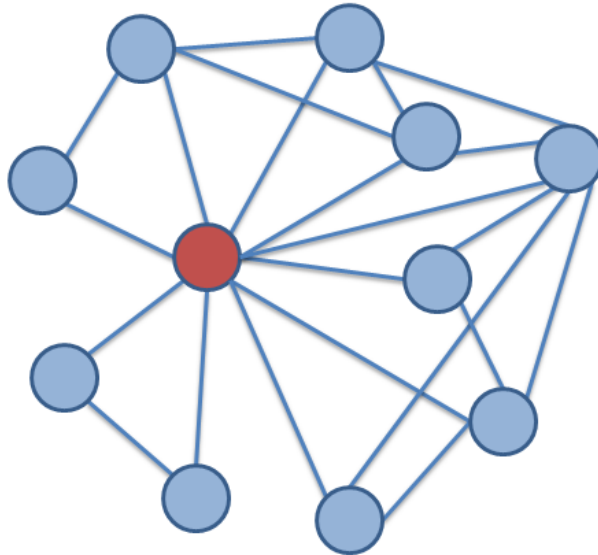


December 18, 2017

Teach-in

Global Payments, Banking, and Technology

Bitcoin Decrypted: A Brief Teach-in and Implications



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Agenda: Key topics...

We'll talk about:

- I. Brief (very brief) Bitcoin history
- II. Bitcoin's structural objectives
- III. Status of Bitcoin market
- IV. Attempts at valuing Bitcoin
- V. The unanticipated limits/problems with Bitcoin
- VI. Regulatory view on Bitcoin
- VII. Banks/institutional efforts in Bitcoin
- VIII. Semi universe impact
- IX. Morgan Stanley Research reports on Bitcoin

Agenda: ...and a few we'll skip (for now)

What we won't comment on (today)

1. Price target for Bitcoin and other cryptocurrencies
2. A comprehensive (or even cursory) view of other cryptos
3. Addressing Bitcoin's weaknesses with other cryptos/tokens
4. Trading dynamics of Bitcoin markets, including futures
5. The systemic point of Bitcoin
6. Bitcoin as inflation creator
7. Uses for underlying technologies (like Blockchain)

I. Very brief history

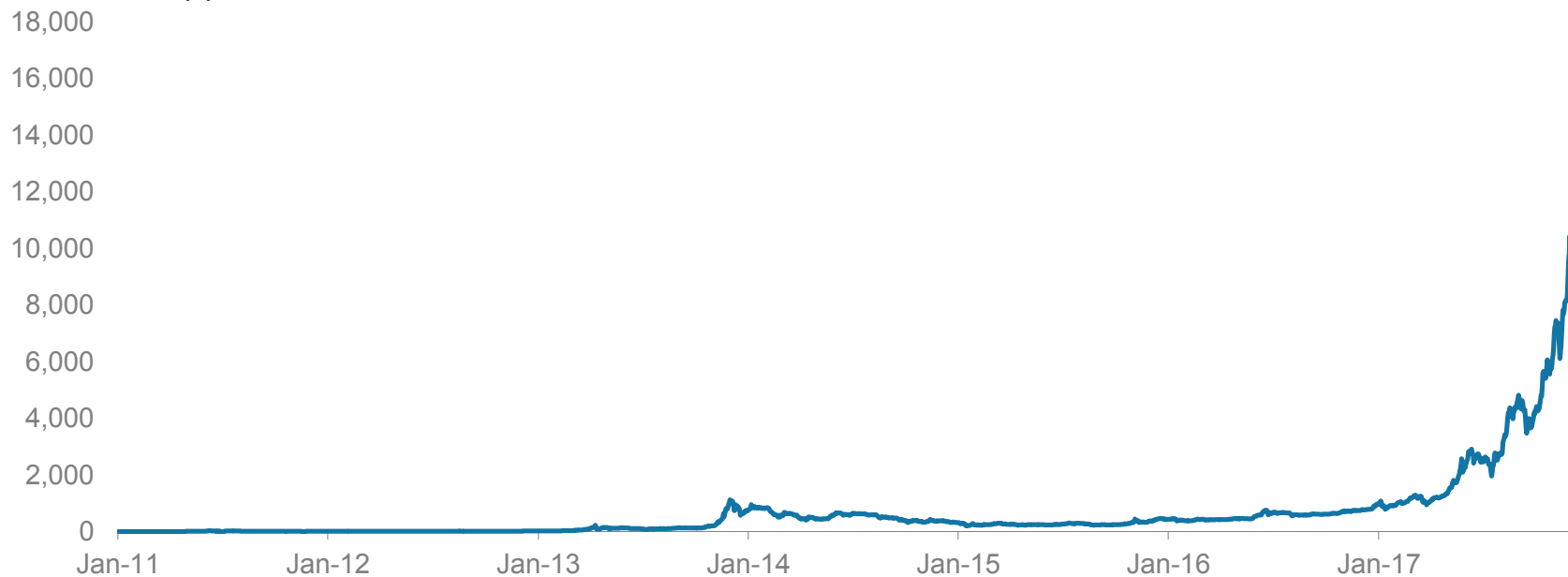
A very brief history of Bitcoin

Taking it to the people

Satoshi Nakamoto – Unknown person(s) responsible for creating first blockchain database

- specifically anti-establishment motivated
- “Genesis block” in January 2009
- Nakamoto involved in Bitcoin software into 2010; Gavin Andresen inherits

Bitcoin value (\$)

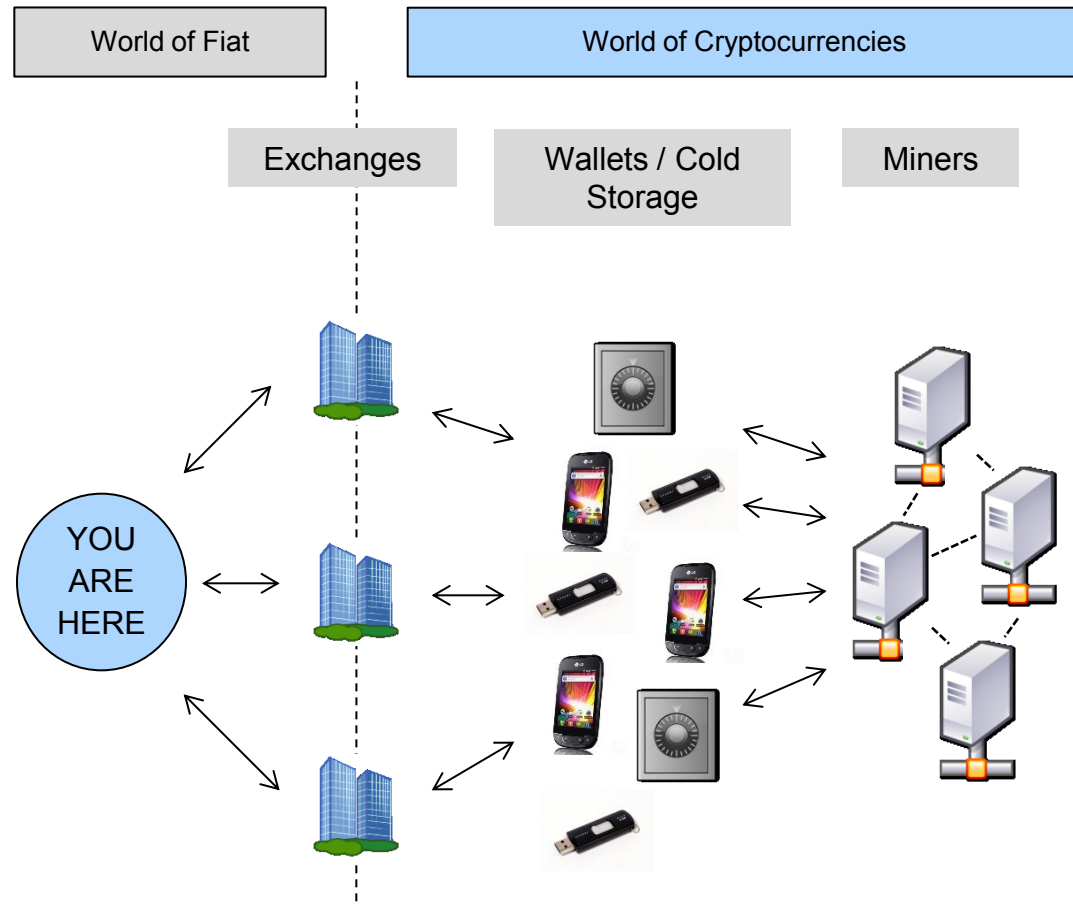


II. Bitcoin's structural objectives

Solving for 4 objectives

Bitcoin's uncompromised structure

1. Decentralization
2. Zero Trust
3. Anonymity
4. Lifetime limit of circulation
 - 21mn Bitcoin limit; 16.7mn (80%) mined to date



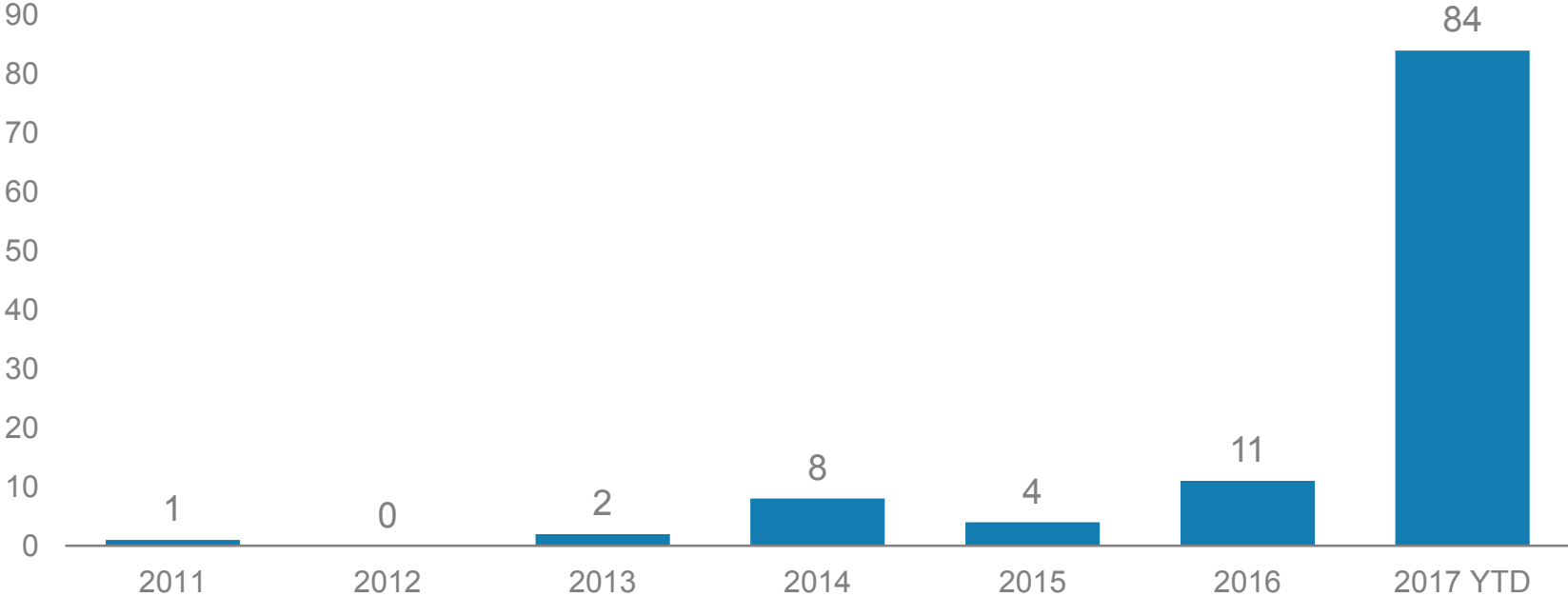
III. Status of Bitcoin Market

Implied valuation

Institutions beginning to invest...

Over \$2bn in estimated AUM from over 100 crypto-dedicated funds, 2018 will likely be bigger

Crypto-dedicated funds, by year of inception



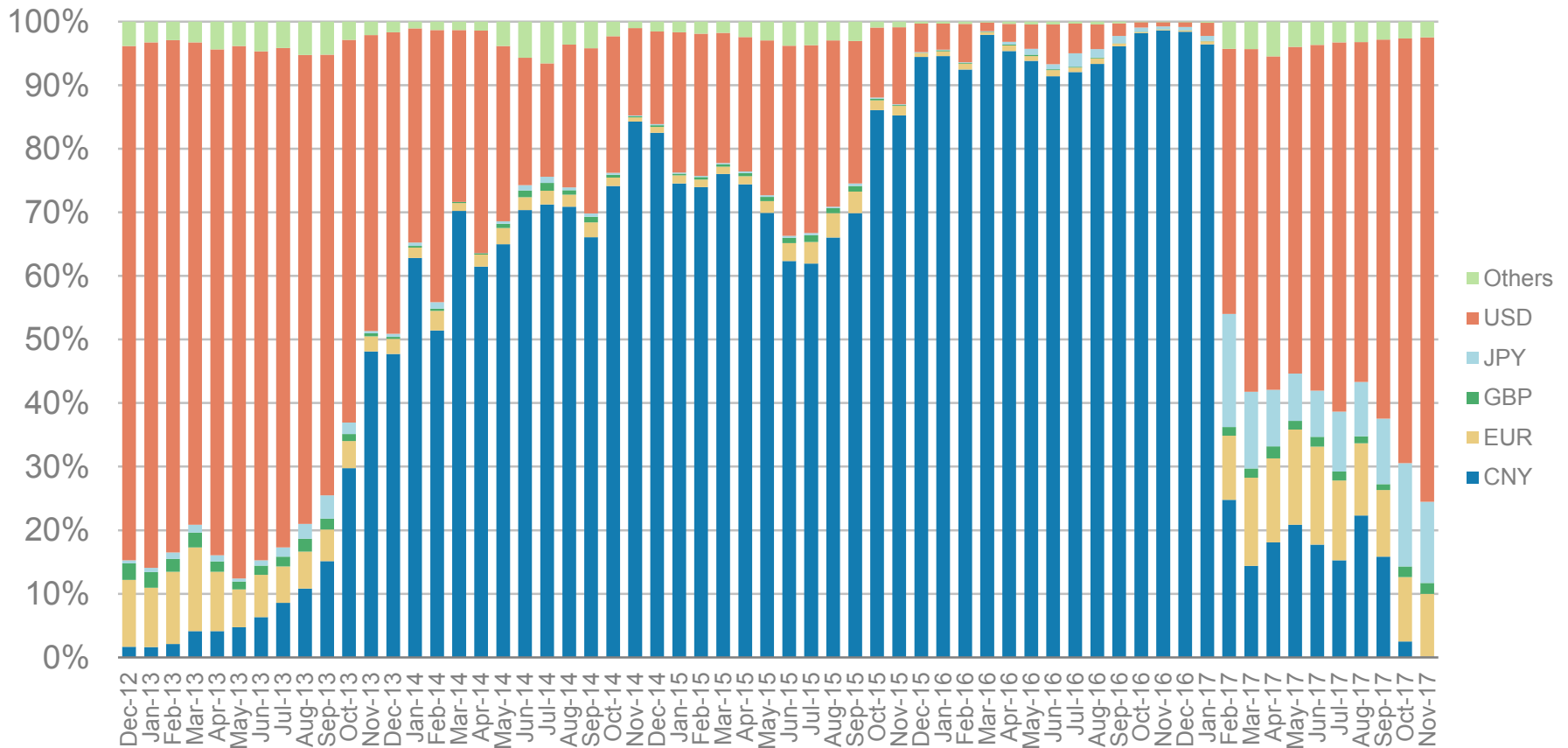
Source: Autonomous Next, Morgan Stanley Research

III. Bitcoin's Appeal

Current Bitcoin investment case

Where are trades happening? A list of currencies:

Bitcoin/fiat trade composition, by currency



Source: blockchain.info, Morgan Stanley Research

III. Bitcoin's Appeal

Size of the Cryptocurrency market and liquidity

- 62% of total cryptocurrency value is in Bitcoin
- Over \$600bn spread over 1,400 coins

#	Name	Symbol	Price (USD)	Total Float (USDbn)	Total Float (% total)	Volume 24h (USDmn)	Volume 24h (% Market Cap)	Supply (USDmn)	Supply (% max)	Max coins (mn)	Smallest traded (unit)	Smallest traded (USD)	Mined?
1	Bitcoin	BTC	19301	323.27	53.62	13419	4.2	16.7	80	21	1.00E-07	1.93E-03	Y
2	Ethereum	ETH	743	71.64	11.88	2323	3.2	96.4	N/A	No	1.00E-18	7.43E-16	Y
3	Bitcoin Cash	BCH	1906	32.13	5.33	931	2.9	16.9	80	21	1.00E-07	1.91E-04	Y
4	Ripple	XRP	0.75	29.25	4.85	1073	3.7	38739.1	39	100000	1.00E-06	7.55E-07	N
5	Litecoin	LTC	324	17.62	2.92	1248	7.1	54.4	65	84	N/A	N/A	Y
6	Cardano	ADA	0.5	12.89	2.14	326	2.5	25927.1	58	45000	N/A	N/A	Y
7	IOTA	MIOTA	4	11.47	1.9	445	3.9	2779.5	100	2780	N/A	N/A	N
8	Dash	DASH	1107	8.59	1.42	257	3	7.8	41	19	N/A	N/A	Y
9	NEM	XEM	0.8	7.16	1.19	95	1.3	9000	N/A	No	N/A	N/A	N
10	Monero	XMR	356	5.51	0.91	183	3.3	15.5	N/A	No	N/A	N/A	Y

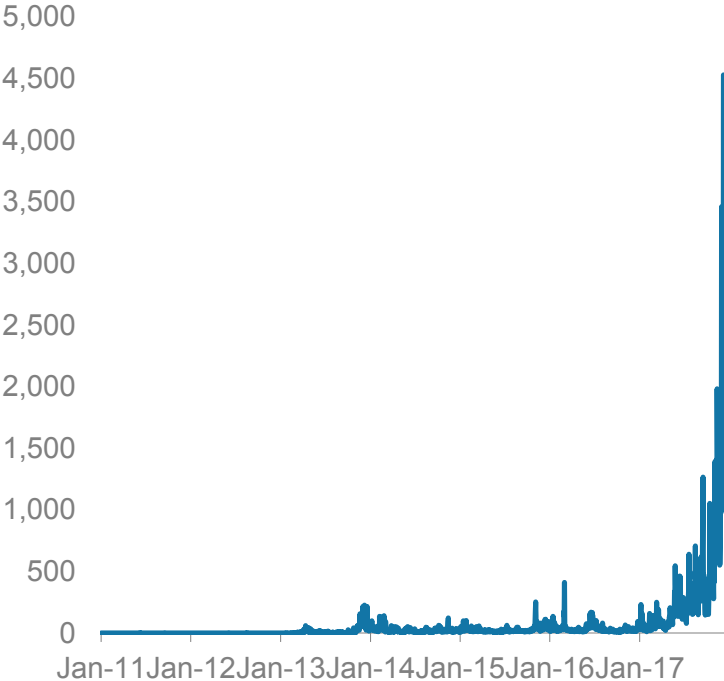
Source: blockchain.info, Morgan Stanley Research

III. Bitcoin's Appeal

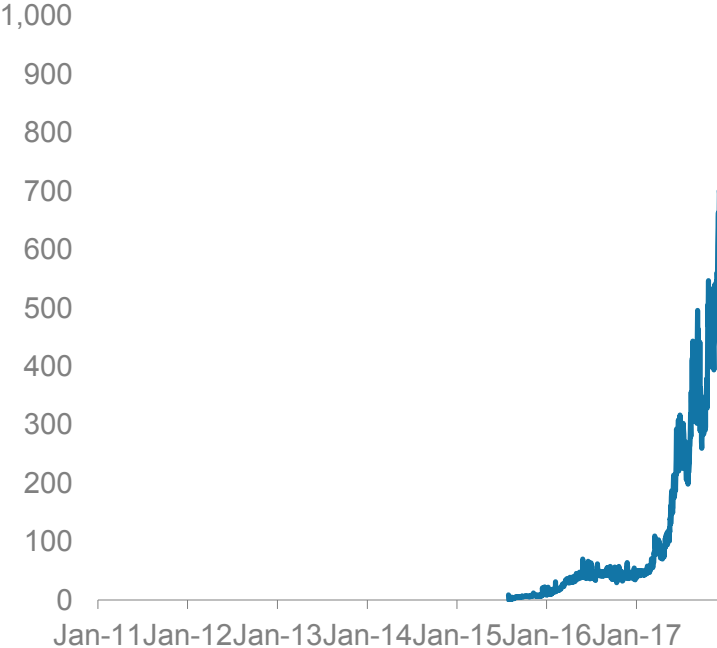
Size of the Cryptocurrency market and liquidity

Trading Volume

Bitcoin Daily Trading Volume (\$mn)



Ethereum Daily Transaction Count (thousands)



Source: blockchain.info, Morgan Stanley Research

IV. Valuing Bitcoin

Attempts to Value Bitcoin

Very difficult question to answer, but some points to consider

- **Can Bitcoin be valued like a currency?** No. There is no interest rate associated with Bitcoin.
- **Like digital gold?** Maybe. Does not have any intrinsic use like gold has in electronics or jewelry. But investors appear to be ascribing some value to it.
- **Is it a payment network?** Yes but it is tough to scale and does not charge a transaction fee.
 - Bitcoin average daily trading volume of \$3bn (last 30 days) vs \$5.4 trillion in the FX market
 - Est. <\$300mn in daily purchase volume vs. \$17bn for Visa

IV. Valuing Bitcoin

Bitcoin Relative to Global Transactions

- If nobody accepts the technology for payment then the **value would be 0**.
- We don't think Bitcoin/cryptocurrencies would replace every fiat currency payment made today.
- For comparison, Bitcoin's "float" of \$300bn is a fraction of payments and fiat money in circulation today:

	In USD	Bitcoin "float" as a % of data point
Global broad money supply*	\$90trn	0.33%
Global exports (per month)	\$1.4trn	21.7%
Global card payments	\$22.7trn	1.3%
Gold used in investment & official reserves	\$2.8trn	10.4%

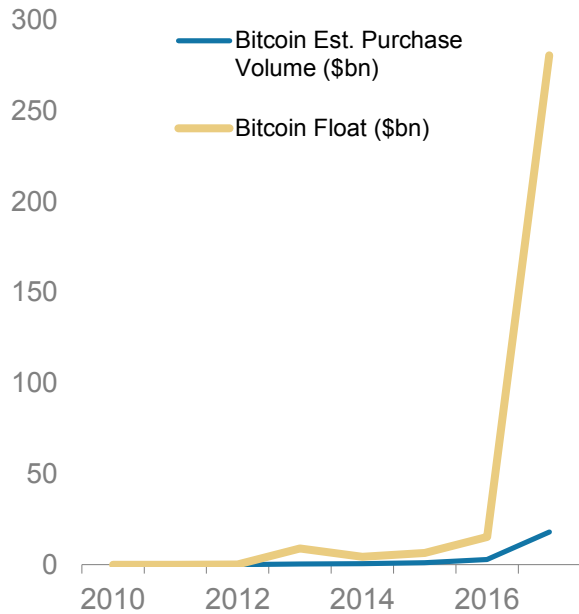
Source: CIA World Factbook, Macrobond, VISA, World Gold Council, Morgan Stanley Research. *M2 where available.

IV. Valuing Bitcoin

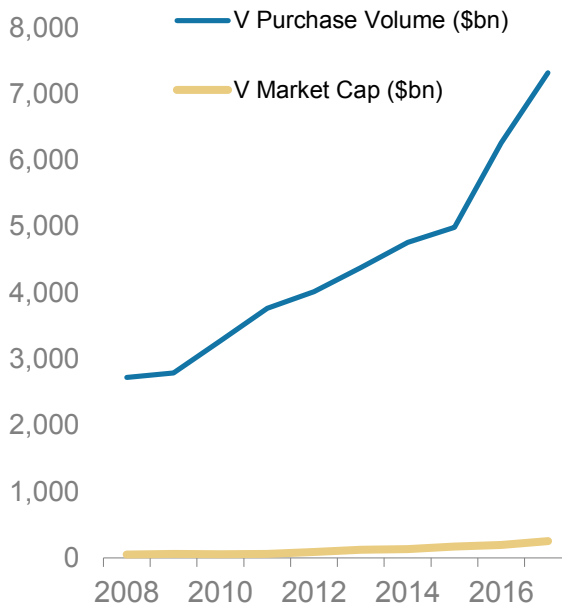
Implied Valuation

Bitcoin's value is a multiple of its underlying volume, a stark contrast to Visa

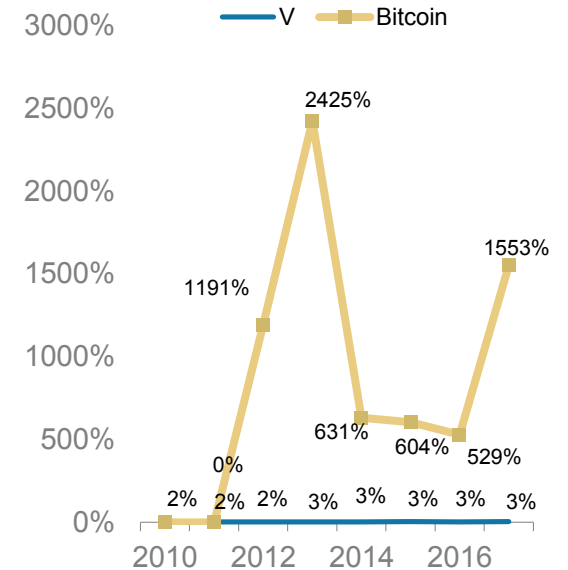
USD billions



USD billions



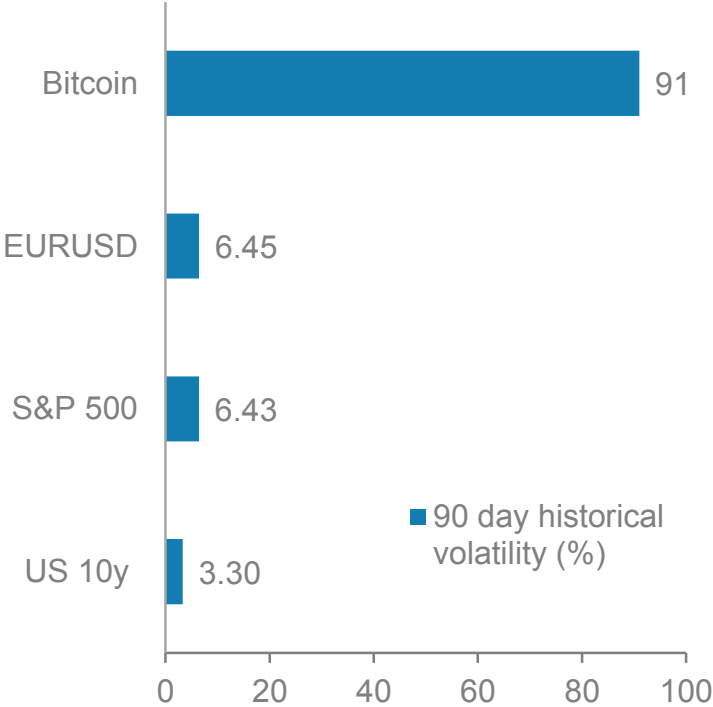
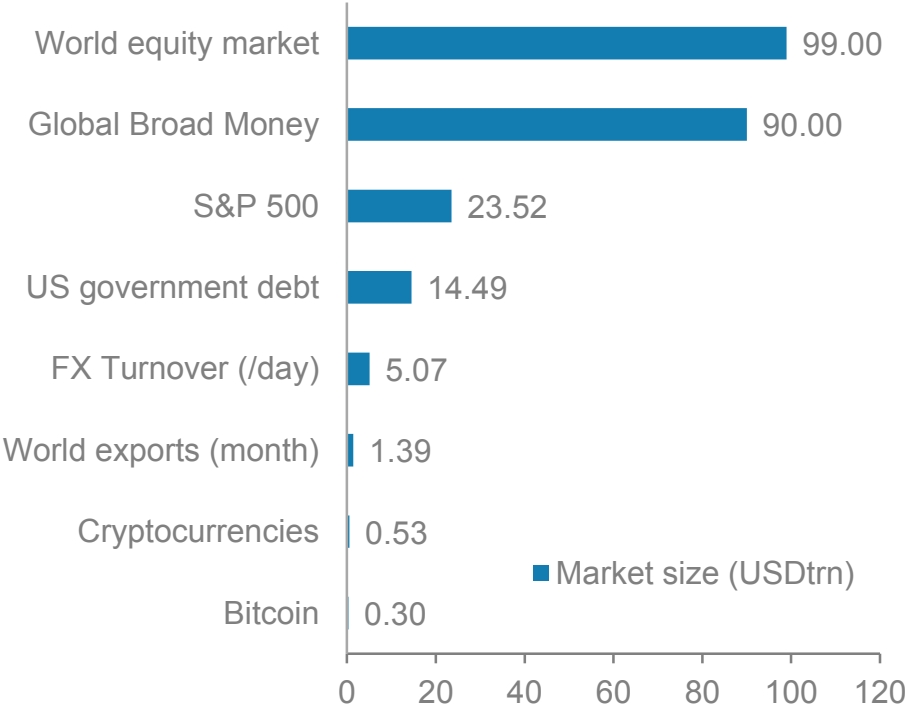
Ratio of Market Cap / Float to TTM Volume



Source: Company Data, blockchain.info, Morgan Stanley Research

IV. Valuing Bitcoin

Bitcoin Relative to Global Markets



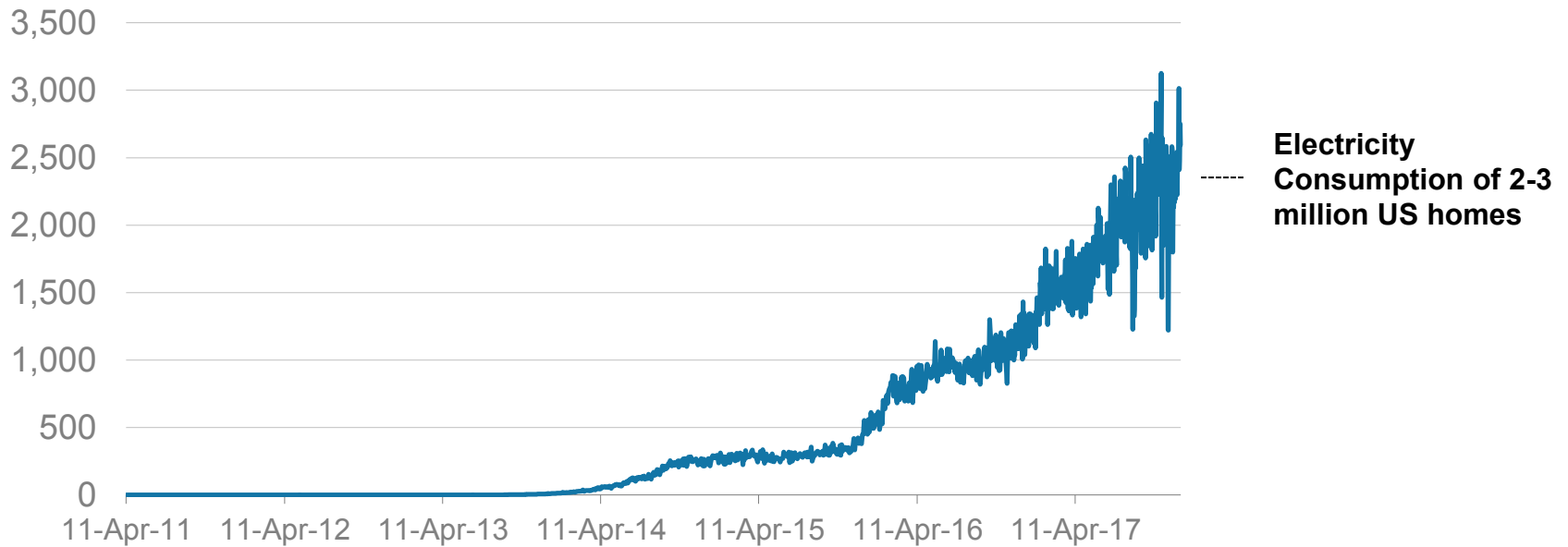
Source: Macrobond, Bloomberg, CoinMarketCap, Morgan Stanley Research

V. Unanticipated problems/limits

Current compromises

Bitcoin and SRI: Mutually Exclusive (For Now?)

Total Bitcoin Mining Energy Consumption (Megawatts)



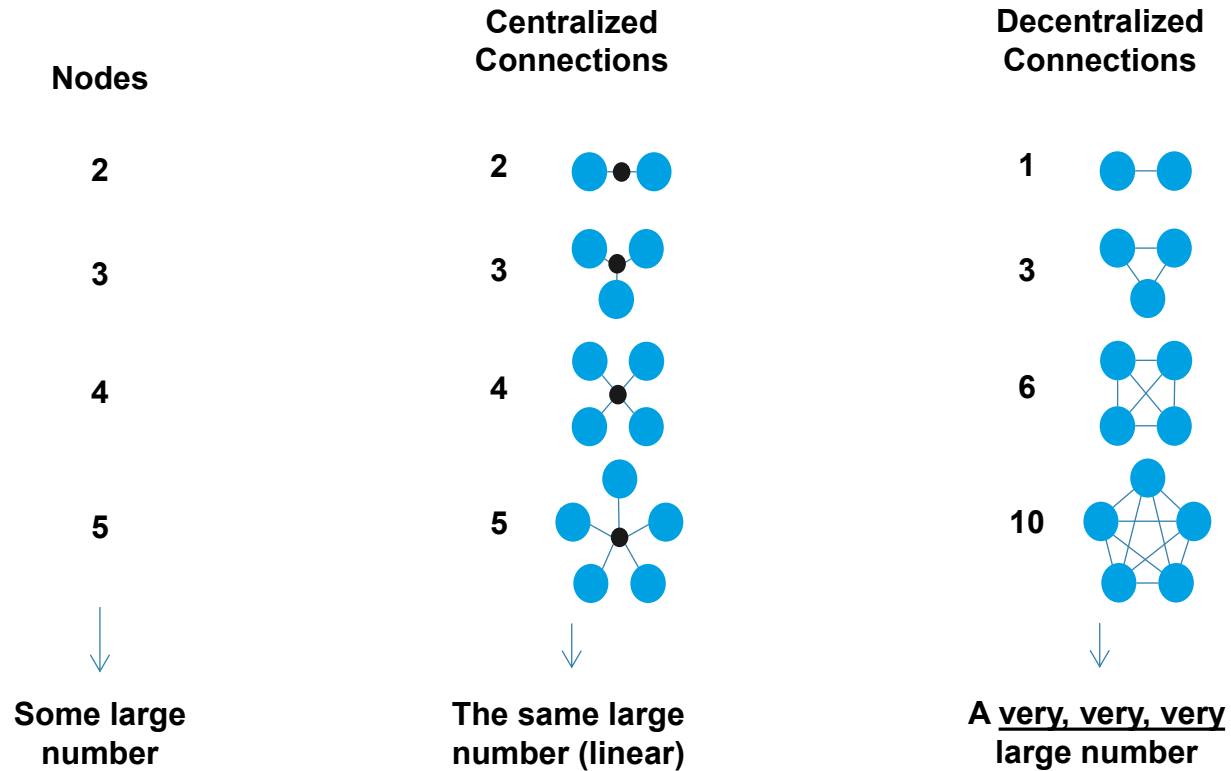
Source: blockchain.info, Morgan Stanley Research estimates

1. Energy consumption estimated based on global mining hash rate multiplied by average Joule/gigahash/s energy usage, which we assume declines linearly from 1.5 in 2014 to 0.2 in 2017

V. Unanticipated problems/limits

What works and what doesn't

Decentralized is less efficient than centralized



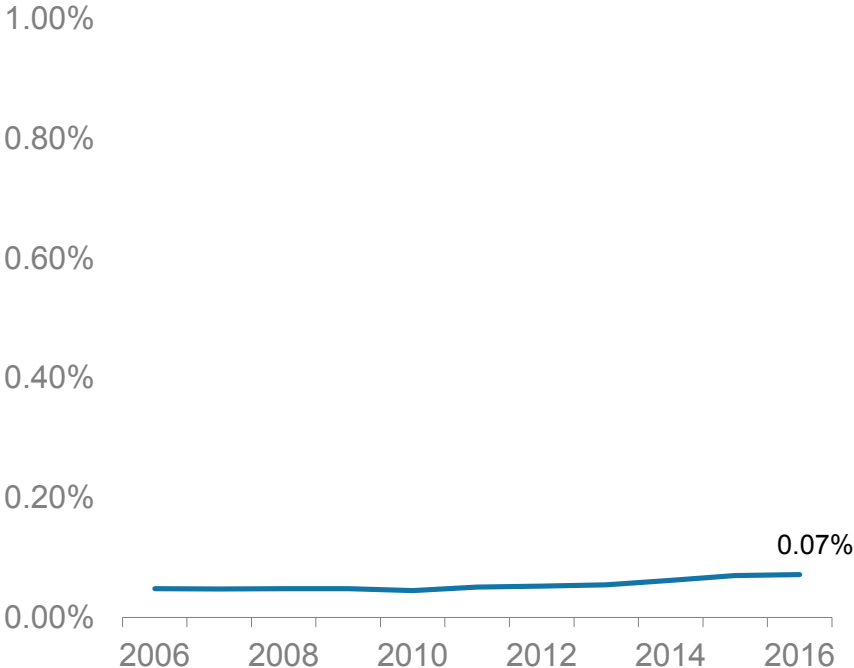
Source: Morgan Stanley Research

V. Unanticipated problems/limits

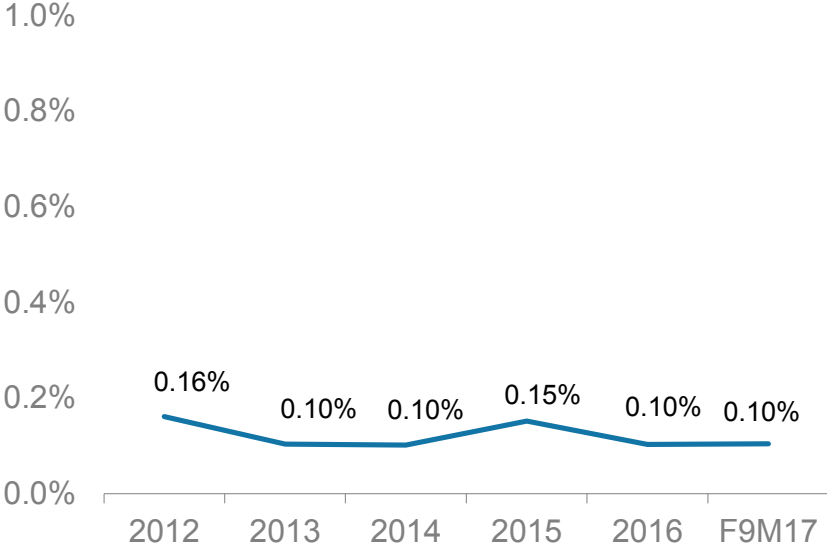
What works and what doesn't

Zero trust transactions are hard – Necessary?

Global Card Fraud Rate (% of Transaction Value)



Square Transaction and Advance Losses (as % of Payment Volume)



Source: The Nilson Report, Company Data, Morgan Stanley Research estimates

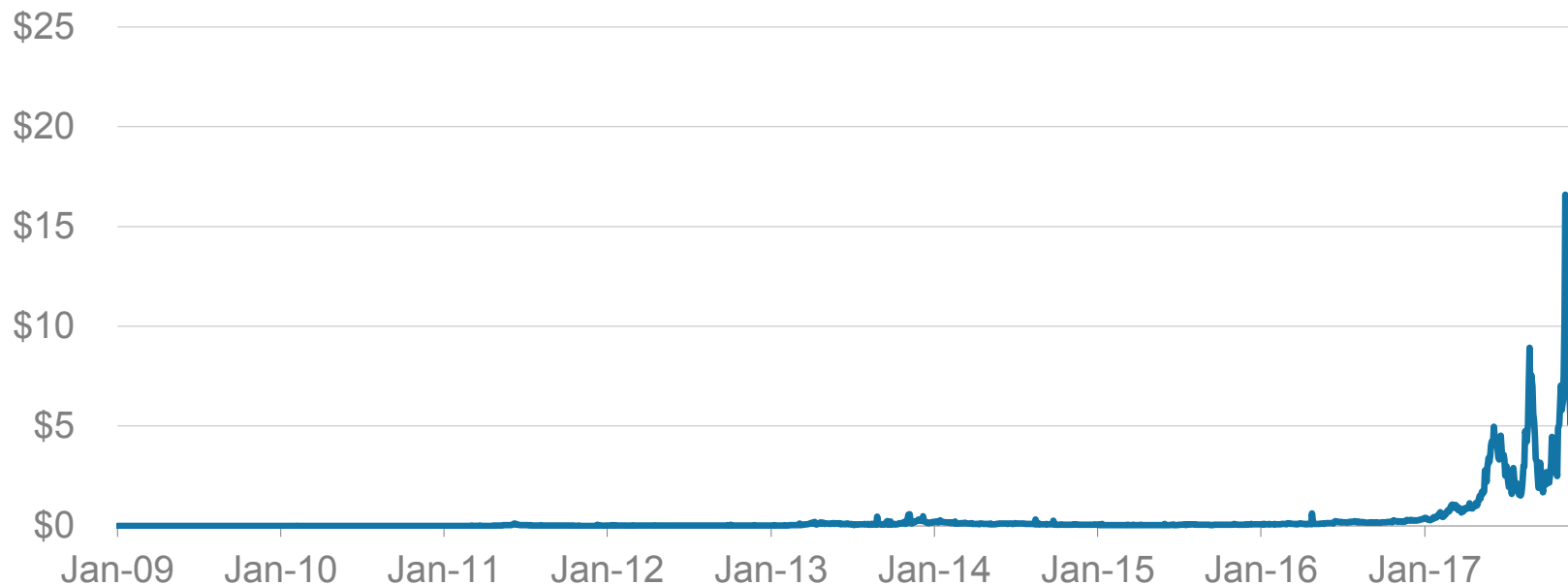
V. Unanticipated problems/limits

Current compromises

Transaction costs growing

- Transaction cost over \$20, FX spread varies widely by exchange, from 0.25% - 3%+

Average Transaction Cost for Bitcoin Txn



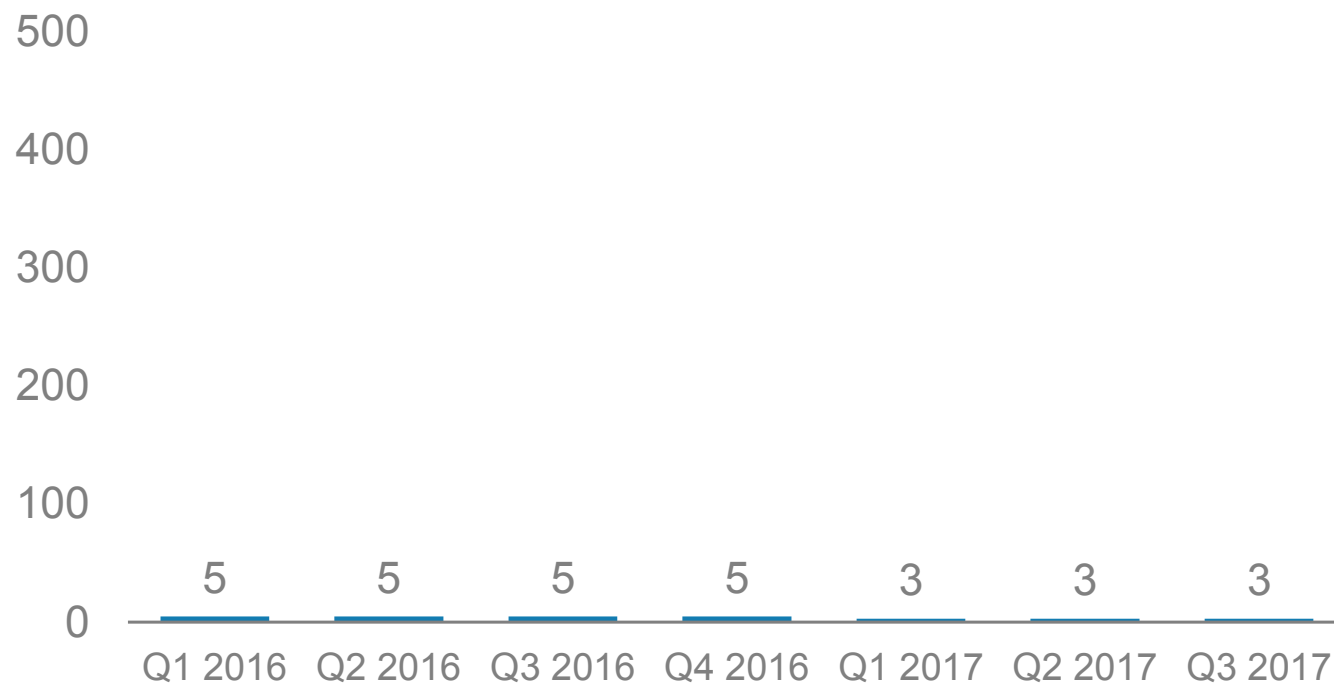
Source: blockchain.info, Morgan Stanley Research

V. Unanticipated problems/limits

Current compromises

Virtually no acceptance, and shrinking

Bitcoin acceptance among top 500 eCommerce Merchants



V. Unanticipated problems/limits

Current compromises

The unintended consequences

- **Frequency:** Every 8 minutes (last 24 hours); resets to ~10 minutes
- **Concentration:** 77% of mined transactions done by 6 mining pools (AntPool, BTC.COM, BTC.TOP, SlushPool, ViaBTC, and F2Pool)
- **Transaction costs:** \$20/txn+ in transaction fees to miners (vs. <\$1 at beginning of year)
- **Frequency:** ~4 transactions / second (About 2,500 txns fit in a “block”)
- **Cold Storage:** 98% of Coinbase customer funds stored “offline”; USB drives and paper in boxes and vaults (the literal kind)

V. Unanticipated problems/limits

Hacks and losses

Incidences of loss, with no recourse available

- NiceHash, Dec 2017, \$63mn
- Bitfinex, Aug 2016, \$72mn
- Bitstamp, Jan 2015, \$5.2mn
- Mt. Gox, Feb 2014, \$487mn
- BitFloor, Sept 2012, \$250k
- Mt. Gox, June 2011, \$9mn

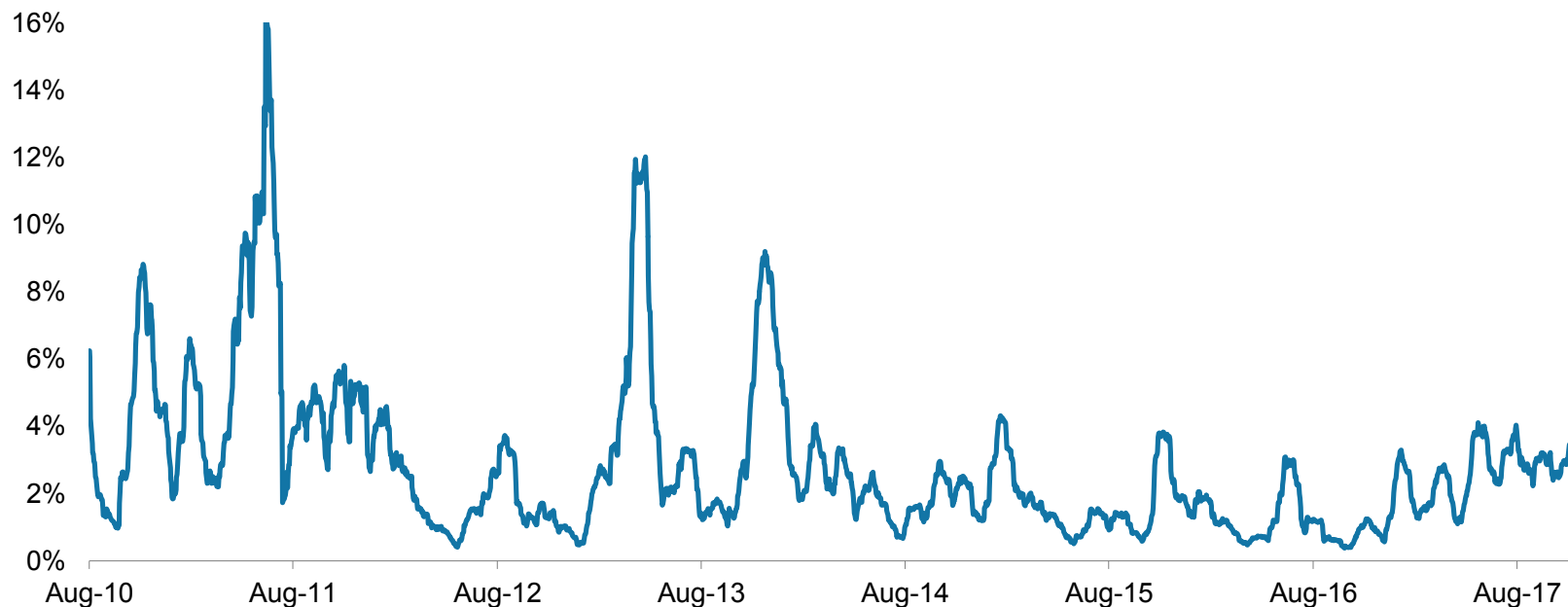
Over \$630mn total, not including other cryptocurrencies

V. Unanticipated problems/limits

Volatility

Volatility is creating many of the unintended consequences, questions

Average daily BTC/USD change (30 day trailing average)



Source: bitcoinity.org, Morgan Stanley Research

VI. Regulatory view on Bitcoin

Bitcoin Has Many Risks

- No Regulatory Oversight
- No Safety and Soundness Measures
- No Recourse in the Event of Mistaken or Misallocated Transactions
- High Cyber Risk
- No Deposit Insurance

VI. Regulatory view on Bitcoin

Regulators Watching Closely... in the US

- “[Bitcoin is a] highly speculative asset. It is not a stable source of value, and it doesn't constitute legal tender. Undoubtedly there are individuals who could lose a lot of money if bitcoin were to fall in price, but I really don't see that as creating a full-blown financial stability risk”
-- Janet Yellen, Fed Chair
- “Bitcoin, a virtual currency, is a commodity unlike any the commission has dealt with in the past. We expect that the futures exchanges, through information sharing agreements, will be monitoring the trading activity on the relevant cash platforms.”
-- Chris Giancarlo, CFTC Chairman
- “Most people believe that bitcoin is not a security. The question is, jurisdictionally, where does the SEC fall. The various regulators are thinking about it. There are jurisdictional issues around bitcoin and bitcoin trading and where it's taking place.”
-- Jay Clayton, SEC Chairman

VI. Regulatory view on Bitcoin

Regulators Watching Closely... in Europe

- “We think that all this is pretty limited. So it’s not yet something that could constitute a risk for central banks.”
-- Mario Draghi, ECB President
- “This is not a currency in the accepted sense. There’s no central bank that stands behind it. For me it’s much more like a commodity. This is not at a size where it’s a macroeconomic risk to the global economy, but when prices are moving like that, my view would be investors need to do their homework.”
-- Sir Jon Cunliffe, Deputy governor, Bank of England
- “For us, Bitcoin is not money, it is a speculative plaything. Hence my repeated warnings against investing in virtual currencies. We are witnessing a remarkable increase in the value of some virtual currencies. But that does not alter the risk of total loss.”
-- Carl-Ludwig Thiele, Executive Boardmember of the Deutsche Bundesbank

VI. Regulatory view on Bitcoin

Regulators Watching Closely... Asia

- "The value of cryptocurrencies such as bitcoin primarily comes from the market speculation. It will be a disaster to recognize it as a real currency. And the lack of a value anchoring inherently determines that bitcoin can never be a real one."
-- Yao Qian, Director of the Digital Currency Research Institute, People's Bank of China
- "[Students are jumping into the raging market to make a quick buck, leading some to get embroiled in fraudulent crime]. If we let things continue, I feel some serious pathological phenomena could occur"
-- Lee Nak-yon, Prime Minister, South Korea

VII. Bank/Institutional efforts

Central bank response

- Currently faced with private cryptocurrencies without regulation and anonymous transactions.
- Central banks may try to create a competing **e-currency** for transactions.
- Sweden, China, UK, Canada, Russia and the IMF all investigating. Most are focusing on cross-border and intra-central bank transactions.
- Open questions: could currency be created at the central bank and given directly to the citizen without an intervening commercial bank? This may allow negative interest rates to be passed on more efficiently.
- Governments could tax cryptocurrencies if competing with fiat currencies.

VII. Bank/Institutional efforts

Bank's Response to Bitcoin: Limited*Who clears Bitcoin futures?***Yes**

- ✓ GS
 - On a case-by-case basis
 - Requires 100% margin for some trades
 - Exploring the potential for market-making
- ✓ ABN Amro
 - Only for certain clients who request approval in writing
 - Assesses client's trading systems and track record in meeting risk limits
- ✓ Interactive Brokers
 - Allows investors to take a short position
- ✓ Wedbush Securities

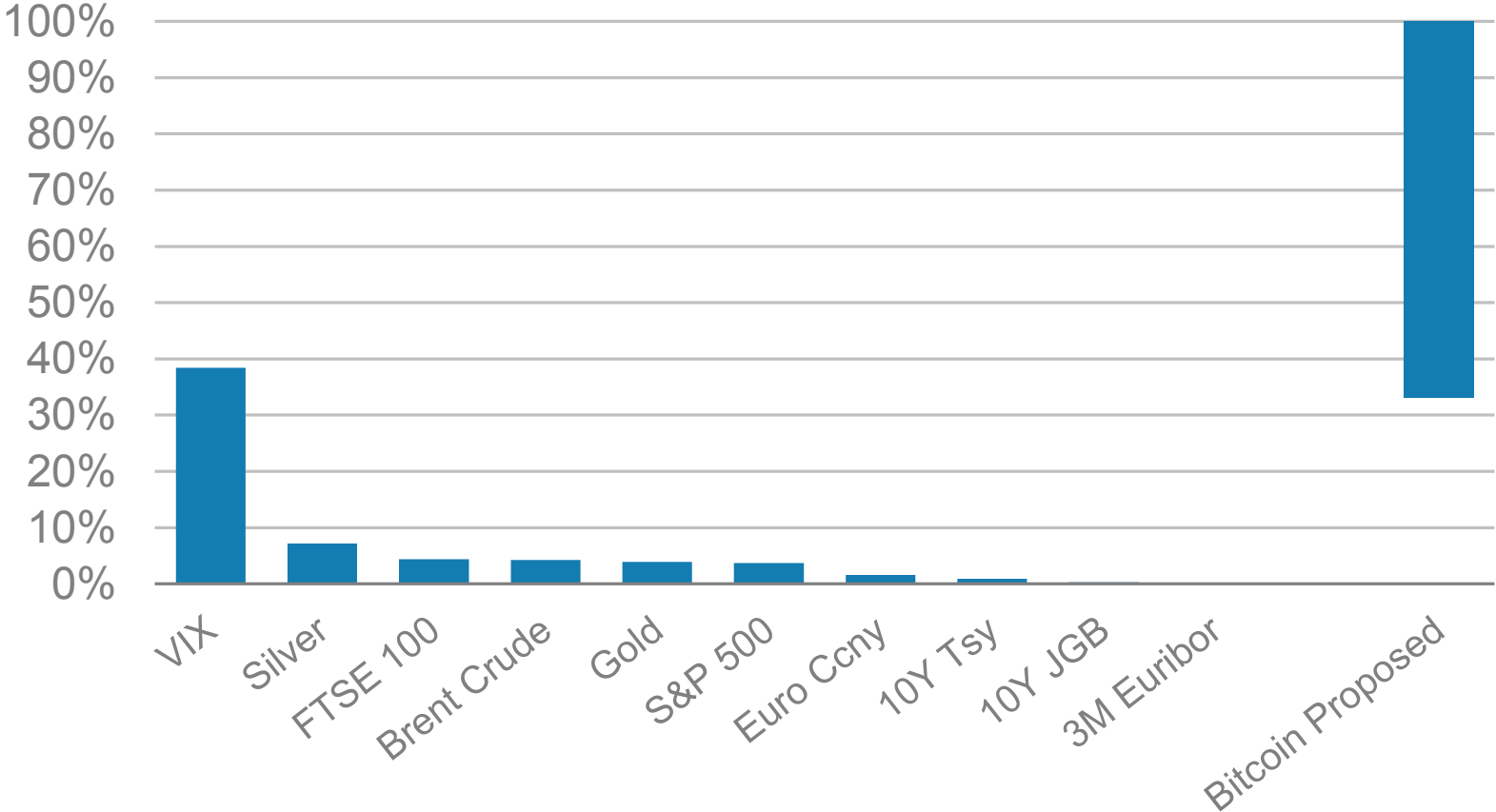
No / Still Reviewing

- ✗ JPM
- ✗ BAC
- ✗ C
- ✗ RBC
- ✗ SocGen

VII. Bank/Institutional efforts

Proposed Initial Margin on Bitcoin Futures are Significantly Higher

Initial Margin as a % of Notional



Source: Bloomberg, Morgan Stanley Research

VII. Bank/Institutional efforts

Bank's Response to Blockchain: Proofs of Concept Proliferate

*Major Examples Spearheaded by Banks***BDS360 (Broker Dealer Services 360)**

- **Who:** BK
- **What:** Blockchain-based platform for US treasury bond settlement. Serves as an internal backup to the core system
- **When:** Still in experimental proof-of-concept stage

Utility Settlement Coin

- **Who:** UBS, DB, SAN, BK
- **What:** Asset-based digital cash instrument on blockchain technology for global institutional financial markets
- **When:** Targeting commercial release in 2018

Madrec

- **Who:** UBS, BARC, CS, KBC, SIX and Thomson Reuters
- **What:** Ethereum platform to simplify data reconciliation between banks in a post-MIFID world
- **When:** Pilot due to be completed in Jan '18

Corda

- **Who:** R3 Consortium
- **What:** Open-source distributed ledger platform designed to record, manage and automate financial agreements
- **When:** Released Corda 2.0 in Nov '17

VIII. Semi universe impact

Cryptocurrency and Mining

We believe that cryptocurrency mining is driving close to \$5 bn run rate in semiconductor logic sales in 4q, and growing.

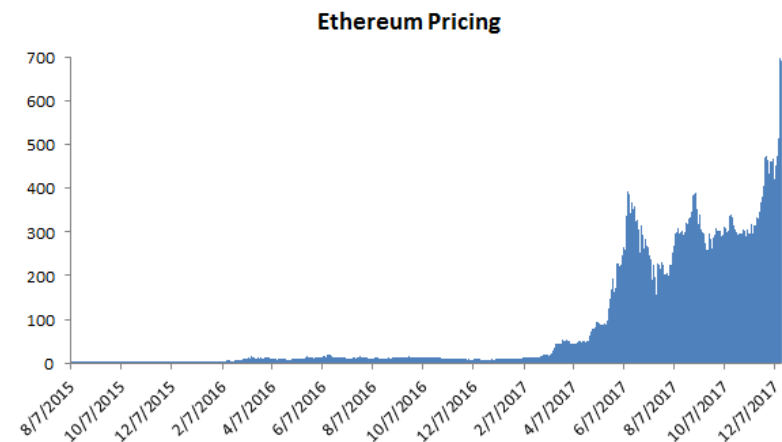
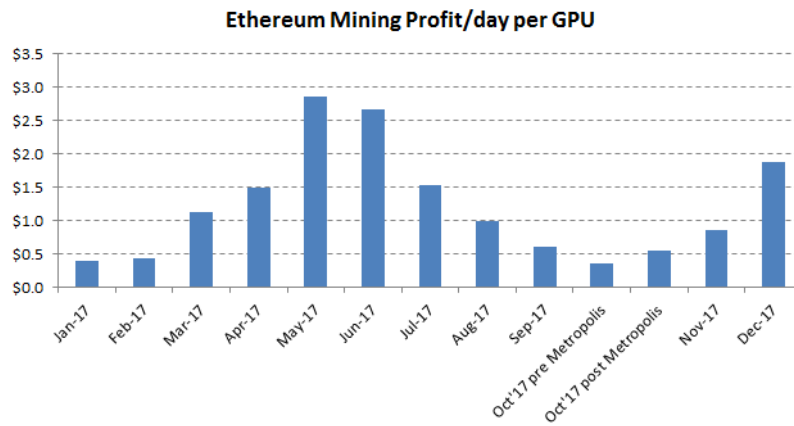
- **Bitcoin** mining rigs use mostly ASICs, with small FPGA usage, close to \$1 bn revenues in 4q
- **Ethereum** uses graphics chips, at roughly \$300 mm in 4q

Surges in currencies drive strong economics for miners, and we would expect all mining chips to be in shortage at year end.

VIII. Semi universe impact

Ethereum mining economics have declined by ~35% from peak levels in May

- As Ethereum pricing spiked in May, the breakeven calculation on new mining hardware, came down to ~ 5 months...
- ...however due to a pick up in spending - as more mining hardware is used - the mining "puzzles" have become 8x more complex...
- ... as a result the payback period on new hardware declined to ~12 months by October.
- But as Ethereum pricing increased ~125% over the past month the payback period has declined again to 7 months
- With a 10% increase in complexity per month, in 2018 we would see profits erode to the point that mining would cease to be profitable in areas with high power costs exiting 2018



Source: Morgan Stanley Research, Company Data, Etherscan.io

VIII. Morgan Stanley Research

Morgan Stanley Research on Bitcoin/Blockchain

[Greater China Technology Semiconductors: Which Asia Semi producers stand to benefit from Bitcoin mining ASIC demand? \(17 Dec 2017\)](#)

[Brokers: Will Bitcoin Futures on CME & CBOE Open the Door for Discount Brokers? \(7 Dec 2017\)](#)

[TSMC: Speedbumps Ahead; Downgrade to Equal-weight \(26 Nov 2017\)](#)

[Freight Transportation: Blockchain in Freight Transportation: Early Days Yet but Worth the Hype \(24 Nov 2017\)](#)

[Semiconductors: Graphics for Cryptocurrency: A Primer \(13 Nov 2017\)](#)

[Advanced Micro Devices: Moving to UW as 2018 upside looks less likely \(30 Oct 2017\)](#)

[Payments and Processing: Bitcoin, Ethereum, XRP: Decrypted! Takeaways \(21 Sep 2017\)](#)

[MasterCard Inc: AI vs. Bitcoin: Buzzword Battle for Supremacy. Or eventual cooperation? \(21 Aug 2017\)](#)

[Western Union Co: Circle and Ripple Bringing the Blockchain Risk \(19 Jun 2017\)](#)

[Global Financials and Payments: Blockchain: Unchained? \(16 Jun 2017\)](#)

[Global Financials and Payments: Fintech – A Gauntlet to Riches \(17 May 2017\)](#)

[Global Exchanges: Global Insight: Blockchain - Is ASX set to shape a brave new world? \(1 Jun 2016\)](#)

[Sustainable and Responsible: S+R Soundbite: Blockchain -The Solution for Supply Chain Transparency? \(23 May 2016\)](#)

[Global Financials / FinTech: Global Insight: Blockchain in Banking: Disruptive Threat or Tool? \(20 Apr 2016\)](#)

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Global Stock Ratings Distribution

(as of November 30, 2017)

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STOCK RATING CATEGORY	COVERAGE UNIVERSE		INVESTMENT BANKING CLIENTS (IBC)			OTHER MATERIAL INVESTMENT SERVICES CLIENTS (MISC)	
	COUNT	% OF TOTAL	COUNT	% OF TOTAL IBC	% OF RATING CATEGORY	COUNT	% OF TOTAL OTHER MISC
Overweight/Buy	1149	36%	313	41%	27%	559	38%
Equal-weight/Hold	1400	44%	363	47%	26%	669	45%
Not-Rated/Hold	56	2%	5	1%	9%	9	1%
Underweight/Sell	587	18%	91	12%	16%	235	16%
TOTAL	3,192		772			1472	

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Data include common stock and ADRs currently assigned ratings. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months. Due to rounding off of decimals, the percentages provided in the "% of total" column may not add up to exactly 100 percent.

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Overweight (O). The stock's total return is expected to exceed the average total return of the analyst's industry (or industry team's) coverage universe, on a risk-adjusted basis, over the next 12-18 months.

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Danyal Hussain, CFA		
Automatic Data Processing Inc (ADP.O)	E (11/14/2017)	\$118.19
Fleetcor Technologies Inc (FLT.N)	O (10/16/2014)	\$190.11
MoneyGram International Inc (MGI.O)	E (06/18/2013)	\$13.33
Paychex Inc (PAYX.O)	E (08/16/2017)	\$69.77
TriNet Group Inc (TNET.N)	U (08/22/2017)	\$43.40
Western Union Co (WU.N)	U (02/02/2015)	\$19.48
WEX Inc (WEX.N)	E (07/09/2014)	\$131.31
James E Faucette		
First Data Corp. (FDC.N)	E (06/28/2017)	\$16.48
LendingClub Corp (LC.N)	O (11/03/2016)	\$4.03
MasterCard Inc (MAN)	O (03/28/2016)	\$153.40
On Deck Capital Inc (ONDK.N)	E (05/05/2016)	\$5.91
PayPal Holdings, Inc. (PYPL.O)	O (10/11/2017)	\$75.65
Square Inc (SQ.N)	E (03/28/2016)	\$37.03
VeriFone Systems Inc. (PAY.N)	E (06/10/2014)	\$18.27
Visa Inc. (V.N)	O (03/28/2016)	\$113.82
Vasundhara Govil		
Evertec Inc (EVTC.N)	E (08/08/2013)	\$13.15
Global Payments Inc (GPN.N)	E (10/03/2014)	\$100.83
Green Dot Corp (GDOT.N)	E (02/18/2014)	\$60.36
Total System Services Inc. (TSS.N)	E (06/18/2013)	\$77.81
Vantiv Inc (VNTV.N)	++	\$75.87

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* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Banking - Large Cap Banks

COMPANY (TICKER)	RATING (AS OF)	PRICE* (12/15/2017)
Betsy L. Graseck, CFA		
Ally Financial Inc (ALLY.N)	E (12/20/2016)	\$28.70
American Express Company (AXP.N)	E (01/25/2016)	\$98.52
Bank of America (BAC.N)	O (04/23/2013)	\$29.04
BB&T Corporation (BBT.N)	U (11/14/2016)	\$49.53
BNY Mellon (BK.N)	E (10/21/2016)	\$54.20
Capital One Financial Corporation (COF.N)	E (09/08/2017)	\$96.31
Citigroup Inc. (C.N)	O (11/14/2016)	\$74.77
Discover Financial Services (DFS.N)	O (01/28/2014)	\$74.59
Goldman Sachs Group Inc (GS.N)	O (10/26/2015)	\$257.17
J.P.Morgan Chase & Co. (JPM.N)	O (07/05/2017)	\$106.14
Northern Trust Corp. (NTRS.O)	U (11/28/2011)	\$97.85
PNC Financial Services (PNC.N)	E (07/25/2013)	\$144.95
Regions Financial Corp (RF.N)	E (02/11/2016)	\$17.12
Santander Consumer USA Holdings Inc (SC.N)	E (12/20/2016)	\$17.99
State Street Corporation (STT.N)	E (11/14/2016)	\$98.53
SunTrust (STL.N)	E (08/03/2017)	\$65.00
Synchrony Financial (SYF.N)	E (09/08/2017)	\$37.19
U.S. Bancorp (USB.N)	U (11/14/2016)	\$54.50
Wells Fargo & Co. (WFC.N)	O (09/20/2016)	\$59.87

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COMPANY (TICKER)	RATING (AS OF)	PRICE* (12/15/2017)
Craig Hettenbach		
Amphenol Corp. (APH.N)	E (09/10/2014)	\$89.13
Analog Devices Inc. (ADI.O)	O (07/27/2016)	\$86.69
Broadcom Ltd (AVGO.O)	++	\$265.73
Cypress Semiconductor Corp (CY.O)	U (03/30/2017)	\$15.24
Impinj Inc (PI.OQ)	E (06/19/2017)	\$23.77
Maxim Integrated Products Inc. (MIM.O)	U (07/30/2014)	\$52.46
Microchip Technology Inc. (MCHP.O)	E (11/01/2017)	\$86.75
NXP Semiconductor NV (NXPL.O)	++	\$116.35
ON Semiconductor Corp. (ON.O)	E (09/22/2016)	\$19.90
Qorvo Inc (QRO.O)	E (06/27/2016)	\$65.53
Sensata Technologies Holding N.V. (ST.N)	E (09/10/2014)	\$52.42
Skyworks Solutions Inc (SWKS.O)	U (06/27/2016)	\$94.63
Te Connectivity Ltd (TEL.N)	O (09/10/2014)	\$96.22
Joseph Moore		
Advanced Micro Devices (AMD.O)	U (10/30/2017)	\$10.29
Ambarella Inc (AMBA.O)	O (03/29/2016)	\$56.51
Aquantia Corp (AQ.N)	O (11/28/2017)	\$10.65
Cavium Inc (CAVM.O)	E (11/21/2017)	\$83.77
Inphi Corporation (IPHIL.N)	O (08/17/2015)	\$37.64
Intel Corporation (INTC.O)	E (01/27/2017)	\$44.56
Marvell Technology Group Ltd (MRVL.O)	E (09/14/2015)	\$21.62
Micron Technology Inc. (MU.O)	O (12/17/2015)	\$42.40
NVIDIA Corp. (NVDA.O)	E (10/30/2015)	\$191.56
Quantenna Communications Inc (QTNA.O)	O (11/22/2016)	\$11.39
Texas Instruments (TXN.O)	E (05/30/2012)	\$101.22
Western Digital (WDC.O)	E (11/26/2017)	\$81.62
Xilinx (XLNX.O)	O (12/14/2016)	\$67.98

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Greater China Technology Semiconductors

COMPANY (TICKER)	RATING (AS OF)	PRICE* (12/18/2017)
Charlie Chan		
Advanced Semi Engineering (2311.TW)	E (11/26/2017)	NT\$38.00
ASMPacific (0522.HK)	E (11/26/2017)	HK\$104.20
Chipbond Technology Corp (6147.TWO)	O (07/20/2017)	NT\$56.80
ChungHwa Precision Test Tech (6510.TWO)	O (08/09/2016)	NT\$1,005.00
Himax Technology, Inc (HIMX.O)	E (11/26/2017)	\$10.53
Jiangsu Changjiang Electronics Tech (600584.SS)	U (09/22/2015)	Rmb21.10
MediaTek (2454.TW)	O (05/23/2017)	NT\$287.50
Nanya Technology Corp. (2408.TW)	O (12/08/2016)	NT\$78.70
Phison Electronics Corp (8299.TWO)	U (11/26/2017)	NT\$301.00
Powertech Technology (6239.TW)	E (07/26/2017)	NT\$86.90
Shenzhen Huiding Technology Co Ltd (603160.SS)	U (11/28/2016)	Rmb100.87
Silergy Corp. (6415.TW)	E (11/14/2017)	NT\$635.00
Silicon Motion (SIMO.O)	O (11/07/2014)	\$52.96
Siliconware Precision Industries Co. (2325.TW)	E (08/21/2015)	NT\$49.90
SMC (0981.HK)	O (06/24/2013)	HK\$11.04
TSMC (2330.TW)	E (11/26/2017)	NT\$227.00
UMC (2303.TW)	U (07/27/2016)	NT\$14.50
Unigroup Guoxin Co Ltd (002049.SZ)	U (08/25/2017)	Rmb48.76
Universal Scientific Ind. (Shanghai) (601231.SS)	O (08/04/2015)	Rmb14.41
Vanguard International Semiconductor (5347.TWO)	U (08/02/2016)	NT\$61.10
WIN Semiconductors Corp (3105.TWO)	O (11/26/2017)	NT\$305.00
Daniel Yen		
Asmedia Technology Inc (5269.TW)	O (09/14/2017)	NT\$363.00
Aspeed Technology (5274.TWO)	O (03/31/2017)	NT\$681.00
Egis Technology Inc (6462.TWO)	O (11/28/2016)	NT\$215.50
Macronix International Co Ltd (2337.TW)	O (06/01/2017)	NT\$42.00
Novatek (3034.TW)	O (07/20/2017)	NT\$113.00
Parade Technologies Ltd (4966.TWO)	O (09/14/2017)	NT\$600.00
Realtek Semiconductor (2379.TW)	E (07/31/2017)	NT\$104.50
WPG Holdings (3702.TW)	O (07/31/2017)	NT\$38.90

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