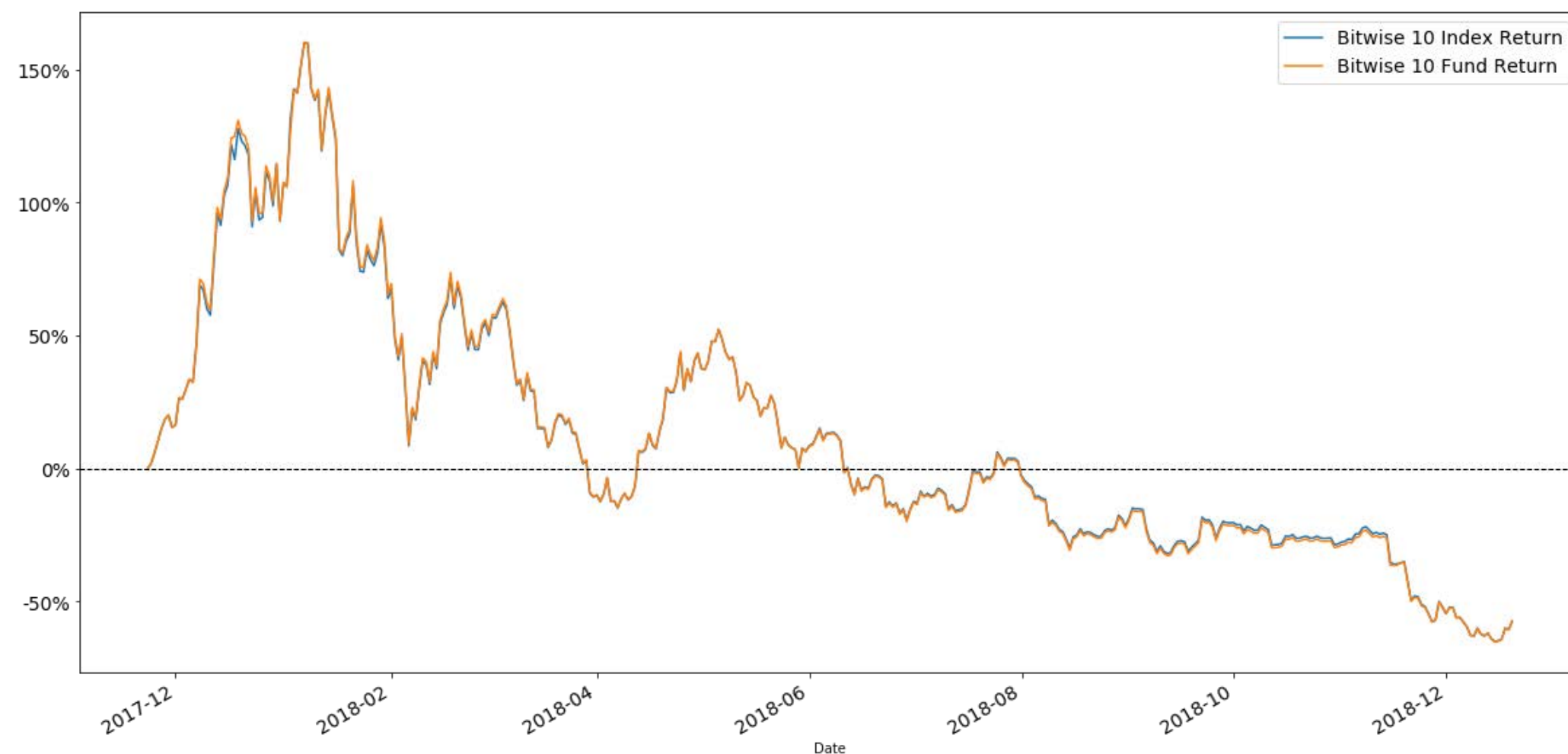
- The Amun Bitcoin ETP (ABTC) launched on the Six Swiss Exchange on February 26, 2019.
- Despite limited trading volume, spreads have averaged below 0.60% from day 1.

Screenshot Source for XBT Providers: Nasdaq Nordic. 3/16/19
 Launch Date Source for XBT Providers: XBT Providers. 3/16/19
 Spreads Source for XBT Providers: Yahoo Finance. 3/16/19
 Premium Source for XBT Providers: Bloomberg. 3/16/19
 Screenshot Source for ABTC: Six Swiss Exchange. 3/16/19
 Launch Date and Spreads Source for ABTC: Six Swiss Exchange. 3/16/19



Bitwise's Demonstrated Tracking Ability Confirms That Prices Are Real And Executable

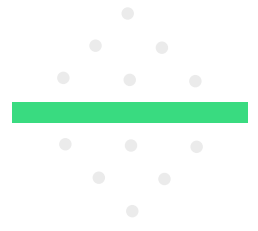
Bitwise has been able to achieve exceptionally tight tracking versus its benchmark in its flagship Bitwise 10 Crypto Index Fund, despite significant inflows and outflows on a weekly basis. This suggests that sufficient liquidity exists to execute trades that are inline with global spot prices. (Note: Bitwise's flagship private fund holds the top 10 cryptocurrencies, some of which are significantly less liquid than bitcoin itself.)



	MTD	QTD	YTD	Inception to Date
Bitwise 10 Index	-6.53%	-45.93%	-79.52%	-57.47%
Bitwise 10 Private Index Fund	-6.38%	-46.49%	-79.40%	-57.36%

Source: Bitwise. Data as of 12/18/18.

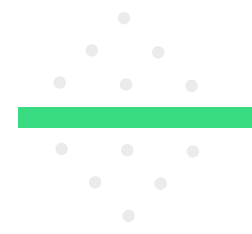
Are There Professional Market Makers
Operating in the Bitcoin Market That Could
Support a Bitcoin ETF?



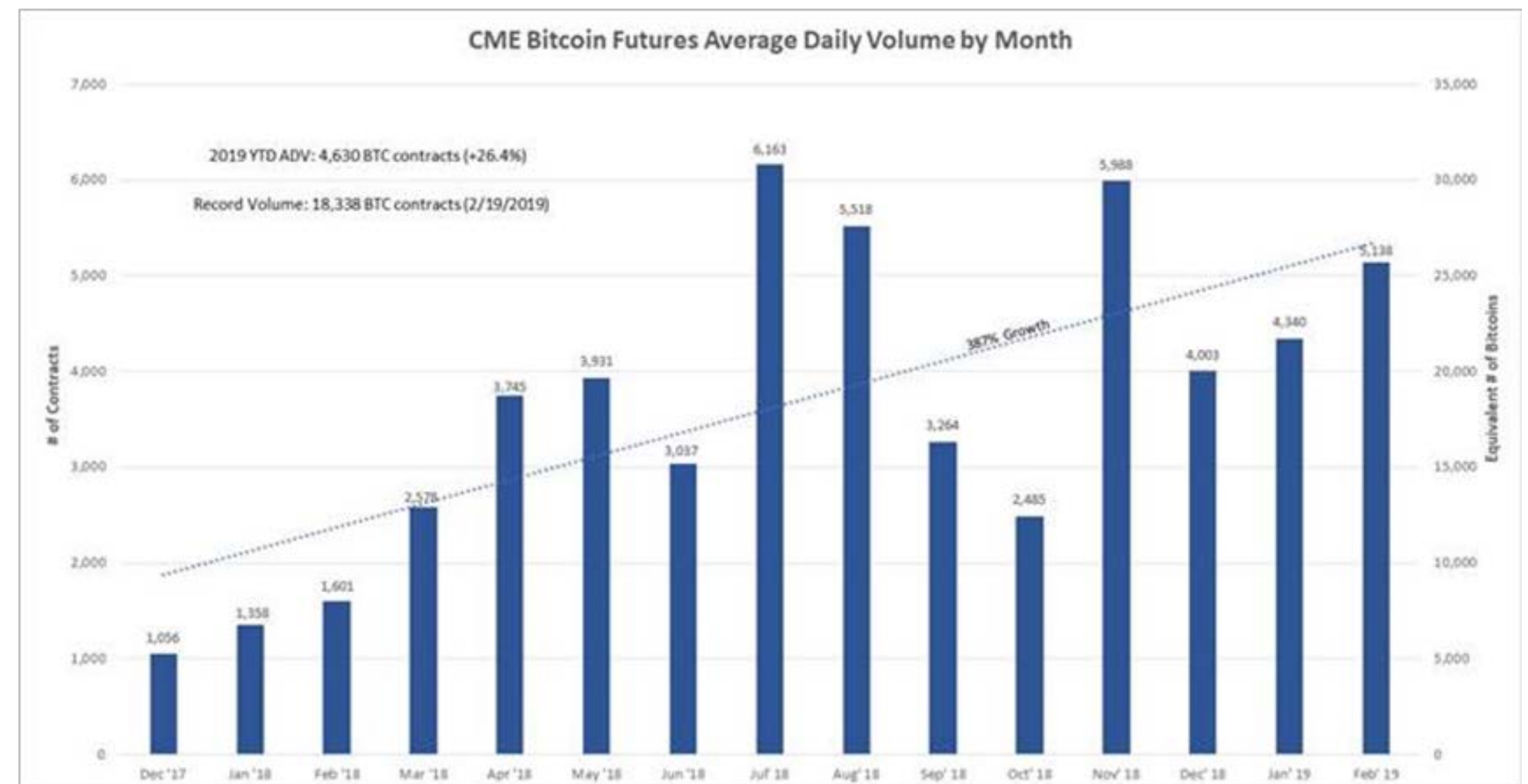
Yes. There are a large number of professional, established market makers operating in the bitcoin market who could support a bitcoin ETF.



Are There Adequate Hedging Tools in Place for These Market Makers to Fully Support the Market?



Yes. As discussed earlier, the emergence of strong liquidity in CME's bitcoin futures market has empowered market makers to facilitate extremely tight markets. This has been supported by the emergence of an institutional market for bitcoin lending.



Source: Chicago Mercantile Exchange. Data as of 2/28/19



Appendix

Direct Answers To Each Question Raised In The January 18,
2018, Staff Letter on Fund Innovation and Cryptocurrency-
related Holdings



Market Manipulation Question 1

In a recently issued statement, Chairman Jay Clayton noted that concerns have been raised that cryptocurrency markets, as they are currently operating, feature substantially less investor protection than traditional securities markets, with correspondingly greater opportunities for fraud and manipulation. The Commission has also discussed concerns relating to the risk of fraud and manipulation in cryptocurrency markets in orders denying exchange proposals to list the shares of commodity trusts that would hold cryptocurrency. In addition, a number of recent media reports have highlighted a range of possible vectors for potential manipulation of cryptocurrency markets... How have these concerns informed your responses to the foregoing questions concerning, for instance, valuation and liquidity?

- Bitwise has demonstrated that the global spot bitcoin market is an integrated market that trades at a unified price.
- Bitwise's unique approach to striking its daily NAV, as well as its use of in-kind creations and redemptions, provides unique protections against short-term market manipulation.
- The fact that Bitwise's NAV is drawn from exchanges that capture substantially all of spot bitcoin trading volume helps mitigate concerns about liquidity.
- The fact that Bitwise's NAV captures trading volume over a 30-minute period further mitigates concerns about liquidity.



Market Manipulation Question 2

How would you weigh these concerns in considering whether offering a proposed fund is appropriate for the wide range of investors, including retail investors, who might invest in the fund?

- Retail investors and other potential users of the proposed Bitwise Bitcoin ETF Trust have many factors to consider when determining if the fund is appropriate for them.
- These include but are not limited to the high historical volatility of bitcoin, uncertainty regarding its long-term prospects for adoption, new technological advances and regulatory changes, among other factors, all of which are and will be covered extensively in the Risk Factors section of the S-1 for the Bitwise Bitcoin ETF. No investor should invest without considering and studying these risk factors.
- Bitwise believes that the design of the Bitwise Bitcoin ETF Trust and the fundamental nature of the bitcoin market help mitigate risk factors that come from pricing, valuation, market manipulation and related concerns.
- Bitwise believes that the launch of the ETF will be an incremental positive to the bitcoin market, as it will create another regulated market for further price discovery.



Market Manipulation Question 3

Would investors, including retail investors, have sufficient information to consider any cryptocurrency-related funds and to understand the risks?

- Bitwise believes that investors, including retail investors, would have sufficient information to consider the risks of cryptocurrency-related funds as outlined in the risk disclosure section of the S-1, supported by extensive educational materials.
- Bitwise believes that the primary risks that attend to the Bitwise Bitcoin ETF Trust will be risks inherent to the underlying asset's returns, volatility and functioning, more than unique risks that pertain to custody, pricing, liquidity, arbitrage or market manipulation-related issues. Notwithstanding that opinion, Bitwise plans to make a full disclosure of all attendant risks in its S-1 and supporting documentation.



Market Manipulation Question 4

Have you discussed with any broker-dealers who may distribute the funds how they would analyze the suitability of offering the funds to retail investors in light of the risks discussed above?

- Bitwise has not discussed the proposed Bitwise Bitcoin ETF Trust with any broker-dealers beyond general terms, although many have expressed a desire for the ability to offer clients a bitcoin ETF as a way to allow clients to have institutionally managed exposure to bitcoin rather than buying it individually from exchanges.
- Bitwise has had discussions with broker-dealers and platforms around the distribution of its private funds, including the Bitwise 10 Private Index Fund and the Bitwise Bitcoin Fund. In Bitwise's experience, these broker-dealers — like the SEC itself — are well-informed and ask carefully calibrated questions. They are, however, generally open to the idea of a well-structured bitcoin fund appearing on their platforms.



Market Manipulation Question 5

Are there particular challenges investment advisers would face in meeting their fiduciary obligations when investing in cryptocurrency-related funds on behalf of retail investors?

- Bitwise is not a financial advisor and therefore cannot speak for any particular advisor. Nonetheless, Bitwise has seen questions about the application of fiduciary obligations to bitcoin investments in multiple media reports, roughly structured along the following lines:
- **Non-Cashflow Generating/Valuation:** Some reports express concerns that it is impossible to value bitcoin as a non-cashflow-generating asset. These concerns seem curious, as the same argument can be made for all precious metal commodities and many financial derivatives, as well as many equities.
- **High Volatility:** Some reports express concern that bitcoin's volatility is too high for most investors. Of note, bitcoin's volatility has fallen sharply in the past years. Still, bitcoin's volatility should cause people to think about the appropriate size and rebalancing strategy surrounding their bitcoin positions.
- **Physical Location and Custody:** Some reports express concerns over custody and locating bitcoin; these technical concerns are allayed by the Bitwise Bitcoin ETF Trust's use of a regulated, insured, third-party custodian.
- **Lack of Understanding:** Some reports express concerns over the ability of advisors or investors to "understand" bitcoin. It's not clear why understanding bitcoin as "digital gold" is harder than analyzing the market for private leveraged loans, evaluating the shape of the volatility futures curve or (even) figuring out if Apple will retain its dominant position in the phone and laptop markets given mounting competition. Education is needed, and Bitwise is committed to delivering it.



Custody Question 1

To the extent a fund plans to hold cryptocurrency directly, how would it satisfy the custody requirements of the 1940 Act and relevant rules? We note, for example, that we are not aware of a custodian currently providing fund custodial services for cryptocurrencies.

- The bitcoin custody market has evolved rapidly and in a positive way since January 2018 when the letter was written.
- As discussed earlier, there are today five (and we expect by the end of 2019 there will be eight) regulated, insured, third-party crypto custodians operating in the bitcoin market.
- These custodians are regulated either as New York Limited Purpose Trust Companies or as South Dakota Trust Companies.
- The Bitwise Bitcoin ETF Trust intends to use at least one of these regulated, insured, third-party custodians to custody its bitcoin.
- We recently completed an exhaustive due diligence process to evaluate leading crypto custodians, and would be happy to share our non-confidential findings and processes with the Commission upon request.



Custody Question 2

In addition, how would a fund intend to validate existence, exclusive ownership and software functionality of private cryptocurrency keys and other ownership records?

- The fund intends to use a highly-qualified third-party auditor to validate the existence, exclusive ownership and software functionality of its private keys.
- The generalized outline of how this audit process works is explained earlier in this presentation.



Custody Question 3

To what extent would cybersecurity threats or the potential for hacks on digital wallets impact the safekeeping of fund assets under the 1940 Act?

- Bitwise believes that the tried-and-tested procedures around “cold storage,” outlined in a generic and simplified manner in this presentation, offer a way for funds to safely hold bitcoin.
- These processes have been used and refined in the crypto setting over the past decade, and have proven remarkably effective. They mitigate the exact concerns mentioned above by transforming bitcoin storage from a digital problem to a physical problem.
- Beyond cryptoassets, public/private key cryptography underlies significant amount of society’s modern infrastructure, including the core functioning of the internet, commercial point-of-sale transactions, our government’s secure communication protocols and more. As a result, the means to safeguard private keys are well-established and have been tested in many settings with very high stakes.
- The rapidly expanding list of insurance companies willing to insure cryptoassets suggests that traditional financial firms are increasingly comfortable understanding, quantifying, and monitoring potential risks.
- The Bitwise Bitcoin ETF Trust intends to use a regulated, insured third-party custodian to mitigate against the potential for loss.



Custody Question 4

While the currently available bitcoin futures contracts are cash settled, we understand that other derivatives related to cryptocurrencies may provide for physical settlement, and physically settled cryptocurrency futures contracts may be developed. To the extent a fund plans to hold cryptocurrency-related derivatives that are physically settled, under what circumstances could the fund have to hold cryptocurrency directly?

- There are no physically-settled cryptocurrency-related derivatives that we are aware of.
- There are, however, proposals for such derivatives, notably from the proposed Bakkt exchange (Bakkt was created by the Intercontinental Exchange (ICE)).
- Bitwise is not aware of the finalized specifics for the exchange, the contract, the custody architecture and other factors, and believes many of these factors are still under regulatory review.
- Regardless, the Bitwise Bitcoin ETF Trust S-1 does not permit the fund to participate in the derivatives market.



Custody Question 5

If the fund may take delivery of cryptocurrencies in settlement, what plans would it have in place to provide for the custody of the cryptocurrency?

- The Bitwise Bitcoin ETF Trust intends to hold bitcoin using a regulated, insured, third-party custodian.
- The Bitwise Bitcoin ETF Trust S-1 does not permit the fund to participate in the derivatives market.



Valuation Question 1

Would funds have the information necessary to adequately value cryptocurrencies or cryptocurrency-related products, given their volatility, the fragmentation and general lack of regulation of underlying cryptocurrency markets, and the nascent state and current trading volume in the cryptocurrency futures markets?

- As Bitwise has demonstrated earlier in this presentation, the spot bitcoin market is extremely efficient. Bitcoin trades at a globally unified price across all 10 of the exchanges that contribute prices to Bitwise's NAV methodology, and any small discrepancy in prices between exchanges is rapidly arbitrated away. As such, Bitwise is comfortable that it has the information necessary to adequately value bitcoin.



Valuation Question 2

How would funds develop and implement policies and procedures to value, and in many cases “fair value,” cryptocurrency-related products?

- Bitwise has a transparent and rules-based approach to valuing bitcoin. This approach draws prices from 10 exchanges representing substantially all of the spot bitcoin market.
- Bitwise’s NAV methodology has extensive protections to eliminate the impact of aberrant pricing on any one exchange.
- Bitwise does not anticipate a situation where it would need to fair value bitcoin, as it has the ability to draw prices from 10 separate exchanges located on three different continents in distinct regulatory regimes. The loss of one, two or even many exchanges would still leave Bitwise with sufficient pricing feeds to adequately price bitcoin according to its rule book.
- In the extraordinarily unlikely event that nine or even all ten of the exchanges stopped providing prices, Bitwise’s pricing procedures allow for fair valuing the asset based on all available pricing inputs, likely to include prices on the remaining exchange (if one exists), futures prices, exchange-traded swap prices, or other sources.
- In the unlikely event that this occurs, the Trust may temporarily halt creations and redemptions, in the way that ETFs have halted creation and redemption activity due to fundamental disruptions of their underlying markets in the past (for instance, in the case of the Van Eck Vectors Egypt Index ETF (EGPT) during the Arab Spring uprising of 2014, when the Egyptian stock market closed for multiple days).



Valuation Question 3

How would funds' accounting and valuation policies address the information related to significant events relevant to cryptocurrencies? For example, how would they address when the blockchain for a cryptocurrency diverges into different paths (i.e., a “fork”), which could result in different cryptocurrencies with potentially different prices? How and when would funds recognize such information in their NAV?

- As discussed earlier, Bitwise has rules-based, transparent and tested procedures for handling significant events relevant to cryptocurrencies such as hard forks.
- Bitwise's pricing methodology recognizes hard fork assets as soon as two exchanges allow deposits and withdrawals of those assets.
- At that point, Bitwise applies its standard pricing methodology to determine the value of each asset.
- The Trust will distribute the New Coin in-kind to the Sponsor, as agent for the shareholders, and the Sponsor will sell the new coin and distribute the proceeds to the shareholders.



Valuation Question 4

What policies would a fund implement to identify, and determine eligibility and acceptability for, newly created cryptocurrencies offered by promoters (e.g., an “air drop”)? How might a fund account for those holdings if the fund chooses to claim such cryptocurrencies?

- The Bitwise Bitcoin ETF Trust does not intend to claim airdrops, nor will Bitwise incorporate their theoretical value (if any) into the fund’s NAV or associated index calculations, for the reasons outlined earlier in this presentation.



Valuation Question 5

How would differences among various types of cryptocurrencies impact funds' valuation and accounting policies?

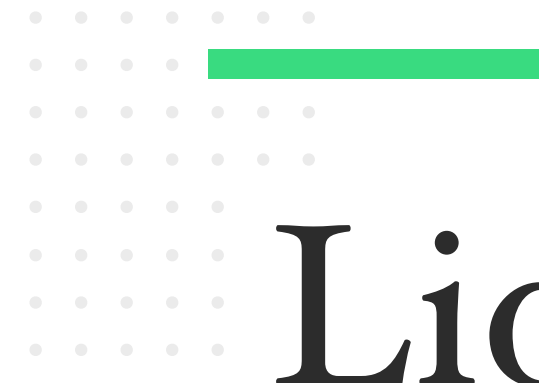
- The Bitwise Bitcoin ETF Trust intends to invest all of its assets in bitcoin.
- The only time differences among various types of cryptocurrencies will come into effect is when dealing with air drops or hard forks.
- Bitwise has transparent and rules-based procedures for pricing these assets, which have been described earlier in this presentation.



Valuation Question 6

How would funds consider the impact of market information and any potential manipulation in the underlying cryptocurrency markets on the determination of the settlement price of cryptocurrency futures?

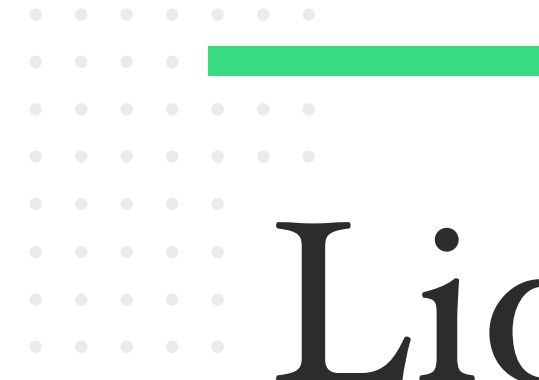
- The Bitwise Bitcoin ETF Trust does not invest in derivatives.



Liquidity Question 1

What steps would funds investing in cryptocurrencies or cryptocurrency-related products take to assure that they would have sufficiently liquid assets to meet redemptions daily?

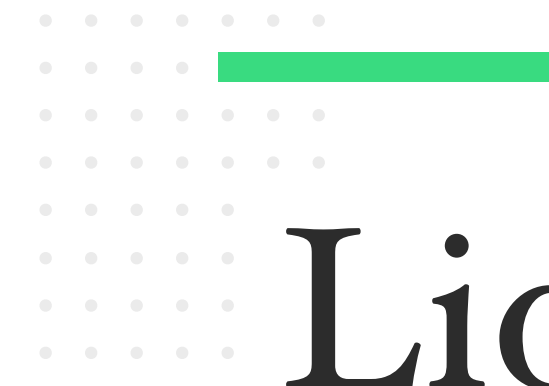
- The Trust will use only in-kind creations and redemptions. That means APs that redeem shares of the ETF will receive bitcoin in exchange. The Trust itself will never have to sell bitcoin itself to process redemptions.
- If APs have concerns about their ability to liquidate and/or hedge the bitcoin they receive from redeeming shares of the ETF, they will allow the ETF trade to a discount to its stated NAV before processing redemptions.
- Bitwise considers this highly unlikely, and historical data from the trading of the Bitcoin Tracker One ETN on Nasdaq Nordic supports this position: The ETN has traded at or near fair value over the past year, despite significant declines in the price of bitcoin.
- The bitcoin market is substantially more liquid than the underlying market for many ETFs, including many emerging market equity ETFs and fixed-income ETFs.



Liquidity Question 2

How would funds classify the liquidity of cryptocurrency and cryptocurrency-related products for purposes of the new fund liquidity rule, rule 22e-4? For example, would any of these products be classified as other than illiquid under the rule? If so, why?

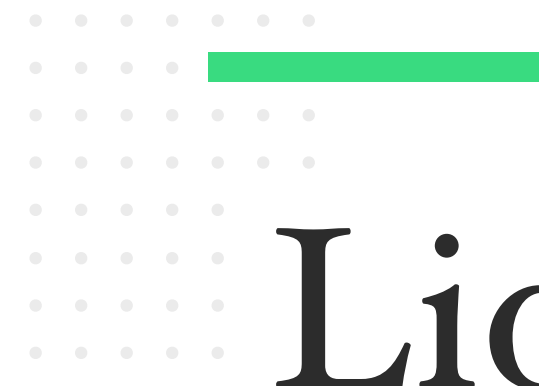
- The SEC's fund liquidity rule 22e-4 does not apply to the proposed Bitwise Bitcoin ETF Trust, which is registered under the 1933 Act.
- As such, the fund has not conducted a formal liquidity classification process to determine which category of liquidity bitcoin would be assigned to.
- Bitwise has relied on historical data for bitcoin ETPs in other jurisdictions, a thorough analysis of the spot bitcoin market, conversations with market makers and Bitwise's experience operating private cryptoasset fund to gain comfort around the liquidity of the underlying and the ability of market makers to successfully make markets in the ETF.



Liquidity Question 3

How would funds take into account the trading history, price volatility and trading volume of cryptocurrency futures contracts, and would funds be able to conduct a meaningful market depth analysis in light of these factors?

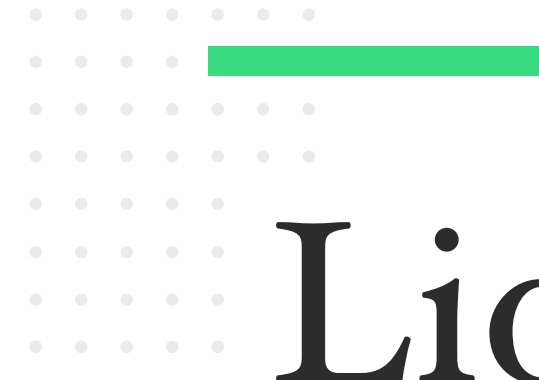
- The proposed Bitwise Bitcoin ETF Trust will not invest in the derivatives market.



Liquidity Question 4

Similarly, given the fragmentation and volatility in the cryptocurrency markets, would funds need to assume an unusually sizable potential daily redemption amount in light of the potential for steep market declines in the value of underlying assets?

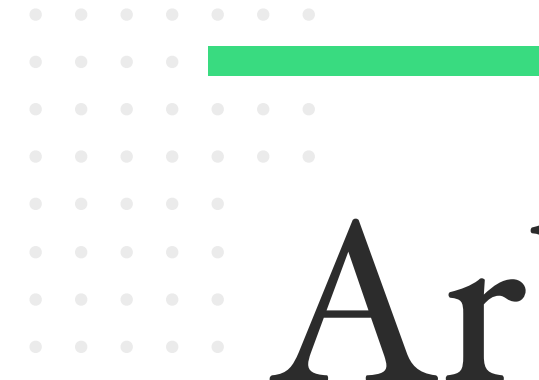
- Bitwise has demonstrated that the global spot bitcoin market, though fragmented across 10 major exchanges, functions as a single integrated market with effective arbitrage in place.
- The Bitcoin Tracker One ETN, listed on Nasdaq Nordic, has experienced outflows, but those outflows have been orderly and have been processed without disrupting trading in the ETP or the underlying markets. The average closing discount to NAV for the fund over the past year was 0.02% as of March 15, 2019, according to Bloomberg.
- Bitwise believes that the underlying bitcoin market, and the supporting market making community, is sufficiently established and organized to handle redemption activity in the Trust, even during extreme market conditions.



Liquidity Question 5

How would a fund prepare for the possibility that funds investing in cryptocurrency-related futures could grow to represent a substantial portion of the cryptocurrency-related futures markets? How would such a development impact the fund's portfolio management and liquidity analysis?

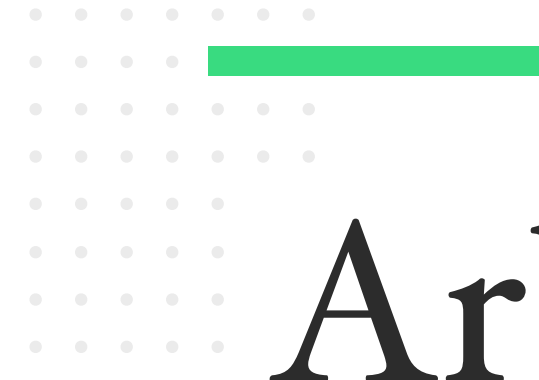
- The proposed Bitwise Bitcoin ETF Trust will not invest in the derivatives market.



Arbitrage Question 1

In order to promote fair treatment of investors, an ETF is required to have a market price that would not deviate materially from the ETF's NAV. In light of the fragmentation, volatility and trading volume of the cryptocurrency marketplace, how would ETFs comply with this term of their orders?

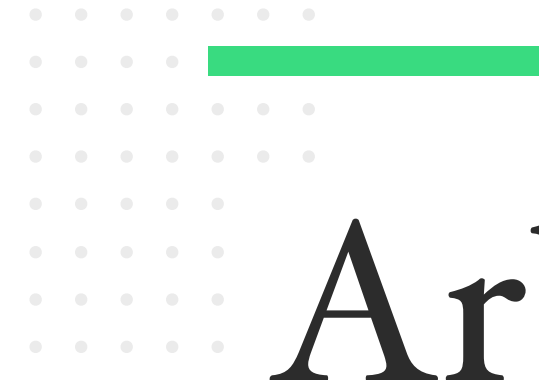
- * As demonstrated earlier in this presentation, the real spot market for bitcoin is tightly integrated and does not experience material price dislocations between exchanges, even when volatility is high.
- * Market makers are able to source bitcoin from many markets, and can use a variety of hedging tools to support their arbitrage efforts, including the robust futures market and the established short lending market that surround bitcoin.
- * The Trust's proposed NAV methodology draws prices from exchanges representing substantially all of the global spot bitcoin volume, and uses prices drawn over a 30-minute window, which will support liquidity in the creation/redemption process.
- * As such, Bitwise is confident that the ETFs market price will not deviate materially from its NAV.



Arbitrage Question 2

Have funds engaged with market makers and authorized participants to understand the feasibility of the arbitrage for ETFs investing substantially in cryptocurrency and cryptocurrency-related products?

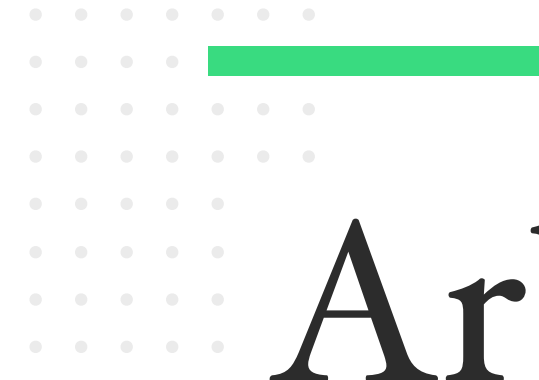
- * Bitwise has engaged with market makers and Authorized Participants, including firms that currently provide market making services to cryptocurrency exchange-traded products listed on the Nasdaq Nordic exchange and the SIX Swiss Exchange, as well as for futures contracts listed on CME and CBOE.
- * As demonstrated, the real spot market for bitcoin is tightly integrated and does not experience material price dislocations between exchanges, even when volatility is high.
- * Market makers are able to source bitcoin from many markets, and can use a variety of hedging tools to support their arbitrage efforts, including a robust futures market and an established short lending market.
- * Through this engagement and because of these circumstances, Bitwise is confident in the belief that the arbitrage mechanism for ETFs investing substantially in bitcoin is demonstrably feasible and that the in-kind creation / redemption mechanism naturally enhances transparency, liquidity and price discovery.



Arbitrage Question 3

How would volatility-based trading halts on a cryptocurrency futures market impact this arbitrage mechanism?

- * The spot market for bitcoin is substantial and trades hundreds of millions of dollars per day. While the CME bitcoin futures market is a significant market, and while it represents a helpful hedging tool for market makers, there is sufficient liquidity in the bitcoin spot market to support liquidity and market making in the proposed ETF even if the futures market is halted.



Arbitrage Question 4

How would the shutdown of a cryptocurrency exchange affect the market price or arbitrage mechanism?

- * The spot market for bitcoin is globally integrated and has low switching costs. As such, if one exchange were to shut down, we would expect the volume to migrate quickly to one of the other exchanges.
- * In conversations with market makers, it is clear that they participate on multiple spot exchanges, which suggests again that the loss of any one exchange would not have a meaningful impact on either the market price or arbitrage system.
- * Additionally, both the Trust's NAV methodology and the proposed Intraday Indicative Index methodology draw prices from ten exchanges. The shutdown of one or more exchanges would not have a significant impact on either of these processes.

Bitwise Asset Management, Inc. and its affiliates (collectively, "Bitwise") has prepared this presentation (this "Presentation") for presentation to and discussion with the Staff of the Securities and Exchange Commission on March 19, 2019. This Presentation is neither an offer to sell nor a solicitation for an offer to buy interests or units in any Fund or securities offering. The summary set forth in this presentation does not purport to be complete. Information in this presentation may change and be inaccurate, incomplete, or outdated. The information contained in this Presentation is subject to further discussion, completion, and amendment. All of the information herein is subject to change without notice. For example, Bitwise may select new data providers to re-evaluate and re-analyze the information. This Presentation may be updated to provide additional information or reflect changes in the information herein. Bitwise intends for this presentation to be included as a public comment on SR-NYSEArca-2019-01, "Notice of Filing of Proposed Rule Change Relating to the Listing and Trading of Shares of the Bitwise Bitcoin ETF Trust under NYSE Arca Rule 8.201-E, (Release No. 34-85093; File No. SR-NYSEArca-2019-01)", dated February 11, 2019.