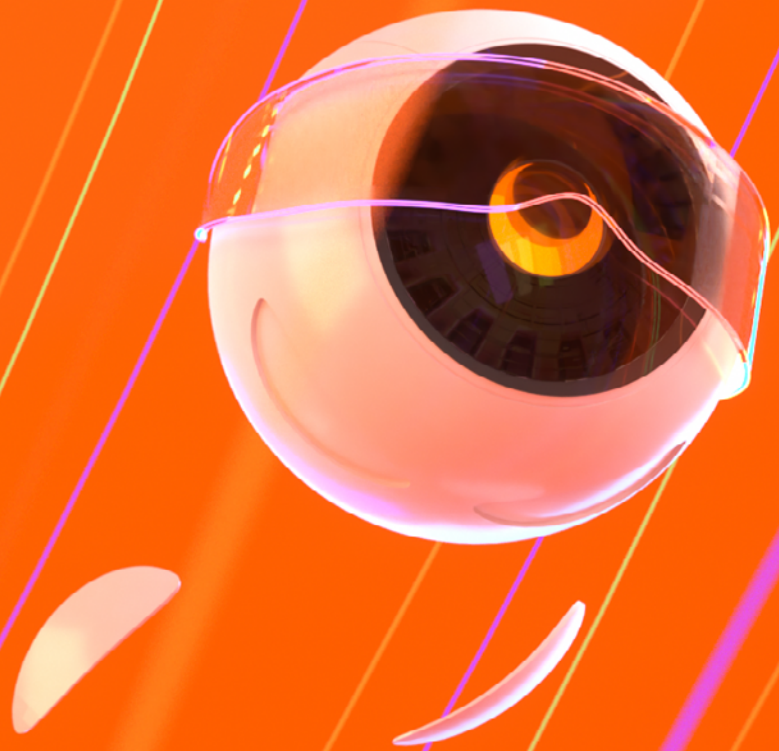
Investment Recipes

by AtonRā Partners



7 OCTOBER 2020

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TIME TO PLAY THE CHIPS

A.I. – Semiconductors In The Driving Seat

Artificial Intelligence demands semiconductors

AI has been around since the '50s but has become mainstream over the last 10 years thanks to breakthroughs in processing power, memories and networks.

- In the 2000's Graphics Processor Units (GPUs), >1GHz microprocessors, gigabit networks and terabyte memories enabled the rise of deep learning algorithms.
- Artificial Intelligence is expected to drive a global semiconductor market of $65bn by 2025 – 5x the non-AI semiconductor compound annual growth rate.

High barriers to entry

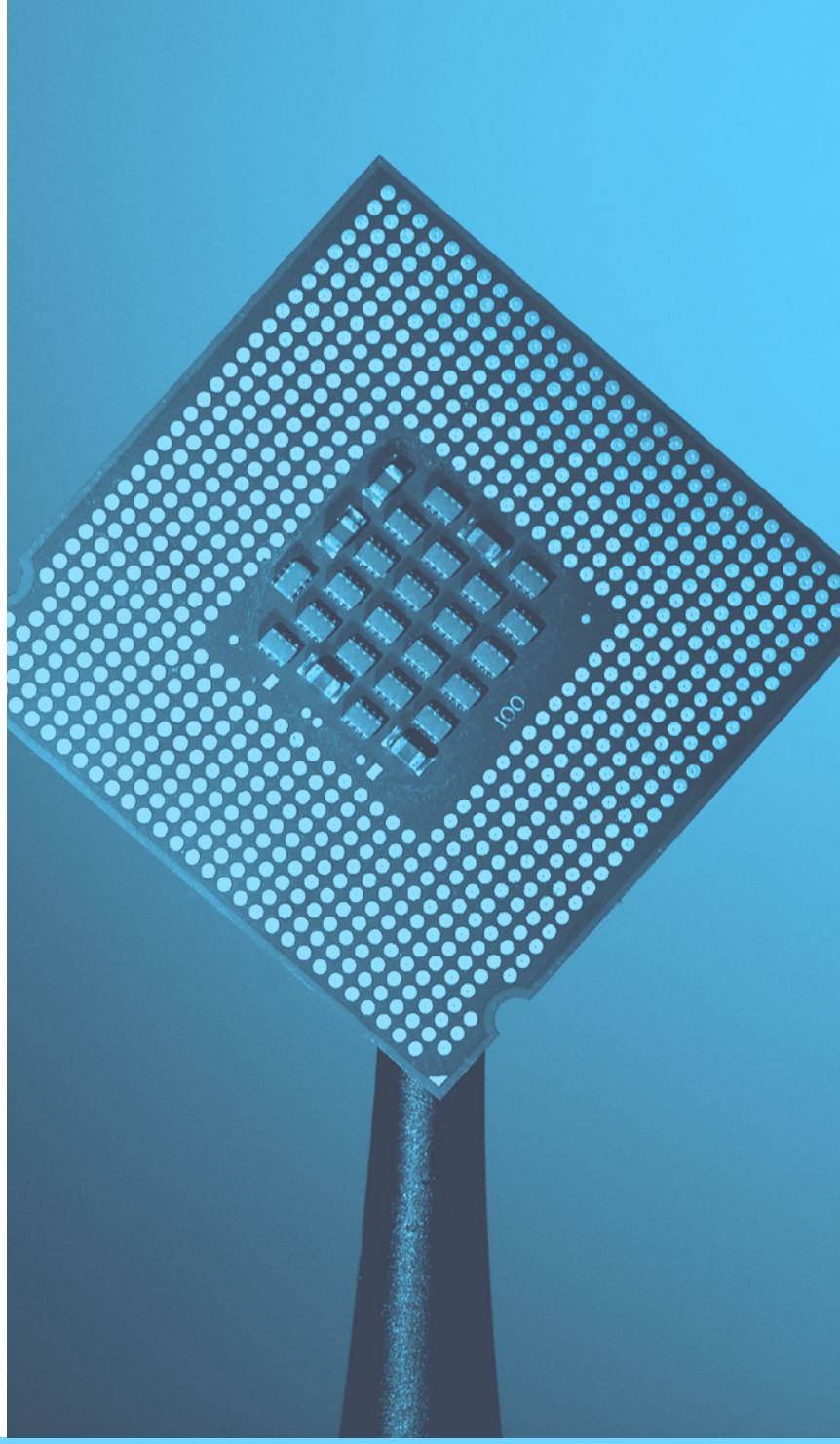
Artificial Intelligence takes advantage of the most complex chips and as such has changed the economics of technology development, inducing a scarcity of players competing for this fast-growth opportunity.

- Only 3 companies can manufacture leading-edge artificial intelligence chips.
- State-of-the-art technologies require nanometre features, hence very specific machines that only a handful of companies can deliver (e.g., ASML for lithography).

Size matters

The semiconductor supply-chain requires both massive investments and tight coordination. Such feats are more likely to be met by global companies which can create an ecosystem around them.

- The Nvidia ARM deal will create a dominant ecosystem for Artificial Intelligence.
- Manufacturing capacity is limited at the leading edge and companies are vying to get their share (TSMC, Samsung).
- Processor is nothing without high speed memory (Micron, Samsung, SK Hynix).



SOURCE:
Photo: Brian Kostuk

No Artificial Intelligence Without Semiconductors

Mathematics to the core

Artificial intelligence is born in the early1950's and has long been a field of theoretical mathematics as no computing machine was powerful enough to materialise applications.

- The foundations were set before 1970 with the perceptron and fuzzy logic.
- Artificial Neural Networks were introduced in the 70's and enhanced in the 80's with back propagation and convolutional neural networks.

More capable cores

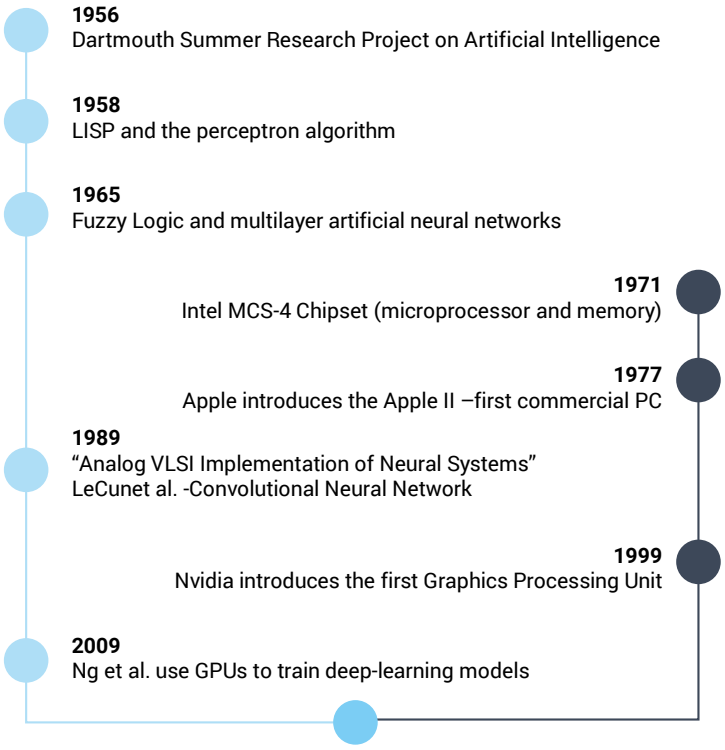
In 1965, Gordon Moore observed that the number of transistors per chip was doubling every two year. This trend has been lasting for five decades and has provided the computing capabilities to enable machine learning and reasoning.

- In 1971, Intel introduced the first commercial DRAM (Dynamic Random-Access Memory) and the first commercial CPU (Central Processing Unit).
- In 1999, Nvidia introduces the first GPU (Graphics Processing Unit), which ten years later transformed artificial intelligence by enabling deep learning.

A decade that transformed the world

The 2010's have established Artificial intelligence as the most transformative force in technology, illustrating how progress compounds and accelerates over time.

- Deepmind, which turned 10 last month, has proved that artificial intelligence can outperform humans in the most complex games (AlphaGo, AlphaStar).
- Natural Language Processing is everywhere (IBM/Jeopardy, Apple/Siri …).
- Deep Learning has outperformed humans in understanding images (Google Brain, Facebook DeepFace) and text reading (Alibaba in 2018).



Artificial Intelligence Boosts Semiconductors

The largest single opportunity for semiconductors

Artificial Intelligence is opening the best opportunities for semiconductor companies in decades. We believe it will drive a significant increase in revenues and fuel the technology roadmap, with disproportionate returns for market leaders.

- AI semiconductor market is expected to grow 5x faster than non-AI semiconductor.
- Machine learning accelerators are the most technology demanding semiconductor products (design, technology and manufacturing).

Commoditization is not even close

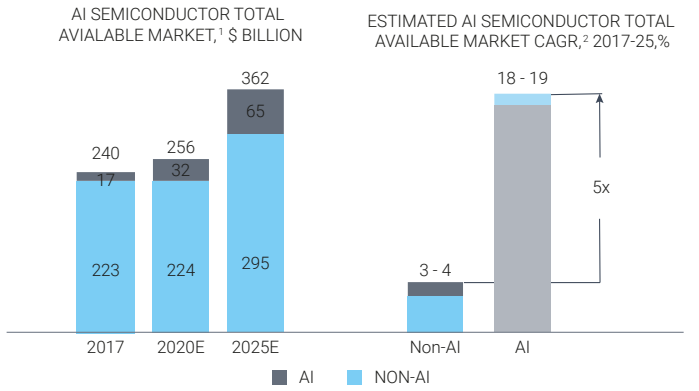
Artificial Intelligence is very much about algorithms and data science secret sauce. Yet, artificial intelligence accelerators and dedicated memories make all the difference by enabling smarter approaches to be brought to the market.

- Myth: Widely available sophisticated AI tools will level the playing field.
- Reality: Pioneers are increasing their investment in AI, widening the gap with others.

Artificial Intelligence is pushing the technology envelope

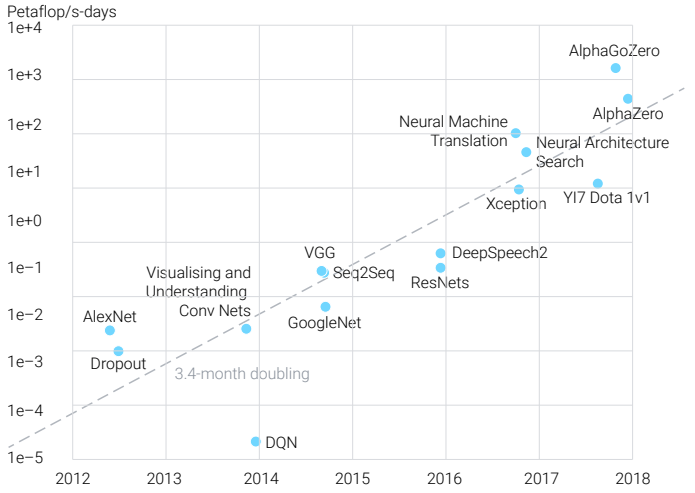
Since 2012, the amount of compute used in the largest AI training runs has grown by more than 300'000x (doubling every 3.4 month).

- AMD Epyc, Intel Stratix and NVIDIA Ampere are now the most complex chips ever manufactured with more than 40 billion transistors.
- According to Marvell, machine learning accelerators are the reason why you need ever smaller transistors (below the 7nm critical dimensions).



[1]Total available market includes process, memory, and storage; excludes discretes, optical, and micro-electrical-mechanical systems

ALEXNET TO ALPHAGO ZERO: A 300'000X INCREASE IN COMPUTE (LOG SCALE)



SOURCE:
McKinsey on Semiconductors Number 7, October 2019
MIT Sloan management review, September 2018
OpenAI.com - AI and Compute, May 2018

High Barriers To Entry – Billions And Billionth

Barriers to entry: cashflows

Integrated Circuits (IC) design costs have jumped to ~$300 million for a 7nm chip (7 billionth of a meter, about 20 silicon atoms) and above $500 million for 5nm. The cost of designing a chip for the forthcoming generation (3nm) is expected to range from a staggering $500 million to $1.5 billion for the high-end GPUs.

- Less than 20 semiconductor suppliers allocate more than $1bn for R&D.
- Only a handful of them can spend this amount for a single family of chips.

Barriers to entry: technological capability and capacity

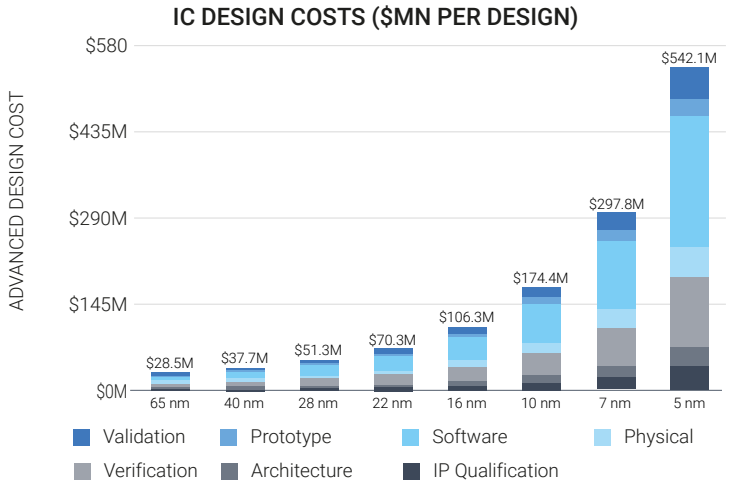
The most advanced AI accelerators already embed about 50bn transistors and fill the entire reticle (i.e. the design you can print on a silicon wafer). Hence, smaller geometries are required to increase the complexity.

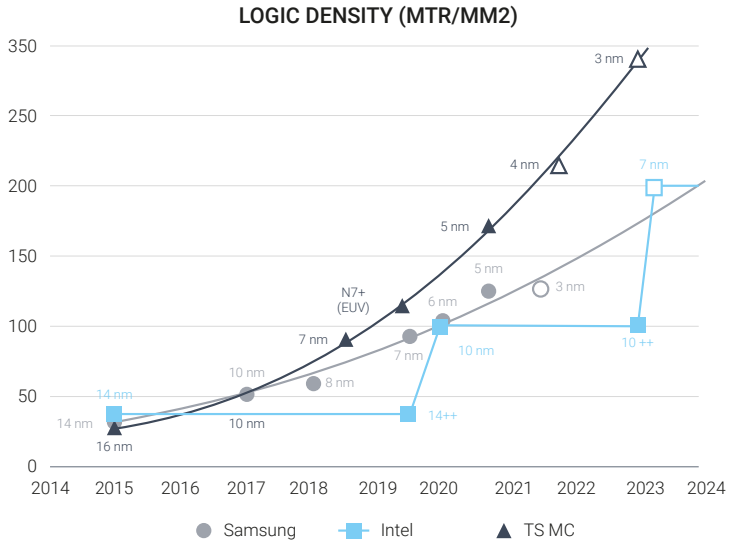
- TSMC is the undisputed leader for advanced technologies, enabling its customers to achieve 1.5x to 2x the density of competing foundries.
- Such density requires the use of extreme ultraviolet lithography (provided only by ASML) of which TSMC already owns more than 50% of the installed capacity.

Artificial Intelligence at the edge

We foresee edge processing as the next big thing, with low-power, high-efficiency chips demand to be much higher compared to current needs for data centers.

- The semiconductor market for edge hardware is expected to grow from a few hundred million dollars to more than $5bn in the next five years.
- Image and voice recognition will be the main drivers (incl. autonomous vehicles).





SOURCE:
IBS - International Business Strategies, Inc.
Intel, TSMC, Samsung, IC Knowledge, WikiChip, AtonRâ Partners

Small Is Beautiful, Big Is Successful

Nvidia's Arm deal – the center of the chip world

Nvidia is buying ARM to create the dominant ecosystem for distributed Artificial Intelligence. We see this deal as industry changing, enabling the emergence of an end-to-end ecosystem of artificial intelligence accelerators.

- Nvidia leveraging ARM in the datacentre to provide full computing solutions.
- ARM leveraging Nvidia to deliver computational building blocks for the multitude of edge and autonomous artificial intelligence devices.

Taiwan Semiconductor Manufacturing – the kingmaker

TSMC is the world leading foundry with more than 50% market share globally and a quasi-monopoly for the most leading-edge technologies. The company has been instrumental in the success of Nvidia and AMD, and companies targeting artificial intelligence are vying for capacity at TSMC for 7 and 5nm.

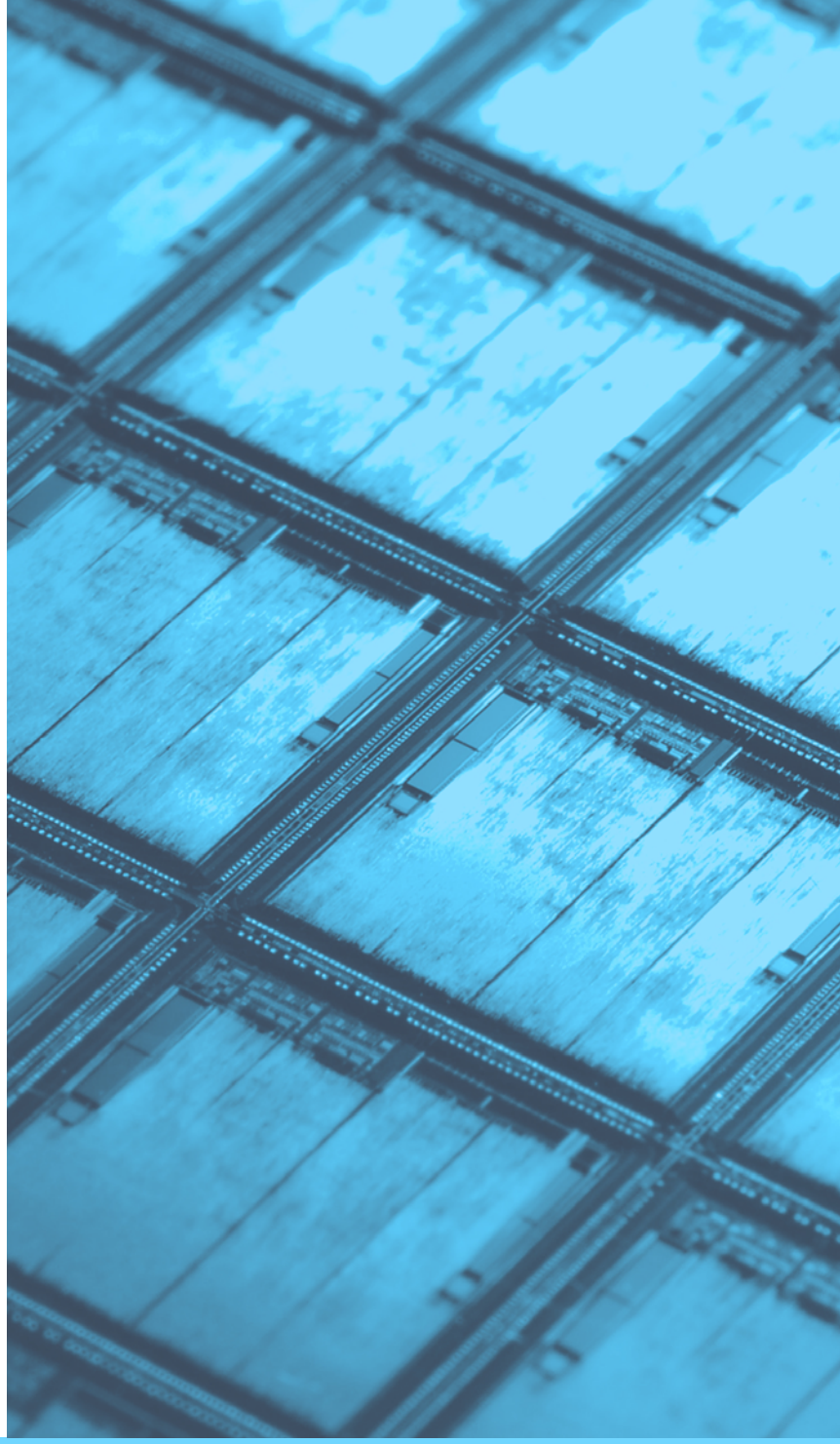
- Apple has captured the 5nm capacity for its next generation chipsets.
- Nvidia and AMD have been building orders for TSMC 7nm in 2020.
- Intel is said to be negotiating with TSMC and formulating a cooperation plan.

Memory manufacturers – the “eminences grises”

Artificial Intelligence requires accelerated memories as well as accelerated computing, providing opportunities to leverage partnerships

- Building on its collaboration with Nvidia, Micron transformed the memory/GPU interface with its GDDR6X to deliver the world’s fastest discrete memory solution.
- AMD has transformed the computing chip partitioning by introducing HBM (High Bandwidth Memory) in partnership with SK Hynix and Samsung.

SOURCE:
Photo: Laura Ockel



Catalysts

- **EUV Lithography enables a wave of products.** The mass availability of 7nm and 5nm nodes at TSMC in 2H2020 is likely to trigger a wave of new AI accelerators from AMD, NVidia, Apple, ARM, Marvell and Qualcomm.
- **Emerging ecosystems.** Disrupting Intel dominance (x86), Nvidia and ARM are igniting a new era based on ARM CPU (Neoverse, …) and accelerators for deep learning and networking (Ampere, NVLink,…).
- **Lawmakers push to invest billions in the semiconductor industry.** China has pledged an estimated $1.4 trillion through 2025 for technologies ranging from wireless networks to artificial intelligence, with semiconductors being fundamental to virtually every component of such technology ambitions.

Risks

- **Ethics and Regulation.** Artificial Intelligence acceptance in society and associated ethical challenges are still under discussion - regulation tends to lag innovation.
- **Supply chain disruptions.** Artificial intelligence pushes technology to the limits. The semiconductor industry is tightly interconnected and any delay in the supply chain might slowdown market and company growth.
- **US-China trade tensions.** The technology cold war between the US and China adds pressure on geopolitical hotspots (Taiwan, Korea) and might lead to a dis-integration of the global supply chain. Such uncertainties could both delay and limit opportunities.

Bottom Line

- Semiconductors are both the core enablers and prime beneficiaries of the artificial intelligence transformative drive. We believe that artificial intelligence will drive a significant increase in revenues and fuel the technology roadmap, with disproportionate returns for market leaders. Hence, we see xPU (all flavors of computing units) and leading-edge memory systems to significantly benefit from the trend.
- Once the infrastructure for training and cloud services is scaled, our view is that the next wave is expected to be driven by many more players, designing chips for the edge with power efficient chips. We see the potential deal between Nvidia and ARM as transformative and reiterate our interest in leading companies for image/voice recognition and autonomous vehicles for our portfolios.

Companies mentioned in this article:

Google (GOOGL US), IBM (IBM US), Apple (AAPL US), Facebook (FB US), Alibaba (9988 HK), AMD (AMD US), Intel (INTC US), NVidia (NVDA US), Marvell (MRVL US), ASML (ASML EU), TSMC (TSM TW), Micron (MU US), Samsung (005930 KS), SK Hynix (000660 KS)

DECENTRALIZED FINANCE, SYSTEM REVOLUTION OR CRAZE?

A Nascent Industry Full Of Promises

2020, a pivot year for blockchain in finance

As we wrote in a recent issue of our Investment Recipes, the sanitary crisis is accelerating the shift towards a cashless society. Blockchain usage is moving from tests and prototypes to industrialized real-life use cases, notably in finance.

- 12 years after the Bitcoin white paper, real applications for digital assets like securities trading, mortgages, payments, insurance, etc. are in place.
- Governments are working on central bank digital currencies (CBDC).

Decentralized finance (DeFi) has been gathering momentum

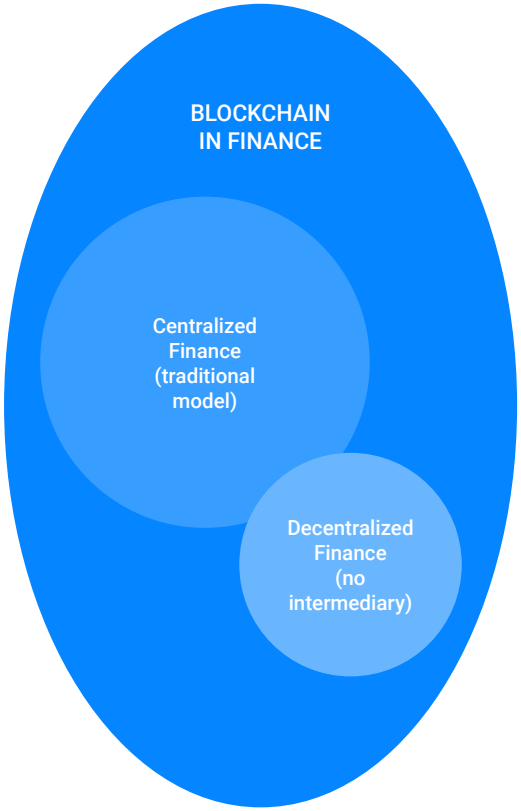
DeFi aims to develop a financial world based on blockchain systems, with no intermediaries involved in the transactions. This application of blockchain technology is among the winners of 2020 and is ushering the open-banking era.

- The total value locked in smart contracts by DeFi protocols was multiplied by ~20x in just one year, crossing the $10bn mark in September.
- Current applications mainly focus on digital assets, but several projects work on interoperability with real-world assets.

DeFi is interesting, but not mature yet

While some DeFi applications are worth monitoring, most DeFi developments have the potential to challenge and force traditional finance to evolve. Counterintuitively, DeFi success is likely contingent on the adoption and adaptation of DeFi's protocols and principles by private institutions.

- DeFi still has a long way to go to become a standard.



SOURCE:
Defi Pulse

What Is DeFi?

A decentralized ecosystem

Decentralized Finance refers to a financial ecosystem that is available to everyone and operates without any central authority. This ecosystem is built on peer-to-peer open-source applications that interact on top of blockchain networks.

- DeFi aims to become an essential building block of the sharing economy.
- Any financial service (savings, loans, insurances, etc.) becomes available to anyone in the world with a smartphone and an internet connection.

Our financial system is built on centralized finance

By contrast to DeFi, traditional finance relies on a point of control such as a central bank or an old-style banking institution. This framework was thought to bring stability and security. However, fraud, questionable lending processes and non-universal financial inclusion cannot be avoided by such a system.

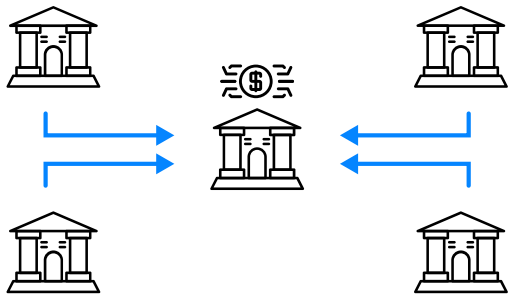
- As of 2017, 1.7bn adults didn't have access to a bank account.

DeFi, banking without banks

DeFi has the potential to eliminate barriers to entry and the bureaucracy of the financial system. DeFi users decide where to park their funds, as there is no intermediary acting as a custodian. Moreover, the traditional advantages of the blockchain technology, e.g. transparency and security, hold true in DeFi too.

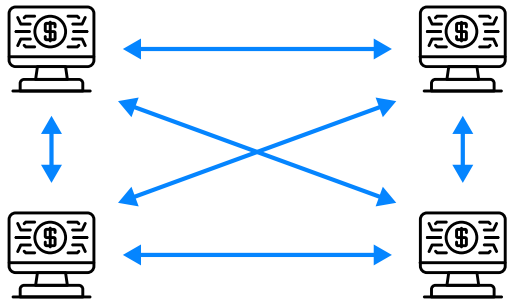
- The code specifies the resolution of every possible disputes – courts and arbitrators become useless.
- Although considered as safe, blockchains are only as strong as their weakest link.

TRADITIONAL FINANCIAL SYSTEM



A centralized ledger tracks within the financial system

DECENTRALIZED FINANCIAL SYSTEM



A distributed ledger is held by all parties of the network eliminating the need for a central authority

SOURCE:
Binance Academy, World Bank – Global Findex Database, Stably blog

Why DeFi?

An ecosystem based on applications

All DeFi services run on programs called DApps. As opposed to early-stage blockchains and the traditional banking system, DeFi protocols can be combined like Legos. It results in the development of new financial markets, unconstrained liquidity, or the launch of products that cannot exist in the traditional system.

- The code is transparent, meaning anyone can audit it and look for bugs.
- Over 3'600 DApps were launched, mostly on the Ethereum platform.

Traditional players should get interested in DeFi

The DeFi ecosystem offers the possibility for traditional financial institutions to reduce the layers of intermediaries and improve operational efficiency. As a result, costs will be reduced. Proposing banking solutions and services through blockchain technology is also a solution to differentiate the product offering.

- Banks must either pursue a digital transformation or risk disappearing.

Make open banking real

Open banking refers to the development of open-source APIs to build applications and services around financial institutions. Ultimately, account holders should regain control over their data, which are now stored and owned by banks. DApps can accelerate the transition to the open banking era.

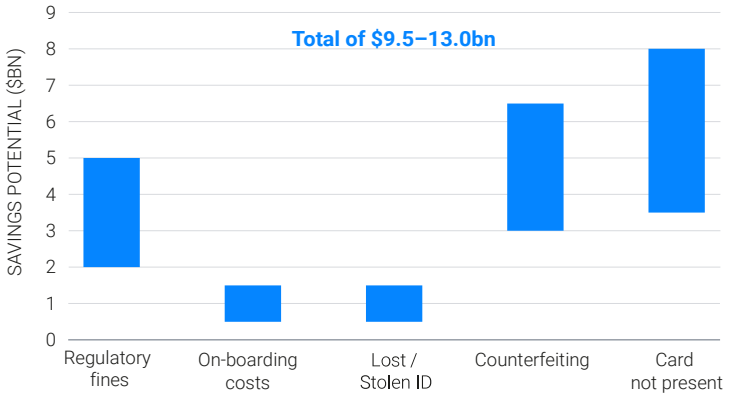
- The concept of open banking emerged in October 2015, when PSD2 was adopted by the European Parliament.

TOP-5 PLATFORMS FOR DAPPS (SEP 2020)

Platform	Total DApps	Daily active users*
Ethereum	2'948	21'060
EOS	331	19'180
TRON	110	11'260
Steem	78	n/a
Klaytn	58	3'240

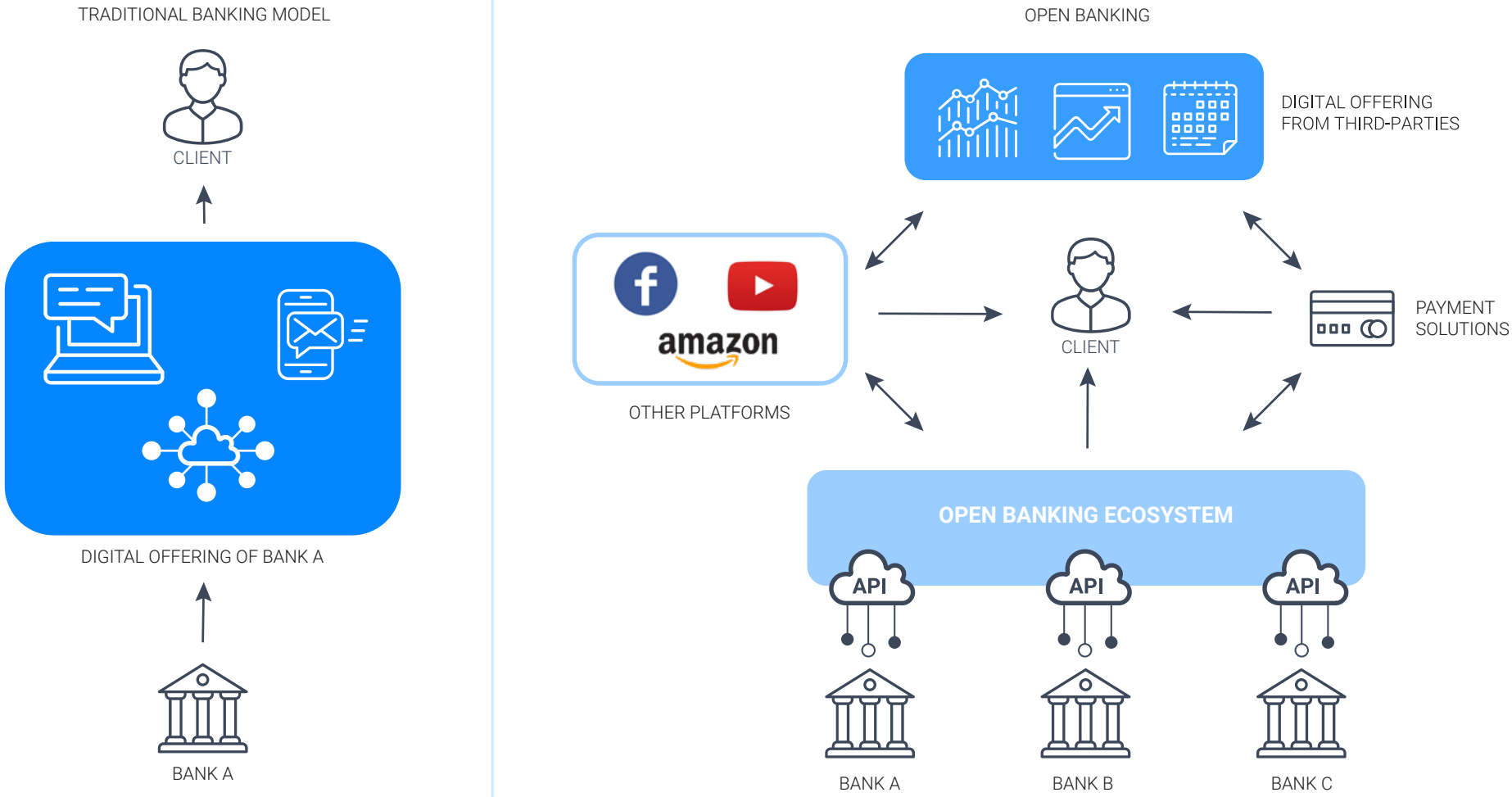
*Number of unique source addresses in transactions to Dapp contracts.

RETAIL BANKS SAVINGS POTENTIAL FROM BLOCKCHAIN-BASED SOLUTIONS (KYC, FRAUD, REGULATORY ONLY)



SOURCE:
Sate of the dApps, McKinsey, AtonRâ Partners

The Era Of Open Banking



SOURCE:
Kalaidos Fachhochschule, AtonRâ Partners

Smart Contracts (1/2)

The banking business is a contract story

Services offered by a financial organization to its customers are essentially contracts. It requires a huge workforce to monitor the life cycle of these documents, and to make sure all parties respect their obligations.

- Most activities require agreements: account opening, loans, portfolio management, etc.

From paper contracts to smart contracts

Banks and their legacy IT systems struggle to digitize the contracting process. Smart contracts represent a digital alternative that takes place on a distributed ledger. For a financial institution, a smart contract on an enterprise blockchain can facilitate the transfer of information, reduce intermediaries, and improve transparency and security.

- A smart contract is a computer program which intends to automatically execute, control or document legally relevant events and actions to the terms of a contract or agreement.

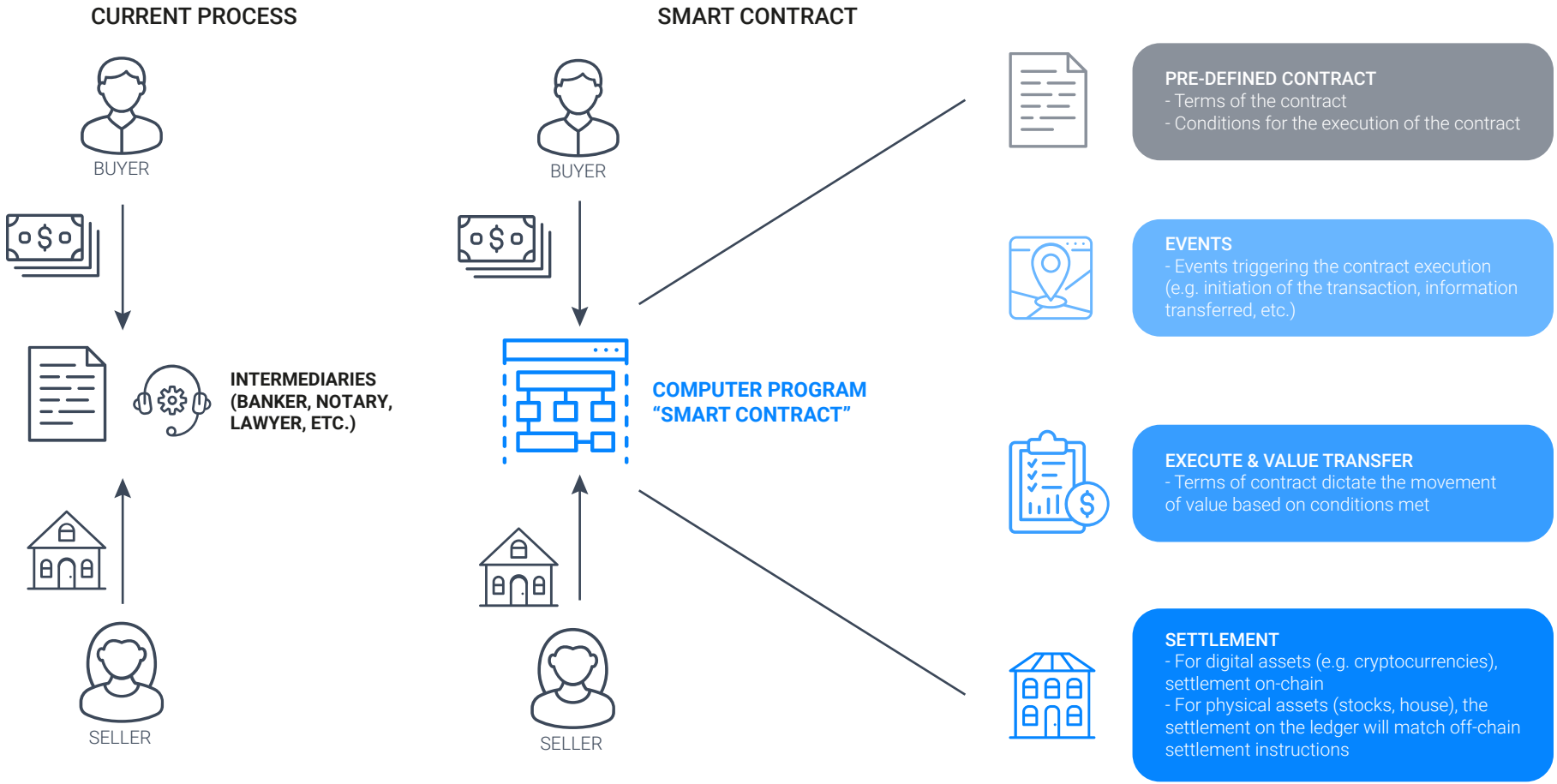
Behind the stage, the rise of computing power

The surge in computing power supported the developments of the blockchain industry. Before one of the peer computers can add a new block to the chain, its authenticity must be validated by a computational consensus process requiring a powerful infrastructure.

- GPU (graphic processing unit) chips of Nvidia and AMD are widely used in crypto mining farms.

SOURCE:
Wikipedia

Smart Contracts (2/2)



SOURCE:
AtonRâ Partners

Ethereum As An Enabling Platform

Ethereum, the protocol used for DeFi smart contracts

The vast majority of DeFi applications are developed on the Ethereum blockchain. When launched in 2015, the Ethereum platform wanted to facilitate the development of applications and of immutable and programmatic contracts.

- Ethereum-based coins (ETH) are the second largest market cap of all coins at $43bn (about 5x less than Bitcoin's, as of September 2020).

Implementation of DApps on Ethereum

Deploying an application on the Ethereum blockchain requires to code a smart contract using a programming language and to compile the code into machine-understandable code. Once deployed, smart contracts receive a contract address on the blockchain where transactions will be run.

- Solidity is the primary object-oriented programming language for Ethereum smart contracts, influenced by JavaScript, Python, and C++.

Using the Ethereum blockchain has a cost

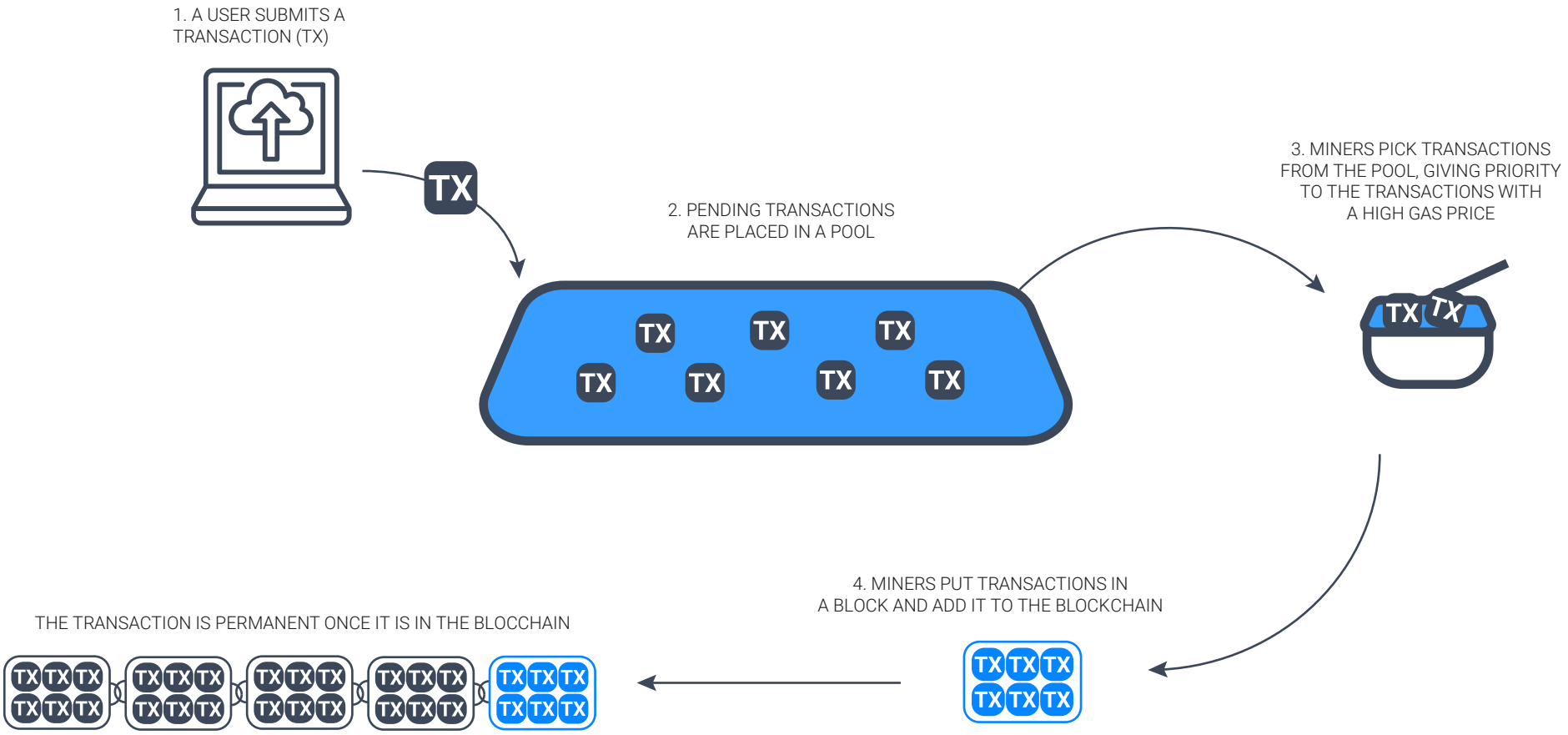
Whenever a smart contract is deployed or transactions on a smart contract sent to be executed, users must pay a small fee, called gas, to reward the miners. The miners are the machines (the nodes) that will execute a transaction and validate a block.

- To run a car, one needs fuel. To run an application on Ethereum, one needs gas, priced in Gwei, a small denomination of ETH.
- The price for gas depends on the demand for resources on the network.
- The amount of gas needed depends on the complexity of the smart contract and how fast one wants a smart contract to be executed.

	Bitcoin (BTC)	Ethereum (ETH)
What is it?	A cryptocurrency.	A platform, an environment.
Transaction type	Transactions primarily monetary and store of value.	Transactions can be monetary, but not the primary function. Ethereum was built to allow executable codes, i.e. smart contracts that materialize when some pre-defined conditions are met.
Token Supply	Deflationary, finite supply – There are about 18.5mn BTC in circulation, and there will be in total 21mn BTC mined. The last BTC should be mined sometime around 2140.	Inflationary – like a fiat money, the number of ETH in circulation increases.
Time needed to mine a block	On average 10 minutes.	On average 10-15 seconds.
Actual transactions per day (90-day average)	13'000	46'800

SOURCE:
Investopedia, CoinGecko, Buy Bitcoin Worldwide, Wikipedia, Pentablog, Ethereum.org, ETH gas station, bitinfocharts.com

How The Ethereum Blockchain Works



SOURCE:
Medium.com, AtonRâ Partners

The DeFi Market: Total Value Locked

COVID-19 has accelerated the development of blockchain technology

Like for other tech-related industries, the sanitary crisis has contributed to accelerating the evolution of the blockchain industry. We noticed a material shift in the views of central banks, private companies, and financial institutions about blockchain.

- We expect the number of real-life blockchain applications to increase exponentially.

DeFi among the winners of the rising interest in blockchain

The recent focus on blockchain technology is benefiting DeFi players. This subgroup of the blockchain ecosystem is experiencing exponential growth rates on all possible metrics used to quantify the phenomenon.

- DeFi is still lagging Centralized Finance (CeFi, blockchain services with an intermediary), but offers a larger palette of interesting possibilities.

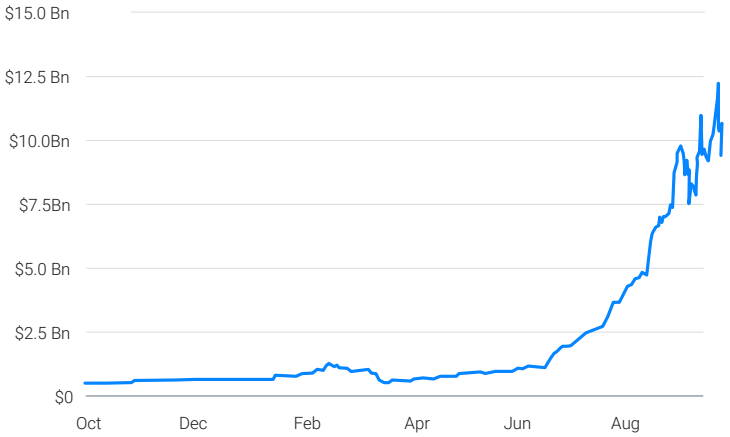
Almost $10bn in DeFi smart contracts

The total value locked (TLV) refers to the total balance of ether (ETH) and other tokens on the Ethereum platform linked to smart contracts. The rise in this value has been astonishing. However, TLV is amplified by leveraged strategies. And some argue that there is some double-counting that exaggerates the true amounts, since the DeFi protocols combine like Legos.

- In less than 3 years, TLV went from $1mn to over $10bn.
- Less than 5% of ETH are locked in DeFi, leaving a lot of room for growth.

HOW INSTITUTIONS PERCEIVE BLOCKCHAIN

1-YEAR EVOLUTION OF THE TOTAL VALUE LOCKED ($BN)



Data as of 25/09/2020

SOURCE:
CB Insights, DeFi Pulse, CoinMarketCap

The DeFi Market: Users And Private Equity

Rising volumes go in pairs with additional users

Headlines and rising TLV have attracted more users to DeFi protocols. The number of unique addresses is booming. Like for TLV, the actual number is a bit overstated, as one user can access several protocols and have multiple addresses. But the rising trend in the number of addresses is clear.

- The number of addresses has increased by a factor of almost 5 since the beginning of the year.

Behind the screen, profile of the average user

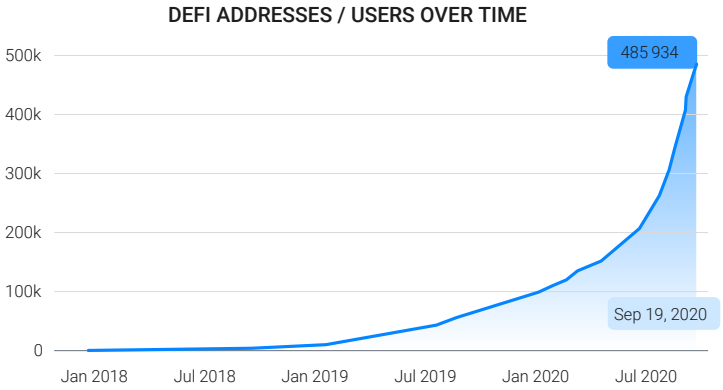
While Square's Cash App is democratizing the trading of Bitcoin to millions of Americans, DeFi has not reached the masses yet. Navigating this ecosystem still requires above-average IT skills. Geeks, specialized alternative funds, and crypto enthusiasts are the likely key users of DeFi applications.

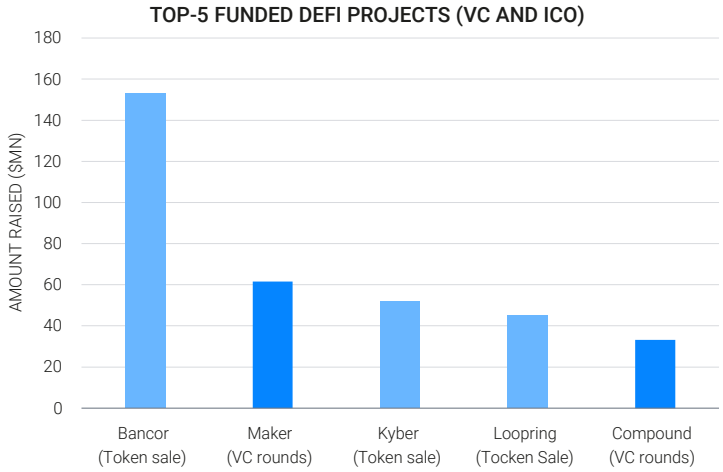
- Square's users purchased $875mn of Bitcoins in Q2 2020 (+600% YoY).

Venture capital growing appetite

Initial DeFi projects were funded during the 2017-2018 ICO boom. These projects were mostly funded by retail investors and struggle to meet expectations. But venture capitalists (VC) are turning to DeFi as business plans become more mature, professional and realistic.

- 100 VC funds invested over $500mn in projects listed on DeFi Pulse.
- Maker and Compound are the DeFi companies that raised the most capital from VC players.





SOURCE:
Dune Analytics, The Defiant

The DeFi Market: Market Capitalization (1/2)

DeFi tokens experience a surge in market capitalization

Tracking the market capitalization of the DeFi tokens is not straightforward. Given the open-source model of DeFi, projects keep being cloned. Money flows to the latest trendy DApps, influencing tokens' values. On average, we noticed a boom in the DeFi market caps lately, fueled by news headlines.

- As of 21 September 2020, the total value of DeFi tokens reached $15bn.
- According to DeFi Market Cap, there are over 950 DeFi tokens.

A move explained by governance tokens

To attract liquidity, DeFi projects have issued so-called governance tokens to their users. The rights linked to these tokens is not always clear. Investors bet on possibilities to monetize project fees to token holders. In other words, customers own the service provider – the ownership economy is born.

- For instance, MakerDAO holders can vote on stability fees, debt ceilings, process changes, etc., all of which could affect the MKR token price.

DeFi projects generate revenues

Decentralized does not mean free. Besides the gas required to send transactions, and like traditional platforms, DeFi lending platforms have different borrowing and lending rates. Part of the spread is accrued to the platform for its services – and may be returned to token holders.

- On the lending platform Compound, spreads vary according to the underlying digital asset and market forces such as supply and demand.

EVOLUTION OF YEAR.FINANCE (YFI) MARKET CAP: ANOTHER BOOM & BUST CRYPTO STORY?

TOP-5 PLATFORMS FOR DAPPS (SEP 2020)

Market / Token	Deposit	Borrowing
DAI	2,90%	3,95%
ETH	0,31%	3,16%
USDC	1,80%	5,60%
USDT	0,96%	2,47%
WBTC	0,25%	4,13%

Data as of 21 September 2020

SOURCE:
DeFi Market Cap, Coin Gecko, Bitcoin Suisse, Compound

The DeFi Market: Market Capitalization (2/2)

Valuation models for crypto

Valuation models for digital assets are imperfect but help provide information, like for traditional assets. When a crypto is used as a store of value, models often rely on FX and macro concepts. But elements linked to the digital side of these assets can also be considered.

- FX and macro concepts may include purchasing power parity, uncovered interest rate parity, or quantity theory of money.
- Supply scarcity, perceived value, network effect are among the pure crypto-asset concepts used to value digital assets.

P/S, a valuation metrics that can be used for DeFi projects

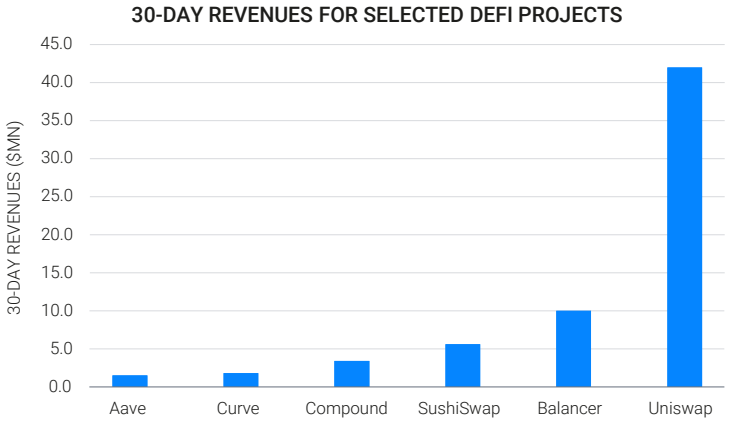
Since DeFi projects generate revenues, price-to-sales ratio can be used to compare the market capitalization of the various DeFi tokens.

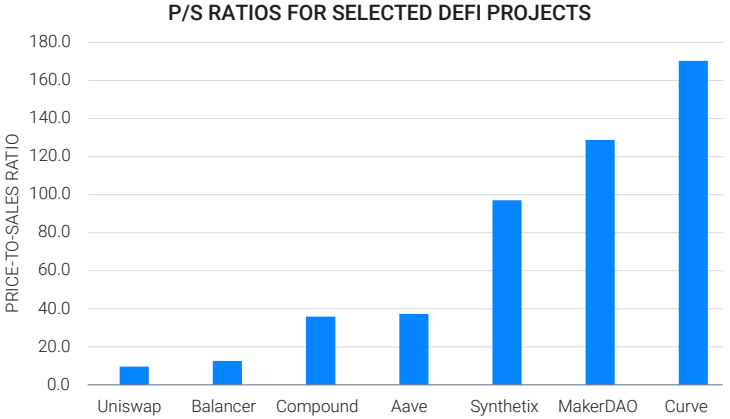
- P/S metrics for DeFi projects vary significantly between platforms.
- For DeFi projects, P/S is a good proxy for P/E and P/FCFF.

Implications of a higher market cap for DeFi

Although the bets on digital assets by the hedge fund industry are still relatively small, a higher market cap for DeFi implies a lower market share for other coins. Funds investing in diversified crypto portfolios will have to adjust their asset allocation. Possibilities of DeFi, e.g. lending, should also be considered by these players, given their large holdings of ETH or BTC.

- At the end of 2019, crypto hedge funds managed $2bn ($1bn in 2018).
- 38% and 27% of crypto hedge funds were involved in lending and borrowing activities, respectively.





All Data on the graphs as of 23 September 2020

SOURCE:
SEBA, Ernst & Young, Token Terminal, PWC – 2020 crypt hedge fund report

DeFi Intensifies Scaling Issues

DeFi has increased gas price on Ethereum

The increased popularity of DApps is congesting the Ethereum network. This results in increased processing time and transaction fees.

- The median price of gas was below 10 Gwei in March 2020 and peaked at more than 500 Gwei in mid-September.
- A simple transfer of ETH cost less than $0.2 in June but reached $4.5 in mid-September.

Ethereum 2.0 to lower transaction costs and enhance speed

We already mentioned blockchain scalability issues in the past. These performance issues are not acceptable for a technology that aims to become an alternative to the traditional financial system. Ethereum is developing a major upgrade that will improve functionality, performance and transactions per second.

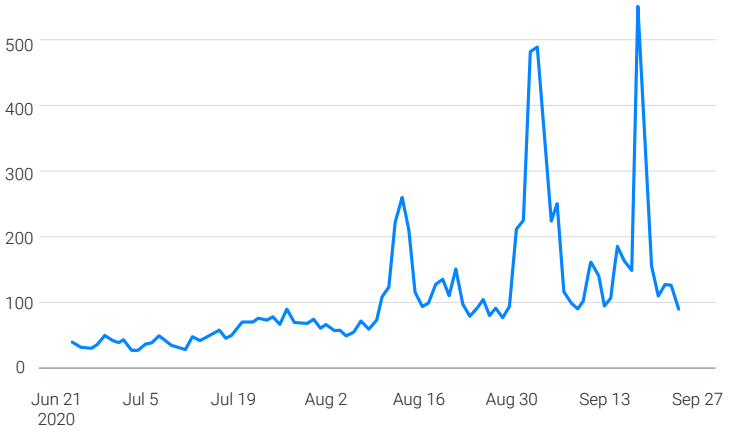
- Ethereum will be rolled out in three phases. The first phase with a new consensus is expected in Q4 2020. It is only in late 2021 or early 2022 that the full upgrade will be achieved.

Overview of blockchain consensus

The consensus is the process for achieving agreement on the next state of a data value within a distributed network. It verifies the legitimacy of transactions on a blockchain. Within the main families of consensus mechanism, we have:

- Proof of work (e.g. Bitcoin, Ethereum): Physical computing power and electricity to solve complex mathematical equations to build blocks.
- Proof of stake (e.g. Ethereum 2.0, Dash): Validators lock up collateral for the right to verify transactions – lower energy consumption.

90-DAY MEDIAN DAILY GAS PRICE



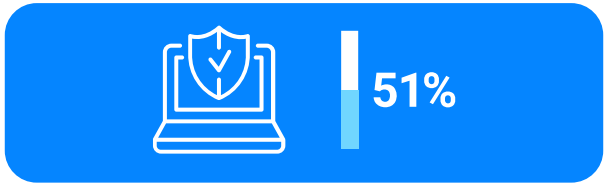
Data as of 23 September 2020

TRANSACTIONS PER SECOND (TPS)

Method	Theoretical max	Practical max	Actual use
Bitcoin	27	6-7	4-5
Ethereum	25	15	13-15
Ethereum 2.0	>100'000	n/a	n/a
Ripple	50'000	1'500	13-20
PayPal	n/a	n/a	475-500
Visa	>65'000	n/a	1'500-2'000

SOURCE:
Ethereum.org, Dune Analytics, Cointelegraph, Bit Info Charts, AtonRâ Partners

Proof Of Work Vs. Proof Of Stake

	PROOF OF WORK (POW)	PROOF OF STAKE (POS)
VALIDATING TRANSACTIONS		
	Miners compete to solve a mathematical puzzle to add a block to the chain, using their computing power.	Validators are chosen by an algorithm based on the user's stake placed as collateral (minimum 32 ETH for Ethereum 2.0 each held at least by 16'384 validators)
REWARD		
	The first miner to solve the puzzle gets a reward for its work (6.25 BTC for Bitcoin). Miners group in pools to increase computing power, creating centralized communities.	Transaction fee is based on the amount placed at stake. The platform remains decentralized.
SECURITY		
	Malicious attacks like interrupting the record of new blocks could be done by a group of miners who controls 51% of the mining power (hash rate) – unlikely in a large network like Bitcoin.	Malicious attacks can happen if a group of miners accumulate a 51% stake in the digital asset – unlikely for digital assets with a multi-billion market cap. Ethereum 2.0 will have safeguards against such attacks.

SOURCE:
Block Geeks, AtonRâ Partners

Solutions To Scaling Issues

Ethereum 2.0 will introduce shards, a highway of interconnected chains

Shard chains are sort of parallel chains that are linked to the main blockchain. They take a portion of the network's processing work and increase its capacity.

- Information contained in a shard is still accessible to everyone, keeping the ledger decentralized and secure.
- Shard chains are expected for 2021 on Ethereum, after the implementation of PoS.

The layer 2 (L2) offers additional scaling possibilities

L2 protocols execute transactions off-chain and interact with the main blockchain only to enter it or exit it. L2 transactions can be done in a standard database or on a child chain that operates with its own consensus or validation rules. Other solutions aggregate several transactions into one, reducing transfer fees.

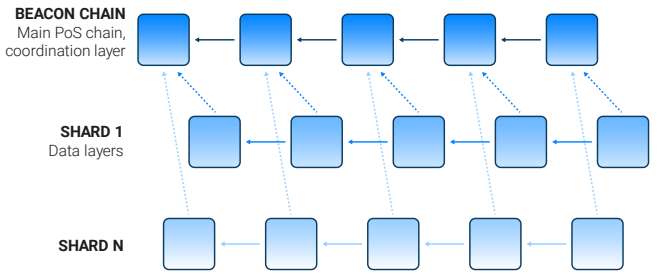
- For example, Loopring (DeFi exchange) uses zkRollup, a bundling method, and can settle up to 2'025 trades per second.

Why not simply increase the block size?

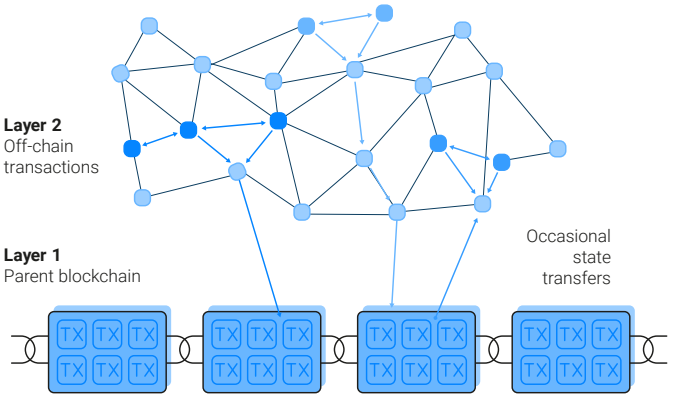
A simple way to increase the number of transactions per block would be to increase the size of the blocks. But this would be a plaster cast on a wooden leg, as long-term scalability issues remain. Larger blocks increase data storage and processing power costs, centralizing the system around a few entities.

- Since 2010, Bitcoin blocks had a size of 1MB. They were increased in 2017 to a theoretical maximum size of 4MB but remained at 2MB in practice.

ETHEREUM SHARD CHAINS



LAYER 2 SCHEME



SOURCE:
Ethereum.org, Loopring, Bitcoin Suisse, AtonRâ Partners

Applications: Lending Platforms

DeFi is mimicking the traditional ecosystem

The first wave of DApps has focused on replicating the traditional financial system for the world of digital assets. Holders of crypto assets have now access to dozens of tools to make sure their digital money works for them.

- Digital assets may offer an alternative to investors not willing to be exposed to negative interest rates and unlimited QE.

DeFi was about credit activities – like traditional banking

Most traditional banks do not accept to open accounts for the crypto-rich, making it difficult to use their wealth in the real world. DeFi lending platforms offer liquidity seekers the opportunity to place their digital coins in collateral and take loans in stable coins or even fiat. Likewise, lenders can get a yield from their holdings.

- Borrowers anticipate price appreciation in the value of their collateral.
- Arbitrage strategies are possible – one can borrow ETH on one platform and lend ETH on another and pocket the interest rate differential.

Loans for everyone

The absence of regulated intermediary opens new possibilities for parties looking for funding. As long as collateral is in place, anyone can take a loan without the need to provide a credit score or get the approval of a credit committee.

- Advanced borrowing strategies, called flash loans, enable users to take loans without collateral. Innovation in this field could create competition for credit card issuers and their peers.

SOURCE:
CoinLoan, AtonRâ Partners

Applications: Decentralized Exchanges (DEX)

Users move from centralized exchanges to decentralized ones

Decentralized exchange allows peer-to-peer trading of digital assets.

- UniSwap, the current DEX market leader, crossed the $2bn total value locked for the first time on 28 September 2020.
- UniSwap supports over 8'000 Ethereum token pairs, 10 times more than Binance, the largest centralized cryptocurrency exchange.
- Curve is another DEX focusing on stablecoins.

Liquidity pools replace traditional market makers

Market makers cannot operate on DEX. Order books must constantly be updated but every interaction with the smart contract costs gas. As a substitute, DeFi protocols have created liquidity pools, where token holders place pairs of tokens in exchange of trading fees or tokens from transactions occurring in the pool.

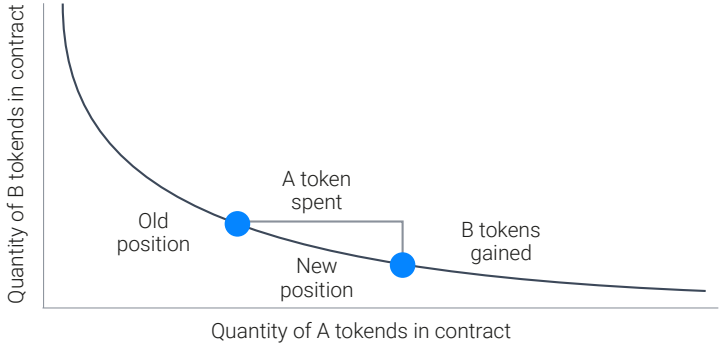
- Liquidity pools are not exclusive to DEX. Lending platforms like Compound have similar features.

Behind the liquidity pool, the automatic market maker (AMM)

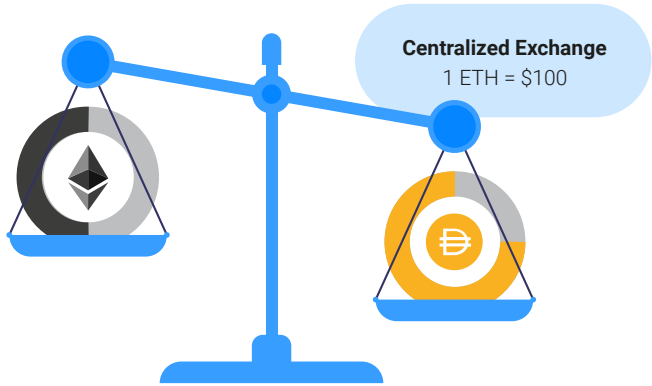
When a user swaps a currency, the amount received depends on the quantity of tokens available in the pool. In other words, the price of tokens in the pool is determined by the balance ratio between the two tokens in the pool. This price adjustment mechanism is called an automatic market maker.

- AMMs started becoming popular in 2018.

AUTOMATED MARKET MAKER ON UNISWAP



1. At pool inception, liquidity providers must place amount for at least two tokens.
2. At any time, the smart contract maintains a constant using token0 * token1 = constant. This ratio ensures that all trades can be settled.
3. Given the ratio, the larger the order, the poorer the execution price (long tails on the above curve, a phenomenon called slippage).
4. If the assets in the pool do not respect market prices, arbitrage opportunities arise between the pool and other exchanges (see below where 1 DAI = $1).



SOURCE:
UniSwap, EthHub, UniSwap, AtonRâ Partners

Applications: Asset Management, Payments, etc.

DeFi is not only about decentralized lending and exchanges

The DeFi community is also developing advanced portfolio and risk management tools for digital assets. The total value locked for most of these projects remain confidential though. These products can be appealing to sophisticated investors.

- ACO offers options on ETH and interest rate swaps.
- Synthetix tracks the value of real-world assets like fiat FX and commodities, while stocks and indices are already planned.
- Melon lets users create and manage decentralized funds, replicating the entire value-chain from the administrator to the transfer agent.

The large potential of the payment industry

New DApps are trying to get a slice of the multi-trillion dollars payment industry by combining the advantages of the blockchain (e.g. instant settlement, low fees and security), and of decentralized finance (anonymity).

- Flexa payment solutions is available in dozens of digital wallets to help easily spend digital coins.

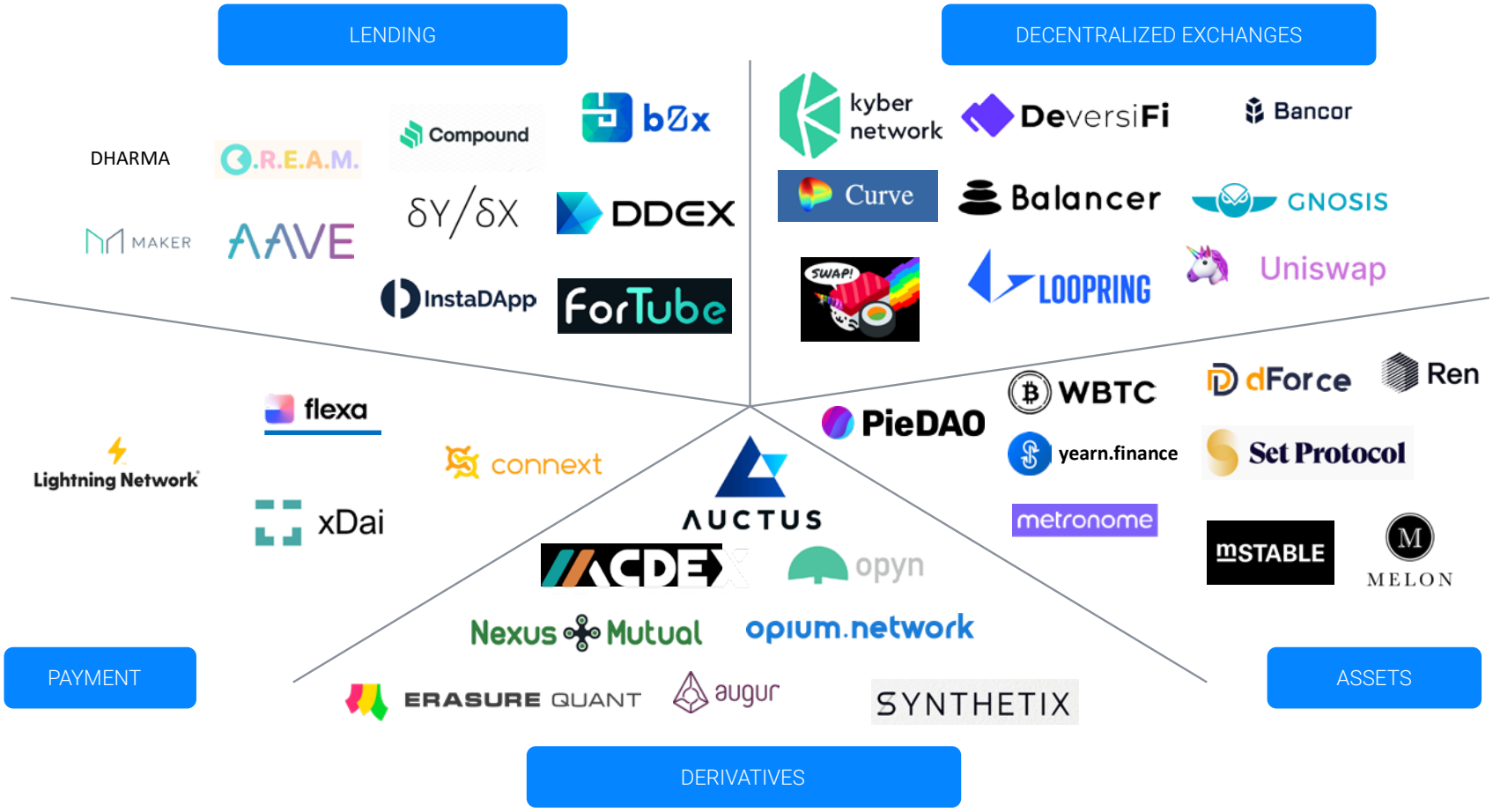
DeFi comes with a new set of investment risks

There is no free-lunch, even in DeFi. When an interest rate offered on a platform seems too good to be true, then the investor better be vigilant. As per the nature of DeFi, risks differ from the risks linked to traditional asset classes.

- Risks may include smart contract bugs, systemic risk of the digital asset industry, admin key linked to the smart contract, impermanent loss for liquidity providers, liquidity pool hacks, etc.
- Regulation risks also exist, e.g. the EtherDelta SEC ruling in 2018.

SOURCE:
Mentioned projects websites, AtonRâ Partners

Main DeFi Projects



SOURCE:
DeFi Pulse, projects websites, AtonRâ Partners

Outlook: Still A Long Way To Go For DeFi

High growth, but low relative value

The exponential growth of the DeFi industry and of the blockchain industry in general is impressive. But in absolute terms it remains a tiny actor compared to the traditional financial system.

- The market potential for DeFi is huge, but it takes time to change people's habits and revolutionize the financial system.

A copy-paste culture that discredits innovation

Some developers have recently been looking for a 5-minute glory and an easy way to gain money by copy-pasting existing projects. Such behavior does not encourage innovation and will not help building a bridge with traditional finance.

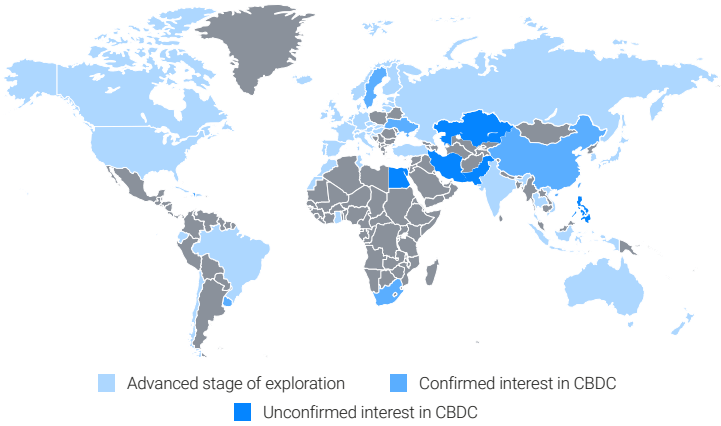
- A user named Chef Nomi copied the code of UniSwap, a decentralized exchange, to launch SushiSwap in August, only to sell its tokens (and netting $13mn) in early September.

Regulation will bring trust

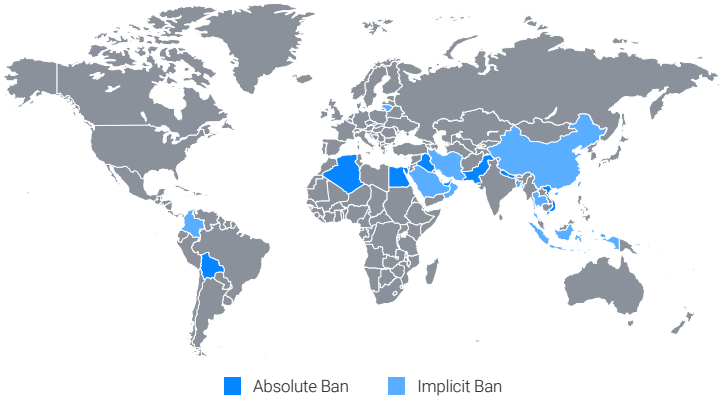
Digital assets already have a market capitalization of hundreds of billions of dollars, but many countries still do not officially recognize them. Without a clear regulatory framework, investors lack protection. Calls for more regulations are emerging, which could affect existing projects but eventually benefit the entire ecosystem.

- In September 2020, Bank of England governor supported global regulations on stablecoins.
- Some countries banning cryptocurrencies are working on CBDC.

COUNTRIES PURSUING CBDC RESEARCH (JULY 2020)



COUNTRIES BANNING CRYPTOCURRENCIES (JUNE 2018)



SOURCE:
Library of Congress, Kiffmeister Chronicles, AtonRâ Partners

Outlook: Improving Security

Not immune to scandals

Scams and problems have often rhymed with the crypto industry, including within the DeFi world. In case of a major scandal, we expect bad headlines for the entire crypto industry. In such scenario, Bitcoin, a store of value, would surge and Ethereum could disappear.

- Bitcoinabuse.com is a platform tracking addresses used for fraud.

Building a new image

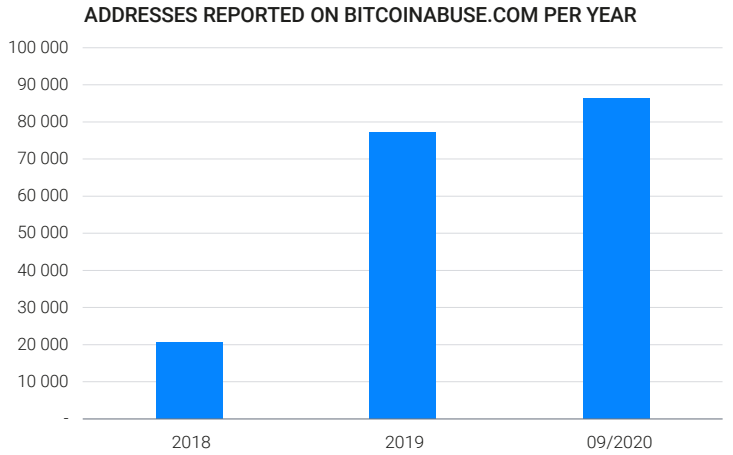
DeFi does not require any KYC and it is seen as a potential haven for money launderers. Technology enablers will have to improve AML and KYT procedures on major chains if they want to improve the reputation of digital assets. The crypto world is still associated with terrorism, hacks, and illegal activities.

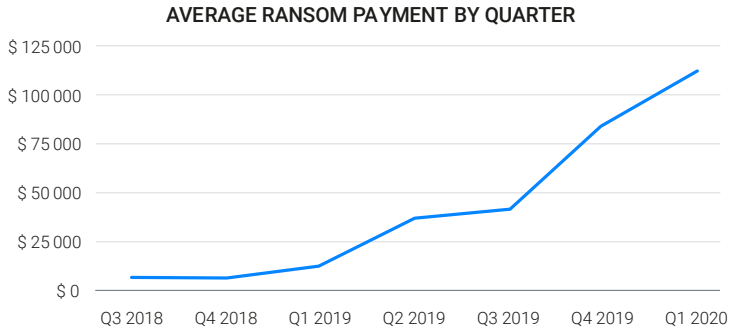
- Over 98% of ransomware requests a payment in Bitcoin.

Professional development needed

Several protocols that attract millions of dollars were coded by lone programmers. Applications testing is not properly conducted resulting in many bugs found. Decentralization cannot be done at the expense of security.

- In early September, a trader exploited a bug on Soft Yearn to turn an ETH 0.5 ($180) investment into ETH 740 ($260K) at the expense of other users.





SOURCE:
bitcoinabuse.com, Coveware, Finance Magnates, OKEx

Outlook: Linking DeFi To The Traditional System

Bringing real-world assets, an interoperability challenge

So far, retail customers account for the majority of blockchain users, including DeFi. Institutional clients have different needs in terms of security and visibility. All transactions cannot be accessible to everyone. Permissioned chains fill this gap. Development in this area could turn DeFi into a trillion-dollar industry.

- Chainlink is one of the projects that aim to link DeFi permissionless chains to CeFi and real-world permissioned infrastructure.

User experience to be improved

The current DeFi applications require advanced knowledge on digital assets. The terminology used is not accessible to the masses. To become truly mainstream, DeFi will have to simplify all blockchain use cases and improve user interface.

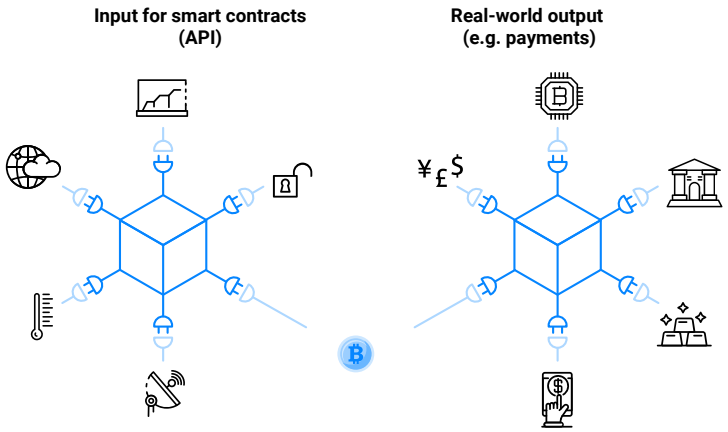
- Current lexicon includes: Smart contract, private key, liquidity pool, yield farming, etc.

Are digital assets really the panacea to rule out inequalities?

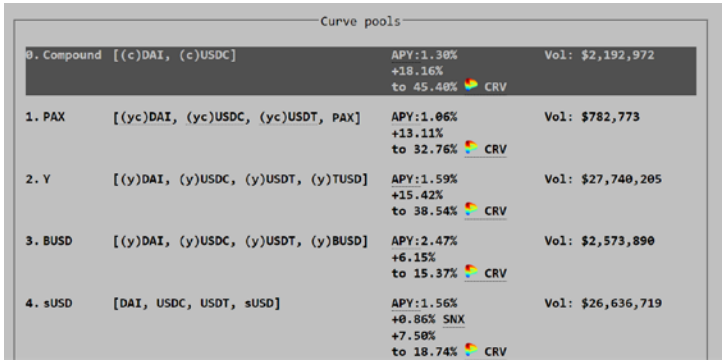
While digital assets can improve financial inclusion, they do little to get rid of inequalities. Traditional cryptos are controlled by a minority of early adopters, the whales, and miners that made heavy investments in computing power. DeFi is no exception, since it requires ETH to enter the ecosystem.

- The Gini index (measuring income inequalities) for BTC or ETH is north of 0.95, way above any country in the world.

CHAINLINK SCHEME



CURVE, EXAMPLE OF A NOT USER FRIENDLY DASHBOARD



SOURCE:
Chainlink, Crypto news, DSHR blog, AtonRâ Partners

Investing In Technology Enablers

The AtonRâ Fintech portfolio and DeFi

We closely monitor the evolutions in the blockchain industry, as we believe it paves the way for innovation in finance. Several of our holdings are working on blockchain solutions, usually to increase efficiency in their operations and reduce costs. However, listed pure players enabling this technology are still missing.

- As per its nature, there will be no DeFi projects listed on a regular exchange.

Ant Group, the mammoth that will go public in October

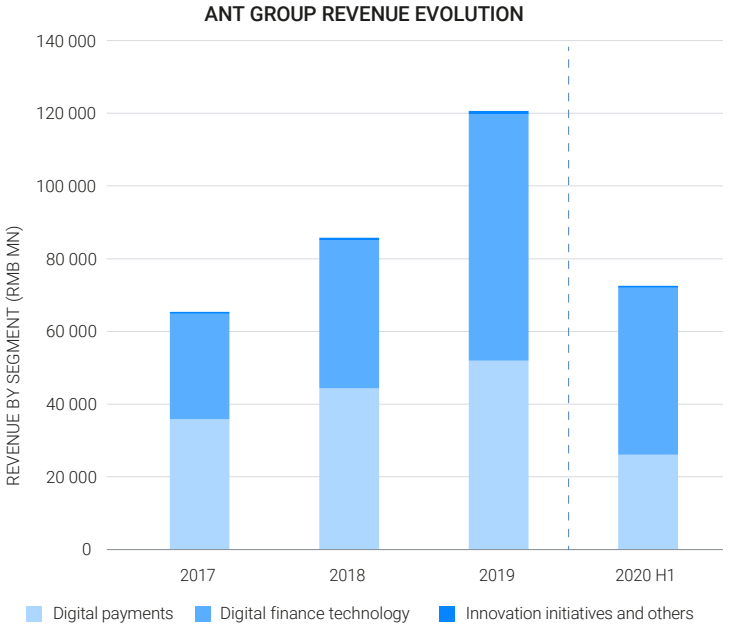
Ant Group regroups all its blockchain activities under the AntChain label. While it is not a pure player, the importance of the company in the Chinese financial system makes it an unavoidable firm.

- The IPO is expected for October 2020 in Hong Kong and Shanghai.
- Ant Chain holds >200 blockchain-related patents (global record) and has >50 use cases.

Bitcoin Suisse, the local player planning to go public

Given the strength of the financial industry and a clear legal framework for digital assets in Switzerland, a developed ecosystem of startups emerged near Zug, the Crypto Valley. Bitcoin Suisse is one of these firms and has become a key partner for institutional players. If the company goes public, it will be one of the largest listed pure players in this industry.

- Series A financing in July 2020 valued the company at CHF 302mn.
- An IPO could happen in late 2021, or more likely in 2022.



Ant Group started monetizing blockchain revenues in 2019. It is still a minor activity, less than 0.5% of the group revenues. But it accounts for the most part of the revenue growth in the Innovation inniviatives and others segment, which went from RMB 745mn in 2018 to RMB 930mn in 2019.

SOURCE:
Ant Group IPO pre-prospectus, AntChain, Bitcoin Suisse, AtonRâ Partners

Catalysts

- **Ethereum 2.0.** Once the main platform for smart contracts will complete its upgrade, scaling issues should belong to the past. A new generation of DApps with will bring DeFi to new frontiers.
- **User-friendly apps.** Blockchain-related applications, like in other sub-themes of fintech, still have to improve the user experience. Mass adoption will only be possible the day applications will be built for a non-tech savvy audience.
- **Central Bank Digital Currencies (CBDC).** China is expected to be the first giant to launch a CDBC. Its launch will help people get familiar with digital assets. This will create the perfect bridge between the old financial system and its challenger.

Risks

- **Regulations.** As the DeFi sector grows, regulators will not remain silent forever. They may seek to impose licenses and force projects to comply with local regulations. No project has currently the workforce and the knowledge to comply with global financial rules.
- **Hackers.** DeFi is a digital system, with its own security gaps. As billions are pouring into these projects, the appetite of ill-intentioned people is growing. For the end user, losing ETH does not have the same effect as having data stolen.
- **Scams.** Investors must remain vigilant and sperate the wheat from the chaff. When a project seems to good to be true, it is better to avoid it.

Bottom Line

- The DeFi ecosystem has so far focused on replicating the traditional financial system. Many applications suffer from teething problems. But future applications will be more user-friendly and offer an improved interoperability with other blockchains and real-world systems.
- We closely monitor the blockchain developments for its disruptive potential to established players. DeFi could become a key element of the open-banking era. Better efficiency, improved transparency, and increased financial inclusion are coming.

Companies mentioned in this article:

Companies mentioned in this article:AMD (AMD US), Ant Group (not listed), Bitcoin Suisse (not listed), Nvidia (NVDA US), Square (SQ US)

Digital assets and DeFi projects mentioned in this article:

ACO (AUC), Bitcoin (BTC), Chainlink (LINK), Compound (COMP), Curve (CRV), Dash (DASH), Ether (ETH), Flexa (not tokenized), Loopring (LRC), MakerDAO (MKR), Melon (MLN), Soft Yearn (SYFI), Synthetix (SNX), UniSwap (not tokenized)

CHARTS FOR THOUGHTS

Generating Data Is The New Power?

Measuring data

Domo publishes an annual Data Never Sleeps Wheel, listing the internet platforms generating most data. The chart here, taken from Visual Capital, shows which companies made the selection since the beginning in 2012.

- To generate data, a platform needs users' interaction – the more people use and interact, the bigger the amount of data produced.
- By measuring the amount of data generated every single minute, Domo's wheel also provides a snapshot of the leading platforms on the net in a given year.

Fame is fickle

Only very few companies have consistently been part of the Wheel over the years, showing how volatile the internet space can be, and how difficult it is to gain and maintain an edge vs competitors.

- Those comanies that showed staying power, managed to capitalize on their strenghts and grow to become some of the biggest companies in the world.

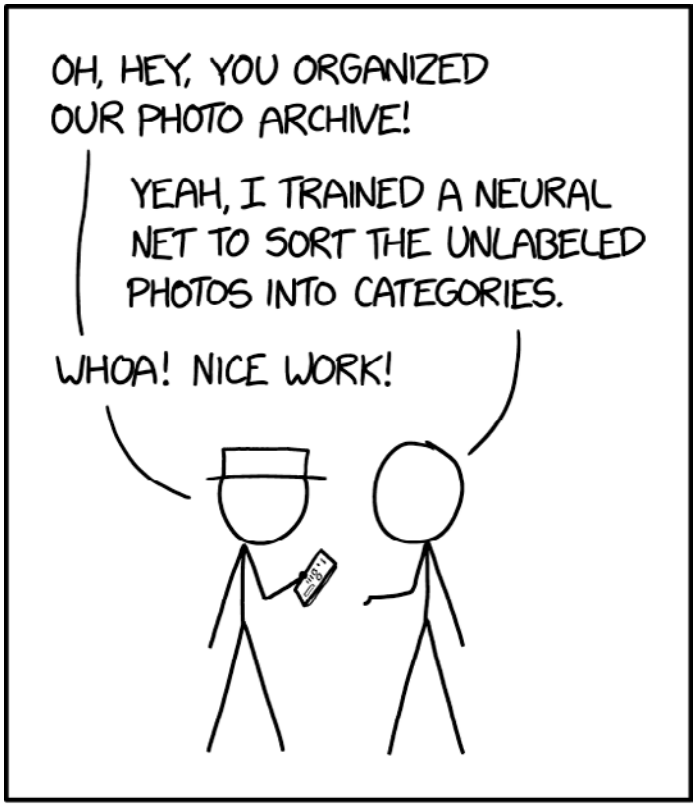
Follow the money

Looking at the new companies coming up offers a glimpse on current hot trends. But also, turnover has increased. In such a rapidly changing environment how can investor identify companies with long-term staying power?

- Cash transfers, e-commerce and collaborative tools are now leading the data generation race.

SOURCE:
Data Never Sleeps 8.0
Here's What Happens Every Minute on the Internet in 2020

CASUAL FRIDAY



SOURCE:
https://xkcd.com/2173/

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AtonRâ Partners is a conviction-driven asset manager combining industrial and scientific research with financial analysis. AtonRâ Partners focuses on long-term trends powerful enough to be turned into thematic equity portfolios.

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