

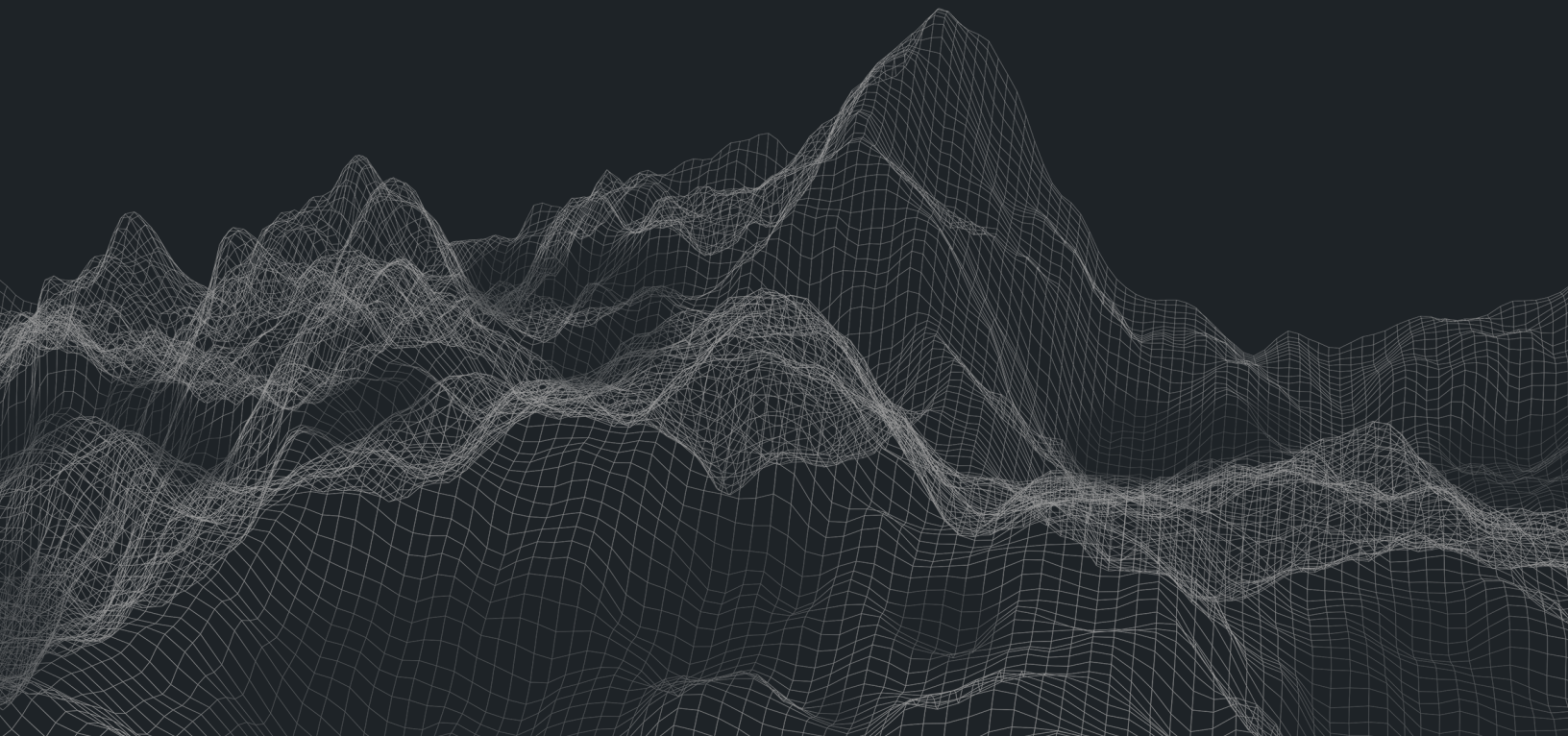
**Fundamental
Labs**

Uncovering Fundamental Insights in Blockchain

Financialized NFTs: evolving opportunities in an early space

June 2022

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We explore the NFT financialization landscape and deep dive into leading protocols, reflecting key actors in the NFT financialization value flow.

SUMMARY

- Financialization transforms illiquid assets into tradable securities, which helps to channel cash flow to borrowers and fund significant economic development.
- NFT financialization verticals include: marketplace and aggregation, liquidity pools, liquidity providers, fractionalization, lending and renting, valuation.
- The penetration rate of the NFT credit market is slightly north of 1%, compared with 10% in the traditional art lending market and over 50% in the mortgage market.
- Greater potential of NFTs can be unlocked if two key limitations are tackled; low liquidity and inadequate price discovery.
- NFTs have low liquidity due to their unique characteristics, low accessibility, and lack of utility.
- The problems incurred when NFTs are illiquid are high slippage, capital inefficiency, and poor price discovery and valuation.
- Pricing mechanism can be categorized into two categories: oracle-based and optimistic proof of stake pricing (human appraiser). Oracle-based pricing mechanism relies on the usage of oracles to retrieve on-chain data. Optimistic proof of stake pricing relies on the consensus of human appraisers.
- Areas to be further explored in this space are: segmenting NFTs into different categories with different tranches of risk and return profiles, building risk profiles of borrowers, and extending NFT utility layers.

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Section 1

The importance of NFT financialization

The technology behind non-fungible tokens unleashes a large, untapped portion of the digital economy and enables ownership of digital assets. Today non-fungible tokens are mostly profile pictures (PFP), which are categorized in the Art and Collectables category. So far PFPs have limited potential for yield generation, but nevertheless they are great for building communities and social status. The NFT technology is much more versatile and the possibilities are endless when the technology is applied to different industries beyond PFPs, both in the physical and virtual worlds.

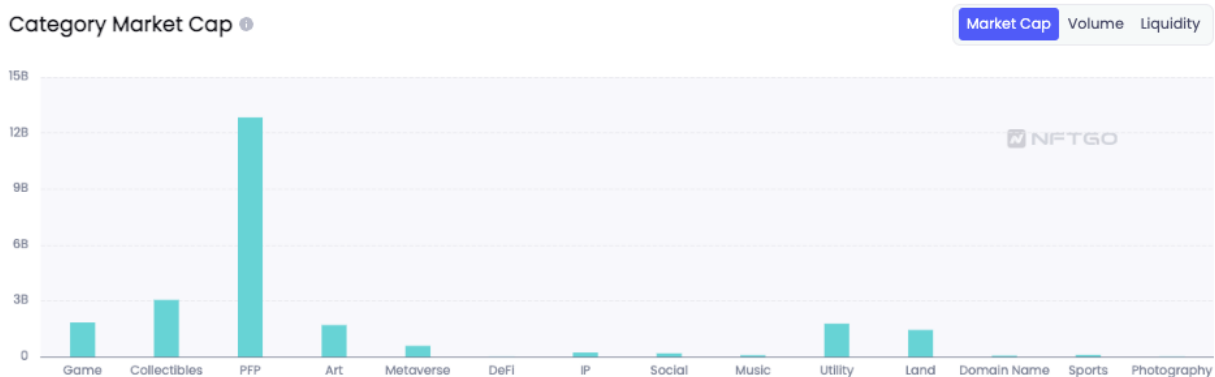


Figure 1: NFTs Category Market Cap; Source: NFTGO, data as of June 2022

Traditionally, securitization has been a long-time practice in the field of finance. Before the modern era of securitization began in 1970, there were a number of precedents, including farm railroad mortgage bonds in the 1860s, the mortgage-backed bonds in 1880s and a form of securitization of mortgages before the 1929 Wall Street Crash.

What is securitization?

According to Investopedia, securitization is the procedure where an issuer designs a marketable financial instrument by merging or pooling various financial assets into one group. The issuer then sells this group of repackaged assets to investors. Securitization offers opportunities for investors and frees up capital for originators, both of which promote liquidity in the marketplace.

In theory, any financial asset can be securitized—that is, turned into a tradable, fungible item of monetary value. In essence, this is what all securities are.

However, securitization most often occurs with loans and other assets that generate yields such as different types of consumers or commercial debt. It can involve the pooling of contractual debts such as auto loans and credit card debt obligations.

The benefits of securitization

By transforming illiquid assets into tradable securities, securitization has helped channel cash flow to borrowers and fund significant economic development. Securitization has also helped issuers and investors diversify risk across asset classes and across the globe.

Securitization can also be considered a form of arbitrage between a less-efficient traditional debt market and a more-efficient capital market where old securities are dressed up as new asset-backed securities by financial firms for profit. Therefore, the slicing and dicing of cash flows and credit risks of the underlying pools of assets turn into securitized products with varying risk-return profiles and maturity spectra. The spreading of risk among wider classes, serves the interest of consumers, borrowers, and the nation at large.

Section 2

The market today and its bottlenecks

Comparing NFT credit market to art-backed loans and mortgage

If you only look at loan issued by NFTfi (industry leader of the NFT credit market), loan volume exceeded \$40 million in 2021 and their cumulative loan volume from Jan 2022 to May 2022 reached \$155 million. With NFT transaction volume of \$3 billion in May 2022 (see figure 2) and \$36 million loan issued by NFTfi the same month, the penetration rate of NFT credit market is slightly north of 1%.

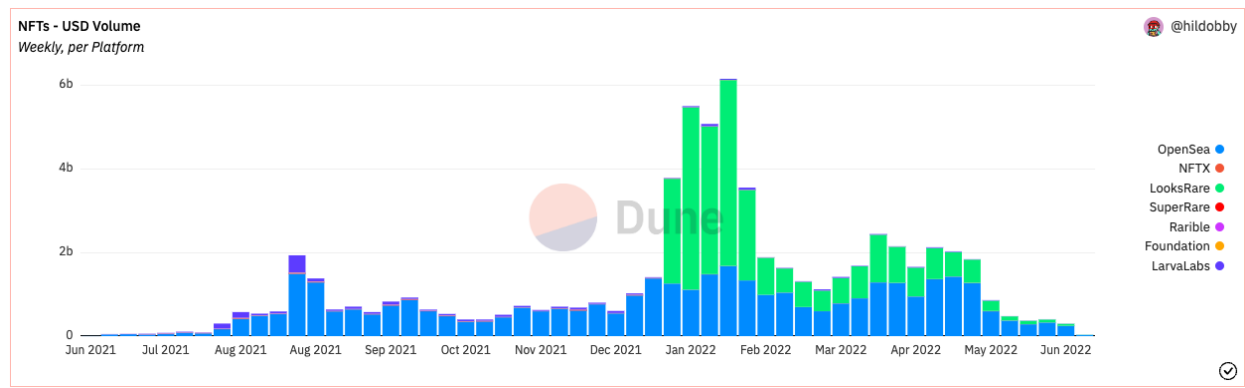


Figure 2: NFTs Transaction Volume: Source: Dune Analytics @hildobby / NFT Market Overview dashboard, data as of June 2022

Since the NFT market is currently dominated mostly by Art and Collectibles, the traditional art lending market can be a good reference for comparison. Art-based lending is a burgeoning business with market size at \$20 billion to \$25 billion according to Deloitte, with a penetration rate of 10% within this ~\$2 trillion dollar Art and Collectibles market.

If you look at a more sophisticated hard asset credit market, specifically the mortgage and the real estate industry, the penetration rates exceed 50% on about \$40 trillion worth of assets.

In the art-backed loans market banks typically charge 2% to 5% on art loans, depending on the client's other assets and businesses, while art lending firms and auction houses often charge 6% to 9%. The duration of an art-backed loan is typically a year, and owners can usually borrow as much as half of the appraised value of an artwork. A typical loan term for NFTs are a 10-30% Loan-to-Value ratio and a 50% annual percentage rate (APR). Annual percentage rate is the cost you pay each year to borrow money, including fees, expressed as a percentage. APR is a broader measure of the cost to you (the borrower) of borrowing money.

According to the data above, **the existing NFT credit market is still highly capital inefficient**. This begs the question "What is the key bottleneck here?".

After deep diving into the NFT financialization market, I realized that the **actual potential of NFT can be unlocked if we tackle two key limitations; low liquidity and inadequate price discovery**. **Market liquidity has two purposes: to exchange, and to value. Low liquidity results in difficulties of price discovery.**

What is Liquidity?

Liquidity refers to how easily an asset can be converted into cash without causing a drastic change in the asset's price. Liquidity involves the trade-off between the price at which an asset can be sold, and how quickly it can be sold. It's obvious then that cash is the most liquid asset you can have. In comparison, an asset with lower liquidity would be something less simple to convert to cash. An example would be large assets such as plants, properties and equipment.

Why do NFTs have low liquidity?

- **Unique characteristics:** Consumers need to spend more time learning about the asset before they can make a purchase decision.
- **Affordability:** Most mainstream NFT collections have high price with low accessibility, which results in a small user base.
- **Lack of utility:** Thus far, most of the experiments around NFTs concentrate on the Art and Collectibles category. As a result of this limited scope, we have yet to see unique and innovative applications beyond PFP emerge. To generate higher liquidity, the product or asset itself needs to have sufficient utility to create strong demand, as with strong demand an asset is easier to sell and convert into liquid assets, such as cash.

Issues arising from NFT illiquidity

- **High slippage:** Lower liquidity to trade against means you can't easily exchange one asset with another, and incurs much higher slippage, which leads to severe price deviations.
- **Capital inefficiency:** NFT holders have very low utilization of their assets with long liquidation cycles and inflexible credit terms.
- **Poor price discovery and valuation:** Illiquid assets have lower trading volume and need of exchange, which results in asymmetric pricing and market information. Opaque information also leads to low activities in marketplaces and difficulties in valuing assets.

Section 3

The market landscape of NFT financialization

Even though we observe the illiquid nature of NFTs and the market's inability to effectively value NFTs, we still see the NFT financialization space evolve constantly and rapidly. According to Dove Metrics, fundraising within the NFT space is trending upwards even though the market is entering a bear (see figure 3 and figure 4). **The current market landscape for NFT financialization is still in its infancy and the solutions still unavoidably fall into the issues of low loan-to-value ratios, high interest rate, lacking scalability, and insufficient liquidity.**

Furthermore, **the lack of scalable, low-risk and trustworthy price appraisal mechanisms limits the NFT credit market and results in a situation where demand of NFT-backed loans exceeds supply of lending capital** and creates abundant unfulfilled needs of NFT lending.

As we see more and more builders and developers exploring and experimenting with NFT use-cases and building the infrastructure to increase liquidity in the NFT space, we are excited to embark on this journey to expand the financialization of NFTs with builders.

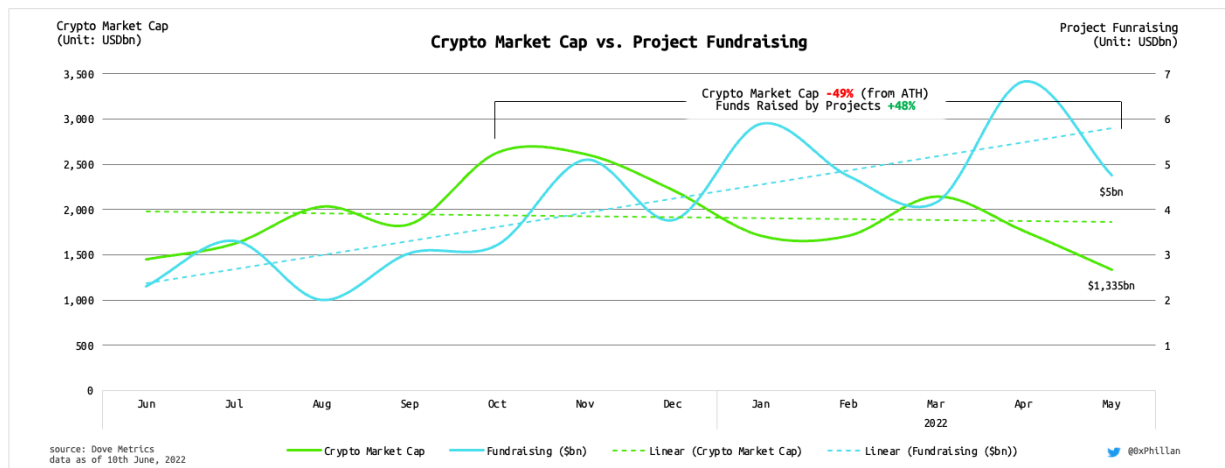


Figure 3: Crypto Project Fundraising versus Crypto Market Cap; Source: Dove Metrics, data as of 10th of June 2022

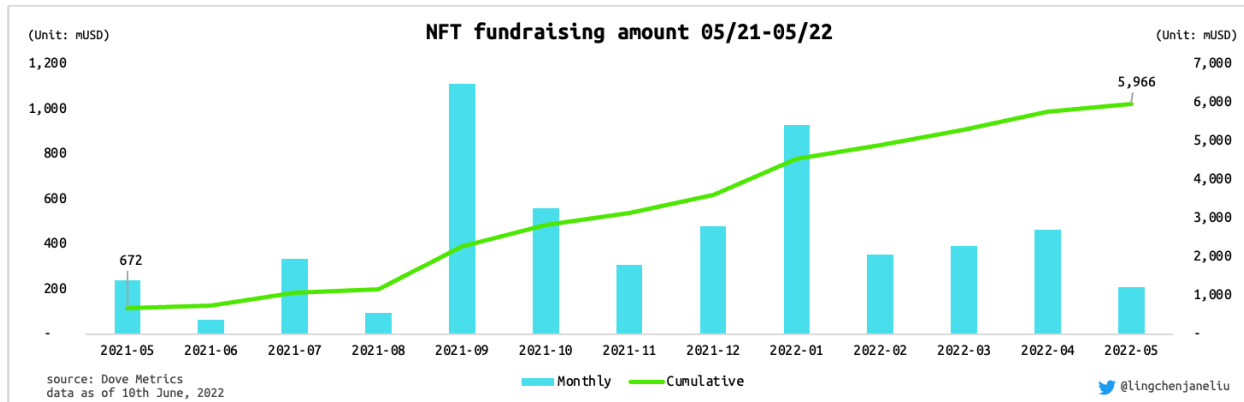


Figure 4: NFTs Fundraising Amount; Source: Dove Metrics, data as of 10th of June 2022

The NFT financialization market landscape can be categorized into the following verticals:

NFT FINANCIALIZATION LANDSCAPE

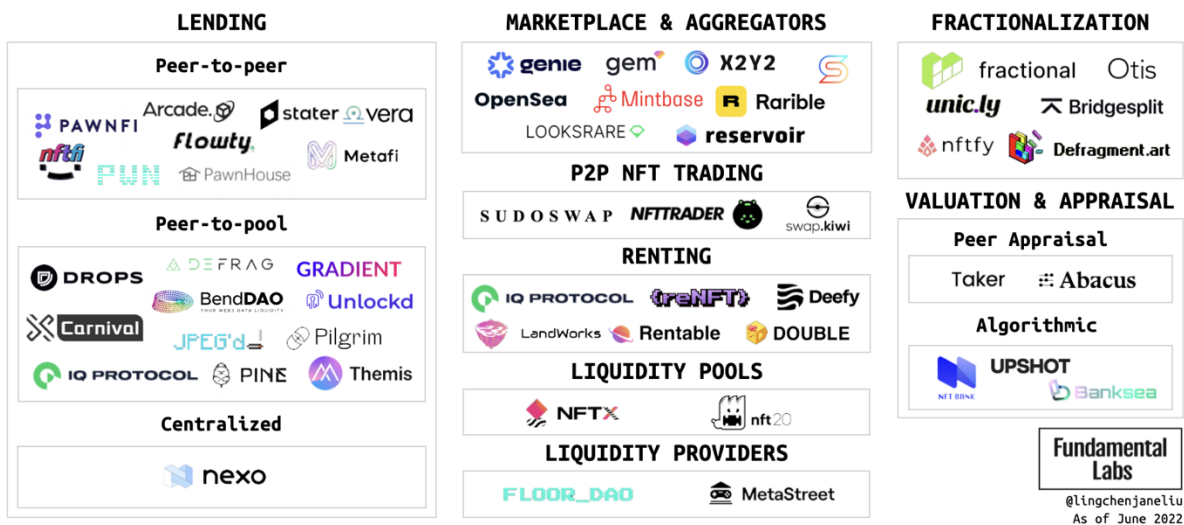


Figure 5: NFT Financialization Landscape

Protocols within the marketplace and aggregators segment facilitate transactions and trading. Protocols exploring NFT lending and the rental market focus on improving capital efficiency and exploring yield-generating possibilities for NFTs. Furthermore, we also see lots of protocols building the foundation, providing and enhancing liquidity, and valuation of NFT financialization. Protocols within the fractionalization, liquidity provider and liquidity pool segments try to tackle issues regarding the low liquidity of NFTs. And finally, protocols working on valuation aim to give a fair and objective judgement on the value of NFTs.

After deep-diving into most of the above protocols, I have picked a sub-set thereof that reflect some of the most popular and mature protocols, as well as some younger yet innovative protocols. In the following paragraphs I will introduce the mechanisms that these protocols employ to achieve NFT financialization, covering valuation, appraisal, and lending mechanics, and review their limitations.

LIQUIDITY POOLS

Liquidity is a key trading infrastructure. The abundance of liquidity can increase the asset utilization rate and speed up user participation. With proper liquidity infrastructure built up, we may see mass adoption of NFTs in various economic verticals.

NFTX

From illiquid to liquid

NFTX is built by a decentralized autonomous organization (DAO) for the purpose of making ERC20 tokens backed by NFT collectibles. NFTX allows users to deposit their NFT into an NFTX vault and mint a fungible ERC20 token (vToken) that represents a 1:1 claim on a random asset from within the vault. ERC20 Vault Tokens (vTokens) can also be used to redeem a specific or a random NFT from a vault.

That being said, a user can go to an Automated Market Maker (AMM) like Sushiswap to purchase a vToken like PUNK and use that token to claim a random CryptoPunk from the PUNK Vault (see figure 6).

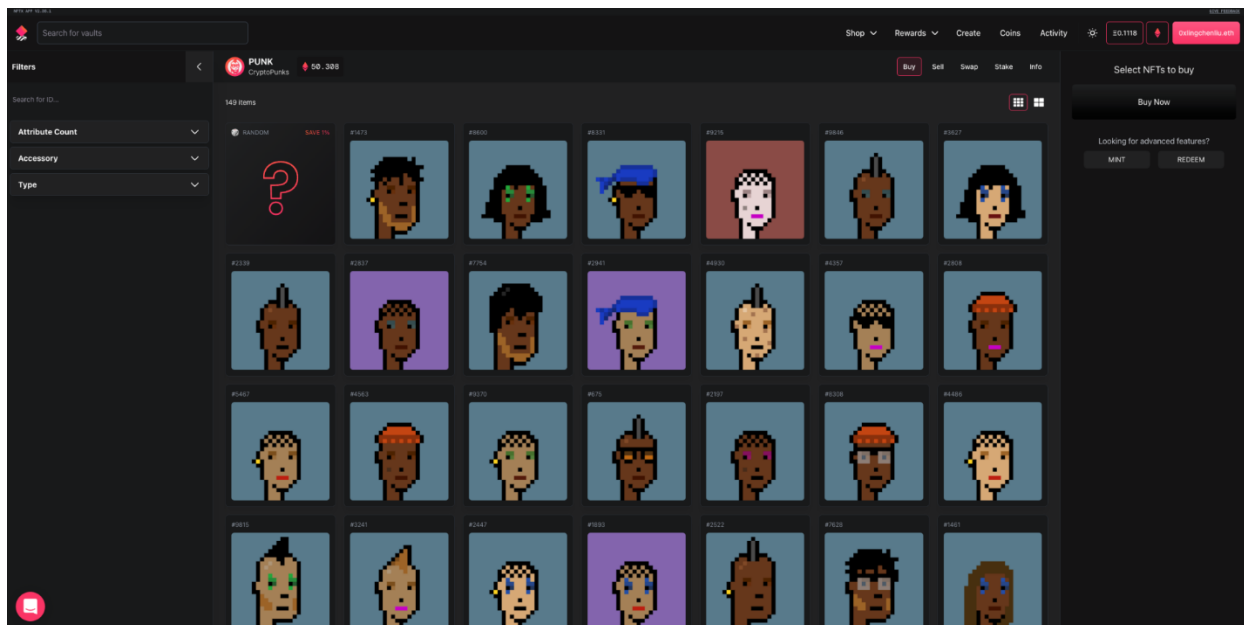


Figure 6: NFTX PUNK Vault

Assisting price discovery

With the mechanism that NFTX established, **NFTX regards the NFTs within the same vault fungible. Therefore, only NFTs with the same traits or rarity will be deposited in the same vault.** The mechanism that NFTX designed is more suitable for floor items within the same collections.

Users who have their minted vTokens in Automated Market Makers (AMMs) can create a liquid market for other users to trade in. Traders can deposit and sell vTokens based on their perception of an NFT

and the arbitraging process assists in price discovery. With liquidity and trading volume established, the NFT-backed vToken enters into price discovery and fair value is slowly established.

NFT FINANCIALIZATION: LIQUIDITY POOL

HOW DOES NFTX WORK?

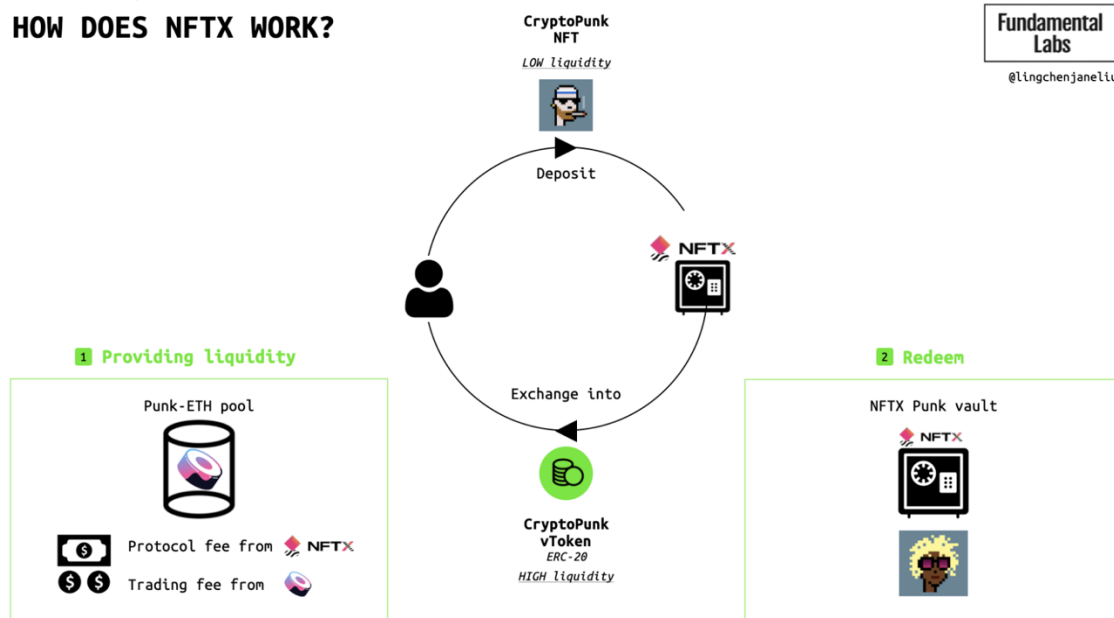


Figure 7: How does NFTX work?

Actors within NFTX system

NFT Holders

NFT holders who deposit and mint vTokens can start extracting more value from their NFTs:

- Earn protocol fees
- Earn trading fees as a liquidity provider on AMMs

NFT Projects / Content Creators

By launching on the NFTX protocol, NFT projects are able to earn protocol fees while providing a stable price and instant liquidity to their communities.

- Earn protocol fees
- Distribute NFTs via an AMM in the form of vTokens
- Create instantly liquid markets for new NFT collections

Deeper pool creates price stability

This article posted by NFTX explains how liquidity pools work on NFTX, highlighting the significance of having a deep pool for price stability. **While having a deep liquidity pool can not only maintain a stable token price, it can also create a smooth trading experience, allowing traders to instantly**

buy, sell, and swap assets, boosting market adoption. Hence it is important to have protocols focusing on creating liquidity.

FloorDAO is the one built upon NFTX to provide deep liquidity and acts as a decentralized market maker for NFTX.

LIQUIDITY PROVIDERS

FloorDAO

FloorDAO is a decentralized NFT market-making protocol. It enables deep liquidity for all NFT collections contained in the FloorDAO treasury. FloorDAO uses the bond & rebase mechanisms (see figure 8) pioneered by OlympusDAO to accumulate liquidity for NFTs, which is then deployed in NFTX vaults to generate yield.

NFT FINANCIALIZATION: LIQUIDITY PROVIDER

HOW DOES FLOORDAO WORK?

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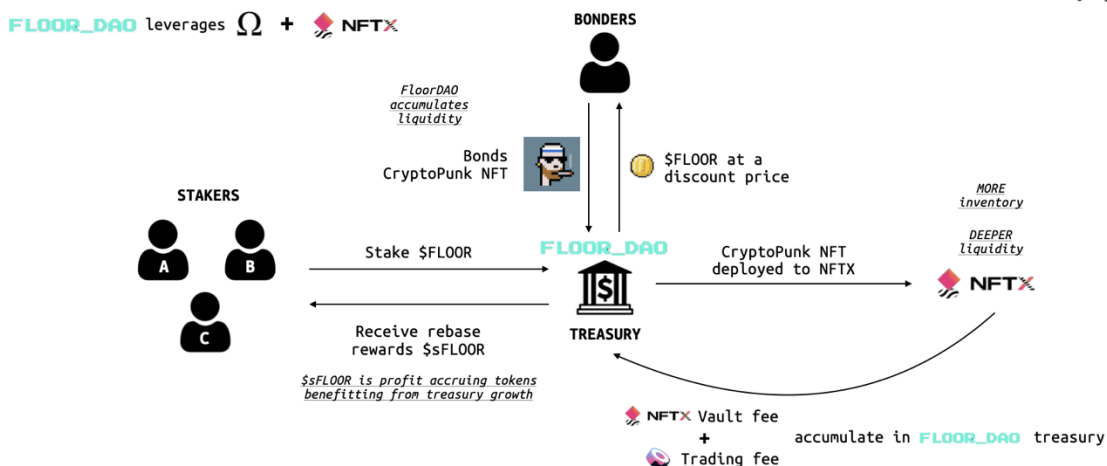


Figure 8: How does FloorDAO work?

Actors within FloorDAO system

Staker

Stakers can stake \$FLOOR with the FloorDAO protocol to receive rebase rewards \$sFLOOR from the protocol (see figure 8). Staked \$FLOOR is represented as \$sFLOOR and rewards are automatically accrued with each rebase.

- Stake \$FLOOR to receive \$sFLOOR in a 1:1 ratio

- Accrue rebase rewards, in terms of \$sFLOOR, from protocol emissions
- Take part in governance with \$gFLOOR, which is wrapped \$sFLOOR

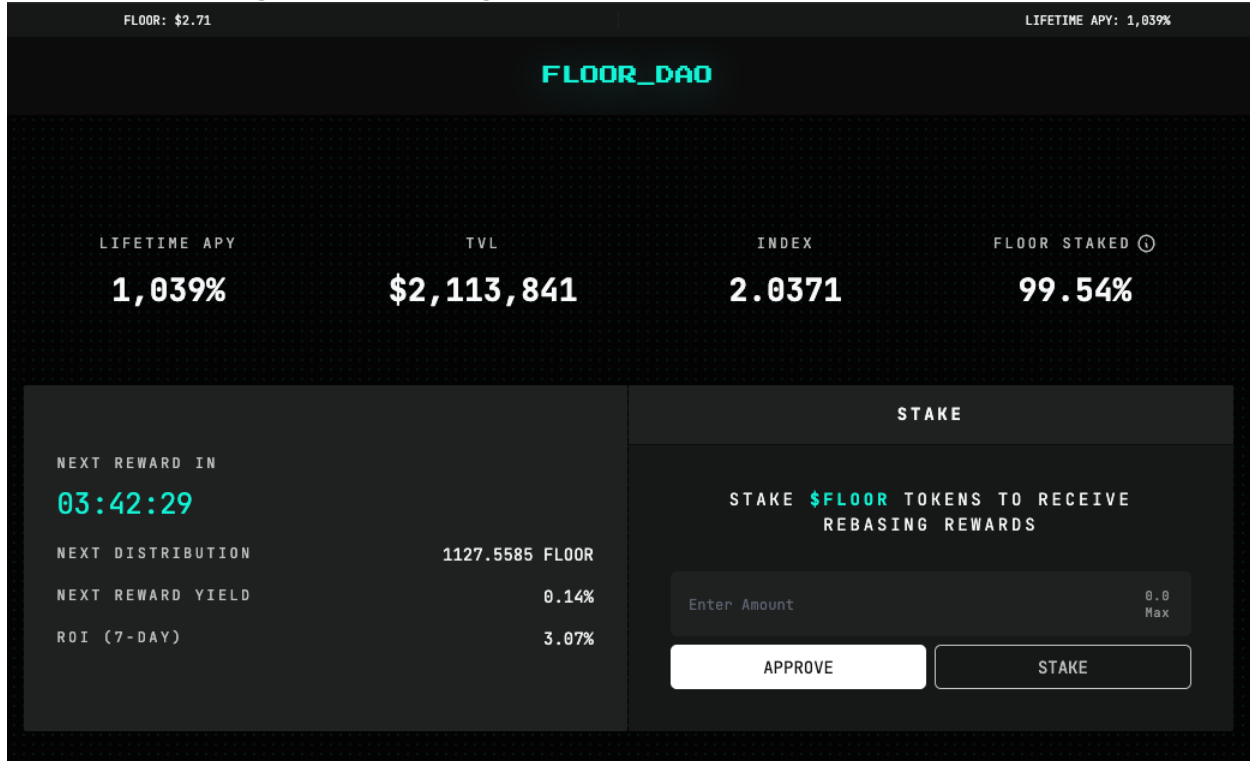


Figure 9: FloorDAO Staking

Bonder

Bonding is the primary mechanism for FloorDAO to acquire liquidity. Bonding is the process of users selling their NFTs to the protocol for acquiring \$FLOOR at a discount (see figure 10). The protocol quotes an amount of \$FLOOR and a token vesting period for the bonder. The yield comes from the discounted \$FLOOR that bonders acquire by depositing their NFTs to FloorDAO.

The choices of bonding assets is decided by the community and so far the chosen assets are blue-chip NFTs. The protocol uses reserves from FloorDAO treasury to sweep NFT collections to create deep liquidity.

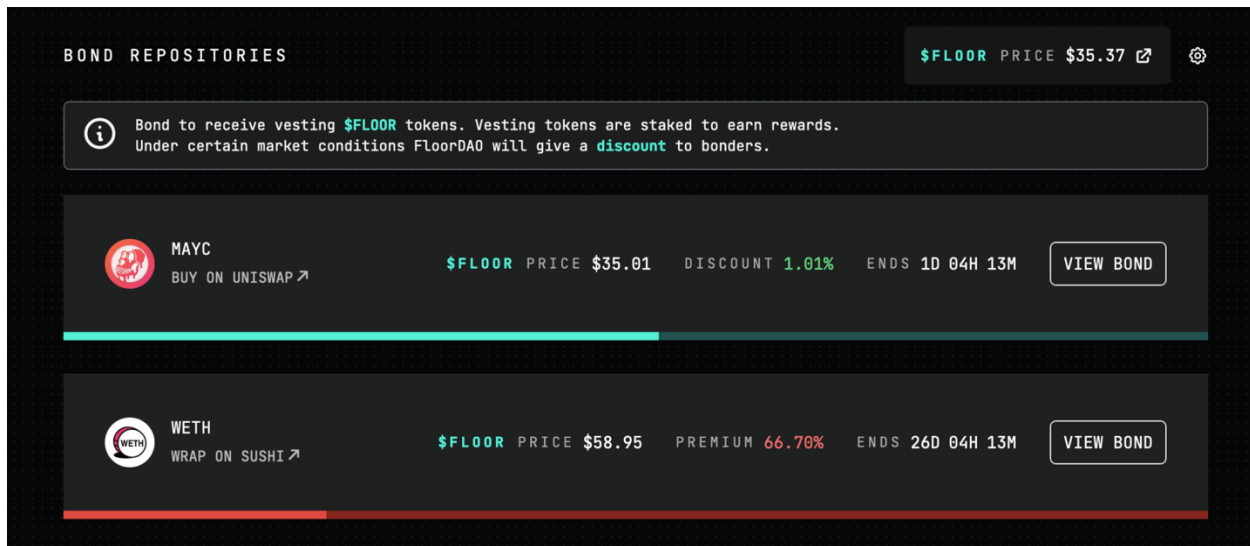


Figure 10: FloorDAO Bonding

Treasury

The FloorDAO treasury generates yield from providing liquidity for NFTs. FloorDAO provides the staked positions (NFTs) to NFTX and earns vault fees from NFTX and the liquidity provided to Sushiswap generates trading fees. Both vault fees and trading fees flow back to FloorDAO treasury.

FRACTIONALIZATION

Fractional art investment has been practiced in traditional Art and Collectibles industry for a decade. Platforms like Masterworks, Particles and Athena Art Finance are main players in the market.

Fractional art fintechs apply big data to mine datasets of historical art sales to identify works of art that may be undervalued by the market. Then the asset is divided into securities so that average investors can buy shares in a fund that purchases the art, safeguards it, displays it in galleries, loans it to museums and, ultimately, sells it for a profit to a collector or another investor.

Same as traditional art fractionalization platforms, **NFT fractionalization platforms operate the same way. The difference is the vehicle of fractional art ownership, the former is via securities and the latter is via tokens.**

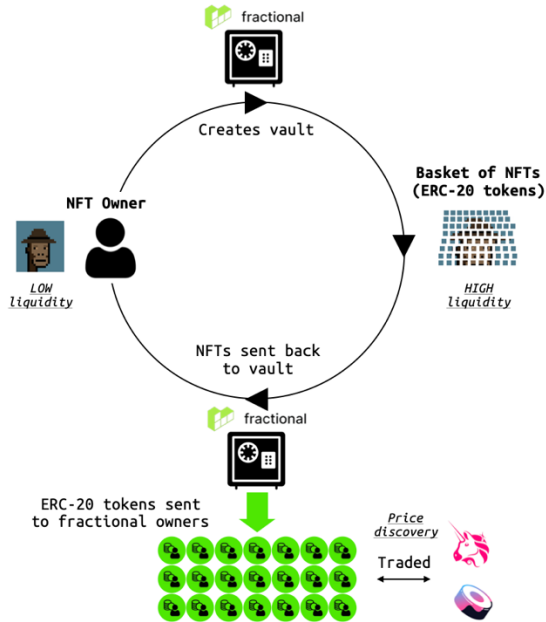
Fractional.art

Fractional.art operates similarly to liquidity pools such as NFTX or NFT20 in that users deposit an NFT and receive a basket of fractionalized NFTs (fungible ERC-20 tokens) in return (see figure 11). The similarity between Fractional.art and NFTX/NFT20 is that when users deposit NFTs into vaults created by NFTX or NFT20, NFT depositors will receive ERC-20 tokens that represent the fractional/whole ownership of the vault/NFT. NFT owners who deposit their NFTs are able to set the amount of fractions the NFT should be divided into. These fractional shares can then be bought/sold on the

market once a liquidity pool is created on Sushiswap or Uniswap and etc. The difference between Fractional.art and NFTX/NFT20 is that once NFTs are deposited in the Fractional.art vaults, NFTs are up for auction without any yield generating mechanism, whereas the deposited NFTs on NFTX/NFT20 are locked in yield-generating pools.

NFT FINANCIALIZATION: FRACTIONALIZATION

HOW DOES FRACTIONAL.ART WORK?



RESERVE PRICE EXPLAINED

Reserve price is the amount of ETH required to initiate an auction for a collectively owned NFT.

A	B	C	OF THE TOKENS
20%	30%	50%	RESERVE PRICE
50ETH	100ETH	70ETH	

The reserve price is set by the calculated weighted average of all ownership token owner votes.

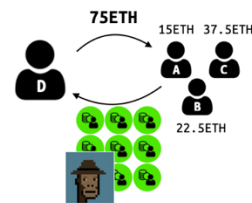
$$50\text{ETH} \times 0.2 + 100\text{ETH} \times 0.3 + 70\text{ETH} \times 0.5 = 75\text{ETH}$$

BUYOUT VERSUS SWAP EXPLAINED

Buyout and Swap are two ways to trade NFTs on the Fractional platform.

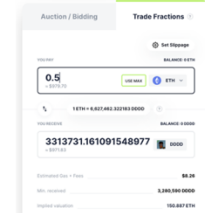
BUYOUT

An external party who deposited ETH that is greater than or equal to the reserve price.



SWAP

Swapping is when you purchase fractional shares of an NFT.



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Figure 11: How does Fractional.art work?

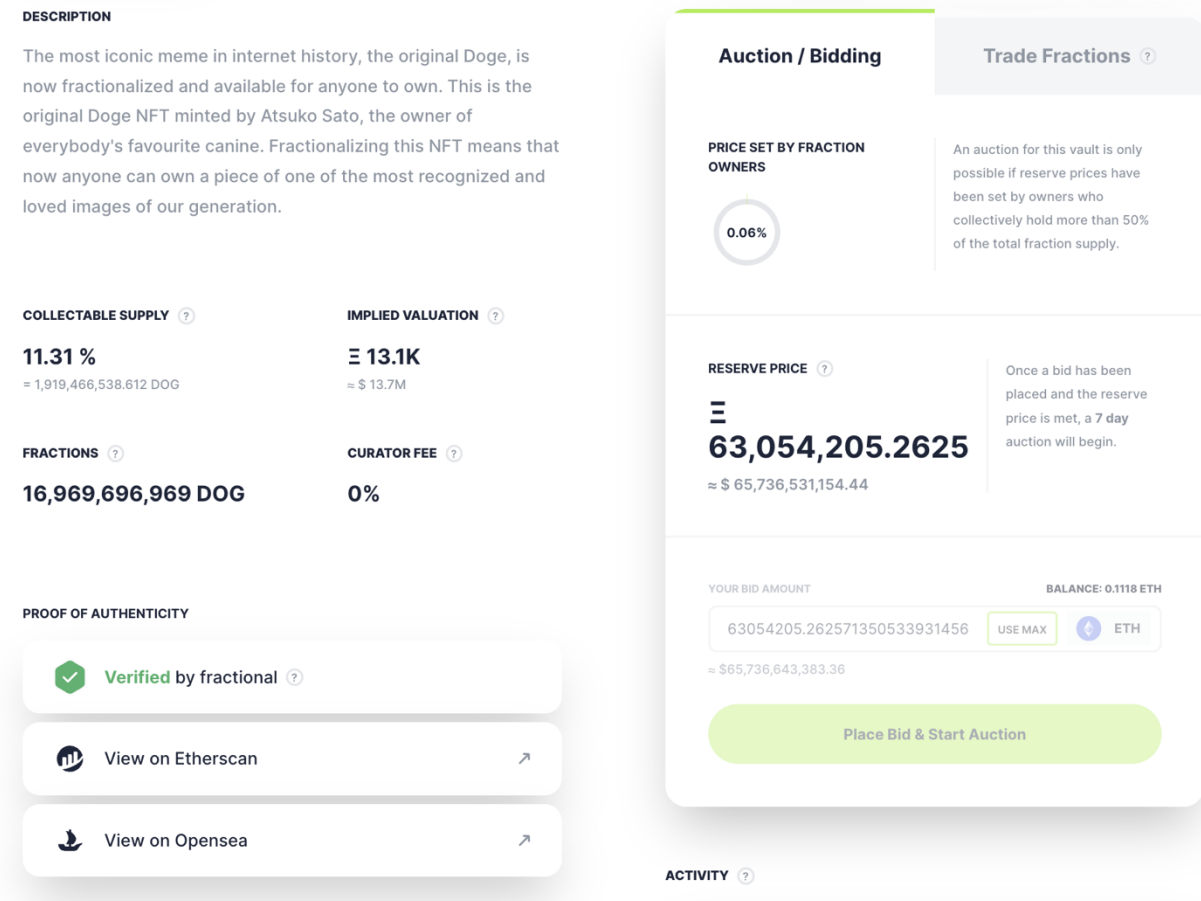


Figure 12: Vaults on Fractional.art up for buyout or fractions trading

Lack of utility leads to low liquidity and collective ownership leads to governance difficulties

Dividing NFT into fractions and fungible tokens doesn't actually solve liquidity problems. The solution just transfers existing liquidity issues from NFTs to fractional NFTs: instead of having one illiquid NFT, you now have many illiquid ERC-20 tokens (to have liquidity for the ERC-20 tokens after fractionalize NFT, you need to build a pool on DEXs and create liquidity for the pool).

Furthermore, multiple people collectively owning one NFT introduces difficulties in governance of the asset, as they could form a majority that can decide the fate of the NFT (see figure 13). Furthermore, without actual utility and yield, the incentive and motivation for investors or traders to own a fractional piece of NFT is relatively low.

I expect increased adoption of fractional NFTs when NFT technology is widely adopted in the physical world and applies to yield-bearing assets, for example, REITs or yield-generating bonds.

Top 10 Vault Owners

RANK	WALLET ADDRESS	QUANTITY	PERCENTAGE	VALUE
#1	 pleasrdao.eth 0xf894...2BE8	8,307,529,359.872 DOG	48.950%	Ξ 6,517.2778 ≈ \$ 6,871,426.75
#2	 daoge.eth 0x563B...86E5	3,934,946,409.968 DOG	23.180%	Ξ 3,086.9754 ≈ \$ 3,254,721.69
#3	 0xc96F...65b1 0xc96F...65b1	961,253,486.55 DOG	5.660%	Ξ 754.1058 ≈ \$ 795,083.91
#4	 0x7731...77dA 0x7731...77dA	937,544,277.503 DOG	5.520%	Ξ 735.5058 ≈ \$ 775,473.25
#5	 0xE933...241a 0xE933...241a	378,891,251.36 DOG	2.230%	Ξ 297.2411 ≈ \$ 313,393.23
#6	 0xf36c...A9fa 0xf36c...A9fa	366,060,619.066 DOG	2.150%	Ξ 287.1754 ≈ \$ 302,780.60
#7	 0x2796...cEb6 0x2796...cEb6	217,642,171.161 DOG	1.280%	Ξ 170.7408 ≈ \$ 180,018.89
#8	 0x6e0e...5438 0x6e0e...5438	118,712,844.626 DOG	0.690%	Ξ 93.1305 ≈ \$ 98,191.24
#9	 0x9CA4...6723 0x9CA4...6723	93,500,000 DOG	0.550%	Ξ 73.3509 ≈ \$ 77,336.88
#10	 jamis.eth 0x9E64...4110	92,665,898.9 DOG	0.540%	Ξ 72.6966 ≈ \$ 76,646.96

Figure 13: Vault ownership distribution based on ownership percentage of NFT fractions

LENDING

Among NFT lending protocols, there are three mechanisms to facilitate NFT-as-collateral loans: peer-to-peer lending, peer-to-pool lending, and over-the-counter (OTC) lending. Due to the highly illiquid nature of NFTs in their current form, NFT holders are looking for solutions to increase capital efficiency. NFT lending protocols have become a popular solution to this issue and have recently gained traction.

Before we look into different lending protocols, let us briefly take a look at the relationship between the actors in the system for guiding the subsequent reading.

- **Debtor (borrower):** receives funds by pledging his or her NFT, and pays principal and interest to the creditor.
- **Creditor (lender):** provides funds to the borrower to earn yield. If the borrower defaults and fails to repay the fund after maturity, the lender can acquire the ownership of the NFT (peer-to-peer mechanism), or get a certain percentage of the funds from a liquidated NFT (peer-to-pool mechanism)

In fact, the way that NFT collateralized lending service works is the same as that of traditional finance, in which the creditor provides liquidity for the debtor. The difference between NFT lending and

traditional finance lending services is the collateralized asset. Traditional finance leverages assets such as real estate, stocks, equipment, land etc, as collateral, while NFT lending protocol uses NFT as collateral and the value of NFT to determine the loan amount, interest rate and loan duration.

In the following paragraphs, I will introduce several protocols utilizing peer-to-peer and peer-to-pool mechanisms. Within the peer-to-peer category, the NFT lending protocol with the longest history and biggest scale is NFTfi.

NFTfi

NFTfi had its public beta launch in June 2020. It issued \$300,000 in loans in 2020, \$40 million in 2021 and \$166 million so far in 2022 (see figure 14). Its loans range from 30 to 180 days in duration and with APR ranging from 30%-100%. The loans are paid back all at once. Typical loan-to-value ratio is about 50%, and NFTfi charges lenders 5% of the interest earned on loans that don't default.

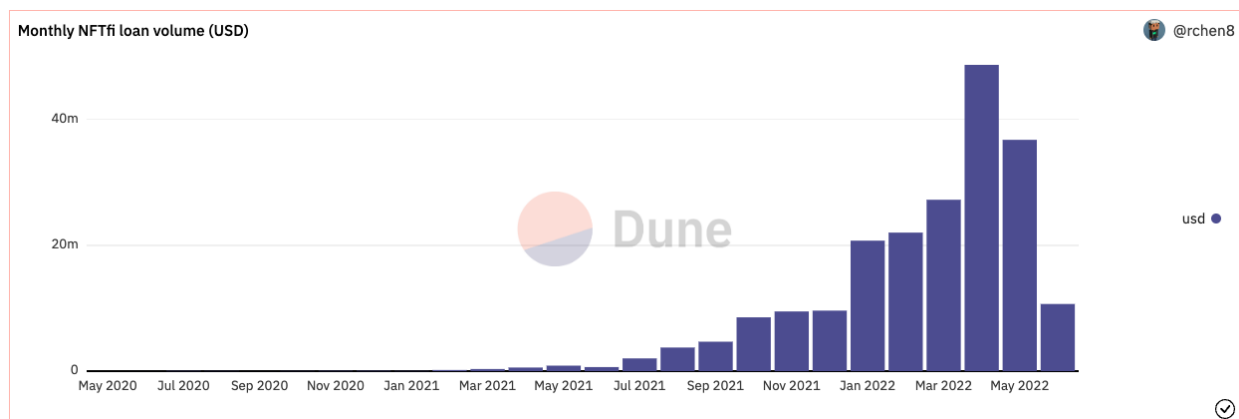


Figure 14: NFTfi monthly loan volume in USD; Source: Dune Analytics @rchen8 NFTfi dashboard data as of June 2022

NFT owners can list their NFTs to the platform (see figure 15) and fill in their preferred terms, including loan amount, duration, APR and token. Liquidity providers can browse the loan terms of each NFT on the platform and make an offer.

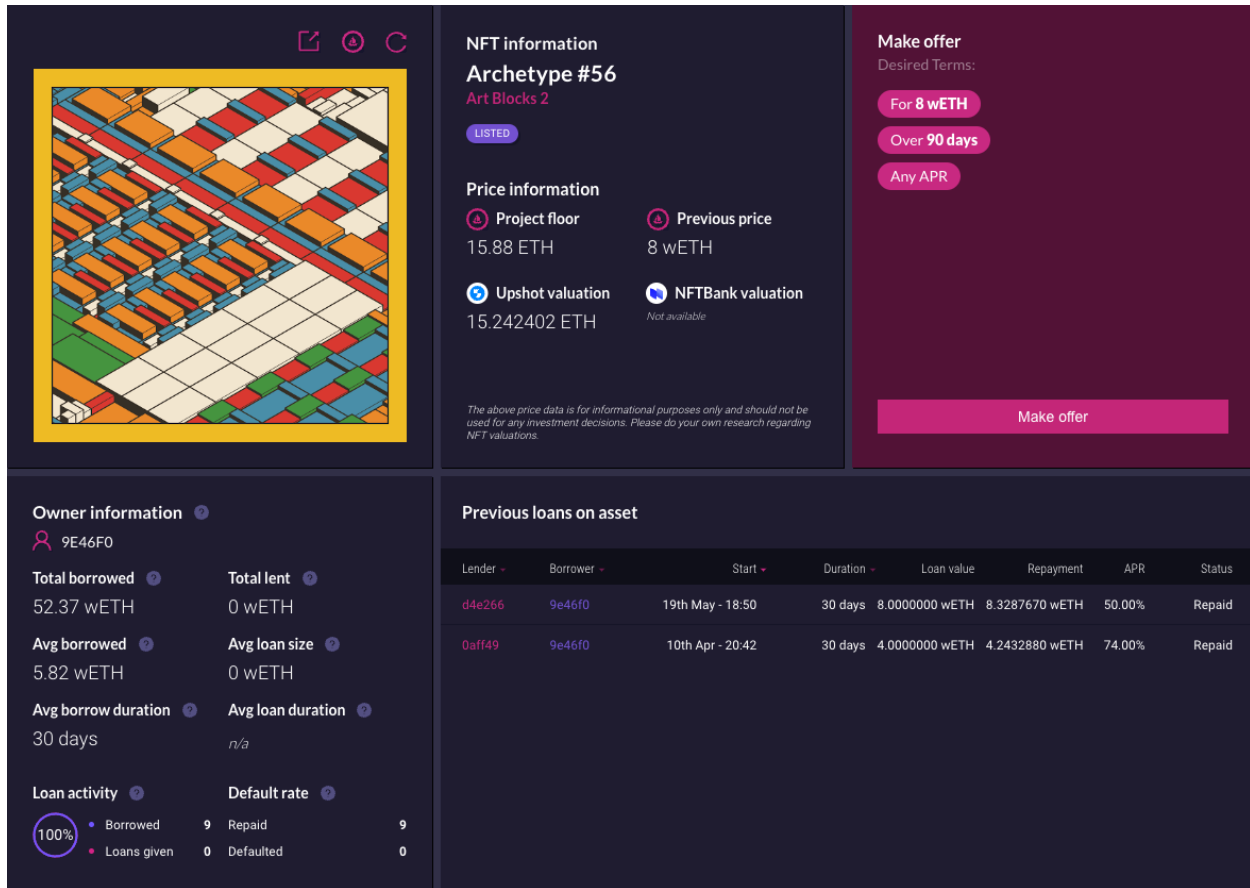


Figure 15: Loan request on NFTfi; Source: NFTfi

The loaning process is similar to a loan marketplace, where the NFT owner selects the offer from several liquidity providers based on their terms (see figure 16). Before due of the loan duration, loan borrowers need to pay the principal and interest for the NFTs to be transferred back to the borrowers, otherwise the NFTs will be transferred from the smart contract to the lenders. As the loaning process is straightforward and the loan terms are customized, we can see NFTfi has the most collections listed on its website asking for loans.

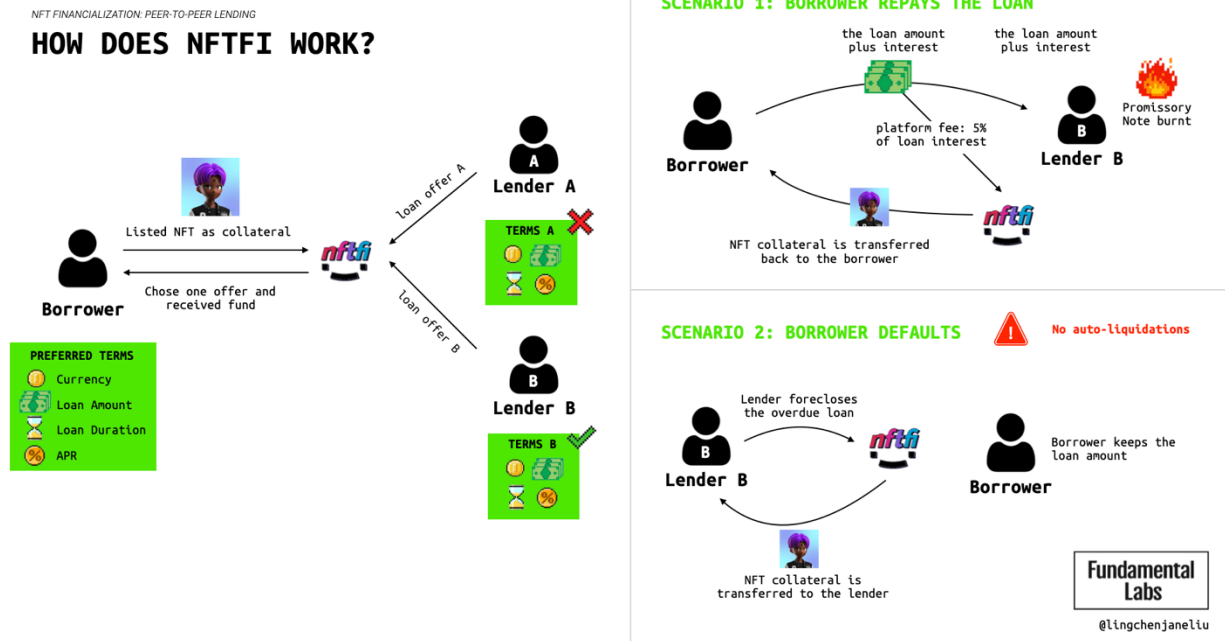


Figure 16: How does NFTfi work?

In the peer-to-pool model, NFT owners can immediately obtain funds after pledging their NFTs to a pool, similar to the process of using AAVE or Compound.

On the other hand, lenders can earn a passive, variable rate of return by providing liquidity via stablecoins or ETH. The amount of interest paid by the NFT owner depends on the amount of borrowed funds and the remaining funds in the pool. If the NFT owner cannot repay the money or the NFT price falls to the liquidation line, the NFT will be put up for auction in an open market, such as OpenSea, and the funds will be returned to the lender.

The market landscape for NFT lending protocols utilizing the peer-to-pool mechanism is quite crowded. Protocols such as BendDAO, Drops, XCarnival, Pine, Gradient Finance, JPEG'd, Pilgrim and many more belong to this category.

However, one of the biggest limitations for these protocols is that only a very small number of NFT series can be accepted as collateral assets.

Peer-to-pool lending projects tend to only provide lending pools for blue-chip NFT projects for which there is a strong price consensus among traders and investors. These blue-chip NFTs tend to have ample liquidity, compared with long-tailed NFT collections. Take the case of BendDAO for instance: BendDAO only accepts blue-chip NFTs such as Azukis, Bored Apes, CryptoPunks, CloneX, Doodles, and Mutant Apes as its collateral types.

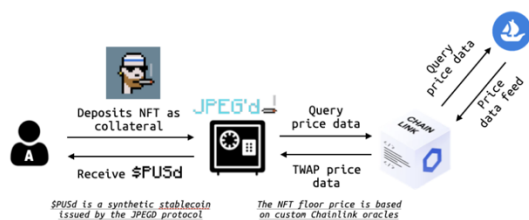
JPEG'd

The peer-to-pool mechanism utilized by JPEG'd enables borrowers to obtain loans instantly. Users can deposit an NFT such as a CryptoPunk in order to borrow the JPEG'd \$PUSd stablecoin. JPEG'd uses custom Chainlink oracles to fetch and maintain the on-chain real-time pricing of its NFT collateral (see figure 17).

The unique feature of JPEG'd, compared with other peer-to-pool projects, is its insurance mechanism. Borrowers can choose to purchase insurance against their loan when they deposit their NFTs as collateral. The insurance fee is 5% of the borrowed amount. If borrowers purchase the optional insurance and their NFTs get liquidated, they can repay their outstanding debt and a 25% fee, which is based on the borrowers' outstanding debt (principal plus accrued interest) to repurchase their NFTs. Otherwise, the JPEG'd DAO will own the NFT and liquidated NFTs will be put up for auction.

NFT FINANCIALIZATION: PEER-TO-POOL LENDING

HOW DOES JPEG'd WORK?



JPEG'd now only support 4 collections, CryptoPunks, EtherRocks, BAYC, MAYC, for NFT holders to take out loans



More to come...

Loan-to-Value Ratio	32%
Liquidation Ratio	> or = 33%
Interest Rate	2% annually
Insurance Fee	5% of debt amount (not obliged)
Deposit Fee	0.5%

LIQUIDATION EXPLAINED

If the debt/collateral value is equal or goes above 33%, the deposited NFT will be liquidated. What is special for JPEG'd is that the JPEG'd DAO will acquire ownership of the deposited NFT if liquidation happens.

$$\text{Debt/Collateral ratio} = \text{Amount borrowed} / \text{NFT floor price}$$

HOW DOES DEBT/EQUITY RATIO GO ABOVE 33%?

NFT floor price decreases -> debt/collateral ratio increases

If the floor price of deposited NFT declines, the risk of liquidation is higher. The NFT floor price feed is from custom Chainlink oracles.

IF NFT IS LIQUIDATED...



When users are liquidated, the DAO repays the users' PUSd debts by burning PUSd in the DAO. Liquidated NFTs will go up for auction.

IF YOU PURCHASE INSURANCE



If users are liquidated, users can repurchase their NFTs from the DAO after repaying their outstanding debt and a 25% insurance fee. The 25% insurance fee is based on the user's outstanding debt which is principal plus any accrued interest.

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Figure 17: How does JPEG'd work?

Pilgrim

Pilgrim is a protocol that combines the Uniswap Automated Market Maker and Fractional.art.

Actors within Pilgrim system

NFT Lister (Liquidity Bootstrapping Pool Owner)

Once NFT lister locks his/her NFT in a Pilgrim pool, the protocol creates a new PilgrimPair, which has two separate interfaces: **rounds** and **metaNFTs**. MetaNFT represents the ownership of the NFT pool in

Pilgrim and rounds represent partial ownership of the position in the pool (rounds are not ERC-20 tokens made by dividing NFT into small parts, but instead reflect a protocol-internal measure for splitting NFTs). MetaNFT holders can earn yield on NFTs locked with Pilgrim. The yield is generated through protocol rewards of \$PIL and trading fees incurred once round traders initiate transactions in the pool.

Round Trader

Rounds are newly minted when a trader buys rounds for a particular NFT (equivalent to providing liquidity to a PilgrimPair), and are burnt when a trader sells rounds back to its underlying base tokens (currently base tokens are WETH, USDC, and PIL). Rounds may only be traded at an AMM-determined round price, which exposes round traders and holders to financial gains or losses. One noteworthy point is, because rounds are not ERC-20 tokens, rounds cannot be transferred to another account.

Buyout Bidder

Anyone can offer bid to pay the current spot price on the locked NFT. Once the bid is approved by the metaNFT owner, the NFT is unlocked and the PilgrimPair is delisted. However, metaNFT owners do not have the right to choose from the buyout bid offers.

The buyout bid price affects round price and vice versa. The circular and speculative behaviors help assist price discovery of an NFT.

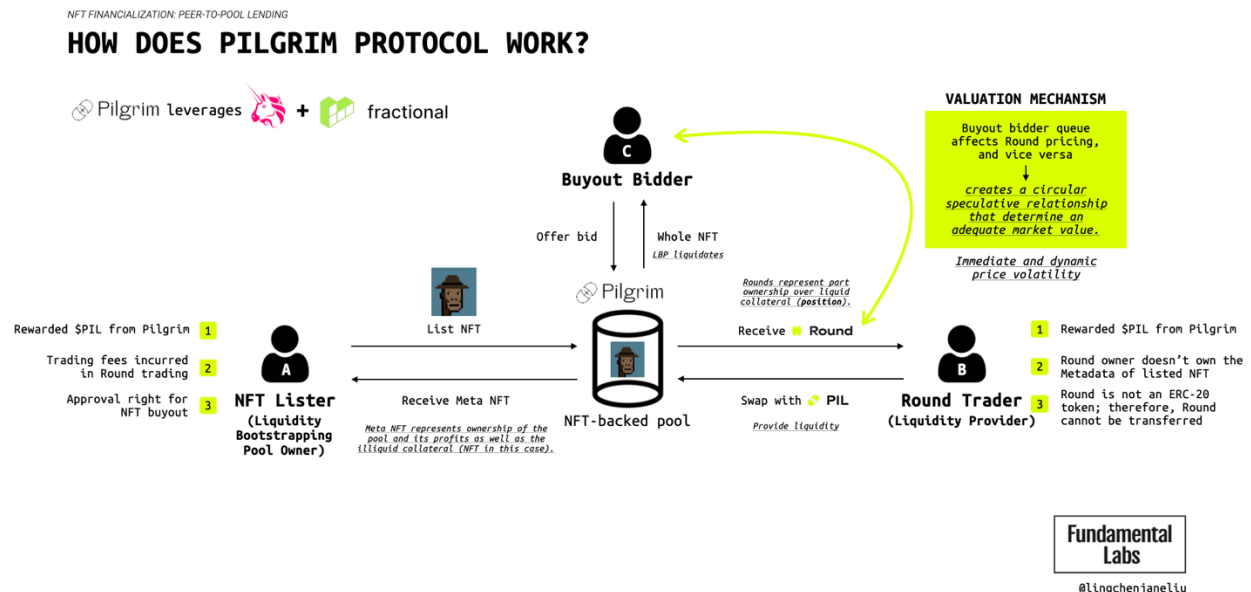


Figure 18: How does Pilgrim work?

RENTING

NFT rental market is still very premature with very few assets listed on rental platforms. According to Dune Analytics, NFTs up for renting on reNFT are still well below 100 NFTs per month. NFTs in the Art and Collectables category usually lack utility and the demand of renting such assets is generally low. In-game assets are the well-suited ones for the rental market; however, popular crypto games tend to have their own in-game asset marketplaces. Adding rental services to their own marketplace technically is not difficult. Furthermore, gaming guilds, like Yield Guild Games and Merit Circle, also provide in-game asset rental services (part of the play-to-earn scholarship) to crypto gamers. As gaming guilds have closer relationships with crypto gamer communities, guilds inevitably become the biggest in-game assets lenders.

Nevertheless, once NFT extends to more verticals, for instance tickets, membership, music, films, and real estate, I expect to see rental demand surge.

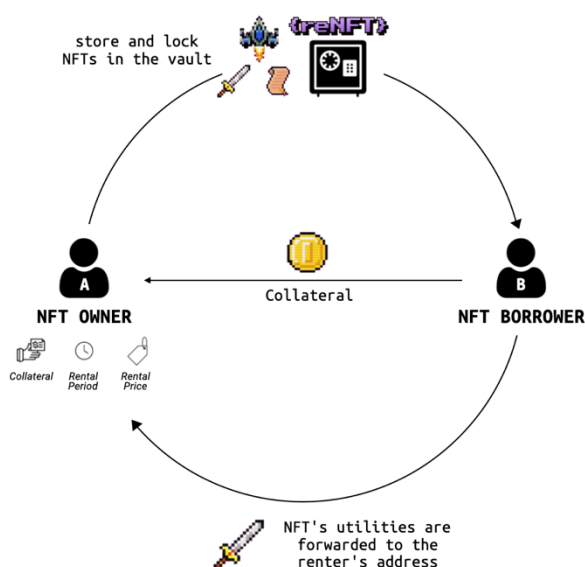
NFT rental protocols such as reNFT, IQ Protocol, and Rentable target general NFT series, while protocols such as Double and Landworks specialize in gaming assets and virtual land respectively.

reNFT

reNFT (see figure 19) enables yield-generating capabilities of NFTs. NFT holders can rent out their NFTs with a set price, rental duration and collateral amount. Furthermore, users can have temporary access to an NFT that they otherwise do not have an access to when they do not have the ownership of the NFT.

NFT FINANCIALIZATION: RENTING

HOW DOES RENFT WORK?



USE CASE EXAMPLES

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Art and Collectibles

NFT art exhibitions Twitter profile picture

Crypto Games

In-game weapons In-game wearables

Metaverse

Virtual ad spaces In-game billboards Digital land uses

Music

NFT music album

Tickets / Events

Admission right Early access

Identity / Governance / Elections

Voting rights Membership access

Figure 19: How does reNFT work?

VALUATION AND APPRAISAL

Valuation and appraisal is a fundamental infrastructural component of any trading market and can be used across many NFT financialization use-cases, such as lending, rental, and pledging. In these applications, having a safe and objective valuation is of great significance to the services provided. However, high market volatility, extreme trading volume fluctuation and diverse traits and characteristics of NFTs make valuation very challenging and complicated. Although liquidity is the root solution to price discovery, there are multiple protocols experimenting on valuation and appraisal mechanisms on NFTs.

In general, pricing mechanisms can be categorized into two categories: oracle-based and optimistic proof of stake pricing (human appraiser). Oracle-based pricing mechanism relies on the usage of oracles to retrieve on-chain data. Optimistic proof of stake pricing relies on consensus of human appraisers.

Optimistic proof of stake pricing

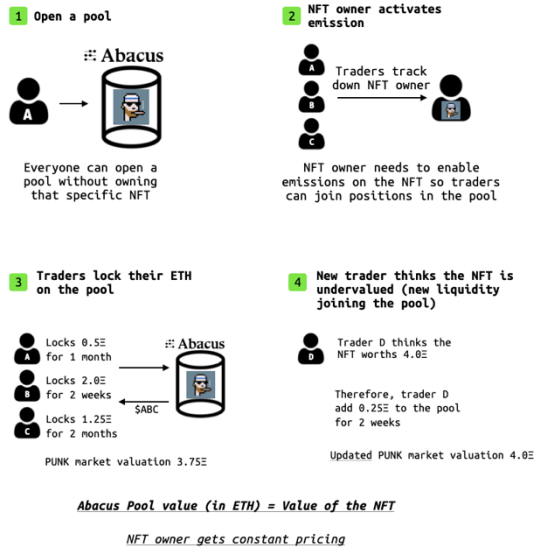
Abacus

Abacus uses optimistic proof-of-stake to create a liquid backed valuation system (see figure 20). Traders act as validators by staking their money in different valuation pools. The attributable valuation of the NFT is the liquidity locked in the pool at any point in time (traders have to lock their \$ETH in the pool). **The value of the NFT equals to the total value locked in the pool.**

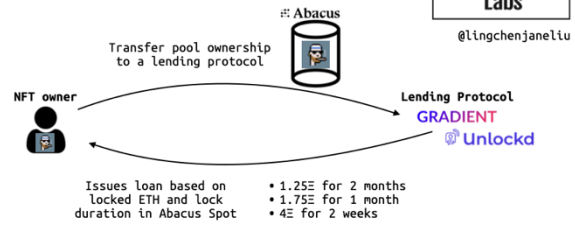
The valuation mechanism of Abacus is one of a kind, which seems to have never appeared before in traditional financial markets. The effectiveness of Abacus' pricing mechanism remains to be proven over time. In the following paragraphs, I will compare different valuation mechanisms and introduce their limitations and advantages.

NFT FINANCIALIZATION: VALUATION & APPRAISAL (PEER APPRAISAL)

HOW DOES ABACUS SPOT WORK?



GETTING A LOAN ON THE NFT



WHEN BORROWER DEFAULTS...

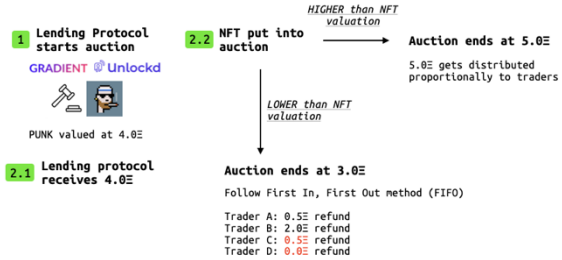


Figure 20: How does Abacus Spot work?

Oracle-machine learning based pricing mechanism

There are several protocols experimenting on leveraging machine learning technology to predict NFT prices, such as NFTBank, Banksea, and Upshot.

Upshot

How oracle-machine learning based valuation protocols work is quite similar. The difference is the dataset and also the machine learning models they use. **Data fed for training models can be categorized into three types: pricing data, NFT metadata, and market data** (see figure 21).

Due to the uniqueness of NFTs, NFT metadata is one of the most important pieces of data to be taken into consideration when constructing machine learning price models. The important step for protocols to build an accurate pricing model is through processing and categorizing NFT traits.

The following shows how protocols process NFT metadata:

1. Decompose the traits of NFT items
2. Regroup NFT items by trait
3. Compute the price statistics per each group
4. Reconstruct the value of an NFT item using the computed statistics

NFT FINANCIALIZATION: VALUATION & APPRAISAL (ALGORITHMIC)

HOW DOES UPSHOT PROTOCOL WORK?

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DATASET

Pricing data



NFT metadata

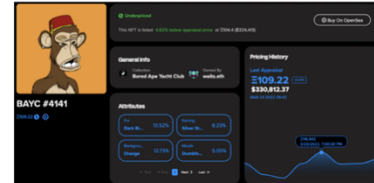
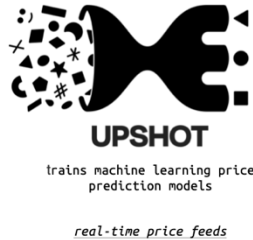
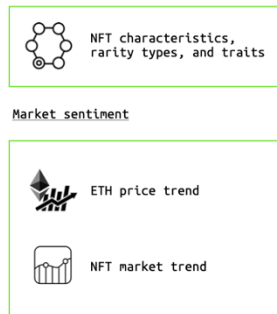


Figure 21: How does Upshot work?

COMPARISON: NFT LENDING MECHANISM

Below table (figure 22) summarizes the various NFT lending mechanisms reviewed in this piece and compares them across key dimensions, including targeted lenders and borrowers, NFT collection suitability and limitations of each mechanism.

NFT LENDING MECHANISM COMPARISON

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	Peer-to-peer lending	Peer-to-pool lending	OTC
How does it work?			
NFT Collection	All NFT collections	Blue-chip NFT collections	Blue-chip NFT collections
Targeted Lenders	Users who have deep understanding of the collections and can have judgement on NFT value	Users who understand the value of blue-chip NFT collections	Institutions
Targeted Borrowers	All NFT collections and high rarity NFT holders	Close-to-floor blue-chip NFT holders	Institutions
Limitations	Long deal-matching time	Limited to collections with strong price consensus (mainstream NFT collections)	Limited to collections with strong price consensus (mainstream NFT collections)
	Low capital efficiency due to low LTV ratio	Low capital efficiency due to low LTV ratio	Low capital efficiency due to low LTV ratio (the lowest among three mechanisms)
	Requires manual work and not scalable	Oracle-based valuation might not reflect fair value of high-rarity NFTs	Centralized service is not so crypto native
	/	/	KYC required

Figure 22: NFT Lending Mechanism Comparison

COMPARISON: NFT VALUATION AND APPRAISAL MECHANISM

NFT valuation and appraisal is a fascinating new field waiting for builders to explore and experiment. From this deep dive into different NFT valuation protocols, valuation mechanism can be categorized into following types:

- Oracle-based pricing
 - Simple price oracle
 - Price oracle + NFT attributes
 - Oracle-machine learning based price
- Optimistic proof of stake pricing

Since the pricing dataset used in the pricing oracle model mostly relies on the most recent transaction price or floor price of an NFT collection, the biggest tradeoff for this mechanism is that the valuation struggles to capture the value of an item when there is distinct variance of the NFT traits or when pricing data is widely distributed. Furthermore, **the price oracle model fails to reflect potential upside when the roadmap of an NFT project is updated and the market is updating its fair value accordingly.** For oracle-machine learning based models, the benefit of the model is that it can potentially achieve time-series pricing and may become a key component of price oracles and even a cornerstone of NFT financialization. However, the difficulties come from the construction of the model and the weightage of different parameters. Below graphs (figure 23, 24, and 25) are detailed analysis on the limitations and advantages of different valuation models unfolded throughout this piece.

VALUATION AND APPRAISAL MECHANISM COMPARISON_01

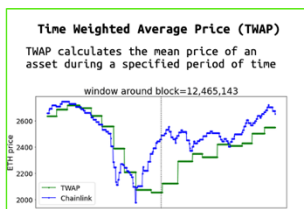
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ORACLE-BASED PRICING

pricing mechanism relies on the usage of oracles to retrieve on-chain data

PRICING ORACLE

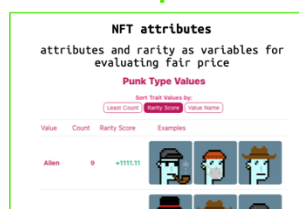
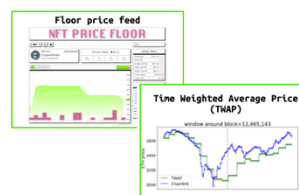


Note: Data showing the deviation between Uniswap v2's ETH/USDG 10 minute TWAP oracle and Chainlink's ETH/USD Price Feed

Limitations

- **Price skewed to floor:** Simply retrieving floor price or any given time period of TWAP will cause the predicted fair value to be skewed to low-valued NFTs and will hardly reflect the fair value for collections with wide sales price distributions.
- **Not able to factor in unexpected upside:** Fail to reflect potential upside if the predicted price is based on historical trading data.

PRICING ORACLE + NFT ATTRIBUTES



Limitations

- **Only well suited to blue-chip NFTs:** Valuation methodology works better for blue-chip NFT collections, which have stronger price consensus.
- **High volatility:** Sudden price drop or market volatility will result in price underestimation of high rarity NFTs.
- **Not Scalable:** Developing custom valuation models for each NFT collection is not scalable.
- **Not able to factor in unexpected upside:** Fail to reflect potential upside if the predicted price is based on historical trading data.

Figure 23: Valuation and Appraisal Mechanism Comparison_01

VALUATION AND APPRAISAL MECHANISM COMPARISON_02

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ORACLE-BASED PRICING

pricing mechanism relies on the usage of oracles to retrieve on-chain data

MACHINE LEARNING

Pricing data feed



Market pricing data feed



NFT data feed



Advantages

- **Scalability:** Training models to predict fair value for collections with historical data is scalable.
- **Textual data feed:** Data feed is not limited to numerical data. Textual data describes artists and artworks for signals of reputation and prestige in addition to performing a visual analysis of the art.
- **Proven model:** Various automated appraisal systems have been around for a decade in the traditional art industry. Sotheby's has had machine learning appraisal model for years.
- **Real-time valuation**

Limitations

- **Hard to apply to new collections:** Valuation methodology works only for collections with historical data. This methodology can hardly apply to new collections or new artists.
- **Not able to factor in unexpected upside:** Fail to reflect potential upside if the predicted price is based on historical trading data.
- **Not enough data source:** Machine learning requires a large amount of data for training, and it remains to be seen whether there is enough valid NFT historical metadata to train a suitable model.

Figure 24: Valuation and Appraisal Mechanism Comparison_02

VALUATION AND APPRAISAL MECHANISM COMPARISON_03

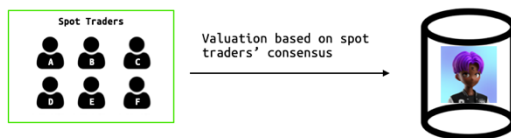
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OPTIMISTIC PROOF OF STAKE PRICING (HUMAN APPRAISER)

ABACUS SPOT

Each Spot trader represents a node in a larger network which uses an optimistic proof of stake consensus mechanism to determine the current and future value of an NFT.



NFT market valuation = Value of Abacus Pool

Advantages

- **Enabling risk-free lending:** A pricing mechanism with guaranteed backing of assets, which enables a risk-free lending scenario.
- **Real-time valuation:** Prices are real-time and are also available through the API provided.

Limitations

- **Inconsistent valuation:** Valuation is based on the accuracy and knowledge of the pool staking participants (spot traders) so the quality of valuation can hardly be consistent.
- **Only well suited to blue-chip NFTs:** Might only be eligible for mainstream NFT projects since mainstream projects have stronger pricing consensus.
- **Not Scalable:** Not a scalable solution because the staking process is manual and not an automated program.

Figure 25: Valuation and Appraisal Mechanism Comparison_03

Section 4

Where we are now and where we are heading

Current obstacles

The development and experimentation of NFT financialization just started. Despite all the progress in various verticals, we see some common challenges in financializing this space.

- **Foundations waiting to be established:** problems such as reliable and agreed-upon models for valuation and instant liquidity are yet to be solved, which make up the base layer of any financial product.
- **Limited utility layers:** currently, NFTs are highly concentrated on profile pictures (PFP) and gaming assets, and the lack of utility hinders mass adoption and therefore curbs demand of NFTs. We envision a world where NFTs become ubiquitous and unprecedented products or goods being treated as new asset classes with the adoption of NFT and blockchain technology.

The road ahead...

Here are some of my thoughts on where we can find opportunities in building this space.

- **Segmenting NFTs into different categories with different tranches of risk and return profiles:**
 - All asset classes in traditional finance have their respective risk and return profiles and there are specialized institutions giving out risk ratings. However, the risk ratings given out by third-party rating agencies are not completely reliable as these financial instruments issued by centralized intermediaries often contain layers of wrapped assets. The opaque process results in difficulties to properly assess risk. Blockchain technology facilitates the transparency of financial instruments and thus, for institutions or for investors, the adoption of blockchain technology can improve the health of financial markets and optimize risk-return profiles.
 - The difficulties of valuing NFTs partially comes from treating all NFTs without discrimination. NFTs in different economic verticals should be segmented into different categories, such as fractionally tradable and fractionally non-tradable assets. For example, an Ethereum Namespace (ENS) address should not be traded, as its fractionalization goes against the nature of the NFT asset, which is to provide identity to an address, and it is not yield-bearing. On the contrary, a mortgage contract that generates stable cash flow can be traded and have specialized valuation model.

- **Building risk profiles of borrowers:**
 - Creditworthiness assessment in the crypto space is still in its very early stages. I expect the area to mature when we have clearer user profiles where users' on-chain data can be bundled with user identities to assess borrowers' creditworthiness and recommend assets matching their risk profiles.
- **Extending utility layers:**
 - I expect to see more economic verticals to leverage blockchain and NFT technology, especially for products or goods with distinct characteristics, such as medical records, conversations, insurance contracts etc. With the help of blockchain technology, the exemption of intermediaries can improve efficiency, and composability can create new business models. When blockchain technology is applied to those distinct areas, new use cases will emerge and we will see new ecosystems built on those foundations.
 - As NFTs expand into the wider economy and gain more applications, we can more easily determine the value of the asset by the value of the application.

Closing

Thank you for reading this research piece on NFT financialization. If you enjoy research that seeks to uncover the fundamental building blocks of our shared Web3 future, consider following @FundamentalLabs on Twitter.

If you are building this space, have feedback on this research, please reach out to me on Twitter @lingchenjaneliu so we can enhance this research and work on this space together.

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