MEMORANDUM

TO: File No. SR-CboeBZX-2018-040

FROM: Edward Cho
             Office of Market Supervision, Division of Trading and Markets

DATE: November 28, 2018

SUBJECT: Meeting with Van Eck Securities Corporation, SolidX Management LLC,
             Patomak Global Partners, LLC, and Cboe BZX Exchange, Inc.

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On November 26, 2018, Brett Redfearn, Elizabeth Baird, Christian Sabella, Andrea Orr, Roni Bergoffen, Ajay Sutaria, David Shillman, John Roeser, Michael Coe, Edward Cho, Lauren Yates, and Alexander Zozos from the Division of Trading and Markets; William Hinman, Valerie Szczepanik (by phone), Amy Starr (by phone), and Charles Garrison from the Division of Corporation Finance; David Lisitza (by phone) from the Office of General Counsel; and Igor Kozhanov from the Division of Economic and Risk Analysis, met with the following individuals:

> Daniel Gallancy, SolidX Management LLC
> Dimitri Nemirovsky, SolidX Management LLC
> Adam Phillips, Van Eck Securities Corporation
> Kyle Murray, Cboe BZX Exchange, Inc. (by phone)
> Laura Morrison, Cboe BZX Exchange, Inc.
> Ben Brown, Patomak Global Partners, LLC
> Craig Lewis, Patomak Global Partners, LLC

The discussion concerned Cboe BZX Exchange, Inc.'s proposed rule change to list and trade shares of the VanEck SolidX Bitcoin Trust, as well as the attached presentation submitted to the Commission staff by SolidX Management LLC.

VanEck SolidX Bitcoin Trust

Presentation for SEC Staff

November 2018

PRESENTATION OUTLINE

PRICE FORMATION: EQUITIES

1. Prices keyed to present value of future free cash flows

2. Highly liquid markets facilitate price discovery

PRICE FORMATION: CRUDE OIL

1. Prices keyed to supply and demand in the spot market

2. Crude oil does not function as a money substitute

   - Does not reflect a premium above its intrinsic value in industrial applications

3. Shortages in the spot market result in higher prices

   - If shortages are expected to persist, producers increase output as long as marginal revenues exceed marginal costs

   - Eventual increases in supply of spot asset cause prices to drop

PRICE DISCOVERY: CRUDE OIL

1. Estimates from a vector error-correction (VEC) model indicate:

   - Short-term: Futures price is positively related to lagged spot price and negatively related to lagged futures price

     - Spot price is insignificantly related to lagged spot and futures prices

   - Long-term: Futures **lead** spot – no evidence of bi-directional causation

2. Estimates of vector autoregression of first-differences in spot and future indicate:

   - Consistent with VEC model results

   - First-difference of spot are **insignificantly** associated with the lagged first-difference of the futures

   - First difference of futures **significantly** associated with the lagged first-difference in the spot

PRICE FORMATION: SILVER

1. Similar to oil, one can derive spot prices based on expected supply and demand conditions

2. Silver cannot be viewed as a pure industrial commodity because it also functions as a "*money substitute*"

   - Silver trades at a premium relative to its intrinsic industrial value

   - This premium reflects market views regarding the asset's ability to hold value in the future as well as its expected future transferability and liquidity

PRICE DISCOVERY: SILVER

1. Estimates from a vector error-correction (VEC) model indicate:

   - Short-term:

     - *Futures price* positively related to lagged spot price and negatively related to lagged futures price

     - *Spot price* negatively related to lagged futures price and insignificantly related to lagged spot price

   - Long-term: Futures **leads** spot – no evidence of bi-directional causation

2. Estimates of vector autoregression of first-differences in spot and future indicate:

   - Consistent with short-term VEC model results

   - First-difference of spot are **insignificantly** associated with the lagged first-difference of the futures

   - First-difference of futures are **significantly** associated with the lagged first-difference in the spot

PRICE FORMATION: GOLD

1. Similar to oil and silver, one can derive spot prices based on expected supply and demand conditions

2. Gold cannot be viewed as a pure industrial commodity because it also functions as a "*money substitute*"

   - The premium over its value as an industrial commodity reflects market views regarding the asset's ability to hold value in the future as well as its expected future transferability and liquidity

   - The premium related to its role as a money substitute is higher for gold than silver

PRICE DISCOVERY: GOLD

1. Estimates from a vector error-correction (VEC) model indicate:

   - Short-term:

      - *Futures price* positively related to lagged spot price and negatively related to lagged futures price

      - *Spot price* is not significantly related to lagged futures and spot pr*ices*

   - Long-term: Futures **lead** spot – no evidence of bi-directional causation

   - Rapid reversion of spot to futures

2. Estimates of vector autoregression of first differences in spot and future indicate:

   - Consistent with short-term VEC model results

   - First-difference of spot are **insignificantly** associated with the lagged first-difference of the futures

   - First-difference of futures are **significantly** associated with the lagged first-difference in the spot

COMMODITY FUTURES – BOTTOM LINE

- Futures markets perform a valuable role in price discovery

- The empirical evidence indicates that the spot and futures prices are cointegrated

  - This indicates that the spot and futures prices are tightly linked

  - This is evidence of a well-functioning capital market

PRICE FORMATION: BITCOIN

Similar to gold and silver, bitcoin derives its value as a "***money substitute***"

Bitcoin Futures and Spot Prices from 12/18/2017 to 9/28/2018
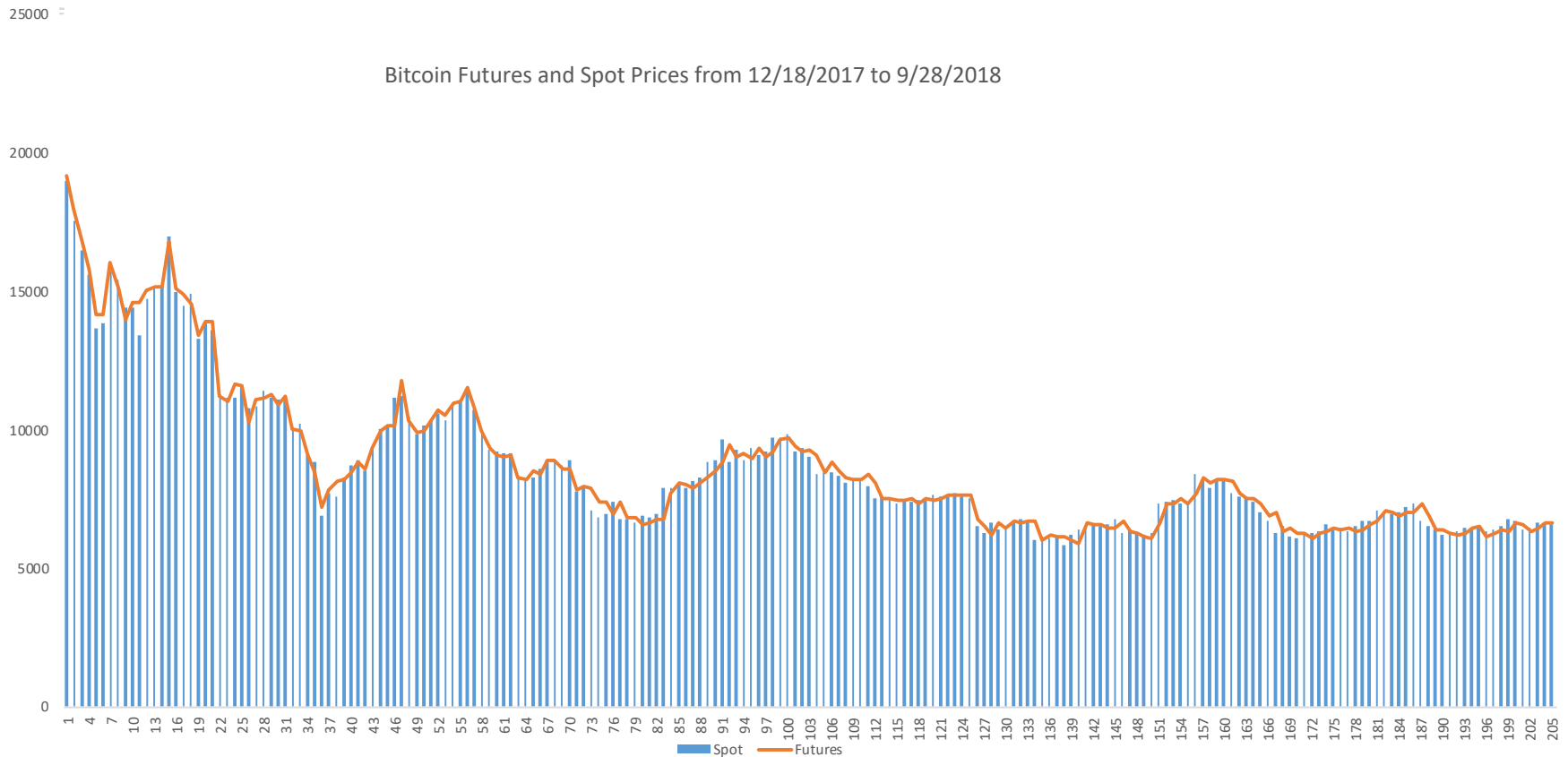
PRICE DISCOVERY: BITCOIN

1. Estimates from a vector error-correction (VEC) model indicate:

    *   No significant short-term price effects

    *   Spot **leads** futures – no evidence of bi-directional causation

    *   Rapid reversion of futures to spot

2. Estimates of vector autoregression of first differences in spot and future indicate:

    *   First-difference of spot are **insignificantly** associated with the lagged first-difference of the futures

    *   First-difference of futures are **significantly** associated with the lagged first-difference in the spot
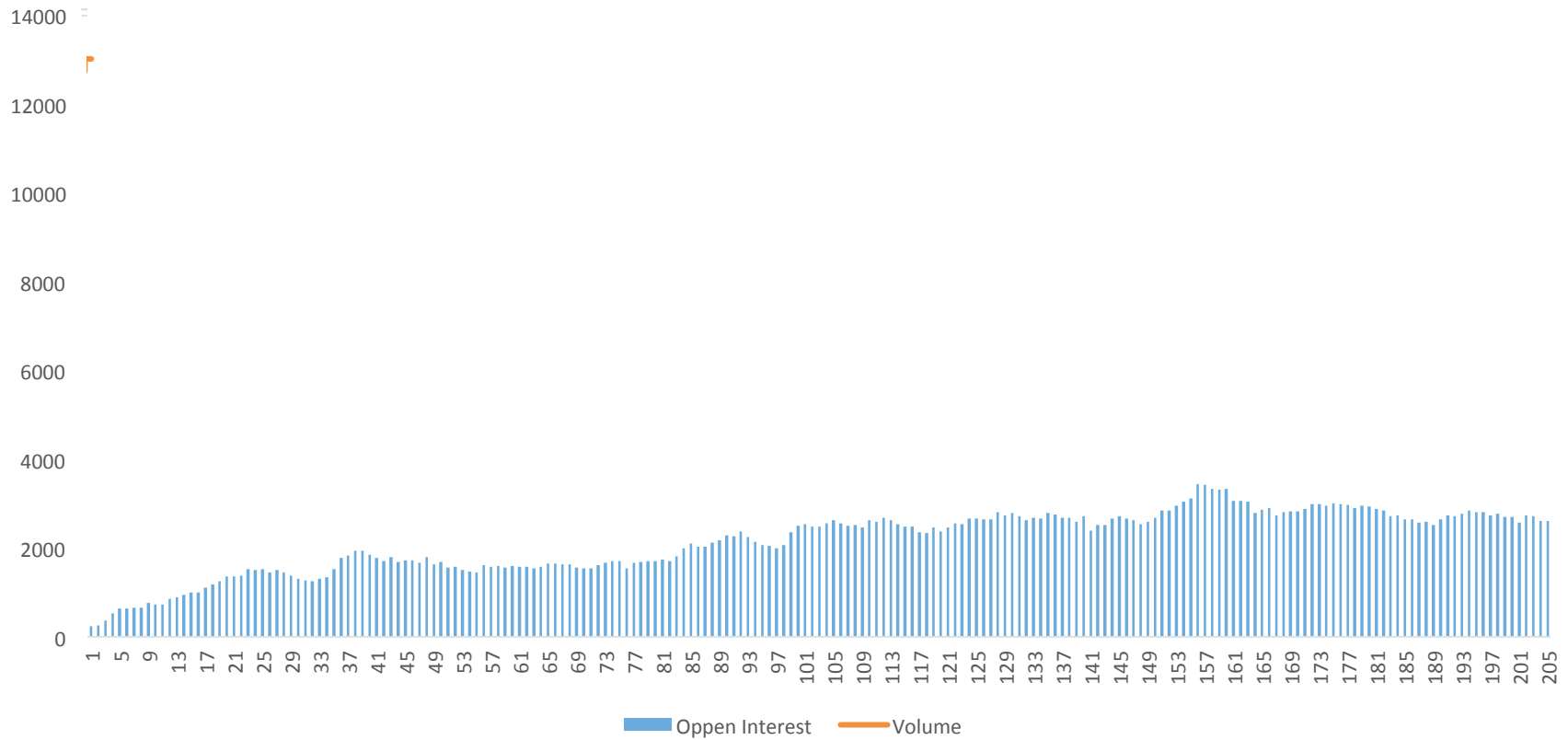
BITCOIN FUTURES – BOTTOM LINE

1. Similar to commodity futures, the spot and futures prices are tightly linked

2. This is evidence of a well-functioning capital market

SIGNIFICANCE OF FUTURES MARKETS – VOLUME AND OPEN INTEREST

Bitcoin CME Futures Volume and Open Interest from 12/18/2017 to 9/28/2018

SIGNIFICANCE OF FUTURES MARKETS – RELATIVE VOLUME FROM CONTRACT INCEPTION

Ratio of Average Daily Nominal Dollar Volume to Initial Week Average Daily Nominal Dollar Volume based on 5-Day Moving Average
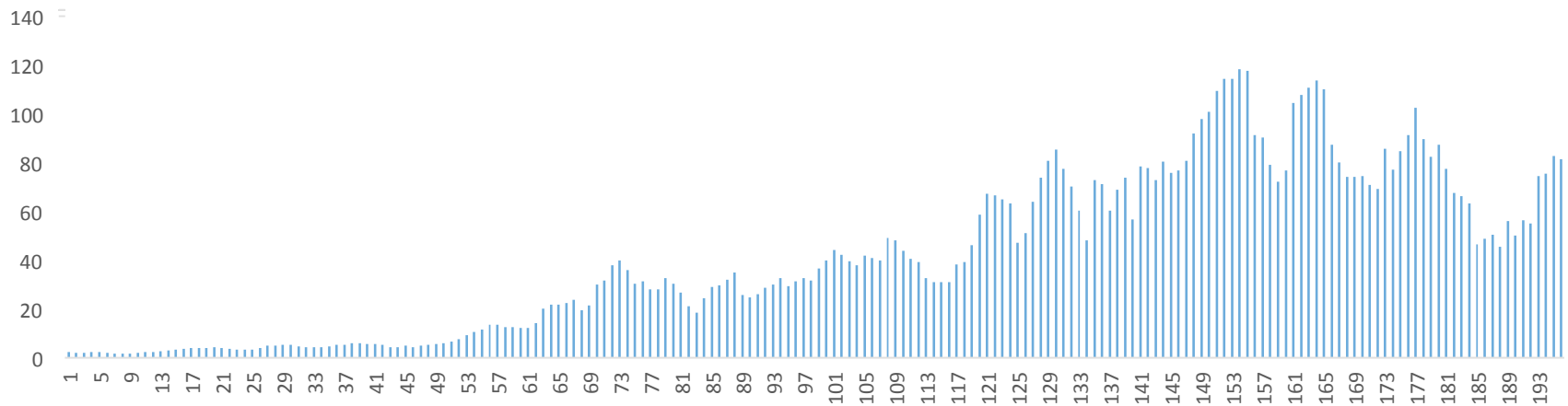
RATIO OF CME FUTURES VOLUME TO SPOT VOLUME FROM LIQUID EXCHANGES

Ratio of CME Futures Volume to
Spot Volume on Liquid Exchanges from
12/18/2017 to 9/28/2018

*Liquid exchanges included in this figure are bitfinex, bitstamp, Coinbase, itbit, Gemini, and Kraken

CRUDE OIL TIME SERIES REGRESSION MODEL

Vector Error-Correction Model

	Futures		Spot	
	Coeff.	Z-score	Coeff.	Z-score
Long-run influence of lagged spot	-0.0188	-0.27	-	-
Long-run influence of lagged futures	-	-	1.0888	2.06
Short-run influences of lagged futures	-0.3504	-3.27	-0.5820	-0.73
Short-run influences of lagged spot	0.0672	4.30	0.0867	0.74
Constant	0.0150	1.35	0.0003	0.00
R-square	0.1122		0.0285	

Vector Autoregression of First-Differences

Spot				
Lag 1	0.0808	5.23	-0.0496	-0.42
Lag 2	0.0311	1.90	-0.1222	-0.98
Futures				
Lag 1	-0.4697	-4.01	0.2559	0.29
Lag 2	-0.1147	-1.05	1.1188	1.35
Constant	0.0127	1.36	0.0798	1.12
R-square	0.1198		0.0096	

SILVER TIME SERIES REGRESSION MODEL

Vector Error-Correction Model

	Futures		Spot	
	Coeff.	Z-score	Coeff.	Z-score
Long-run influence of lagged spot	0.0785	0.43	-	-
Long-run influence of lagged futures	-	-	0.4951	2.91
Short-run influences of lagged futures	-0.6154	-3.54	-0.3913	-2.41
Short-run influences of lagged spot	0.4845	2.56	0.2264	1.28
Constant	-0.0090	-0.70	0.0014	0.12
R-square	0.1747		0.1632	

Vector Autoregression of First-Differences

Spot				
Lag 1	0.5250	3.02	-0.1054	-0.63
Lag 2	0.1932	1.09	-0.1380	-0.81
Futures				
Lag 1	-0.6428	-3.88	-0.0822	-0.52
Lag 2	-0.0680	-0.41	0.1583	1.01
Constant	-0.0104	-0.86	-0.0086	-0.74
R-square	0.0919		0.0465	

GOLD TIME SERIES REGRESSION MODEL

Vector Error-Correction Model

	Futures		Spot	
	Coeff.	Z-score	Coeff.	Z-score
Long-run influence of lagged spot	0.1145	0.69	-	-
Long-run influence of lagged futures	-	-	0.4732	3.02
Short-run influences of lagged futures	-0.5242	-3.15	-0.2466	-1.57
Short-run influences of lagged spot	0.5356	2.98	0.1820	1.08
Constant	-0.3394	-0.58	0.0822	0.15
R-square	0.0541		0.0532	

Vector Autoregression of First-Differences

Spot				
Lag 1	0.7020	4.10	-0.0064	-0.04
Lag 2	0.4673	2.67	0.1448	0.84
Futures				
Lag 1	-0.6937	-4.21	-0.0872	-0.54
Lag 2	-0.2751	-1.72	-0.0717	-0.46
Constant	-0.4486	-0.81	-0.3313	-0.61
R-square	0.0935		0.0149	

BITCOIN TIME SERIES REGRESSION MODEL

Vector Error-Correction Model

	Futures		Spot	
	Coeff.	Z-score	Coeff.	Z-score
Long-run influence of k=lagged spot	-0.6915	-4.36	-	-
Long-run influence of lagged futures	-	-	0.1591	0.90
Short-run influences of lagged futures	-0.0002	0.00	0.1283	1.01
Short-run influences of lagged spot	-0.0064	-0.05	-0.0926	-0.67
Constant	-14.0834	-0.40	-61.2207	-1.57
R-square	0.1672		0.0345	

Vector Autoregression of First-Differences

Spot				
Lag 1	0.4607	4.49	-0.2035	-1.84
Lag 2	0.1997	1.89	-0.0100	-0.09
Futures				
Lag 1	-0.4308	-3.95	0.1954	1.66
Lag 2	-0.2420	-2.29	0.0062	0.05
Constant	-52.6199	-1.51	-49.0619	-1.31
R-square	0.0966		0.0226	

PRESENTATION OUTLINE

PRECEDENT: BREAKWAVE DRY BULK SHIPPING ETF*

In the Approval Order, the Commission noted:

> *The Exchange has represented that the Freight Futures trade on well-established, regulated markets that are members of the ISG. The Commission finds that the Exchange will be able to share surveillance information with a significant regulated market for trading futures on dry bulk freigh*t

The Approval Order includes no additional analysis that specifically discusses whether the markets with which the listing exchange will be able to share surveillance information related to freight futures are significant regulated markets

The Approval Order was silent on whether the listing exchange established that other means to prevent fraudulent and manipulative acts and practices will be sufficient

BREAKWAVE APPROVAL ORDER

The Commission acknowledged that freight futures trades occur off-exchange and are coordinated through a broker network, mostly through phone and instant messaging, and it is only post-trade that any information is shared with a clearing exchange for the contracts to be cleared and for margin requirements to be communicated

Additionally, the listing exchange represented that at least 90% of the net assets of the ETF in the aggregate invested in freight futures and exchange-traded options on freight futures shall be listed on a market that is a member of the ISG or is a market with which the Exchange has a surveillance sharing agreement

The Approval Order also noted that the liquidity in freight futures has generally been constant over the last five years and open interest represents more than $3 billion

The Approval Order did not include any statistics about the daily market-wide trading volume, but the sponsor estimated a daily volume of $50-$100 million in freight futures

BREAKWAVE APPROVAL ORDER INFERENCES

The Approval Order was void of any discussion or facts that can be used to infer that the market for freight futures is a significant market

There was also no discussion about whether the capacity in which exchanges participate in the freight futures market constituted a regulated market

Because there is no specific mention of the factors used to determine that the freight futures market is significant and regulated, the best basis for comparing the Breakwave ETF proposal to the VanEck SolidX Bitcoin Trust proposal is to look to the most obvious factors

BREAKWAVE APPROVAL ORDER CONCLUSIONS

1. The exchanges' role in the freight futures ecosystem is not even that of a market, but rather as a trade reporting facility and clearing venue

   The Commission must have determined that even the limited capacity in which the exchanges are involved in freight futures constituted a market. Comparing that capacity where message and phone based trades are reported after the fact to the exchange to the fully transparent order books in bitcoin futures, the regulatory role and the information available to surveil for manipulative activity are both significantly greater in the bitcoin futures markets at CFE and CME

2. The ADV for bitcoin futures products in the third quarter of 2018 was more than $150 million per day as compared to the estimate of $50-$100 million per day for freight futures

3. There is no question 100% of bitcoin futures trade on "well-established, regulated markets that are members of ISG" (i.e., CFE and CME)

THE COMMISSION MUST BE CONSISTENT IN ITS DEFINITION OF "SIGNIFICANT MARKETS"

Applying the analysis in the Breakwave Approval Order demonstrates that the bitcoin futures market is significant

The Breakwave Approval Order stated that the freight futures markets were significant and did not discuss other means to prevent fraudulent and manipulative activity inherent to the freight futures or underlying dry bulk shipping markets

When compared to the dry bulk shipping market there is no question that the bitcoin futures market is a significant, regulated market

STABILITY OF BITCOIN FUTURES MARKET

The front month contract, on screen bid-ask spread for both CFE and CME have been relatively tight and stable:

- The CFE spread generally ranges between 0.10% and 0.20%

- The CME spread has, with only one exception, remained below 0.40%, even through times of high volatility

There have been a number of instances where trades of $250,000 or more have been executed at prices in line with current market conditions and without any significant impact to spreads, including more than ten instances on CFE, all of which occurred between the best bid and best offer

RESILIENCE OF BITCOIN MARKETS

Several properties of bitcoin and the underlying ecosystem make it less susceptible to manipulation than other commodities that underlie already approved ETPs

- There may be inside information relating to the supply of the physical commodity such as the discovery of new sources of supply or significant disruptions at mining facilities that supply the commodity that simply are inapplicable as it relates to bitcoin

- The linkage between the bitcoin markets and the presence of arbitrageurs in those markets means that the manipulation of the price of bitcoin on any single venue would require manipulation of the global bitcoin price in order to be effective

- Arbitrageurs must have funds distributed across multiple trading platforms in order to take advantage of temporary price dislocations, thereby making it unlikely that there will be strong concentration of funds on any particular bitcoin exchange or OTC platform

- The potential for manipulation on a trading platform would require overcoming the liquidity supply of such arbitrageurs who are effectively eliminating any cross-market pricing differences

- The arbitrage process also has advantages in bitcoin as compared to other commodities, such as oil, because the homogeneity of bitcoin makes for a uniform worldwide market rather than regional semi-independent markets that result in non-fungibility and market fragmentation

- Bitcoin therefore is no more susceptible to manipulation than other commodities, especially as compared to other approved ETP reference assets

PRESENTATION OUTLINE
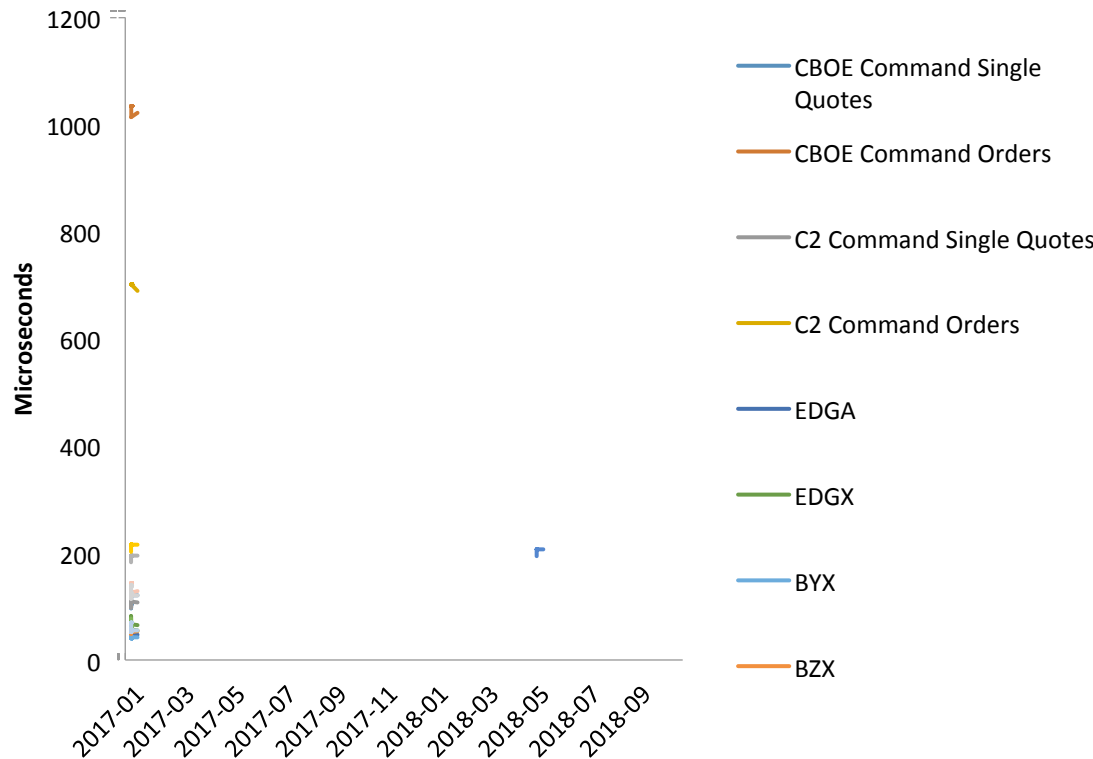
PHYSICAL COMMODITY ETPs AT A GLANCE

Metric	Gold SPDR Gold Trust (GLD)	Silver iShares Silver Trust (SLV)	Copper JPM XF Physical Copper Trust	Bitcoin VanEck SolidX Bitcoin Trust
Initial Filing Date for Physical Commodity ETP	6/7/04	6/30/05	4/2/2012	6/20/18
Approval Date	10/28/04	3/20/06	12/14/12	TBD
Time to Approval	100 (Business Days)	178 (Business Days)	179 (Business Days)	TBD
Listing Date	11/18/04	4/28/06	Never Listed	TBD

PHYSICAL COMMODITY ETPs AT A GLANCE (Cont'd)

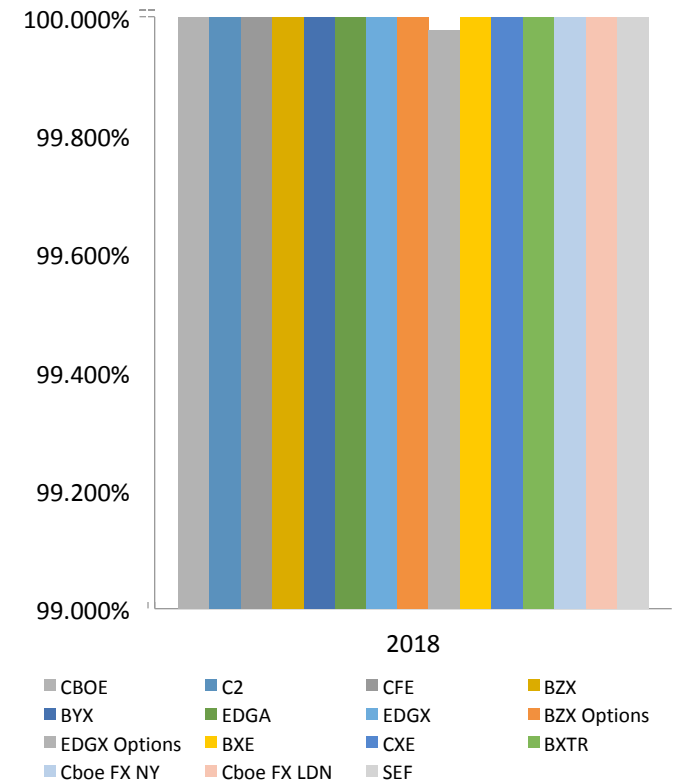| Metric	Gold SPDR Gold Trust (GLD)	Silver iShares Silver Trust (SLV)	Copper JPM XF Physical Copper Trust	Bitcoin VanEck SolidX Bitcoin Trust
Time Period of Reference	2003	2004	2011	2018
Average Daily Notional Volume of Spot	Low:$ 4.9 Billion High: $6.9 Billion	Low: $504 Million High: $956 Million	N/A	$772 Million (10/2017 - 10/2018)
Notional Volume of Futures Contract	$1.8 Billion/daily (COMEX)	$250 Billion/annual (COMEX, 2005)	$9.1 Trillion/annual (LME, COMEX, SHFE)	$2.5 Billion/Sept. 2018 (CME, CFE)

CBOE TRADING PLATFORM EFFICIENCY & RELIABILITY

- Cboe developed, owns and operates the Cboe trading platform. The Cboe trading platform is designed to optimize quality, reliability, speed, scalability and versatility
- 100% uptime across all Cboe markets in Q4/2018 to date*
- Uptick in options latency during extraordinary October trading volumes

Internal Latency (Microseconds)

Legend:
- CBOE Command Single Quotes
- CBOE Command Orders
- C2 Command Single Quotes
- C2 Command Orders
- EDGA
- EDGX
- BYX
- BZX

Reliability – Exchange System Uptime (%)

2018

Legend:
- CBOE
- C2
- CFE
- BZX
- BYX
- EDGA
- EDGX
- BZX Options
- EDGX Options
- BXE
- CXE
- BXTR
- Cboe FX NY
- Cboe FX LDN
- SEF

*Cboe Internal Data. As of November 20, 2018

CBOE MATCHING ENGINE RESILIENCY

Auctions Resiliency
Every effort will be made to failover to the secondary matching engine during auction periods

Auction Matrix Conditions

- **If failover is successful before the auction cut-off and completion times**, auctions will occur on the secondary matching engine

- **If the failover completes after the cut-off time but before the close**, the closing auction will be postponed to allow for a normal five-minute period after the cut-off to ensure the closing auction is fair and orderly

- **If recovery cannot be completed until after the close,** no auction will be conducted but a closing trade will be reported to the consolidated tape

Incident Management Procedures:

1. Notification to all Cboe US associates through Code Red notification system
2. Pull Quotes from SIP
3. Initial Public Notice
4. Updated Public Notice (at least every 30 minutes)
5. Internal Post Mortem
6. Public Post Mortem Notice for all material issues

CBOE REDUNDANCY AND RESILIENCY

2 DATA CENTERS:
Primary Data Center – Equinix NY5, Secaucus, New Jersey
Secondary Data Center – Savvis CH4, Chicago, Illinois

Data Center Redundancy Highlights
- Geographic diversity
- Tested with Members and other exchanges
- Successful intraday switch to secondary data center

Operations Business Continuity
- Redundancy office space in Kansas City, Missouri
- Key operations personnel operate from redundancy space monthly
- Semi-annual shut down of main operations and complete operation run from the redundancy space

45 SECONDS:
Time it takes for the secondary trading system to automatically take over if a primary system fails (software or hardware)

Matching Engine Redundancy Highlights
- Cboe-listed products are balanced across several matching engines
- Rigorous testing of the failover process

Customized Trading Environment
- Option to keep limit orders open during failover
- *Cancel on Disconnect* automatically cancels orders on a disconnected session includes option to continue auction orders

CBOE ANNUAL SIFMA BCP TEST

In coordination with other market centers and in support of Regulation SCI requirements, Cboe participates in the annual SIFMA BCP Test in October of each year

Within fifteen (15) calendar days following the end of each quarter, Cboe provides notice to qualifying Members that have a mandatory DR testing participation requirement. Members that qualify for mandatory participation prior to Q4 of 2016 will be expected to participate in the SIFMA BCP test

Required participants are expected to submit a meaningful amount of orders to the DR site during the test and the expected level of order activity is coordinated between the Exchange and the Member

Non-qualifying Members are also encouraged to participate, but have no registration or volume requirements

The following functionality is tested and verified during the DR test:

- Pre-open trading session
- Member connectivity
- Regular market trading session open
- IPO functionality
- Trade activity
- Market data dissemination
- Order routing
- Clearing
- Regular market trading session close
- After-market trading session

CBOE REGULATION SYSTEMS COMPLIANCE AND INTEGRITY

The Securities and Exchange Commission adopted Regulation Systems Compliance and Integrity and Form SCI in November 2014 to strengthen the technology infrastructure of the US securities markets. Specifically, the rules are designed to:
- Reduce the occurrence of systems issues
- Improve resiliency when systems problems do occur
- Enhance the Commission's oversight and enforcement of securities market technology infrastructure

Who Regulation SCI applies to:
Regulation SCI applies to "SCI entities," a term that includes self-regulatory organizations (SROs), including stock and options exchanges, registered clearing agencies, FINRA and the MSRB, alternative trading systems (ATSs), that trade NMS and non-NMS stocks exceeding specified volume thresholds, disseminators of consolidated market data ("plan processors"), and certain exempt clearing agencies

What Regulation SCI applies to:
Regulation SCI applies primarily to the systems of SCI entities that directly support any one of six key securities market functions - trading, clearance and settlement, order routing, market data, market regulation, and market surveillance ("SCI systems"). Subject to certain exceptions, the compliance date of Regulation SCI is nine months after the effective date of the regulation, or November 3, 2015

- Cboe is required to adhere to Regulation SCI and our trading systems are classified as SCI systems while systems supporting listings are classified as Critical SCI Systems

- Under Regulation SCI, our controls regarding Incident Management/Response and Disaster Recovery are audited by the SEC

- Cboe was most recently audited by the SEC in December 2016
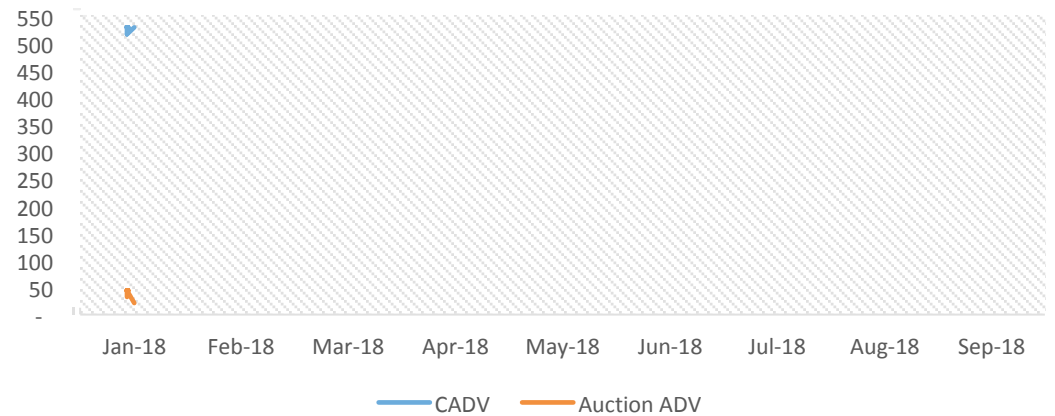
BRK/A AVERAGE DAILY VOLUME

BRK/A Average Daily Volume

Month	CADV	Auction ADV	Price at End of Month
Jan-18	421	21	$ 323,375.10
Feb-18	516	18	$ 310,250.00
Mar-18	327	15	$ 299,100.00
Apr-18	246	11	$ 290,650.00
May-18	313	11	$ 287,200.00
Jun-18	322	15	$ 282,040.00
Jul-18	319	11	$ 301,550.00
Aug-18	237	13	$ 315,800.00
Sep-18	306	32	$ 320,000.05

Price at End of Month
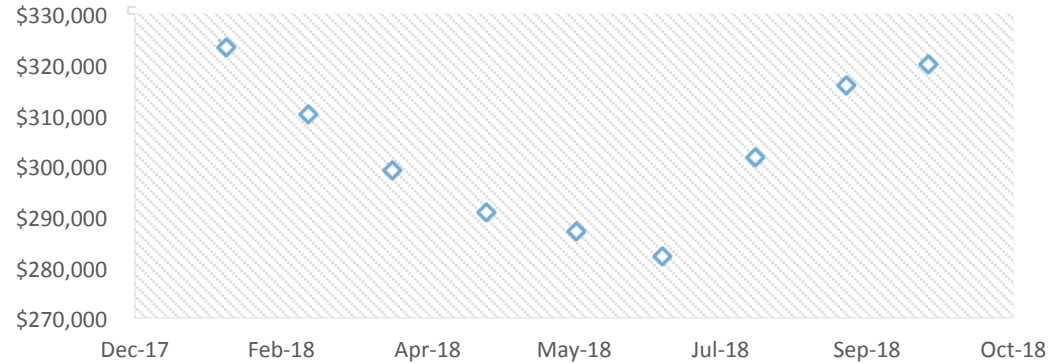
CADV & ADV

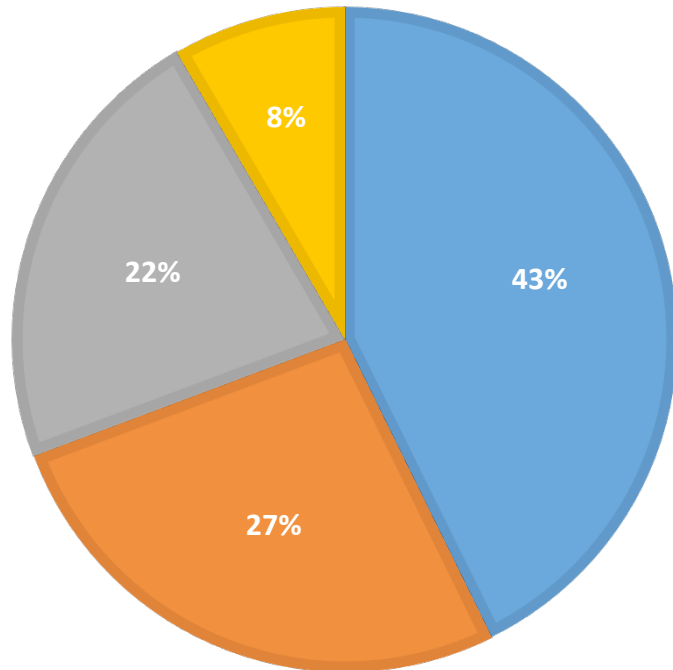# BRK/A EXCHANGE MARKET SHARE

TOTAL VOLUME (1/2018 − 9/2018)

- TRF
- NYSE
- Cboe EDGX Equities
- Cboe BZX Equities
- IEX
- Cboe EDGA Equities
- Cboe BYX Equities
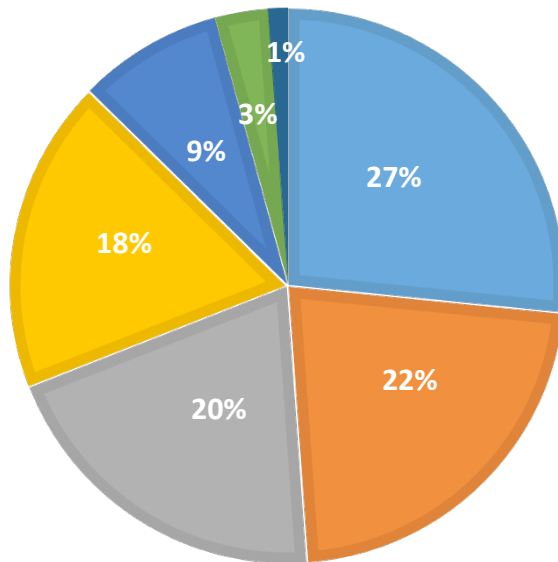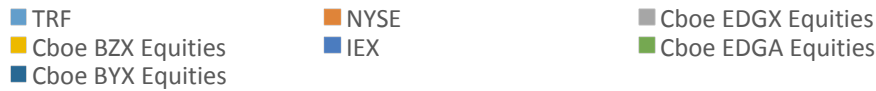
Market Share in BRK/A Volume

Exchange	Total Volume (1/2018 − 9/2018)	Volume Market Share (1/2018 − 9/2018)
TRF	16,562	27%
NYSE	13,887	22%
Cboe EDGX Equities	12,575	20%
Cboe BZX Equities	11,409	18%
IEX	5,243	8%
Cboe EDGA Equities	1,956	3%
Cboe BYX Equities	674	1%
Total	**62,306**	**100%**

BRK/A EXCHANGE GROUP MARKET SHARE

TOTAL VOLUME (1/2018 – 9/2018)

Legend: Cboe ■ TRF ■ NYSE ■ IEX ■

- Cboe: 43%
- TRF: 27%
- NYSE: 22%
- IEX: 8%

Market Share in BRK/A Volume

Exchange Group	Total Volume (1/2018 – 9/2018)	Volume Market Share (1/2018 – 9/2018)
Cboe	26,614	43%
TRF	16,562	27%
NYSE	13,887	22%
IEX	5,243	8%
Total	**62,306**	**100%**

BRK/A EXCHANGE GROUP MARKET SHARE

TOTAL VOLUME (1/2018 – 9/2018)

Legend: ■ Cboe ■ TRF ■ NYSE ■ IEX

	Cboe: 43%
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Market Share in BRK/A Volume

Exchange Group	Total Volume (1/2018 – 9/2018)	Volume Market Share (1/2018 – 9/2018)
Cboe	26,614	43%
TRF	16,562	27%
NYSE	13,887	22%
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Total	**62,306**	**100%**

PRESENTATION OUTLINE

MVIS

VanEck established MVIS in 2011

- Introduction of blue chip indices with investability characteristics specifically designed to underlie exchange-traded products (ETPs)

- Aprroximately $15B passively managed to MVIS indices

- IOSCO compliant, registration under EU benchmark regulation (highest regulatory guidance for indexing available globally today)

- MVIS provides 88 indices across multiple asset classes

MVIS indices are designed around three key principles to ensure intelligent design tailord specifically for ETPs:

- pure-play exposure

- component liquidity

- index diversification

MVIS BITCOIN OTC INDEX

Designed to track the performance of bitcoin in the US OTC market

- Ticker: MVBTCO

- Bloomberg: MVBTCO Index

- Reuters: MVBTCO

- ISIN: DE000SLA56F5

- SEDOL: BG1G1G1

- WKN: SLA56F

Constituent OTC platforms:

- Circle Financial

- DRW's Cumberland

- Genesis Trading

MVIS BITCOIN OTC INDEX CHARACTERISTICS

Index Type: mid-price time series based on firm/tradable bid-ask quotes

Minimum trade size to record: $250,000

Calculation: real-time

Calculation window: daily between 00:00 and 24:00 (CET)

Close: closing value for MVBTCO is 16:00:00 ET with fixed 16:00:00 ET exchange rates

Dissemination frequency: values disseminated to vendors every 15 seconds

Dissemination currency: USD

Base index date: 10/31/2018

Hard fork treatment: none unless a fork takes over the dominant chain

Use: exchange traded products, hedge funds and other applicable instruments, research

MVIS BITCOIN OTC INDEX CALCULATION

Index formula:

The Indices are calculated using the Laspeyres' formula:

$$Index\ Value = \frac{\sum_{i=1}^{n} p_i}{D}.$$

Where (for all platforms (i) in the Index):
p_i = price,
D = divisor/number of platforms.

Input Data:

The following rounding procedures are used for the index calculation:

- Rounding to 2 decimal places:

  – index values,

- Rounding to 18 decimal places:

  – prices (p_i),

MVIS BITCOIN OTC INDEX CONTRIBUTOR SELECTION CRITERIA

Input data shall be sufficient to represent accurately and reliably the market or economic reality that the benchmark is intended to measure

Input data shall be transaction data, if available and appropriate. If transaction data is not sufficient or is not appropriate to represent accurately and reliably the market or economic reality that the index is intended to measure, input data that is not transaction data may be used, including estimated prices, quotes and committed quotes, or other values

Input data shall be verifiable

Clear guidelines regarding the types of input data, the priority of use of the different types of input data and the exercise of expert judgment, to ensure compliance with the Index Guide and index methodology and the aforementioned requirements are defined in MVIS's Code of Conduct for Contributors

MVIS will obtain the input data from a reliable and representative panel or sample of Contributors to ensure the resulting index is reliable and representative of the market or economic reality that the index is intended to measure

MVIS BITCOIN OTC INDEX CONTRIBUTOR CONTROLS

Evaluate market share, reputation, quality and cost of possible input data sources and providers before selecting them on the basis of the gathered information and data

Compare the input data of one contributor with the input data from one or more other contributors in order to ensure the integrity and accuracy of the input data and in case of bad quality replace a contributor with another contributor

MVIS will not use input data from a contributor if there is any indication the contributor does not adhere to MVIS's Code of Conduct for Contributors and in such case shall obtain representative publicly available data

OTC TRADING DESK CONTROLS

Trading counterparty onboarding documents requirements:

- Certificate of Incorporation
- Articles of Organization and any other applicable charter documentation
- Documents proving physical address and other contract information
- Documents reflecting ownership, control & organizational structure of the entity
- Copy of passport for each person authorized to trade
- BSA/AML/KYC program
- Source of funds/wealth, such as pay stub, bank statements (personal & business), copy of last year's federal tax return and tax statement (W-2, 1099), statements from crypto exchanges, crypto holding records
- Hedge funds must also provide: prospectus, offering memorandum, or private placement memorandum, and proof of registration for the fund manager
- Trusts must provide the trust agreement

FinCEN registration as a money services business

PRESENTATION OUTLINE

COMMODITY ETP APPROVAL ORDERS

- Dry Bulk Approval Order:
  https://www.gpo.gov/fdsys/pkg/FR-2017-12-28/pdf/2017-28078.pdf

- Gold Approval Order:
  https://www.nyse.com/publicdocs/nyse/markets/nyse/rule-filings/sec-approvals/2004/NYSE-2004-22app.pdf

- Silver Approval order:
  https://www.nyse.com/publicdocs/nyse/markets/nyse-american/rule-filings/filings/2006/SR_Amex_2005_072_final.pdf
  https://www.sec.gov/Archives/edgar/data/1330568/000119312505127244/ds1.htm

- Copper Approval Order:
  https://www.sec.gov/rules/sro/nysearca/2012/34-68440.pdf
  https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/rule-filings/filings/2012/NYSEArca-2012-28.pdf
  https://www.nyse.com/publicdocs/nyse/markets/nyse-arca/rule-filings/filings/2012/NYSEArca-2012-66[1].pdf

GOLD

SPDR Gold Trust (GLD) formerly known as streetTRACKS® Gold Shares
Filing: 6/7/04   Approval: 10/28/04   Listing: 11/18/04

- The global trade in gold consists of OTC transactions in spot, forwards, and options and other derivatives, together with exchange-traded futures and options

- The approval order states there are no authoritative published figures for overall worldwide volume in gold trading

- The approval order notes the monthly average daily volume figures published by the LBMA, compiled from the five members offering clearing services, for 2003 range from 13.6 million (≈$4.9 billion) to 19 million (≈$6.9 billion) troy ounces per day

- COMEX figures for 2003 indicate the average daily volume for gold futures contracts was 4.9 million troy ounces per day (≈$1.8 billion)

- 12,236,000 Gold Future Contracts were traded and cleared in 2003

SILVER

iShares Silver Trust (SLV)
Filing: 6/30/05   Approval: 3/20/06   Listing: 4/28/06

- The OTC market generally consists of transactions in spot, forwards, options and other derivatives, while exchange-traded transactions consist of futures and options

- The approval order indicates there are no authoritative published figures for overall worldwide volume in silver trading.

- The approval order notes the monthly average daily volume figures published by the LBMA (compiled from the 5 members offering clearing services) for 2004 range from 75.5 million (≈$504 million) to 143.4 million (≈$956 million) troy ounces per day

- Through May 2005, the monthly average daily volume ranged from 76.9 million (≈$563 million) to 152.1 million (≈$1.1 billion).

- COMEX silver futures contracts (5,000 ounces per contract) traded 6,913,000 (≈$250 billion) and 5,686,000 (≈$328 billion) contracts in 2005 and 2006, respectively

COPPER

JPM XF Physical Copper Trust
Filing: 4/2/12   Approval: 12/14/12   Listing: N/A

- Per the filing, the United States Geological Service estimates that reserves—both proven and probable— amount to around 690 million metric tons

- The copper market is the third largest metals market in terms of physical volume. The global market in copper consists of: (i) trading within the physical copper market; and (ii) financial trading through either (a) the exchange-traded futures and options market or (b) the OTC market

- As of December 30, 2011, COMEX open interest for copper was 120,988 contracts

- 2011 LME, COMEX, and SHFE notional trading volume 863 million metric tons, 141.4 million metric tons, and 204 million metric tons, respectively
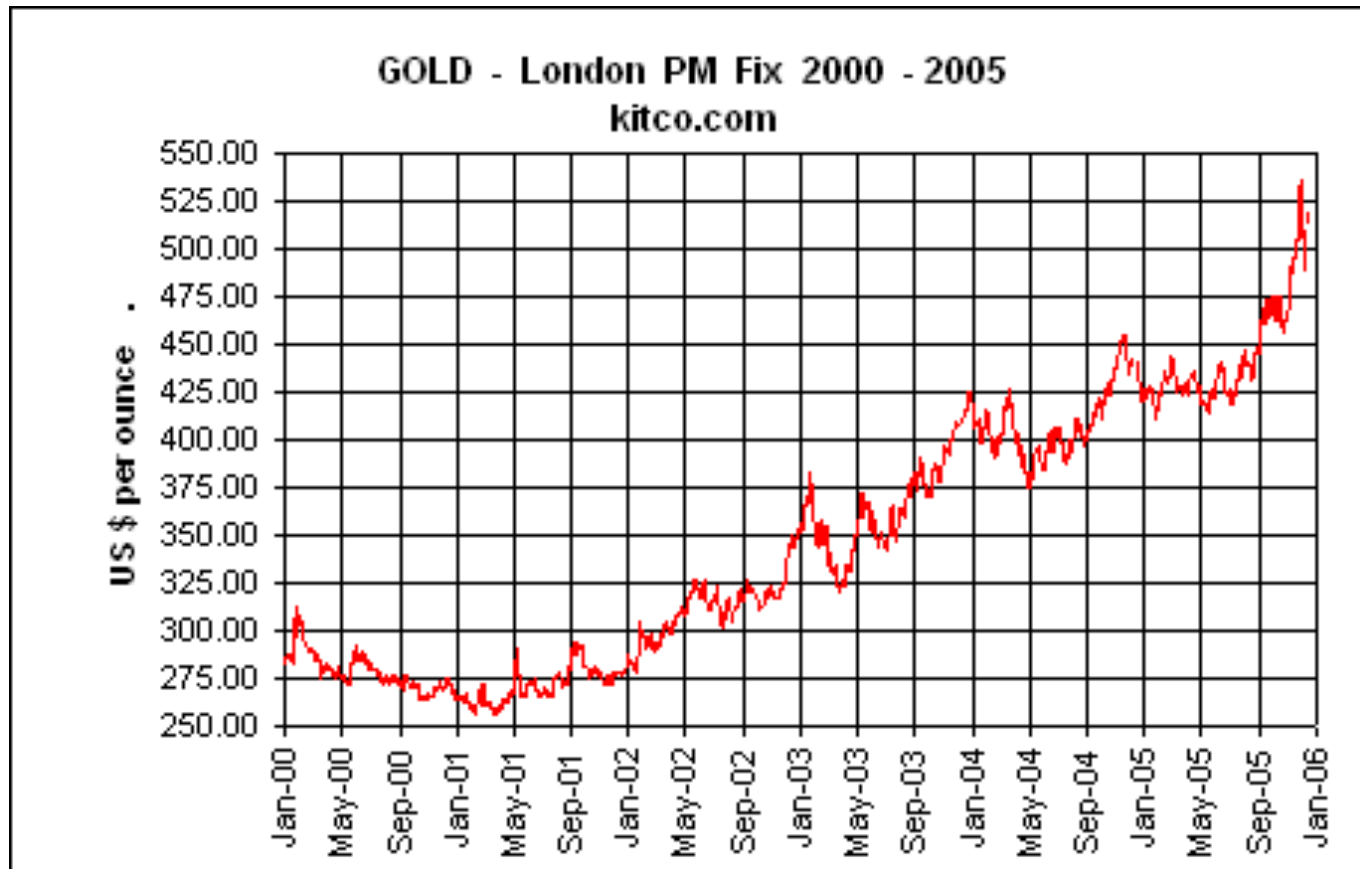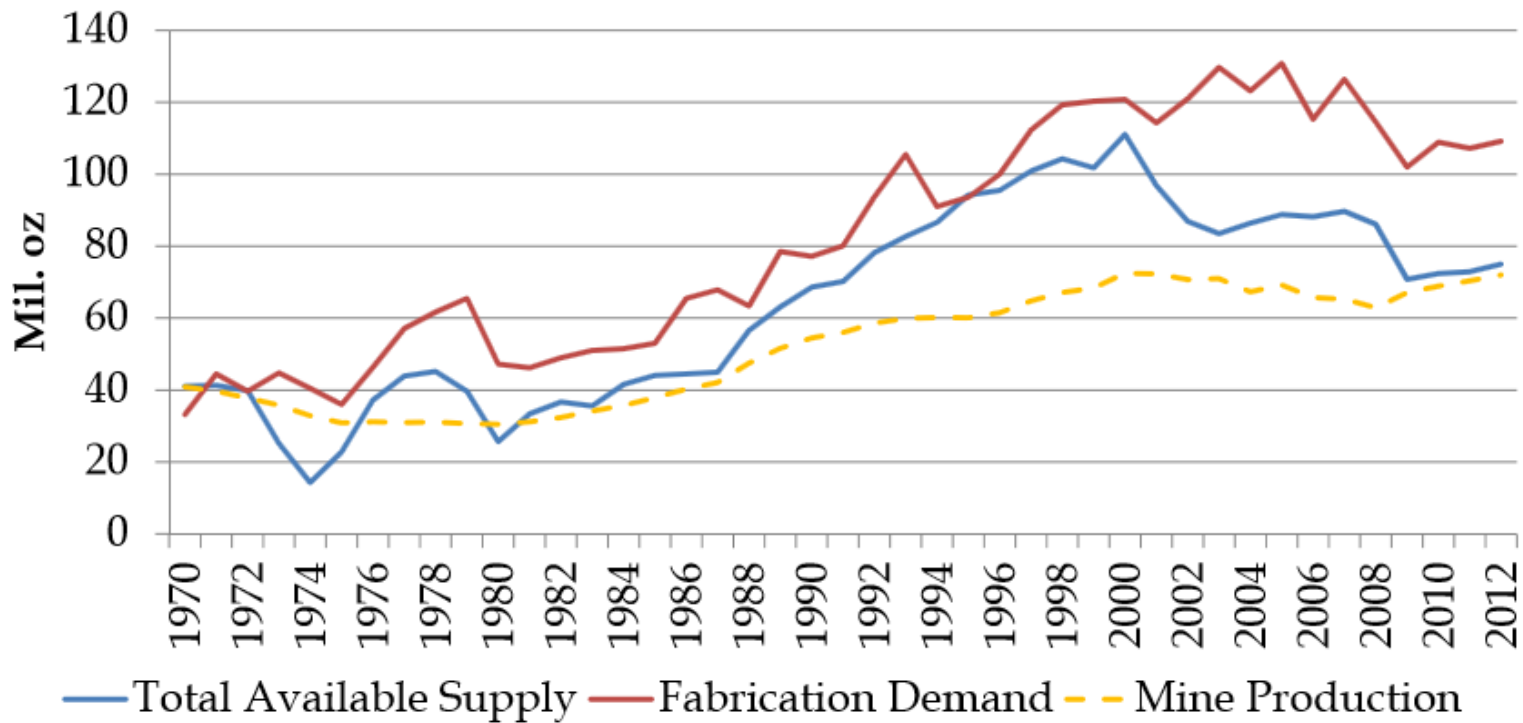
BITCOIN

VanEck SolidX Bitcoin Trust
Filing: 6/20/18

- There will only ever exist 21 million bitcoin, which made the total market cap $114 billion on September 30, 2018. The market cap reached a maximum of $326 billion in December 2017

- $19.9 billion in transactions were processed by the Bitcoin network in September 2018 and the average daily notional volume was $664 million

- $10.9 billion of bitcoin was traded on USD exchanges in September 2018 with an average daily notional volume of $366 million. In 2017, more than $142 billion of bitcoin was traded on USD exchanges with an average daily trading volume of $390 million

- In September 2018, the combined notional trading volume in CFE and CME bitcoin futures products was approximately $2.5 billion*

- As of September 28, 2018, combined notional value of open interest for bitcoin futures was approximately $113 million*

All statistics based on data from blockchain.com or taken directly from CFE and CME websites
* Based on an average bitcoin price of $6750

GOLD: LONDON FIX 2000 – 2005

GOLD: SUPPLY & DEMAND

SILVER: LONDON FIX 2000 – 2005

WORLD SILVER: SUPPLY & DEMAND

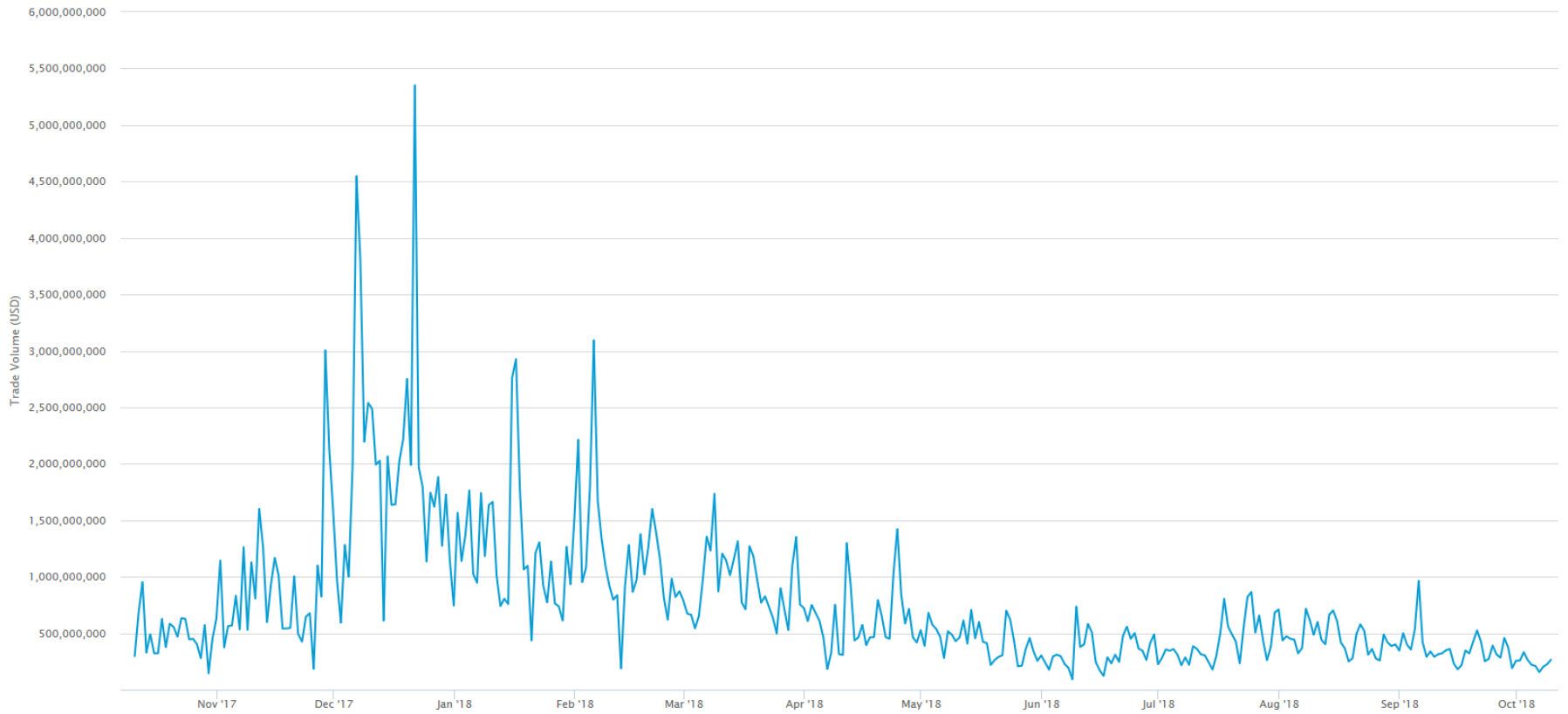**World Silver Supply and Demand**
(million ounces)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Supply										
Mine Production	483.0	491.0	520.7	544.0	548.5	587.3	611.8	607.4	611.2	634.4
Net Government Sales	25.3	18.9	—	40.6	93.1	75.2	71.7	54.9	88.2	61.7
Old Silver Scrap	162.9	158.3	169.3	193.9	181.2	180.4	182.4	187.1	183.6	181.1
Producer Hedging	7.5	—	68.1	6.5	—	—	18.9	0.0	0.0	2.0
Implied Net Disinvestment	89.9	142.8	85.5	44.0	61.1	88.5	—	14.1	0.0	0.0
Total Supply	**768.6**	**811.1**	**843.6**	**829.1**	**883.9**	**931.4**	**884.8**	**863.5**	**883.1**	**879.2**
Demand										
Fabrication										
Industrial Applications	295.7	297.7	320.8	316.4	339.2	375.4	336.3	340.1	350.5	367.1
Photography	209.9	210.1	217.4	225.4	227.9	218.3	213.1	204.3	192.9	181.0
Jewelry & Silverware	236.9	263.7	274.3	259.4	271.7	278.2	287.1	262.7	274.2	247.5
Coins & Medals	26.1	25.2	30.4	27.8	29.2	32.1	30.5	31.6	35.8	41.1
Total Fabrication	768.6	796.8	842.9	829.1	867.9	904.0	867.0	838.7	853.4	836.7
Net Government Purchases	—	—	0.7	—	—	—	—	—	—	—
Producer Hedging	—	14.3	—	—	16.0	27.4	—	24.8	21.0	0.0
Implied Net Investment	—	—	—	—	—	—	17.8	0.0	8.7	42.5
Total Demand	**768.6**	**811.1**	**843.6**	**829.1**	**883.9**	**931.4**	**884.8**	**863.5**	**883.1**	**879.2**
Silver Price (London US$/oz)	5.197	5.199	4.897	5.544	5.220	4.951	4.370	4.599	4.879	6.658

WORLD COPPER: SUPPLY & DEMAND

Total World Copper Supply and Demand

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
					Thousand Tonnes						
Mine Production											
Chile	4,697	4,585	4,942	5,380	5,240	5,293	5,534	5,271	5,400	5,370	5,176
Peru	716	845	849	1,029	995	1,035	1,185	1,254	1,276	1,236	1,219
China	582	569	609	738	750	862	924	1,065	1,045	1,145	1,251
U.S.A.	1,328	1,141	1,124	1,153	1,123	1,182	1,163	1,296	1,182	1,099	1,113
Indonesia	1,038	1,164	1,011	837	1,048	806	786	644	998	863	519
Other	5,273	5,274	5,222	5,457	5,766	5,811	5,891	5,998	5,996	6,275	6,726
Total Mine Production	**13,634**	**13,577**	**13,757**	**14,594**	**14,922**	**14,990**	**15,483**	**15,527**	**15,897**	**15,989**	**16,005**
Total percent change	*3.2%*	*-0.4%*	*1.3%*	*6.1%*	*2.2%*	*0.5%*	*3.3%*	*0.3%*	*2.4%*	*0.6%*	*0.1%*
Refined Metal Production											
Primary Refined Production	13,746	13,436	13,487	13,848	14,411	14,678	15,1910	15,418	15,435	15,749	16,113
Secondary Refined Production	1,892	1,918	1,785	2,069	2,161	2,613	2,743	2,823	2,818	3,249	3,517
Total Refined Metal Production	**15,638**	**15,354**	**15,272**	**15,917**	**16,572**	**17,291**	**17,934**	**18,241**	**18,253**	**18,998**	**19,630**
Total percent change	*6.0%*	*-1.8%*	*-0.5%*	*4.2%*	*4.1%*	*4.3%*	*3.7%*	*1.7%*	*0.1%*	*4.1%*	*3.3%*
Consumption											
China	2,348	2,772	3,123	3,263	3,755	3,920	4,678	5,454	6,695	7,522	7,712
European Union	4,162	3,983	3,934	4,111	3,856	4,256	4,060	4,629	3,473	3,972	4,186
U.S.A.	2,665	2,395	2,350	2,435	2,256	2,099	2,130	2,009	1,593	1,752	1,798
Japan	1,165	1,179	1,234	1,292	1,228	1,284	1,256	1,185	852	1,061	1,032
South Korea	864	948	924	949	868	829	858	816	908	857	766
Other	3,742	3,954	4,109	4,659	4,906	4,969	5,058	4,062	4,168	4,211	4,495
Consumption of Refined Copper[1,2]	**14,946**	**15,231**	**15,674**	**16,710**	**16,870**	**17,358**	**18,040**	**18,154**	**17,688**	**19,375**	**19,988**
Total percent change	*-1.2%*	*1.9%*	*2.9%*	*6.6%*	*1.0%*	*2.9%*	*3.9%*	*0.6%*	*-2.6%*	*9.5%*	*3.2%*
Refined Copper Balance[2]	692	123	-402	-793	-298	-67	-106	87	565	-377	-358
Exchange Metal Stocks[3]	1,138	1,293	806	124	156	253	238	390	688	568	544
No. weeks of consumption	4.0	4.4	2.7	0.4	0.5	0.8	0.7	1.1	2.0	1.5	1.4
Annual Average LME Cash Price (US$/mt)	$ 1,578	$ 1,557	$ 1,777	$ 2,876	$ 3,715	$ 6,730	$ 7,126	$ 5.164	$ 6,952	$ 7,539	$ 8.811
% Change Year Ago	*-13.0%*	*-1.3%*	*14.1%*	*61.8%*	*29.2%*	*81.2%*	*-2.4%*	*-25.7%*	*-2.4%*	*46.07%*	*16.9%*

BITCOIN EXCHANGE TRADED VOLUME (USD)

BITCOIN MARKET CAPITALIZATION

BITCOIN FUTURES VS. SPOT ADV

CME bitcoin futures trading overtakes largest US spot exchange

Average daily volume, bitcoin equivalent

Sources: Bloomberg, Coinalyze.net
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