

Scarcity in the Digital Realm

April 17 2020



Digital Gold Institute: Vision

R&D center of excellence focused on teaching, training, consulting, and advising about scarcity in digital domain (bitcoin and crypto-assets) and the underlying blockchain technology

Bitcoin: Digital Gold



The most successful attempt at creating scarcity in the digital realm without a trusted third party. Bitcoin is the digital equivalent of gold, disruptive for our current digital civilization and the future of money and finance. More a cryptocommodity than a crypto-currency, Bitcoin aims to be world reserve asset.

Beyond Bitcoin: Timestamping



A timestamp demonstrates that a document existed in a specific status prior to a given point in time. Digital data can be securely timestamped though the attestation of its hash value in a blockchain transaction. What jewellery is for gold, Timestamping could be for bitcoin: not essential but effective at leveraging its beauty.

Blockchain: Hype or Reality?



Blockchain requires an intrinsic native digital asset to provide the economic incentives for the blockchain maintainers to be honest. Without the seigniorage revenues associated to its native asset, a blockchain system would need to select and appoint its maintainers, ultimately resorting to central governance.

Financial Services for Crypto



The most promising field, instead of technological applications of blockchain, is the development of financial services for crypto assets: those tools, practices, and facilities needed by institutional investors and high net worth individuals. Finance might not need blockchain, but the blockchain economy needs new financial services.

Digital Gold Institute: Services

R&D center of excellence focused on teaching, training, consulting, and advising about scarcity in digital domain (bitcoin and crypto-assets) and the underlying blockchain technology

Partnership Program



Becoming one of our <u>partners</u> means empowering your business with a proper understanding of Bitcoin, crypto assets, and blockchain technology. It is a strategic choice that will allow you to leverage unique opportunities while avoiding the irrational hype that pollutes these topics.

Research



Our research activity includes quarterly reports on the bitcoin and blockchain ecosystem and the thesis works of our students. Anyway, the bulk of the activity is happening at the Crypto Asset Lab (CAL), a joint research initiative with the University of Milano-Bicocca.

Training Program



We offer training and education about Bitcoin, crypto assets, blockchain, distributed ledger, smart contracts, and cryptography: the program is based on the <u>Bitcoin and Blockchain Technology</u> course taught at Milano-Bicocca and other universities.

Development



We write code and love to get our hands dirty in programming and technology. Check out our OpenTimestamps calendar free facility and btclib, an open-source Python library intended for teaching/learning/using bitcoin, its blockchain, and the associated elliptic curve cryptography.

Digital Gold Institute: Partners

Educational Program Partner













Partner

CheckSig



Deloitte.



The DGI Quarterly Report

- Exclusive for our partners and their guests
- A quarterly update on the crypto assets world with a focus on:
 - 1. Market
 - 2. Technology
 - 3. Regulation
 - 4. Ecosystem
 - 5. Updates from the Institute





Bitcoin Performance

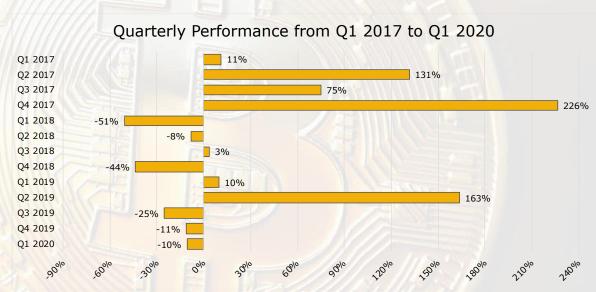


Bitcoin Performance (Log Scale)

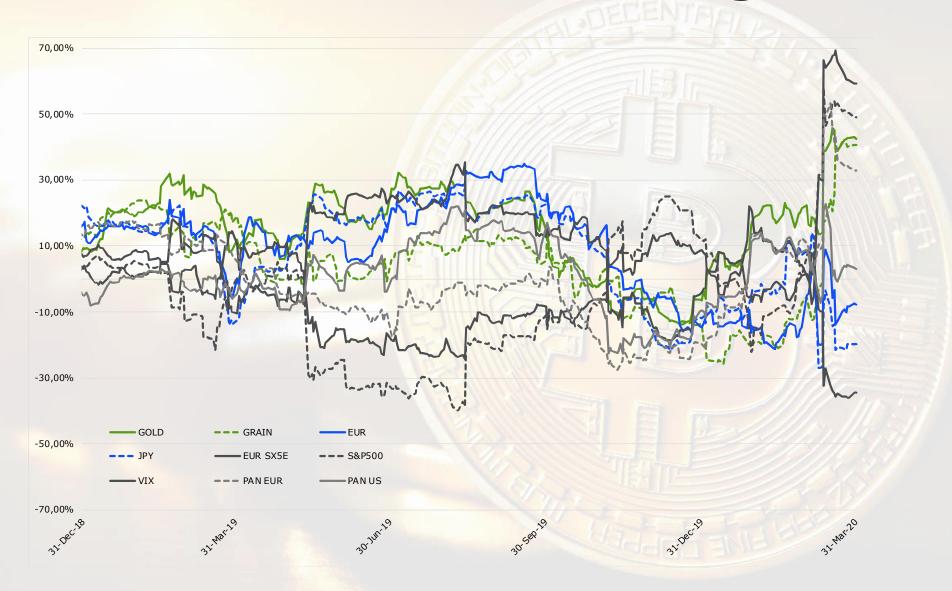


Bitcoin Performance (2020 Q1)

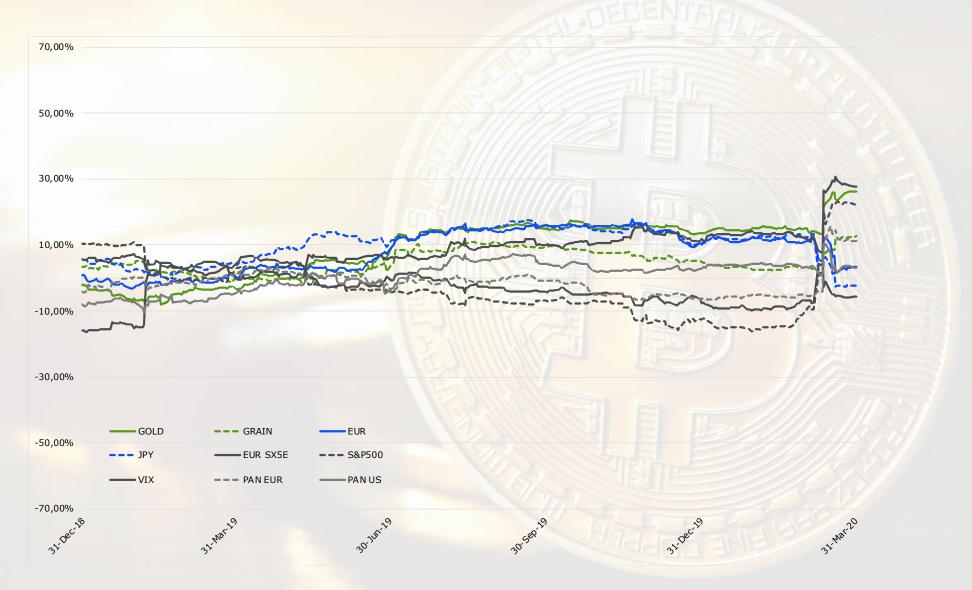




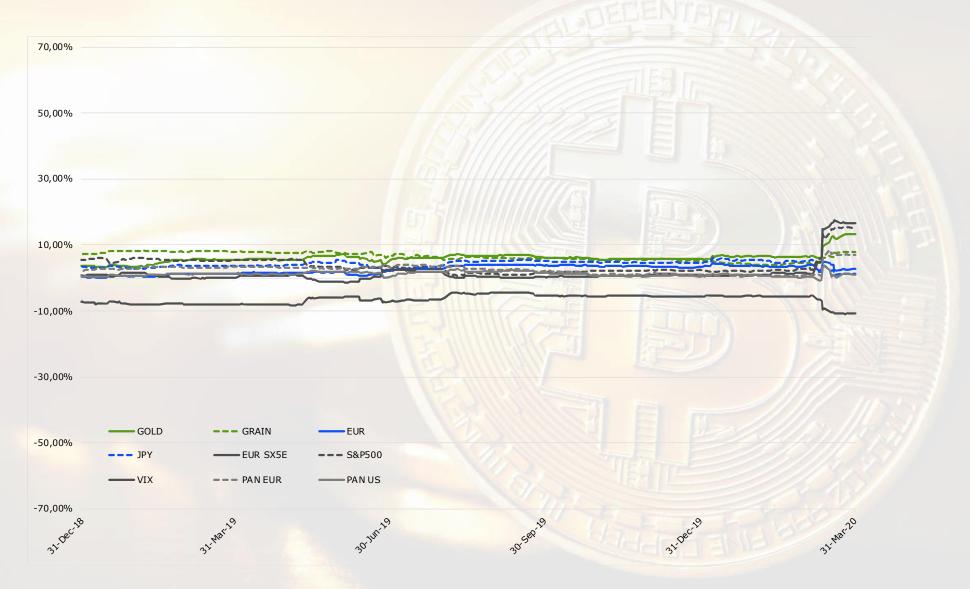
Correlation with Bitcoin: 3M Rolling Window



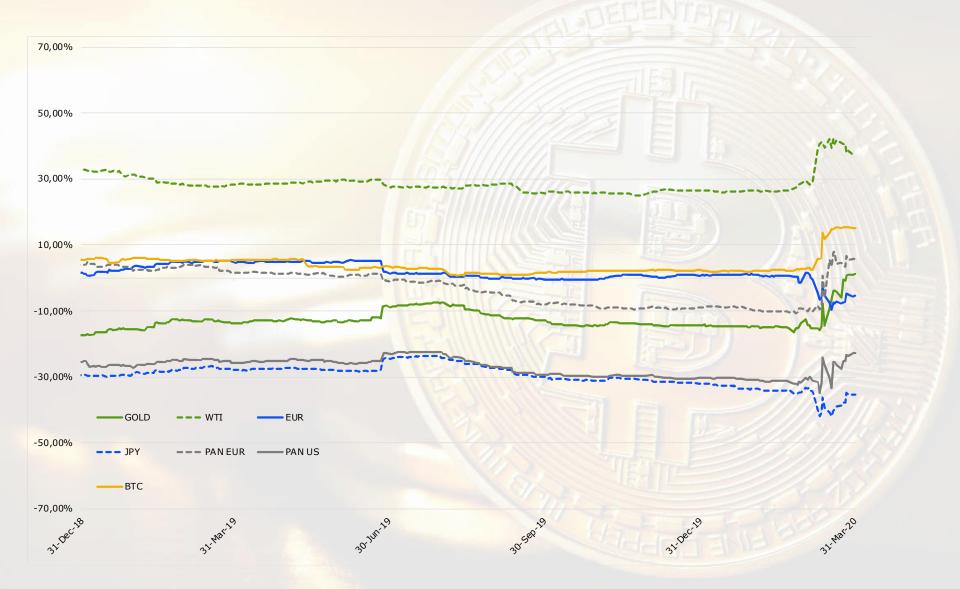
Correlation with Bitcoin: 1Y Rolling Window



Correlation with Bitcoin: 3Y Rolling Window



Correlation with S&P500: 3Y Rolling Window



Correlation Matrix (1/3)

3Y																				
ВТС	100,00%										1/4	Data c	et: 20	17 01	01 / 5	2010 1	12 21			
ETH	17,09%	100,00%										Jala S	set. Zu	1/-01	-01/2	2019-1	12-21			
LTC	15,65%	56,63%	100,00%																	
XRP	12,02%	37,21%	39,55%	100,00%																
GOLD	5,68%	5,03%	0,11%	0,20%	100,00%															
IND MET	-0,15%	2,05%	-1,11%	1,34%	14,06%	100,00%														
WTI	-0,75%	1,99%	-2,92%	-0,44%	3,99%	20,64%	100,00%													
GRAIN	5,34%	1,20%	-2,64%	1,82%	2,93%	6,13%	10,94%	100,00%									1111114			
EUR	3,39%	9,31%	4,16%	1,31%	48,27%	19,98%	2,37%	6,38%	100,00%								Positive			
CHF	4,25%	8,58%	1,10%	-2,17%	56,04%	9,29%	-0,71%	4,32%	73,19%	100,00%	1.						Negative			
GBP	3,51%	3,85%	0,50%	-2,59%	27,11%	9,32%	4,37%	4,45%	55,11%	40,57%	100,00%	-								
JPY	4,61%	8,90%	2,57%	0,98%	63,67%	-8,62%	-8,25%	-1,80%	39,66%	57,71%	20,73%	100,00%								
NASDAQ	2,88%	1,84%	2,36%	1,23%	-12,20%	19,32%	21,89%	4,60%	-0,56%	-14,89%	5,54%	-28,62%	100,00%							
EUR SX5E	1,07%	2,44%	8,19%	1,42%	-25,46%	24,80%	18,94%	8,55%	-10,59%	-27,97%	4,76%	-44,63%	47,75%	100,00%	/					
S&P500	2,31%	2,11%	2,24%	1,54%	-14,22%	20,77%	26,54%	5,44%	0,89%	-14,73%	6,34%	-32,01%	95,05%	52,89%	100,00%	1000				
MSCI BRIC	1,20%	3,62%	3,48%	4,15%	2,74%	36,61%	21,85%	10,64%	13,09%	-0,10%	15,76%	-15,09%	48,33%	48,63%	46,30%	100,00%				
VIX	-5,69%	-4,14%	-1,52%	-2,85%	10,12%	-15,35%	-20,77%	-10,44%	-0,95%	14,13%	-5,11%	27,47%	-76,17%	-47,64%	-79,15%	-40,97%	100,00%			
EUR AGG	-0,36%	-4,63%	-3,80%	-1,48%	29,05%	-12,83%	-2,78%	-5,53%	-9,76%	4,35%	-10,71%	27,78%	-4,48%	-4,49%	-6,98%	-6,99%	1,92%	100,00%		
PAN EUR	0,85%	-5,08%	-3,83%	-1,30%	27,70%	-16,19%	-2,30%	-4,79%	-18,74%	2,18%	7,88%	28,93%	-5,90%	-5,39%	-8,87%	-7,66%	4,89%	91,63%	100,00%	100.000/
PAN US	0,55%	0,36%	0,48%	4,24%	46,06%	-14,36%	-13,04%	-3,50%	9,89%	27,91%	3,65%	52,39%	-26,55%	-27,34%	-30,30%	-16,68%	25,71%	55,09%	57,03%	100,00%
	ВТС	ETH	LTC	XRP	GOLD	INDMET	WTI	GRAIN	EUR	CHF	GBP	JPY	NASDAQ	EUR SX5E		MSCI BRIC	VIX	EUR AGG	PAN EUR	PAN US
		Crypto-c	urrency			Comm	odity		Currency					Equ	ity		Volatility Bond			

Correlation Matrix (2/3)

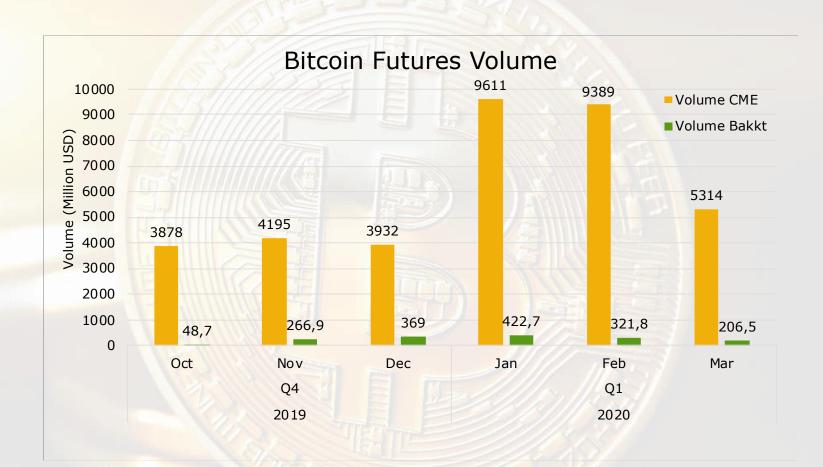
1Y																		No. 1		
ВТС	100,00%										1/4)ata c	oti 20	10 01	01 /	2010	12 21	_		
ETH	23,35%	100,00%										Jala S	et: 20	19 -01	-01/	2019-	12-21			
LTC	21,75%	81,62%	100,00%								(11/1/2									
XRP	20,77%	79,71%	68,62%	100,00%																
GOLD	13,74%	4,08%	-3,86%	2,46%	100,00%															
IND MET	-3,53%	-1,05%	-2,03%	6,31%	-11,19%	100,00%														
WTI	-1,94%	11,46%	5,08%	11,88%	-4,31%	19,98%	100,00%													
GRAIN	4,72%	8,16%	4,09%	8,95%	0,78%	5,51%	11,78%	100,00%								/ £\\\	1111111	10 20		
EUR	10,55%	11,26%	5,57%	9,90%	43,01%	13,90%	1,72%	9,20%	100,00%								Positive			
CHF	15,50%	7,62%	2,27%	6,69%	60,24%	-6,44%	0,30%	5,72%	72,66%	100,00%	1						Negative			
GBP	3,60%	1,12%	-1,77%	-0,34%	14,11%	13,26%	2,49%	2,05%	47,77%	27,97%	100,00%									
JPY	11,13%	9,85%	2,09%	8,70%	65,49%	-32,91%	-16,16%	-4,06%	33,36%	58,69%	9,08%	100,00%	1							
NASDAQ	-10,97%	-10,01%	-4,70%	-4,49%	-28,03%	39,12%	27,33%	5,16%	-6,68%	-26,59%	7,06%	-51,39%	100,00%							
EUR SX5E	-7,51%	0,15%	3,31%	6,42%	-32,62%	43,64%	19,32%	9,99%	-9,71%	-29,08%	14,09%	-54,29%	68,29%	100,00%	11					
S&P500	-12,12%	-11,45%	-6,92%	-6,86%	-27,16%	40,08%	29,05%	7,57%	-5,40%	-25,67%	8,69%	-53,76%	96,51%	72,26%	100,00%	1000				
MSCI BRIC	-8,07%	-3,48%	2,88%	2,39%	-16,99%	41,97%	25,00%	8,24%	8,32%	-12,07%	15,54%	-34,29%	60,10%	55,78%	57,30%	100,00%				
VIX	11,23%	12,53%	10,61%	8,31%	20,45%	-32,12%	-21,24%	-11,39%	8,49%	26,21%	-7,50%	45,19%	-79,18%	-58,65%	-83,42%	-46,87%	100,00%	March 1		
EUR AGG	-8,52%	-6,09%	-10,92%	-0,40%	41,71%	-20,90%	-6,09%	-10,37%	-20,34%	6,59%	-14,33%	28,27%	-16,53%	-9,61%	-17,69%	-14,32%	12,03%	100,00%		
PAN EUR	-6,24%	-6,73%	-11,77%	-2,25%	39,48%	-22,22%	-6,55%	-9,97%	-21,35%	5,96%	6,36%	29,14%	-16,96%	-7,35%	-17,80%	-14,69%	11,74%	94,53%	100,00%	
PAN US	3,31%	8,01%	-0,30%	8,07%	57,10%	-27,48%	-21,80%	-12,07%	7,31%	33,49%	1,63%	63,27%	-42,24%	-33,73%	-45,43%	-27,26%	35,74%	64,28%	64,52%	100,00%
	ВТС	ETH	LTC	XRP	GOLD	IND MET	WTI	GRAIN	EUR	CHF	GBP	JPY	NASDAQ	EUR SX5E		MSCI BRIC	VIX	EUR AGG	PAN EUR	PAN US
		Crypto-c	urrency			Commo	odity		Currency					Equ	ity		Volatility Bond			

Correlation Matrix (3/3)

1Y 100.00% Data set: 2019-04-01 / 2020-03-31 18,79% 100,00% 18,70% 87.37% 100,00% 18.82% 86.85% 80.83% 100.00% 100.00% 26.18% 17.29% 9.29% 10,06% **GOLD** -14,53% 100.00% 2,56% -1.23% -2,42% 5,17% **IND MET** 21,68% 5.10% 3.29% 6.54% 9.33% 34,26% 100,00% WTI 12,78% 8.86% 4.94% 8.80% 4.56% 11,07% 22,82% 100.00% **GRAIN** -13.04% 100.00% 3.46% 11.68% 8.62% 7,00% 33.44% 8.51% -2,57% **EUR** 100,00% 5,03% 10.98% 6,74% 6,27% 41.27% -4,29% -16.19% -4,91% 84,16% Negative CHF 10,51% 18.27% 12,59% 11.56% 28.54% 22.66% 8.16% 1,43% 56,71% 46,05% 100,00% **GBP** -2.19% 17.04% 11,58% 12,00% 35.93% -18,50% -36.85% -15.06% 58.88% 70.44% 33,41% 100.00% 22,10% -24.30% -19.50% -18.90% 3.34% 36.43% 41.94% 16.45% -20.27% -28.14% 9.44% -47.73% 100.00% NASDAQ 22,61% 100.00% 27,74% 4.15% 5.00% 6,21% 13.14% 40,34% 41,68% 19,82% -15.41% -26.28% -41,32% 72,23% **EUR SX5E** 22,28% -23.12% -18.74% -17.90% 5.81% 37,74% 41,10% 15,12% -16.36% -22,96% 13,03% -43.52% 97.98% 73,44% 100.00% S&P500 15,36% -0.63% 1.19% 3,31% 4.20% 50.42% 40.68% 17,48% -5.98% -17,18% 26,00% -35,47% 67.29% 78,20% 69.59% 100.00% **MSCI BRIC** -5,57% 12,78% 13,28% -21,84% 32,56% -2,22% -51,98% 100,00% 18,90% 16,48% -32,97% -26,42% 22,12% 48,94% -74,19% -57,55% -69,84% VIX 8,50% -0,21% 8,22% 42,31% 25,59% 25,07% -2,07% 100,00% 11,15% -4,41% 13,36% 1,68% 8,81% 20,74% 9,72% 20,27% 10,61% 15,63% **EUR AGG** 11,15% 100,00% 11,12% 3,68% 43,12% 2,43% 9,72% 95,81% **PAN EUR** 13,37% -1,35% 11,98% 9,16% 20,92% 41,20% 26,48% 24,51% 11,10% 20,60% -2,81% 9,75% 9,24% 44,16% -9,88% -3,88% -22,58% -3,75% -20,91% 54,67% 57,76% 100,00% 3,16% 13,26% -8,77% 44,90% 52,53% 35,32% 62,81% -12,07% 26,49% **PAN US** GOLD **IND MET** WTI GRAIN CHF **GBP** NASDAQ EUR SX5E S&P500 **MSCI BRIC** VIX EUR AGG PAN EUR **PAN US** EUR JPY Commodity Volatility **Crypto-currency** Currency Equity Bond

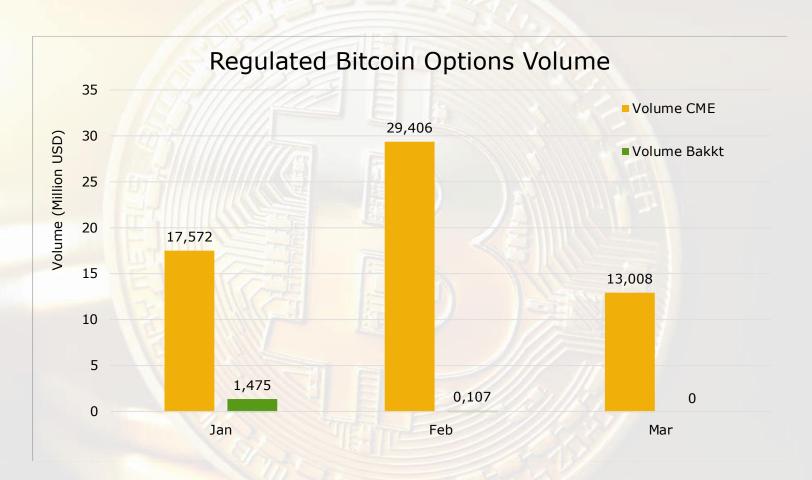
Bitcoin Listed Futures

- Record traded volumes in January for both Bakkt and CME
- CME Futures hit \$100B traded volume since 2017
- Drop in volume starting from mid February due to Covid-19
- CME is market leader



Bitcoin Listed Options

- CME launched listed Bitcoin options in January, joining Bakkt
- CME traded volumes are significantilly higher than Bakkt
- Bakkt options saw zero volume in March



Bitcoin ETF

- SEC reopened the previously rejected Bitwise's Bitcoin ETF proposal. The proposal was rejected because it did not meet legal requirements to prevent market manipulation or other illicit activities
- Bitwise has requested the withdrawal of the proposal in January to prepare new documentation
- SEC has rejected Wilshire Phoenix Bitcoin ETF proposal, because of the risk of market manipulation or other illicit activities.







2. TECHNOLOGY

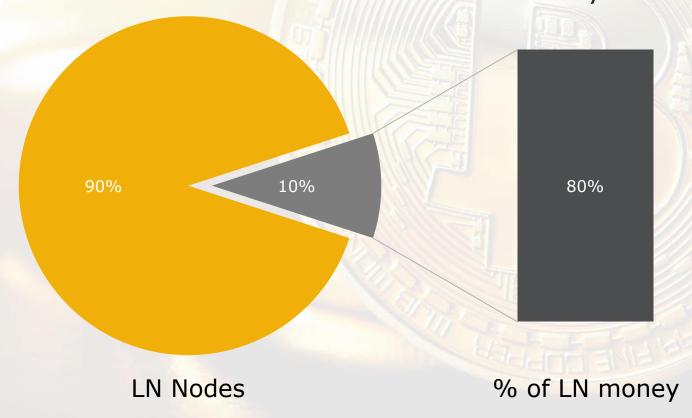


Bitcoin - Protocol Update

- On January 22, Core developer Pieter Wuille submitted BIPs for Schonrr Signature and Taproot
- Ongoing discussion about how to activate these changes in Bitcoin Core
- Two alternatives:
 - BIP9: 95% of miners must approve the changes
 - BIP8 (UASF): all the actors of the ecosystem can vote
- Core Developer Matt Corallo proposed a mixed solution: BIP 9 at the beginning, then, if it failed over the course of a year due to "unreasonable objections," users could debate and regroup over a period of six months. After that, if the change is something the community wants, they can try BIP8 over the period of another year

Bitcoin - Lightning Network

- Jian-Hong Lin, Kevin Primicerio, Tiziano Squartini, Christian Decker and Claudio J. Tessone published a research "Lightning Network: a second path towards centralization of the Bitcoin economy"
- 10% of active nodes hold more than 80% of total money



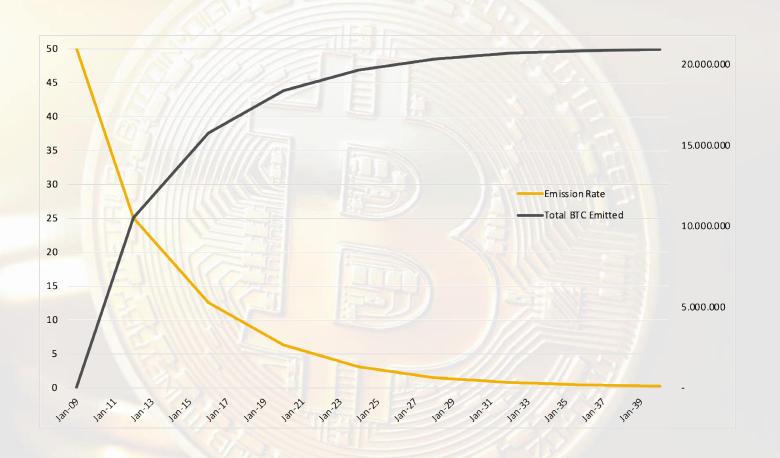
Bitcoin - Mining (1/2)

- Second worst
 negative adjustment
 for difficulty rate
 due to price drop
- Many miners have turned off unprofitable mining hardware



Bitcoin - Mining (2/2)

- Every 210,000
 blocks (about 4
 years) issuance rate
 halves
- In May Bitcoin issuance rate will decrease from 12.5 BTC/block to 6.25 BTC/block



Blockchain - Algorand and AVA

Algorand:

- Silvio Micali, Turing Prize winner
- MIT
- Raised \$200m
- Platform for the Marshall Islands digital currency

Avalanche / AVA

- Emin Gün Sirer, Initiative for Cryptocurrencies and Smart Contracts
- Cornell University
- \$6M
- AVA Labs just moved its offices to Manhattan



Altcoin - Ethereum Update: Muir Glacier

- Muir Glacier: hard-fork just one month after Istanbul
- Proof-of-Work, Proof-of-Stake
- ProgPoW for ASIC-resistance
- Caspar Labs and CryptoKitties are moving to dedicated blockchain
- Plasma -> Optimism
- JP Morgan Quorum / ConsenSys / Microsoft / Ernst & Young: Baseline Protocol

Altcoin - Control and Centralization

- Steem bought by Justin Sun
- IOTA suspended operations
- Bitcoin Cash developer tax



3. REGULATION

Libra

Out: Vodafone

In: Shopify and Tagomi

Not listed among Facebook's 2030 priorities

Multi stablecoin design



Central Bank Digital Currency

- Bank of Canada: CBDC only if Libra happens
- ECB: interested in CBDC, not against private initiative
- BIS working group: Central Banks of CAD, CHF, EUR, GBP, SEC, YEN
- Powell (FED): digital USD might happen

ESMA, Consob, G20, and BaFin

- IOSCO, WEF
- ESMA
 - Consultation about a framework for crypto markets
 - CDF 2:1 max leverage
 - Crypto among the key priorities for 2020-2022
- Consob: presented results of its consultation on January 2, 2020
- G20 / FATF-GAFI: travel rule
- BaFin: bitcoin as financial instrument



4. ECOSYSTEM

Crypto-asset Custody (1/2)

Gemini:

- Captive insurance company, \$200M
- SOC 2 Type 2 and Type 1 certification from Deloitte



- SOC 1 Type 2 and SOC 2 Type 2 certification from Grant Thornton
- Coinbase International Ltd in Dublin for European clients





Crypto-asset Custody (2/2)

 Julius Bear partership with SEBA Bank to offer crypto services to its clients



 Hype (Banca Sella) now offers the possiblity to buy Bitcoin directly from their app, thanks to a partnership with italian startup Conio



Traditional Finance and DeFi

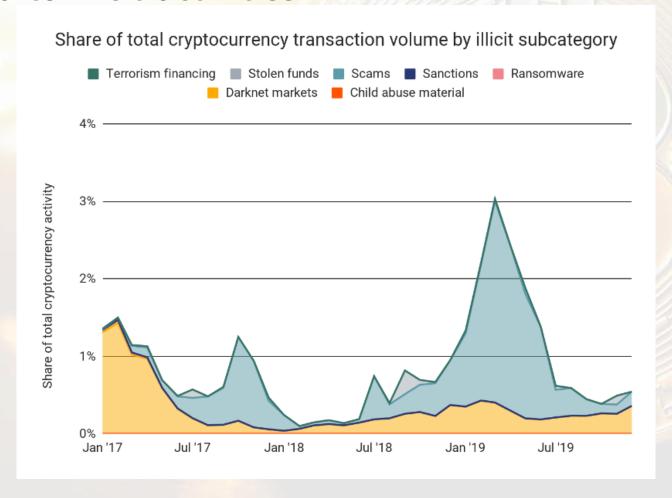
- Paxos and Credit Suisse: liquidity settlement against shares using blockchain
- Bank von der Heydt: stablecoin for financial instruments as tokens on the blockchain
- HSBC: private placement of \$10B on the R3 Corda blockchain
- DeFi: financial smart contracts, such as flash loans



Learning from failures?

Chainalysis and Criminal Activity

Crypto Crime Report 2019: only 1% of \$1B in crypto transactions are connected to illicit activities







Research Activity: a New Publication



A genuine and fruitful intellectual provocation: money is an instrument of freedom and a vector of open society

Blockchain Thesis Award

Schnorr Signature: Additivity and Multisignature

by Chiara Lelli (first DGI alumna)

Winner of the 2017/2018 Blockchain Thesis Award

POLITECNICO DI MILANO

Corso di Laurea in Ingegneria Matematica Scuola di Ingegneria Industriale e dell'Informazione



Schnorr Signature:
Additivity and Multisignature

Relatori: Prof. Daniele Marazzina Prof. Ferdinando Ametrano

> Tesi di Laurea di: Chiara Lelli Matricola 830091

Anno Accademico 2016-2017

42: Puzzle Solved!

■ 1954: express $k \in \mathbb{N}$ in terms of $x, y, z \in \mathbb{Z}$

$$k = x^3 + y^3 + z^3$$
?

- Solutions available for every number (<100), but 33 and 42
- 2019: Andrew Booker finally solved 33
- 2020: A. Booker and A. Sutherland solved the elusive 42 puzzle $42 = -80538738812075974^3 + 80435758145817515^3 + 12602123297335631^3$
- 1983: The Hitchhiker's Guide to the Galaxy, Douglas Adams
 42 is the answer to the fundamental question about life



Save The Date

Bitcoin and Blockchain

April 21-22, July 21-22

https://dgi.io/workshop/

2020-Q2 Report Presentation

July 7

https://dgi.io/reports/

CAL2020

September 16

https://cryptoassetlab.di seade.unimib.it/cal2020/ Bitcoin, blockchain e crypto-asset: impatti nei settori finanziari e assicurativi

September 15

https://www.lseg.com/it/Blockchain2020

Bitcoin and Italian Tax Declaration

Guest speaker:

Francesco Avella

Tax advisor and litigator at Studio Avella Member of the Editorial Board of European Taxation



Digital Gold Institute

Scarcity in the Digital Realm



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