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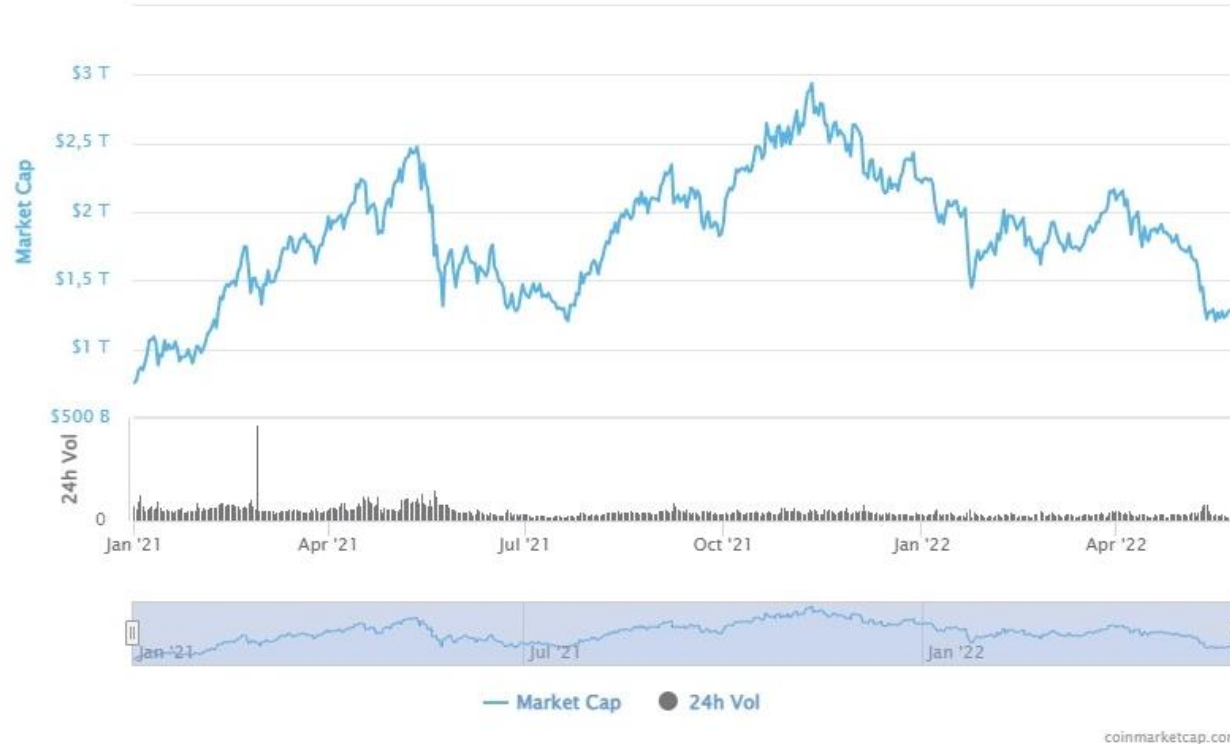22–23 June – etc.venues, 133 Houndsditch, London

Decentralized Finance and Crypto Assets

Genesis of new risks and business models

Economic relevance of Cryptocurrencies

Total Cryptocurrency Market Capitalization

Reached almost
USD 3 Trillion
in Nov 2021

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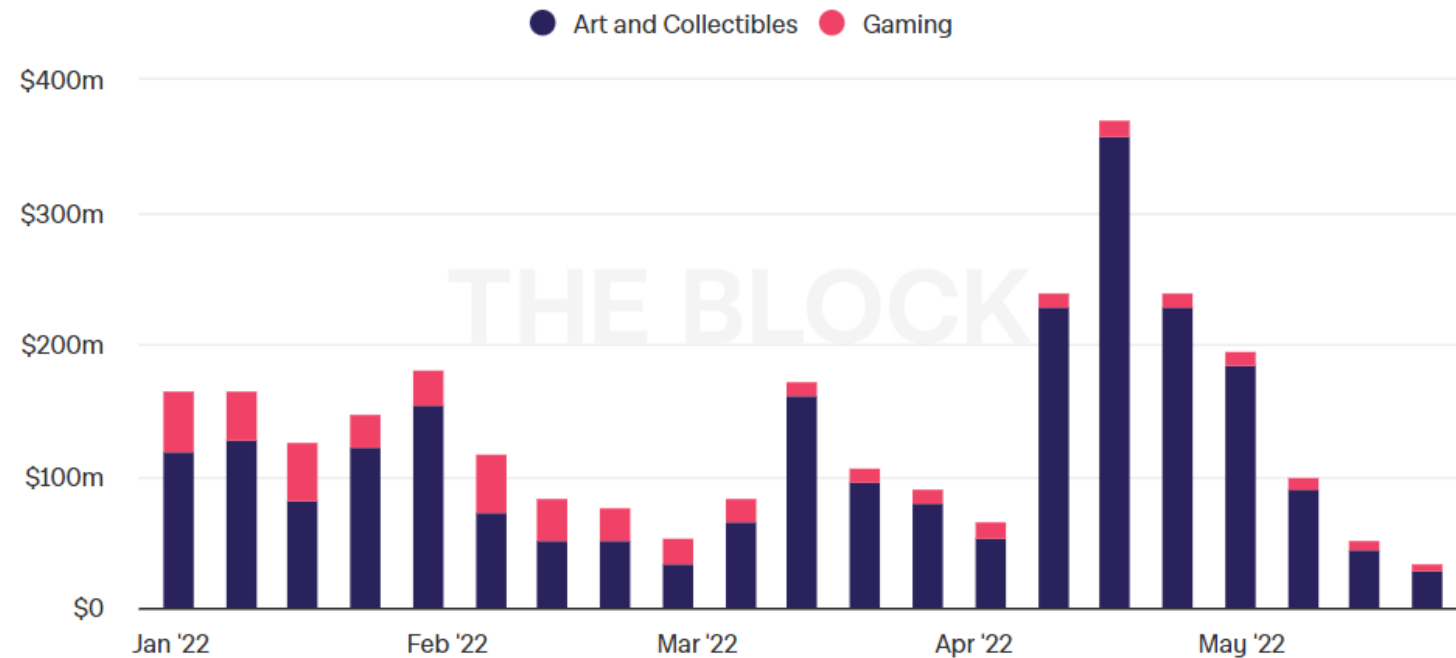
Economic relevance of NFTs

Trade volume reached
around USD 370m
in April 2022

Weekly Trade Volume of NFTs by Category

● Art and Collectibles   ● Gaming
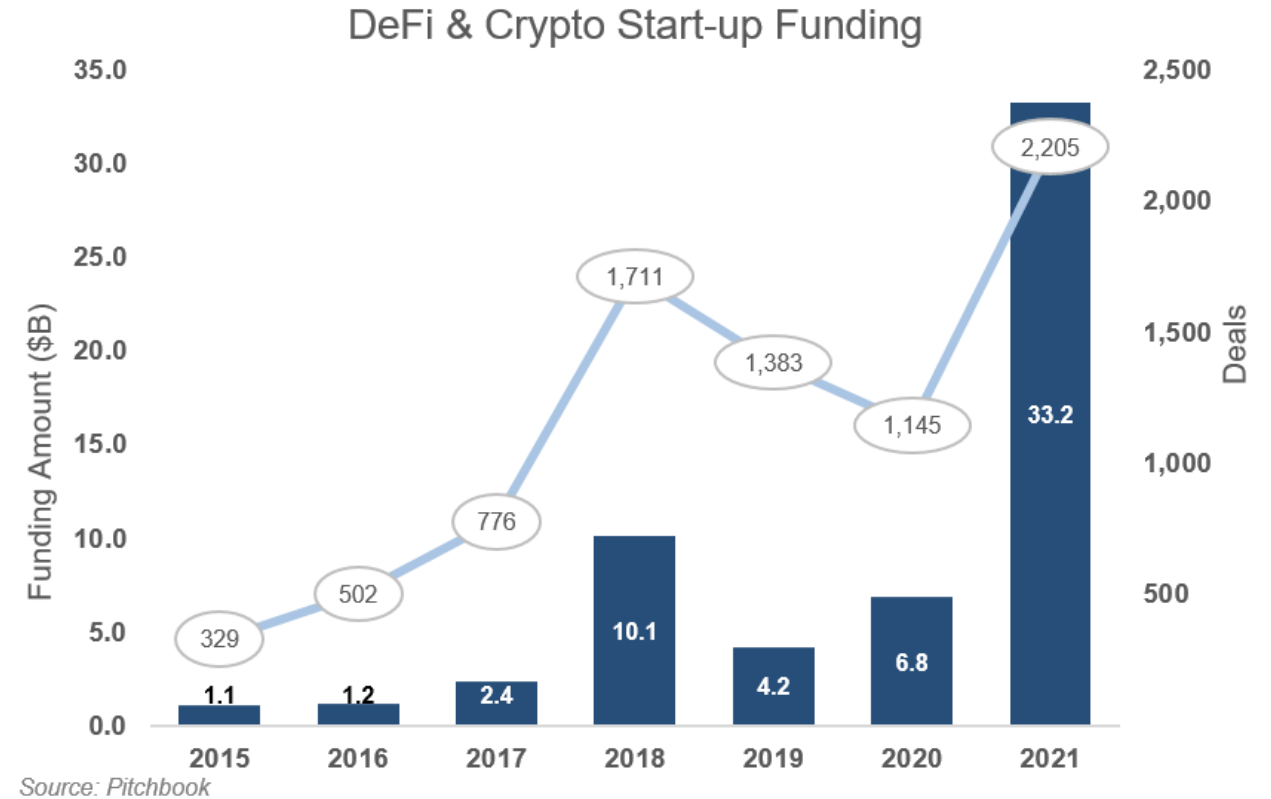
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Venture Capital

12,000 Crypto projects are currently in development with USD 30 bn of Venture Capital backing these projects.
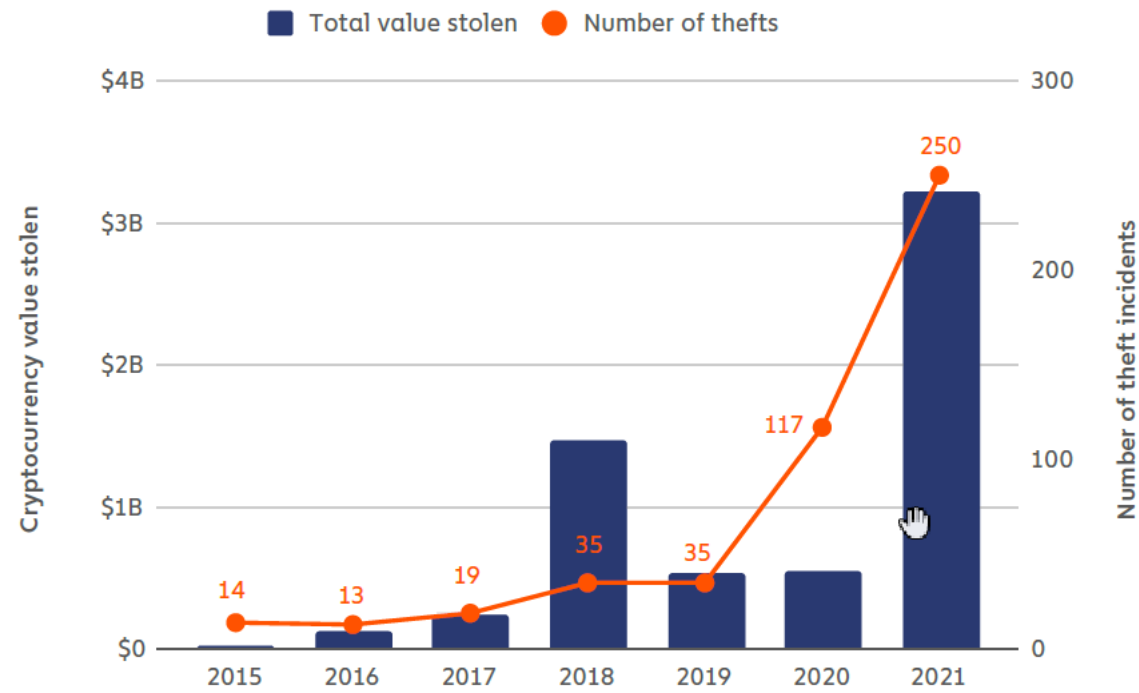
This is 5% of the entire Venture Capital invested in 2021 and Crypto is the largest sub-sector next to AI.

DeFi & Crypto Start-up Funding

Source: Pitchbook

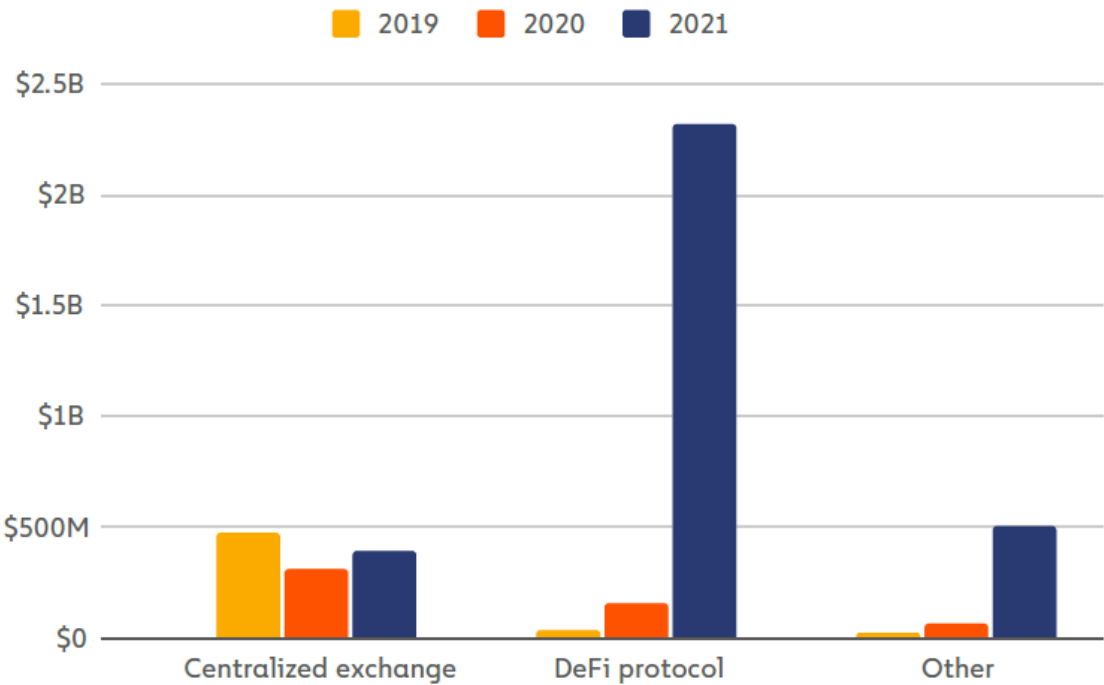Institute and Faculty of Actuaries

Economic relevance of DeFi Crime

Total value stolen and total number of thefts | 2015–2021

■ Total value stolen   ● Number of thefts

Annual total cryptocurrency stolen by victim type | JAN '19–DEC '21

■ 2019   ■ 2020   ■ 2021

Source: Chainalysis, The 2022 Crypto Crime Report, Feb 2022

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Some properties of Crypto Assets / Currencies

- Technology based property system used for monetary of certification purpose

- Decentralization avoids single point of failure

- Peer-to-peer transactions without any institutional or political intermediate

- Worldwide accessibility (despite variety of legal restrictions*) and anytime accessible

- No disclosure of personal data necessary

- Self-custody possible

* from total ban to official national currency

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Custody of Crypto Assets / Currencies

Terminology:

"Cryptocurrencies are held in a Wallet"

Technically:

There is a Distributed Ledger including all transaction ever made and stored in the Blockchain. Modifications are based on a robust protocol.

Effectively:

A Secret / Private Key allows to sign and authorize transactions of cryptocurrency from one Wallet to another.

Scope of Custody:

It's about secure storage of the Secret Key to be protected against loss and illegitimate access and usage.

Custody Risk

Risks occurring
in custody of cold / warm / hot wallets:

- Destruction

- Theft

- Loss

- Inaccessibility

by thread of

- Hacking

- Fraud

- Violence

- Incompetence, Error
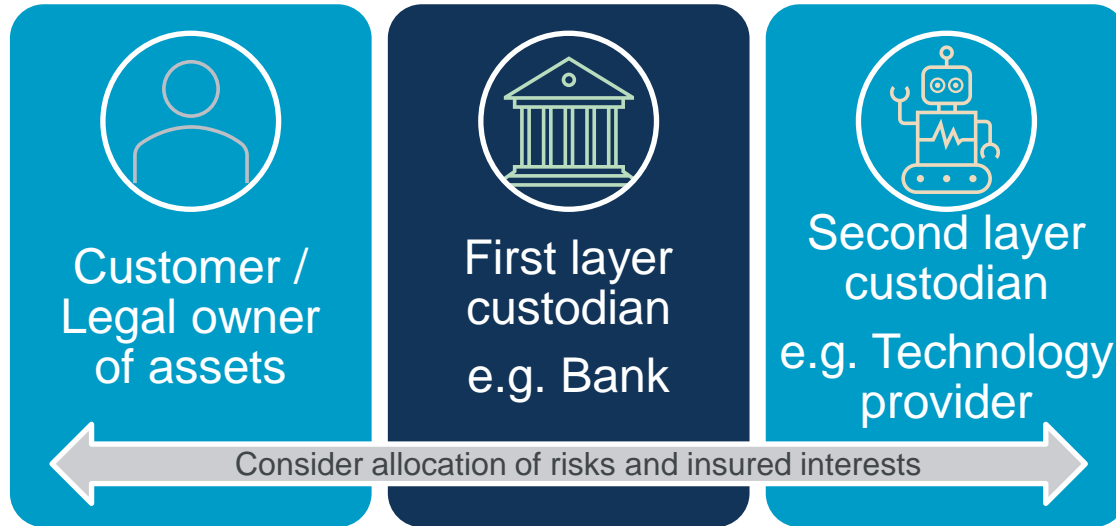
- Fire, NatCat

- Failure of underlying Blockchain

Subject at risk

- Key

- NFT

- Storage medium

- Blockchain

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Custodial Infrastructure

Customer / Legal owner of assets

First layer custodian e.g. Bank

Second layer custodian e.g. Technology provider

Consider allocation of risks and insured interests

Risks and insured interest might differ depending on the insured entity.

Contractual guarantees and liabilities between these entities are relevant for insurance structure.

The Custody Provider Landscape

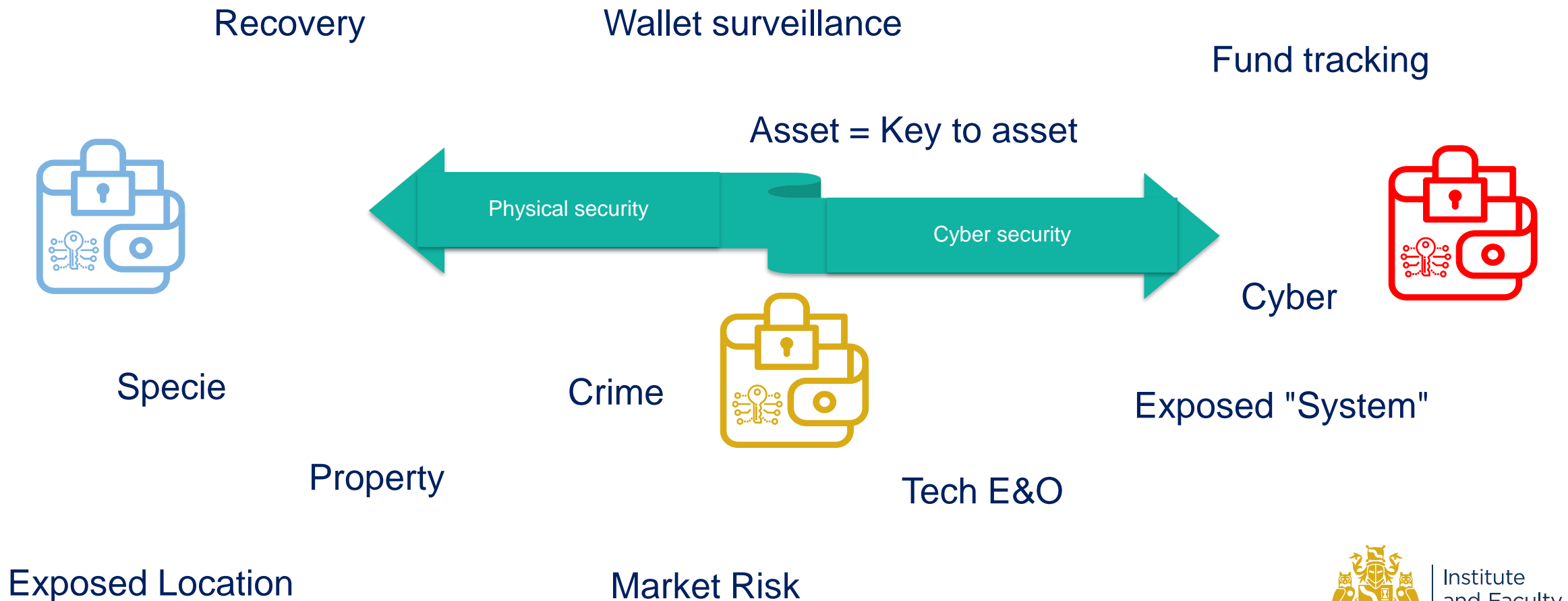| Custodians	Hybrid	Technology Providers
coinbase, ANCHORAGE DIGITAL	BitGo	Fireblocks, Ledger
GEMINI, Fidelity DIGITAL ASSETS	Hex Trust	TAURUS, basezero
copper, NYDIG	TANGANY	Qredo, unbound security
Prime Trust, bakkt		METACO, unchained capital

Source: The Block Research, Ledger Vault. Represents select industry participants and is not an exhaustive list.

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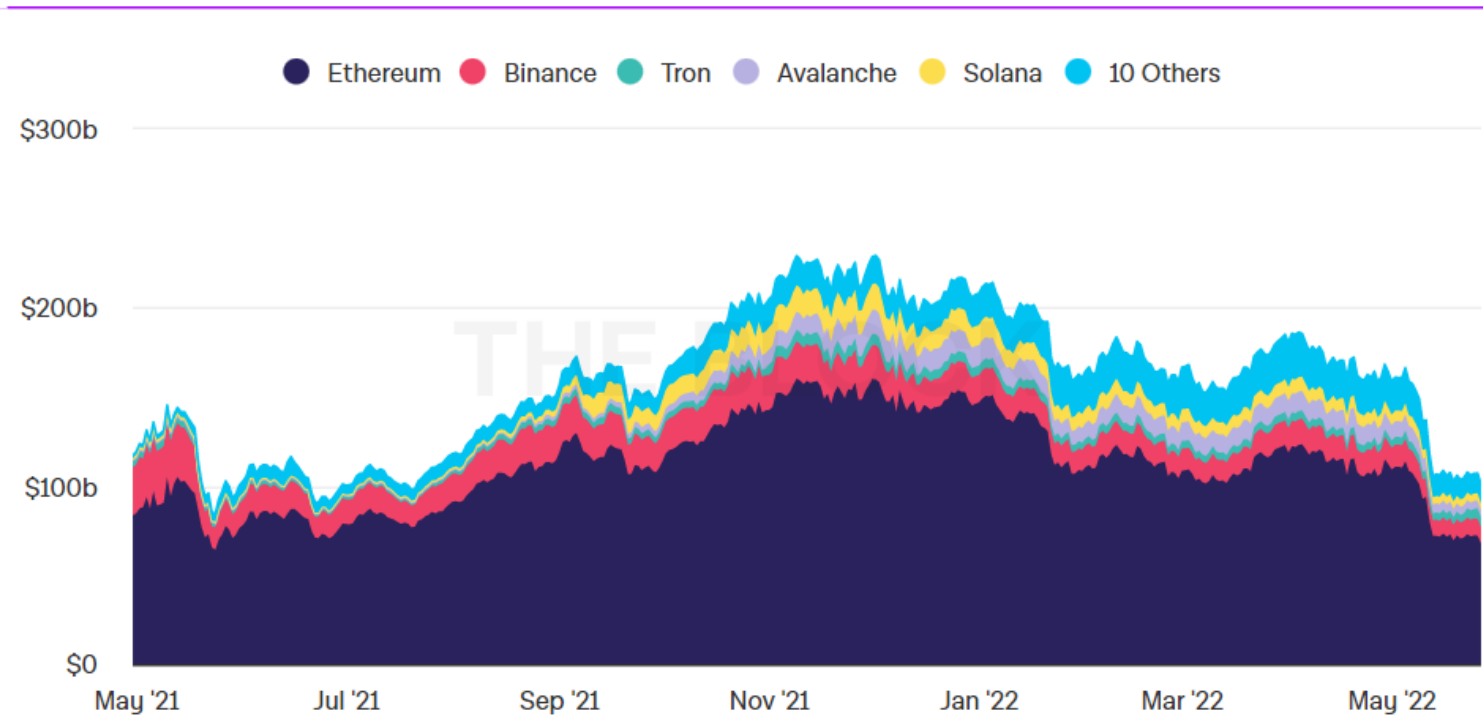# What's common, what's new?

Recovery

Wallet surveillance

Fund tracking

Asset = Key to asset

Physical security

Cyber security

Specie

Crime

Cyber

Exposed "System"

Property

Tech E&O

Exposed Location

Market Risk

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Economic relevance of Smart Contracts

Around USD 100 bn
Total Value Locked
as of May 2022

Value Locked by Blockchain

Legend: ● Ethereum ● Binance ● Tron ● Avalanche ● Solana ● 10 Others

Y-axis: $300b, $200b, $100b, $0
X-axis: May '21, Jul '21, Sep '21, Nov '21, Jan '22, Mar '22, May '22

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Smart Contract risk

Description:

Loss of funds due to a smart contract hack or frozen funds due to a smart contract bug

Our approach:

- Partner with smart contract experts to understand attack vectors, price risks and monitor risks

- Star with the largest and oldest protocols (Maker, Aave, Compound, Uniswap…)
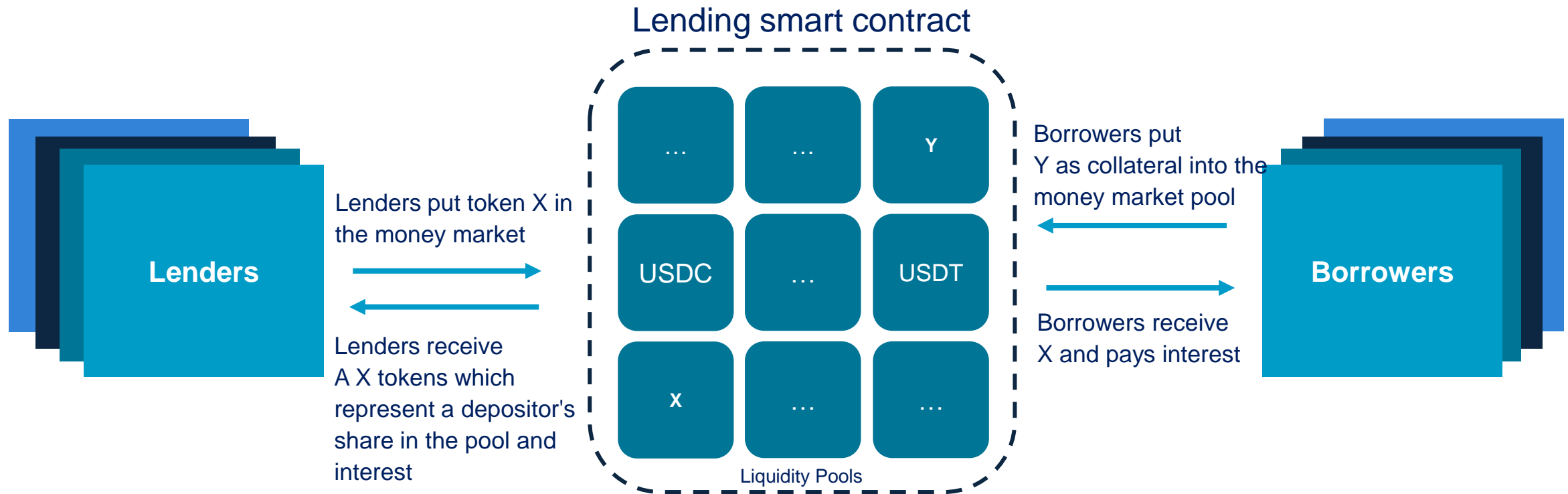
Outline:

- ✓ Wording finalized for different protocols
- ✓ First policy and CeFi partnership to be announced soon
- ✓ How to partner with DeFi?

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Smart Contract Risk Example: A decentralized platform for lending and borrowing tokens

Lending smart contract

Lenders

Lenders put token X in the money market

Lenders receive A X tokens which represent a depositor's share in the pool and interest

USDC ... USDT

X ... ...

... ... Y

Liquidity Pools

Borrowers put Y as collateral into the money market pool

Borrowers receive X and pays interest

Borrowers

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Deep Dive in Smart Contract Risks: Attack Vectors

- **Logic Error:** A vulnerability in the program that is caused by wrongly implementing the desired algorithm.

- **Reentrancy Attack:** A reentrancy attack occurs when a function makes an external call to another untrusted contract. Then the untrusted contract makes a recursive call back to the original function

- **Arithmetic Over/Underflows:** An over/underflow occurs when an operation is performed that requires a fixed-size variable to store a number (or piece of data) that is outside the range of the variable's data type.

- **Randomness Illusion:** All transactions on the Ethereum blockchain are deterministic state transition operations.

- **Oracle Manipulation:** DeFi oracles are a 3rd party service enabling blockchain smart contracts to access external, real-world data and are used by many DeFi smart contracts.

- **Governance Attacks:** Protocols that implement decentralized governance mechanisms tend to rely upon governance tokens, which empower token holders to propose and vote on protocol upgrades.

- …...

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# Deep Dive in Smart Contract Risks: Pricing

We analyzed 117 DeFi hacks in 2021 in depth and did a probability / severity analysis

- **Probability Analysis:** We estimate the "insured hack" probability of a randomly chosen protocol to over 6%

- **Severity:** Bath-tube shape, giving heavy weight on small or complete losses
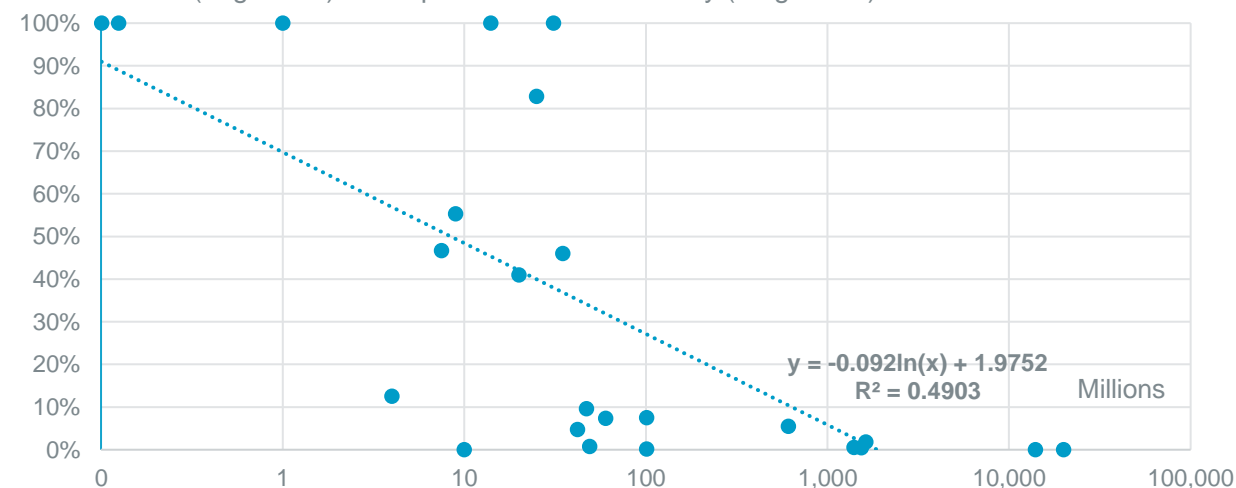
Open research questions:

- Effect of Smart contract Audit on Expected Loss

- Lindy Effect on hack probability

- ......

Severity Distribution for Smart Contract hacks
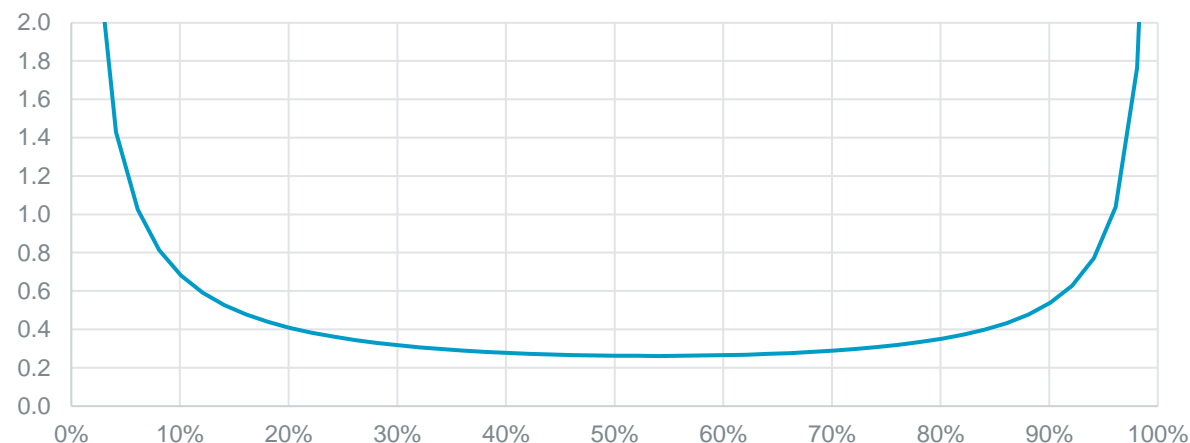
TVL (Log Scale) of the protocol vs loss severity (Log Scale)

$y = -0.092\ln(x) + 1.9752$
$R^2 = 0.4903$

Millions

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Which risks does Munich Re actively explore?

Slashing Risk

Description:

Misbehaving during the block validation process can lead to punishment and a loss of staked funds

Our approach:

- We see a demand from the market
- Cloud outage elements combined with Tech E&O
- Exploring the risks and players

Other Bets

Description:

- NFT Storage Insurance
- Miners: Green Energy
- Crypto Tech E&O

Our approach:

- Looking at everything
- Cautious approach with selective risk appetite

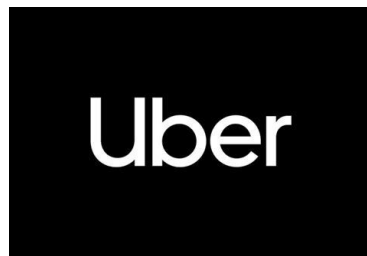+ Old risks with crypto specifics (e.g. D&O, Cyber Property Mining, ….)

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How do I see the crypto insurance market?

Uber's

- Decentralized?
- **Platforms** for **Crypto Risks**
- Nexus, InsurAce, Tidal, Nsure, Harbor, Shentu, Bridge, Fairside, Sherlock ….

Hippo's

- Old risks
- Main advantage is **operational efficiency**
- Platform: Nayms, Ensuro
- Centralized: Parametric Insurance

Moonbird's

- Centralized
- **New companies**
- Specialized **in crypto risks**
- OneDegree, tba….

Dinosaur's

- Centralized
- **TradFi companies**
- Looking for new risks
- Munich Re, Lloyds … (not many)

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How do the new decentralized platforms work?

Decentralized Autonomous Organization
- No owner
- No centralized legal entity
- No employment contracts
- No organizational structure

DAO

Governance

Governance by (semi-anonymous) token holders for e.g. :
- Product listening
- Parameter changes (Pricing, Risk model…)
- Claims

- Permissionless access for risk taker and cover holder
- Transparent
- "Immutable"

Smart Contract Based

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SWOT Analysis of crypto-native primary insurance players

Strength

- New DAO structure might resonate with insured and insurers from the crypto community
- Hive mind approach: The self-governance might lead to a self improving, effective insurance set-up
- Access to new capital from risk-seeking, crypto-native stakers (investors)
- Less/No regulation hurdles
- Operational efficiency through using blockchain technology and no legacy systems

Weakness

- As non-regulated" entities crypto-native insurer will struggle in distribution (clients), marketing, with institutional clients and reinsurance companies
- Casualty insurance impossible since staker can withdraw their funds from the capital pool in a relatively short time
- Cumbersome Governance and Claims assessment since every decision must be voted by the community. Therefore, only a relatively small number of (complex) claims per month possible.
- Low growth in the "private sector" (advertisement, transaction costs, capital efficiency, RoI in comparison to other DeFi projects)
- Marketing

Opportunities

- Using crypto-native insurer as reinsurance capacity
- Staking against insurance risk to earn a corresponding yield
- We see both options as difficult since there is no KYC process
- As a regulated entity we have an advantage to do business with regulated entities

Threats

- Competing with traditional insurance in the crypto native insurance markets
- Due to their lean cost structure, certain (especially parametric) risks cover can be offered cheaper
- Naturally integrated in a growing crypto community
- In case DeFi takes over TraFi a lot of premium will switch to DeFi

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Munich Re as a partner

Our ideal partner

- Risk carrier with exceptional technical expertise
- A scalable & profitable business model
- Distribution power

What we can offer

- Large balance sheet
- Most innovative TradFi insurer in the crypto area

Our Challenges

- Insurance is a very regulated industry:
  - We need KYC and AML
  - Decentralized entities (e.g. DAOs)

Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenters.

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