Studying the Impact of Fractional Ownership on Art Market Liquidity

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Abstract

The global art market presents an enticing opportunity for investment, yet several persistent market inefficiencies deter investors from entering the market. In response, several “ArtTech” solutions have emerged in an effort to democratize the industry, including fractional ownership platforms. This paper will primarily focus on Masterworks, the first fungible platform that allows investors to buy and sell shares representing an investment in the art market through the creation of a secondary market. Under the hypothesis that secondary markets help promote the efficient allocation of resources, better price discovery, and increased investor confidence, this paper performs a comparative analysis of the traditional art market, ArtTech (Masterworks) market, and equity market to understand how liquidity and volatility fare across each.

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I. Background

1. Traditional Art Market Investing

1.1 Size & Opportunity Within the Traditional Art Market

The global art market presents an exciting opportunity for investors and appreciators of art, alike! In 2021, global art was valued at $65.1 billion in transactions. The recent coronavirus pandemic caused the art market to shrink by 22% in 2020, however, in this same time period, we saw an influx of activity move towards the digital art world. Specifically, the online art market grew 21% year-over-year to reach ~$13.3 billion in 2021. (McAndrew 2022)

1.2 Art Market Inefficiencies that Discourage Investment

Despite its size, the global art market remains an esoteric and inaccessible asset class. Prospective art market investors are forced to reconcile with several issues underlying an artwork's attractiveness as a standalone investment or as an addition to a diversified portfolio. These inefficiencies are wide-ranging and include the following (Fresco Network 2018):

Disparate sources of valuation An artwork's price appraisal is dependent on several factors unique to the piece itself. These factors are often qualitative and relatively subjective: an artwork's medium, condition, artist's popularity, exhibition and/or publication records, and collectors' reputation. This adds difficulty to defining an artwork's true value, annualized return, and relative correlation to other asset classes.

- Lack of clarity with observable price trends: Art indices (such as the Moses Mei All Art Index or ArtRank) are largely exposed to sample selection bias as a result of their reliance on auction data, representing only 53% of the global art market. There are also several unknown sources that act as a buoyant force to art prices and help prices maintain their artificial scarcity. Driving factors include museum accessions, dealers' vaults of unsold inventory, and unsuccessful collections never coming to market.

- In “Does it Pay to Invest in Art? A Selection-Corrected Returns Perspective”, researchers found that paintings with higher price appreciation are more likely to trade, which contributes to strong biases in estimates of returns (Korteweg et al. 2013). The authors conclude that passive index investing in paintings is not a viable investment strategy once selection sample bias is accounted for, as mean annual returns indicate that art as an asset class has been declining over the last decade. This paper helps to demonstrate how bias inherent to industry-wide public data reporting shrouds an investor’s true understanding of the market potential.

Dubious provenance standards Provenance is the “chronological documentation of an artwork’s ownership.” Trustworthy provenance is critical for validating the authenticity and indicating that the amount of capital previously invested is a legitimate signal for future price appreciation. Currently, buyers must place their trust in collectors, who typically don’t provide a detailed record of past ownership.

Selective promotion To achieve commercial success, artists often need the support of a reputable dealer or gallery. Yet, these agencies restrict the number of artists they can annually support, further limiting the promotion of excluded pieces.

Lack of liquidation The process of liquidating a piece of physical artwork is long and complicated, further inhibited by high-interest rate art loans.

High threshold for purchase The art market has traditionally remained an investment for high-net-worth and well-connected individuals. This is not only because of the high price threshold but because everyday buyers aren’t privy to purchasing channels.

Together, these issues disincentivize many from approaching art as an investment.

2. The Rise of "ArtTech" Solutions - Fractional Ownership Models

Recently, fintech innovations within the "ArtTech" space have attempted to tackle these problems. One approach has been through the rise of fractional ownership platforms.

2.1 Fractional Ownership for Investors - Masterworks v. Maecenas Case Studies

Masterworks is an example of a platform that allows investors to buy and sell fungible shares representing an investment in the art market. Shares on Masterworks' platform are not minted but rather proprietary to the Masterworks platform. Further sections throughout this paper will expand on the Masterworks platform in greater depth and as a point of focus.

Other platforms follow a similar model but instead do employ blockchain technology. Maecenas, for example, is the "first blockchain-based platform that allows anyone to buy, sell, and trade part ownership in masterpieces on a liquid exchange" (Maecenas 2022) Similar to Masterworks', Maecenas divides artworks into Ethereum-based asset tokens, representing fractional ownership within the painting. Investors can buy tokens using bank transfers, credit cards, and other cryptocurrencies as well. Unlike Masterworks' business model, Maecenas does not transfer the cost of storage fees to investors (to be further discussed) and instead only delegates fees of 1% for buyers and 8% for sellers. (Maecenas 2022)

Maecenas has created utility ART tokens to act as a "clearing and settlement mechanism..to issue digital shares of paintings", essentially its in-house currency (Casil 2017). Using ART tokens allows Maecenas to operate in a decentralized space, especially in the case of Dutch auctions where Maecenas receives bids from investors in exchange for digital asset token shares. All amounts invested are converted to ART, allowing Maecenas to collect income from smart contract activities. Maecenas has set ART's supply to be fixed such that increased economic activity on the platform helps the market capitalization of ART grow as well. (Casil 2017)

The graphic created by Maecenas in Figure 1 depicts the tokenization process for paintings on the platform.

Maecenas boasts use cases for their platform to the following types of users (Maecenas):

- Galleries (Traditional Institutions) - Raises funds from Maecenas investors by listing some of their artwork at a one time 8% fee vs. using art-secured loans
- High Net Worth Investors (akin to Traditional Collectors) - Bypasses minimum investment threshold for fine art funds to invest invest in asset tokens
- Crypto Investors & Family Offices - Invests in asset tokens to diversify their portfolio

Examples of blockchain-powered art marketplaces include Fresco, ArtSquare, and Look Lateral (Adam 2021).

With either fractional ownership model, investors are afforded increased flexibility and access to investing in fine art.

2.2 Resale Royalties and Fractional Ownership for Artists

Both the prior models of fractional ownership have centered around investors. However, there are also emerging strategies that seek to benefit artists in traditional art market environments.

Professor Amy Whitaker's and Roman Kräussl's work in "Blockchain, Fractional Ownership, and the Future of Creative Work" posits that the environment around artists has transformed from one that views art as a collectible to one that values artists as an operating company or machine. Traditional art markets don't allow artists to participate in the value their work creates, however, Whitaker et al. offer that new models integrating resale royalties allow for artists to have compensation opportunities that outlive the initial sales. (Whitaker et al. 2020) This model entitles living artists to a certain percentage of any resale of their artwork. In California, a model of resale royalties was piloted but struck down due to interstate commerce laws and in general potential downsides to this approach include difficulties in administration, reduced competitiveness of the art market, and some economists arguing little actual tangible benefit exists (Kaplan 2018). (Whitaker et al. 2020)

Whitaker et al. also propose the idea of artist-owned fractional equity, wherein artists forgo cash from the primary sale of artwork to retain an equity stake in the painting. Hypothetically, per Whitaker et al.'s findings, an equity stake could be very lucrative for an artist with a major secondary market. Fractional ownership for artists can be privately contracted and therefore avoid the nuances of government administration/regulation, instead of relying on the creation of said secondary marketplace to help facilitate equitable distribution of returns. (Whitaker et al. 2020) However, potential challenges could include valuation moving between private and public domains (Kaplan 2018).

3. Implications of ArtTech Solutions

In summary, the world of ArtTech presents exciting new opportunities that aim to not only target traditional art market inefficiencies but also help democratize the market. The perceived benefits to the art market can be divided among key stakeholders, as follows (Clavien 2020):

- ***Investors:*** Gain accessibility to otherwise expensive, blue-chip[1] artworks to expand and diversify their portfolios; corporate investors stand to benefit from capital gains from the circulation or sale of artworks; fractional ownership platform and especially blockchain marketplaces add heightened transparency to otherwise blurry provenance standards; potential to increase corporate social responsibility for corporate or finance professionals
- ***Institutions:*** Maintenance costs and potential dividends are shared across investors;
- ***Artists:*** Reduces the need for centralized promotion; increased visibility; potential new monetization avenues

Beyond the traditional art market, several "alternative" and luxury assets have begun entering the securitization space. For example, the fine wine market! Vint.co was founded in 2019 and aimed at making it "'possible for anyone to invest and diversify in securitized collections of fine wine and rare spirits" (James 2022). Positive results from fractional ownership models in the art space could potentially be translated to tangential industries facing similar opportunities and challenges.

[1] Blue-chip art is a term used to describe artworks that are universally recognized and traditionally garner high auction prices. (Team Arternal 2022)

4. Masterworks

4.1 Platform Overview

As briefly discussed in the previous section, Masterworks is the first fungible platform that allows investors to buy and sell shares representing an investment in the art market. According to the platform, "through a proprietary dataset and extensive due diligence, Masterworks identifies high momentum artist markets with lucrative risk-adjusted return potential." From there, Masterworks purchases selected artworks to later securitize. Figure 2 is sourced from Masterworks' website and helps demonstrate their general business model.

Investors of paintings on Masterworks own equity in a Delaware LLC, that owns one single artwork with no other assets or debt. Masterworks offerings are considered Reg A+, meaning that because each LLC is passive and has no operations like a traditional publicly-traded company, Masterworks investors aren't conferred additional rights (i.e. voting) beyond ownership of their shares.

Masterworks is poised to become one of the largest art buyers in the world. In a recent interview, CEO and founder Scott Lynn stated that Masterworks plans to buy roughly $1 billion in art in 2022 alone, with goals of gaining monopsony (a single-buyer dominated market) power in the art world (Marcus 2021).

4.2 Securitization Process Brief Overview

1. Painting Acquisition: Masterworks acquires paintings based on internal due diligence.
2. Legal Set-Up: Masterworks constructs segregated Cayman portfolios to hold title to the painting; Masterworks Gallery owns 100% membership interests prior to the offering. This will be further explained in depth in the next section.
3. Initial Offering: Shares of an artwork are first offered to investors through an initial offering. Masterworks has a standard price per share of $20 in this initial offering. Consequently, the number of shares outstanding per painting varies depending on the value of the painting itself

(50k shares in a $1mm offering, 500k shares in a $10mm offering). This value or offering amount is calculated as the sum of the acquisition price Masterworks paid for the painting and 10-11% true-up expense to cover underwriting costs, filing fees, etc. Shares are not eligible to be traded in the secondary market until at least 90 days after the initial offering is fully funded and closed.

Figure 3 depicts an investor view of an initial offering on the Masterworks investor landing page and Figure 4 depicts an investor's view in tentatively participating in the initial offering.

4. Secondary Market Opens: Investors can buy or sell shares on the secondary market at least 90 days after the initial offering is fully funded and closed.
    a. After 90 days, trading begins! Masterworks doesn't participate in the secondary market at all, since it is strictly peer-to-peer. This means that there are no external market-making efforts within the Masterworks market and individual shareholders can list their shares at any price, and as long as there is a willing buyer, they can sell them. During this time period, Masterworks also provides quarterly appraisal values of the artworks (based on the artist's market activity and comparable sales), starting six months after the final closing of the initial offering. Trading in the secondary market for each artwork closes upon Masterworks' final sale of the painting.
5. Secondary Market Closes: Upon Masterworks' final sale of the painting; proceeds are distributed to investors pro-rata (principal received up to $20/share owned) and 80% of profit proportionate to shares; taxes owed when the painting is sold

4.3 Key Players & Organizational Structure

From the Offering Circulars of Masterworks paintings as well as publicly available information, the following individuals and groups serve as the key players of Masterworks' business model:

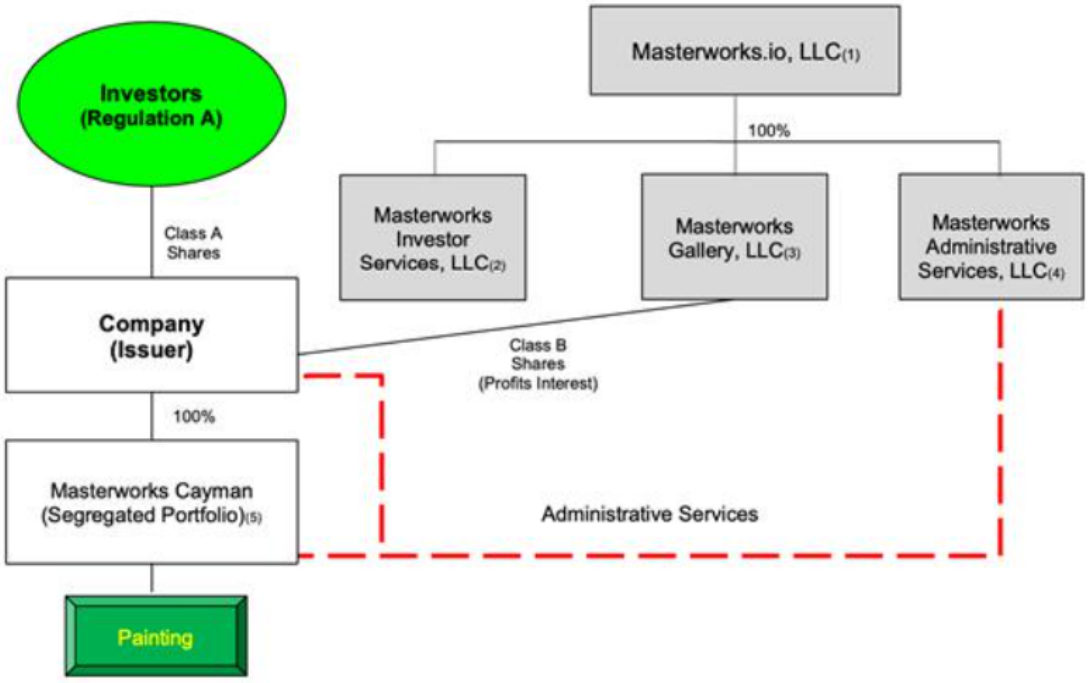
Entity Name	Specific Players (other than the main entity itself)	Decision-Making Agency	Details
Masterworks, io LLC	• Scott W. Lynn - Founder of Masterworks, entirely responsible for funding painting acquisition • Scott Lynn's role as the single source of painting acquisition funding presents a large key-man risk.	Owns and controls Masterworks' platform	Masterworks is a manager-managed Delaware limited liability company by a "Board of Managers". These managers are not easily disclosed, even with a thorough inspection of Linkedin and Crunchbase.
Masterworks Investor Services, LLC	Individually-involved personnel are unknown/not readily accessible	• Conducts investor relations services • Pays all fees and expenses of the underwriter • Acts as an agent of Masterworks Administrative Services, LLC	Masterworks Investor Services, LLC is not a registered investment advisor and also operates as a Delaware limited liability company.
Masterworks Gallery, LLC	Individually-involved personnel are unknown/not readily accessible	• Owns 100% of membership interests prior to giving effect to the offering • If proceeds from the initial offering are less than the purchase price, Masterworks Gallery, LLC will advance to the segregated portfolio of Masterworks Cayman that will acquire the painting any additional funds required to consummate the acquisition • Remaining net proceeds of offering + any unsold Class	• Operates as a Delaware limited liability company • Portion of the proceeds from the initial closing of this offering contribute to a segregated portfolio of Masterworks Cayman to acquire the painting

		A shares will be contributed to the segregated portfolio of Masterworks Cayman that will acquire the painting and will be used as repayment of the advance and payment of the true-up	
Masterworks Administrative Services, LLC	Individually-involved personnel are unknown/not readily accessible	Operate Masterworks Platform and performs administrative services for Masterworks and Masterworks Cayman	Retains control of subsidiary Masterworks Transfer Services, LLC (wholly owned subsidiary of the administrator)
Masterworks Cayman, Segregated Portfolio	• Cayman Islands Segregated Portfolio Company • (Where applicable) Creditors of Masterworks Cayman	• Primarily allows Masterworks to hold title to the painting in a segregated portfolio of a Cayman Islands segregated portfolio company • The potential creditor is only entitled to recover against assets attributed and credited to the specific segregated portfolio to which the contract is attributed (because each portfolio's assets and liabilities are legally separated from the assets and liabilities of the Masterworks Cayman ordinary account as well as any other related segregated portfolios)	• Masterworks holds title to each painting; this portfolio is just a single legal entity that can establish internal segregated portfolios
Investors	Retail investors with accounts on Masterworks platforms	• Fund the initial offering, although not always in its entirety • Can optionally participate in the secondary market to make intermediate profits between opening of	Investors need a minimum of $10,000-15,000 to join the platform as an investor, and $500 to trade in a single painting's share on the secondary market.

		secondary market and the painting's sale	
Painting sellers	Entities with whom Masterworks receives or negotiates sale price from; in painting Offering Circulars there is no disclosure as to who paintings are bought from	Negotiates painting acquisition deal	N/A

Figure 5 is a Masterworks-created diagram of their organizational structure:

Figure 5. Masterworks Organizational Structure (Masterworks)



4.4 Information Asymmetries & Further Criticisms of the Platform

As could be gleaned from the above information and the following table, there are several areas of information asymmetry that Masterworks investors could potentially suffer from:

4.4.1 Securitization Process Information Availability Across Market Players

Step of Securitization Process	Information Known to Decision Makers	Information Known to External Parties	Information Known to Investors
1. Painting Acquisition	Terms of sale, painting for sale, painting investment thesis, projected painting investment horizon, negotiation terms	None	None
2. Construction of Segregated Cayman Portfolios	Details of painting sale, constitution of portfolio assets and liabilities in main and segregated portfolios, estimated true-up and administrative costs	None	None
3. Painting Securitization	All information disclosed in SEC filings, intended timeline for funding, actual true-up and administrative costs, split between shares	None	None
4. Painting Upload Onto Platform	Timeline for funding, desired amount of investors/investment, investment thesis to display, information displayed on the website (Historical price appreciation of similar works, % progress of funding, investment thesis [artist background, number of lots sold, recent auction sales, painting details, painting image], offering circular)	Information displayed on the website (Historical price appreciation of similar works, % progress of funding, investment thesis [artist background, number of lots sold, recent auction sales, painting details, painting image], offering circular)	Information displayed on the website (Historical price appreciation of similar works, % progress of funding, investment thesis [artist background, number of lots sold, recent auction sales, painting details, painting image], offering circular)
5. Painting Funding	All information disclosed in SEC filings, intended timeline for funding, actual true-up and administrative costs, split between shares, information displayed on the website	Information displayed on the website	Decision to invest, information displayed on the website
6. Opening Secondary Market	All information disclosed in SEC filings, the intended timeline for funding, actual	External Alternatives Sites: scrape the following information (ex. Vincent)	Information displayed on the website

	true-up and administrative costs, split between shares, information displayed on the website	price per share, market cap, artist background, painting details, # of investors following on the platform, days on Vincent, market cap, historical appreciation, year, ipo date, listed on Vincent date, highlights	
7. Sale of Painting	Investment thesis, investment horizon, seller identity, true proceeds, distribution of pro rata shares, terms of sale	Sellers: terms of sale	Uncertainty around the exact information that investors know upon sale, given that Masterworks has sold one painting to date

The novelty of this platform means that there is very little peer-reviewed literature on the topic, however, according to an analytical blog article on Want Financial Independence, I was able to learn about several further criticisms of Masterworks:

4.4.2 Tax Burden

As demonstrated in the Organizational Structure section, each painting is wrapped into a Delaware LLC, meaning that on an annual basis investors are served a K-1 tax form after the painting is sold. As a collectible, art is subject to a higher long-term capital gains treatment than equities: a 28% fixed collectible tax rate and a 3.8% net investment income tax. In addition to the potential costs associated with preparing a K-1 form per sold painting per year, the taxation costs art investments bear is a seldom-discussed topic that cuts into an investor's breakeven. (Want Financial Independence)

4.4.3 Challenges to Breakeven

There are several costs incurred by investors that make achieving breakeven even more challenging. Masterworks' business platform draws several parallels to the equity markets. In addition to 1.5% of annual expenses, each investor's initial $20 investment in the initial funding funds the true-up costs as well. (Want Financial Independence)

Several aspects of Masterworks' business model remain ambiguous and risk-addled. This leaves room for further exploration as to whether the addition of more disclosure could prove to add more legitimacy to their operations and attract more investors to the platform.

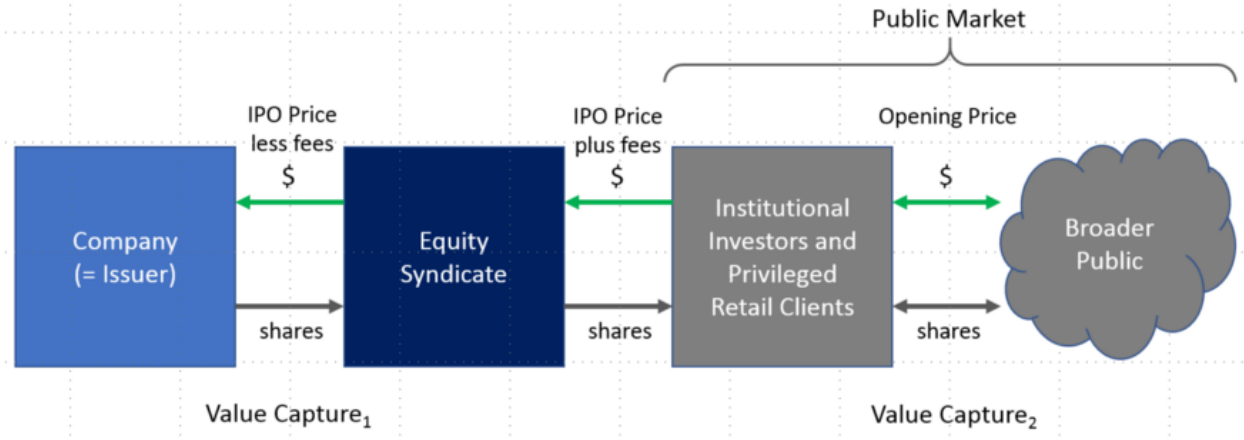
5. The Equity Market & Masterworks

Despite these asymmetries, even as a new platform, Masterworks has the potential to create value for art investors through the creation of its secondary market. In studying Masterworks' securitization process, I was able to draw several parallels to that of the equity market.

5.1 Opportunities for Value Capture in the Equity Market IPO Process

Figure 6 from Medium.com helps to illustrate the IPO process, actors, and opportunities for value capture in the equity market (Keiser 2019).

Figure 6. IPO Process & Actors (Keiser 2019)



As depicted, in traditional equity market IPOs, the company seeks to maximize the value the business receives from the IPO through value capture 1; this means, that the company seeks to maximize the value of the IPO price at which shares in the offering can be sold. Contrastingly, market makers are incentivized to minimize the IPO price to create a value gap in the offering, to ensure the sale of all shares. In value capture 2, investors have an aligned incentive with market makers, wherein they stand to profit from the same value gap that makes for a sizable spread between the IPO price and the anticipated opening price. (Keiser 2019)

A positive value gap in the opening of the secondary market can be seen through IPO pops. An IPO "pop" is when a company's stock price trades much higher on its first day of trading. Laurel Tincher of SoFi Learn writes that "an IPO pop may be a sign that underwriters did not properly price retail

investor demand into the IPO price" (Tincher 2022). In general, several IPOs experience IPO pops, with a record number in both 2020 and 2021. An IPO pop signals that the underwriters could have raised more money in the primary market had they priced the shares higher. A key takeaway from this market behavior is that shortly post-IPOs it is not uncommon for stocks to experience a type of market correction/reaction, resulting in high volatility. (Tincher 2022) Studying post-IPO behavior can help to better understand price discovery regardless of the market.

5.2 Opportunities for Value Capture in the Masterworks IPO Process

In drawing parallels to Masterworks' organizational structure and securitization process, we find that there are notable differences. Masterworks acts as the share issuer, though they don't participate in any market-making fashion during the peer-to-peer transactions of the trading period.

Masterworks mitigates the need to worry about an IPO pop, as they bake in true-up and maintenance fees into the painting's original value. At a fixed IPO price of $20/share, only $18 worth goes towards the actual funding of the painting, making it such that the shares outstanding are consistently flexible to ensure Masterworks' fulfilling and covering all its costs. In value capture 2, Masterworks doesn't reap any direct benefit as it doesn't participate as a market maker. However, in value capture 2, retail investors like those in the equity markets, stand to profit and benefit from value gap arbitrage.

6. Implications of Secondary Markets

Given that both the equity markets and Masterworks platform create secondary markets with similar securitization processes, I was curious to explore what implications this could bear. Secondary financial markets, also referred to as "aftermarkets", allow everyday investors to trade securities that have already been issued by companies, banks, or governments (Lewis 2021). Following the initial public offering of shares, investors are allowed to trade! In auction markets, buyers and sellers can post competitive bids simultaneously; traditionally, brokers on these exchanges such as the NYSE pair buyers and sellers together with compatible bids in exchange for a fee. For the context of this paper, we will be discussing auction secondary financial markets, without focusing on dealer or OTC markets.

In general, secondary markets (Lewis 2021):

- Provide smaller, retail investors the ability to participate in the market
- Create liquidity
- Offer a method of price discovery, through the continuous push and pull of supply-demand dynamics nudging a security's price towards its equilibrium market value.

In this paper, I will largely study the implications of secondary market liquidity. As a result of increased market participation, secondary markets provide more liquidity because buyers and sellers are able to sell and buy shares, respectively (Boyle 2022). Robert Johnson, a finance professor at Creighton University, was quoted as, "robust secondary markets also provide liquidity. They allow investors to buy and sell securities quickly without significant loss of value" (Lewis 2021).

II. Research Hypothesis & Question

With this background in mind, I formulated my hypothesis and research question as follows:

Hypothesis: Secondary markets facilitate increased transactions and liquidity. These forces in tandem should contribute to the more efficient allocation of resources, better price discovery, and increased investor confidence.

Question: How does the creation of and consequent participation within the secondary art market, through securitization, impact liquidity?

III. Literature Review

7. "Illiquidity & stock returns: cross-section and time-series effects" by Yakov Amihud, 2002

In Amihud's paper, he describes the challenges past attempts at understanding market liquidity have encountered. Liquidity alone is described as an "elusive" concept since it can be interpreted through broad measures such as bid-ask spreads and volume. However, Amihud uses illiquidity to instead "reflect

the impact of order flow on price -- the discount that a seller concedes or the premium that a buyer pays when executing a market order -- that results from adverse selection costs and inventory costs." Assessing market illiquidity offers a more complete proxy for liquidity itself, as it avoids often indistinguishable effects between the "number of aspects that cannot be captured in a single measure" (Amihud 2002).

Throughout his paper and cross-sectional study analyzing stock returns and illiquidity, Amihud formulates illiquidity as "the average ratio of the daily absolute return [R] to the (dollar) trading volume [VOLD] on that day" (Amihud 2002):

Figure 7. Amihud Annual Average Market Illiquidity Formula (Amihud 2002)

$$ILLIQ_{iy} = 1/D_{iy} \sum_{t=1}^{Diy} |R_{iyd}|/VOLD_{ivyd},$$

Results from this formula can be interpreted as equivalent to the percent value investors lose to illiquidity for every one dollar invested.

Another key takeaway from this paper was Amihud's observations of market capitalization on illiquidity. The small firm effect explains the inverse relationship between the market value of a stock and its illiquidity such that small-cap stocks experience stronger effects of market illiquidity

8. "Designated market makers still matter: Evidence from two natural experiments" by Clark-Joseph, Ye, and Zi, 2016

According to the NYSE, designated market makers (DMMs) are core liquidity providers, responsible for reducing volatility, improving price discovery, and reducing trading costs for investors. The NYSE boasts the highest market share and liquidity, as demonstrated by the following self-reported 2019 Figure 8, and suggests that these results are in part aided by the presence of DMMs for every security on their market. (NYSE 2019)

In "Designated market makers still matter. Evidence from two natural experiments", authors Clark-Joseph, Ye, and Zi study the exogenous loss of DMMs and the impact of their absence on NYSE

market liquidity. A temporary trading halt served as the event study, and helped them to prove that DMMs play a significant role in improving market-wide liquidity: “when the voluntary liquidity providers on one exchange were removed, liquidity remained unchanged; when DMMs were removed, liquidity decreased market-wide” (Clark-Joseph et al. 2016).

IV. Research Design & Methodology

The aforementioned parallels between Masterworks and the equity market motivated me to pursue a comparative research approach. Given the novelty of Masterworks’ platform, it did not seem reasonable at this time (approximately two years into Masterworks’ life as a business and investment platform) to study any potential correlation or causality between the creation of secondary markets on the measures of interest: illiquidity and volatility. Instead by using a comparative approach, I resolved to discern patterns in market behavior that could help me better answer my research question.

In my hypothesis, I posited that the creation of secondary markets for securitized artworks would help contribute to greater democratization and financial opportunity for art investors. To operationalize this, I decided to study how illiquidity and volatility fared within the ArtTech (Masterworks) market, art market, and traditional art market.

Please note that from here onwards in the paper Masterworks and ArtTech data, as well as nanocaps and equity market, are respectively interchangeable.

9. Relative Comparison Between Asset Classes - Masterworks vs. Equity Markets

In the relative research approach, I’m comparing data between the Masterworks and equity market, specifically studying how illiquidity and volatility perform *between* each asset class, in the time period shortly after its IPO, and what parallels, if any, can tell me about the impact of securitization.

Within this approach, I will be specifically comparing the Months 3-6 Post-IPO Nanocap Data and Months 3-6 Post-IPO Masterworks Data data sets.

I hypothesize that similarities in the data will suggest that there are parallel effects of fractional ownership on early performance within secondary markets.

10. Market Evolution Within Asset Classes

In the market evolution research approach, I'm comparing illiquidity and volatility performance *within* each asset class over a given period of time and analyzing what parallels, if any, can tell me about the impact of securitization.

Within this approach, I will be specifically working with the Months 3-6 Post-IPO Masterworks Data and Months 9-15 Post-IPO Masterworks Data datasets for comparing Masterworks and Months 3-6 Post-IPO Nanocap Data and Months 9-15 Post-IPO Nanocap Data data sets for comparing nanocaps.

I hypothesize that over time we will observe the markets becoming more efficient and consequently decreasing illiquidity and volatility, as a result of this efficient allocation of resources and improved investor confidence.

11. Absolute Comparison - Masterworks vs. Traditional Art Market

Performing a similar empirical analysis on the traditional art market proved challenging, due to limits on the available past auction data in addition to sample selection bias skewing available data results towards positive sales returns.

Instead for this portion of my research, I decided to pursue an anecdotal approach that would allow me to capture a general understanding of the traditional art market's structure, key players, opportunities, and limitations. Using anecdotal evidence to understand the ease and frequency with which paintings are sold would allow me to best gauge liquidity and volatility, respectively.

V. Data Sets

12. Masterworks Data Set

Prior to the start of my project, I reached out to the Masterworks sales team to request access to their platform for research purposes. All prospective investors are subject to a screening call, which some criticize as a way of signaling potentially fake pent-up demand (Want Financial Independence 2022). However, through this call and Masterworks' help, I was able to gain access to an investor account.

Masterworks provides limited insight into a single work's past transaction data. Figure 9 displays how historical transaction data is displayed. In addition to the name of the given painting of interest, an investor can also see the date the transaction was completed, the quantity of shares in the transaction, the transaction settlement price, as well as the settlement price's % difference from the IPO price (standardized across all Masterworks' paintings at $20).

The up-and-down toggle arrow on the "Artwork" filter bar, allows for investors to see two views of the transaction data: most-to-least recent and least-to-most recent. On any given day, for either one of these view settings, the platform will only display 8 pages worth 10 individual successful transactions, 80 historical transactions at a time.

I requested Masterworks personnel for potential access to a more robust, complete, and comprehensive set of past painting data but was unable to acquire this information. Instead, I manually scraped transaction data for each of Masterworks' paintings, in order to compile my own repository of limited yet historical data. Please note that none of these scraped data points were used towards personal investment decisions and my use of the platform was solely for academic study.

Recent Months 9-15 Post IPO Masterworks Data Set Beginning in October 2021, I began using the most-to-least recent filter view to manually collect 80 transactions worth of data at a time for each painting. Up until March 2022, I regularly monitored the website to add more recent data to my compiled repository. Over this six-month period, I compiled historical transaction data for 44 Masterworks

paintings (57 are currently trading on their secondary market as of May 2022). Masterworks does not clearly publicize the exact IPO date for each painting so I instead obtained IPO dates for Masterworks data, where available, from a tangential platform called Vincent, an alternative investments search engine.

For each of the 44 paintings, I compiled historical transaction data for IPOed at various times. For this sample, the start dates were on average 9 months post-IPO, with transactions spanning on average 7 months from that point.

In this sample, the average # of transactions collected per painting was 187 and the average number of individual days' worth of historical transaction data collected was 88.

Early Months 3-6 Post IPO Masterworks Data Set Using the least-to-most recent view, I was able to collect the earliest available data for each painting on Masterworks' platform. The least recent starting date for each painting was inconsistent across Masterworks' portfolio of paintings, causing the first transaction date per painting to vary in a number of months post IPO.

The earliest available and largest sample of data for Masterworks was for paintings with start dates on average 3.33 months post-IPO, with transactions spanning on average 2.63 months onwards from that date. As such, I decided to use paintings with the first date as ~3-4 months post-IPO because this was the largest group of paintings that were also early enough to be considered "shortly post-IPO." The sample size was 19 paintings.

Since this sample did not require more recent data, I did not have to regularly update this data as I did in the previous Masterworks sample. As such, this sample included only "one-take" of the maximum (80) transactions from least-to-most recent. Therefore, in this sample, the average # of transactions collected per painting was 80 and the average number of individual days' worth of historical transaction data collected was 36.

It is important to note that the number of individual days of transaction data collected per painting is often not equivalent to the number of days specified in each data sample's name: 90 (for the Months 3-6

Post IPO Masterworks Data Set) or 180 days (for the Months 9-15 Post IPO Masterworks Data Set). This is because Masterworks paintings do not necessarily trade every day.

Raw Data Collection & Calculations The following raw data was collected per Masterworks painting transaction (Further data on paintings both qualitative and quantitative, not enumerated here, were collected from each painting's Circular Offering and Investment Thesis):

- Artwork name
- Date (the transaction was completed)
- Quantity (of shares transacted)
- Settlement price
- % difference from the IPO price (which is standardized across all Masterworks' paintings at $20)
- IPO Date - collected from Vincent

I calculated the following to make the data more robust and manipulable for my analysis:

- Close price - calculated as the weighted average daily settlement price
- Daily volume - in quantity of shares
- Daily volume - in USD
- Close price daily % change
- Volatility of daily returns
- Average volatility of daily returns
- Daily Amihud illiquidity
- Average Amihud illiquidity per painting

13. Nanocaps Data Set

For my equity market datasets, I limited my range of data to stocks that IPOed in 2019. Although only one painting (the oldest, notably) on Masterworks IPOed in 2019, I wanted to avoid equities that IPOed in 2020 in order to control for pandemic-related volatility swings.

It is worth acknowledging that in general nanocap, colloquially called “penny”, stocks are considered higher risk investments because of investors’ propensity to use traditional pump-and-dump and poop-and scoop market manipulation tactics (Hayes 2022). These factors likely also influence liquidity and volatility, however, for the focus of this project, I weighted the tradeoff more favorably towards controlling for market capitalization as best I could.

Further, given Amihud’s aforementioned small firm effect, I decided to restrict my analysis of the equity market around nanocap stocks, which are defined as those equities that are lower than $50 million in market capitalization. To account for the fact that Masterworks’ largest market capitalization painting (using acquisition price as a gauge for the same) is $12,000,000, I consequently narrowed my view to a group of NYSE nanocaps that were on average $32 million in market cap. The group of stocks is labeled “nanocaps” broadly despite the fact that certain tickers were greater than $50 mm in market capitalization, in order to have a sufficient small sample size to analyze.

With these tickers on hand, I constructed the following data sets, constricting the date ranges to each respectively to mirror the number of months post-IPO of the Masterworks’ datasets

Unlike Masterworks data, Google Finance (as several financial reporting companies do) quotes historical data on a daily basis, meaning that the number of transactions available per stock is equivalent to the number of days’ worth of data collected for that given stock as well.

Early Months 3-6 Post IPO Nanocaps Data Set:

The sample size (or the number of individual stocks) in this data set is 18. The average # of transactions and days/stock were 44.

"Recent" Months 9-15 Post IPO Nanocaps Data Set:

The sample size (or the number of individual stocks) in this data set is 20. The average # of transactions and days/stock was 108.

14. Traditional Art Market Anecdotal Data Set

For my anecdotal approach, I relied on the following sources to grasp market knowledge and real market players' experiences:

- Books: *A Guide to Art Market Methods & Sources* by Tom McNulty and *The Economics of Contemporary Art: Markets, Strategies, and Stardom* by Alessia Zorloni
- Websites: Larry's List

VI. Results

15. Relative Comparison Results

Illiquidity in Early Nanocap & Early Masterworks Data (Figure 10) Though the distribution of illiquidity in both samples is right-skewed, the difference in histogram scales clearly indicates that the early nanocap sample data is significantly lower than that of Masterworks.

In this comparison (as well as the market evolution comparison), I excluded two outliers in the nanocap data that had unusually high illiquidity. With their presence in the data set, the histogram distribution looked deceptively similar.

***Volatility in Early Nanocap & Early Masterworks Data* (Figure 11)** We see from both an average and median standpoint, that the volatility in early nanocaps is greater than that of early Masterworks, by 55.45 and 76.90% respectively. This result is surprising as I would have predicted that nanocaps with lower illiquidity would similarly have lower volatility. A potential explanation could be the result of increased

transactions between early nanocap investors helping to tighten bid-ask spreads, and therefore reduce price volatility.

Relative Comparison Takeaways From this comparison, it's difficult to draw conclusive takeaways as neither market reflects a clear parallel to one another. If anything, their respective right skew for both illiquidity and volatility helps suggest that most stocks and painting shares behave similarly in lower spectrums for each measure. This herding towards the left end of the histogram could perhaps be explained by a shared market sentiment or market behavior across both asset classes.

16. Market Evolution Results

Illiquidity Over Time in Nanocaps (Figure 12) Over time, the nanocap illiquidity increased by 43.47% and 111.63% on average and median. As we can see over each of the quartiles, the illiquidity in recent samples is greater than that of the early samples. We can see that across both samples less than 25% of shares help to pull the average higher.

Volatility Over Time in Nanocaps (Figure 13) When analyzing the nanocap volatility over time, we see that the average and median decrease 20.28% and increase 30.43% respectively. We see here where the shape of the distribution in the illiquidity remained consistently right skewed, in the case of volatility over time, the values moved from the lower and upper edges towards the middle, tightening the range. Therefore, I would classify this change in volatility as statistically insignificant with the values just going closer to the mean.

In this analysis, I excluded 1 stock from the sample in recent nanocap data.

Market Evolution - Nanocaps Takeaways In summary, illiquidity increases slightly in nanocaps over time, while the overall change in volatility is not statistically significant.

Illiquidity Over Time in Masterworks (Figure 14) Over time, the Masterworks illiquidity clearly increased over time, as demonstrated by the differences in histogram scales. It is worth noting the significant difference in the sample composition (from the sample size, average number of transactions per painting, and average number of days' worth of transactions collected per painting) could potentially be attributed to this magnitude of increase.

Volatility Over Time in Masterworks (Figure 15) Similar to the nanocap market, in the Masterworks data we don't see a significant change in volatility over time. The histogram depicts a clear shift towards higher volatility in the second bucket of values, however, the overall range remains relatively consistent.

Market Evolution - Masterworks Takeaways In summary, illiquidity increases significantly over time, with little change in volatility.

Comparing Both Market's Behaviors Over Time The general behavior observed in both nanocaps and Masterworks over time is similar, with increased illiquidity and little change in volatility. However, the increase in illiquidity in Masterworks is much greater than that increase observed in the nanocaps. This takeaway, alongside that of the relative comparison wherein illiquidity is similarly lower in nanocaps overall, helps prove that Masterworks, despite its securitization, is still too nascent of a platform to be comparable on illiquidity terms to that of the equity market. If this analysis were to be replicated in the future, it would be interesting to observe whether Masterworks is able to close this significant gap between itself and the equity market and whether this could signal market efficiency over time.

Potential explanatory drivers between increased illiquidity and general constant volatility in both market over time include the following:

- Discrepancies in data composition in the Masterworks sample, as previously mentioned

- Evident omitted variables between both markets, including those previously mentioned, and especially, the presence of DMMs for every NYSE-listed security, including those in the nanocap samples
- Decreased investor interest in both markets in months further out from the original IPO date

17. Absolute Comparison Results

While there are shared characteristics limiting an art's liquidity regardless (artists' popularity and marketing), a key distinguishing factor is how online platforms are redefining models of art consumption. There is a shift away from societal and decorative needs, towards a greater emphasis on cultural-interest and speculation/investment. This shift in the demand profile inherently expands the investor base and helps to add more liquidity. Limitations on sales prices limit quantifiable results.

Market Players & The Emphasis of the "Collector" On a broad scale, Tom McNulty in *A Guide to Art Market Methods & Sources* defines the traditional art market players as (McNulty 2014):

Artists - Artist success is measured by critical reception and augmented by dealer and collector patronage. Public acclaim, not easily quantifiable, drives artist popularity.

Dealers, auctioneers, art advisers, and consultants - Serve as intermediaries between producers and consumers of art. Their systems arguably define the liquidity of the traditional art market. These keepers of the market control information distribution to the public. The difference between galleries and auctions helps to demonstrate this. Gallery prices are often changing, with the actual price paid for artworks in galleries remaining confidential to the buyer and seller exclusively. Conversely, sales data at auctions are recorded and made public. Of course, this data is subject to the earlier sample selection bias we discussed, but it does provide the most reliable data we have at present on the market.

Collectors - Stratified into individual and institutional. The monetary value of artworks is closely tied to the people or organizations that possess and sell them. To understand the degree to which collectors matter, it is important to note that value can change overnight following deaccession from collections of powerful collectors.

The below row is a table of screenshots from Larry's List, a leading art market knowledge company that specifically provides data and research on contemporary art collectors. The Larry's List Art Collector Database boasts over 3,500 profiles of international art collectors and is the leading source to understand where artworks reside amongst the world's art connoisseurs and collectors. As the compiled screenshots of articles on Larry's List demonstrate in Figure 16, collectors of fine art are not only responsible for the circulation of artworks but also inherently have their own community that bestows and upholds the status of exclusivity and wealth. (Larry's List)

Figure 16. Preview of Larry's List Articles (Larry's List)

| THE TALKS

The Collector Couple Who Met Each Other at Venice Biennale

26.01.2022

| LARRY'S LIST TV

New Video Series! ART INSIGHTS with Actress and Art Collector Zhu Zhu

15.04.2022

| THE TALKS

A Collection Is Like a String of Pearls

20.01.2022

Shifting Emphasis on Art Models of Consumption In *The Economics of Contemporary Art: Markets, Strategies, and Stardom*, Alessia Zorloni contends that there are four models of art consumption (Zorloni 2013):

1. The first model is linked to cultural-interest motivations and stems from a completely inner, aesthetic need, in which the consumer's emotive side predominates.

2. Secondly there is the model which proceeds from a decorative need, connected to the necessity of establishing a pleasant working environment: the functional aspect takes the upper hand here.

3. A third model is based in speculation, bringing together passion for artworks and the need to invest savings beyond the reach of currency fluctuations and fiscal risks: here economic criteria are the most important ones.

4. Lastly, societal motivations are those that consider the collector's activity not as an end in itself, but as a source of social prestige able to respond to need in the symbolic domain.

As our aforementioned discussion on current art market inefficiencies and community of collectors helped to illuminate, a high threshold for purchase limits how actionable certain models of consumption are to low net-worth individuals. ArtTech solutions that dismantle cost as a barrier to entry, cause an emphasis on the first and especially third model. Shifts toward online art investment however devalue the second and fourth model and redefine the place of art as no longer a physical symbol of decoration or societal status.

Liquidity in the Traditional Art Market With regards to liquidity specifically, in the traditional art market, Zorloni states that "the most liquid artists are also those who are most in-demand on the market" (Zorloni 2013). Figure 17 from Zorloni depicts the curvature of an artist's popularity and life cycle.

Where an artist's popularity may be an arbitrarily easy gauge to those deeply cognizant of market trends, in general, it is not easy to ascertain to everyday investors and moreover causes higher illiquidity for investors seeking to invest in non-popular artists' works. This applies to fractional ownership markets as well, however, a centralized marketplace like Masterworks offers the ability for investors to much more easily consider and trade potentially non-popular artists.

Volatility in the Traditional Art Market Although auction sales prices are publicized, past sales data for any one given piece is not easily available. As discussed earlier, provenance for artworks is highly inaccessible. In certain cases, artists can have catalogue raisonnes. These are "comprehensive, annotated listings of all the known works of an artist either in a particular medium or all media" (NYPL). However, these are not guaranteed to be available across all artists in an investor's investment universe, or guaranteed to include the sales price history. Without being able to gain a clear understanding of how the price for a single asset has transformed over time, it is impossible to truly comprehend a given work's price volatility.

Absolute Comparison Takeaways While there are shared characteristics limiting an art's liquidity regardless of the business model (artists' popularity, for example), a key distinguishing factor is how online platforms are re-defining models of art consumption. There is a shift away from societal and decorative needs, towards a greater emphasis on cultural-interest and speculation/investment. This shift in the demand profile inherently expands the investor base and helps to add more liquidity. Volatility is virtually inaccessible market-wide in traditional landscapes, helping to demonstrate how fractional ownership models increase information access for this metric.

VII. External Validity

The world of ArtTech is still developing, and while it portends potentially exciting opportunities, it is important to note that the novelty of the market limits our ability to extrapolate this study's results fully. Additionally, as mentioned earlier, Masterworks is but one of many new types of strategies targeted at securitizing the art market and therefore findings in this study are likely not applicable to other business models.

VIII. Future Research Avenues

Nevertheless, the world of art market investing is new and still leaves much to be discovered! The following are potential paths for research that would be worth further exploration:

- Drivers of asymmetric illiquidity and volatility patterns over time in Masterworks and equity market data
- The impact of the addition of designated market makers within Masterworks
- The impact of increased information disclosure surrounding Masterworks' business model on the amount of investor interest or confidence in the platform
- Price discovery in months 0 onwards post-IPO within Masterworks, specifically investigating whether price settling behaviors mimic or resemble that of equity markets and/or equity market IPO pops
- Comparison of trajectory to investment break-even given risk-neutral trading strategies across fractional ownership platforms i.e. the most investor-friendly art market fractional ownership platform

IX. Figures

Figure 1. Tokenization Process of Maecenas (Maecenas)

Figure 2. General Business Model of Masterworks (Masterworks)

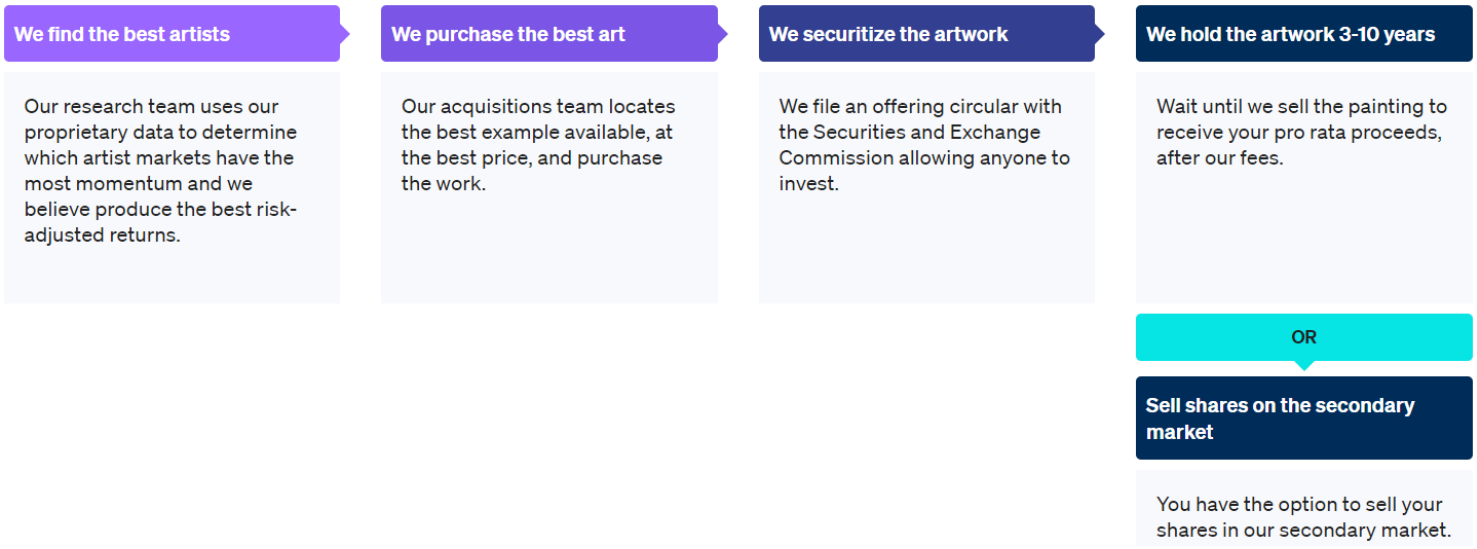


Figure 3. Investor View of Masterworks' Initial Offering (Masterworks; specific price/investment information is redacted)

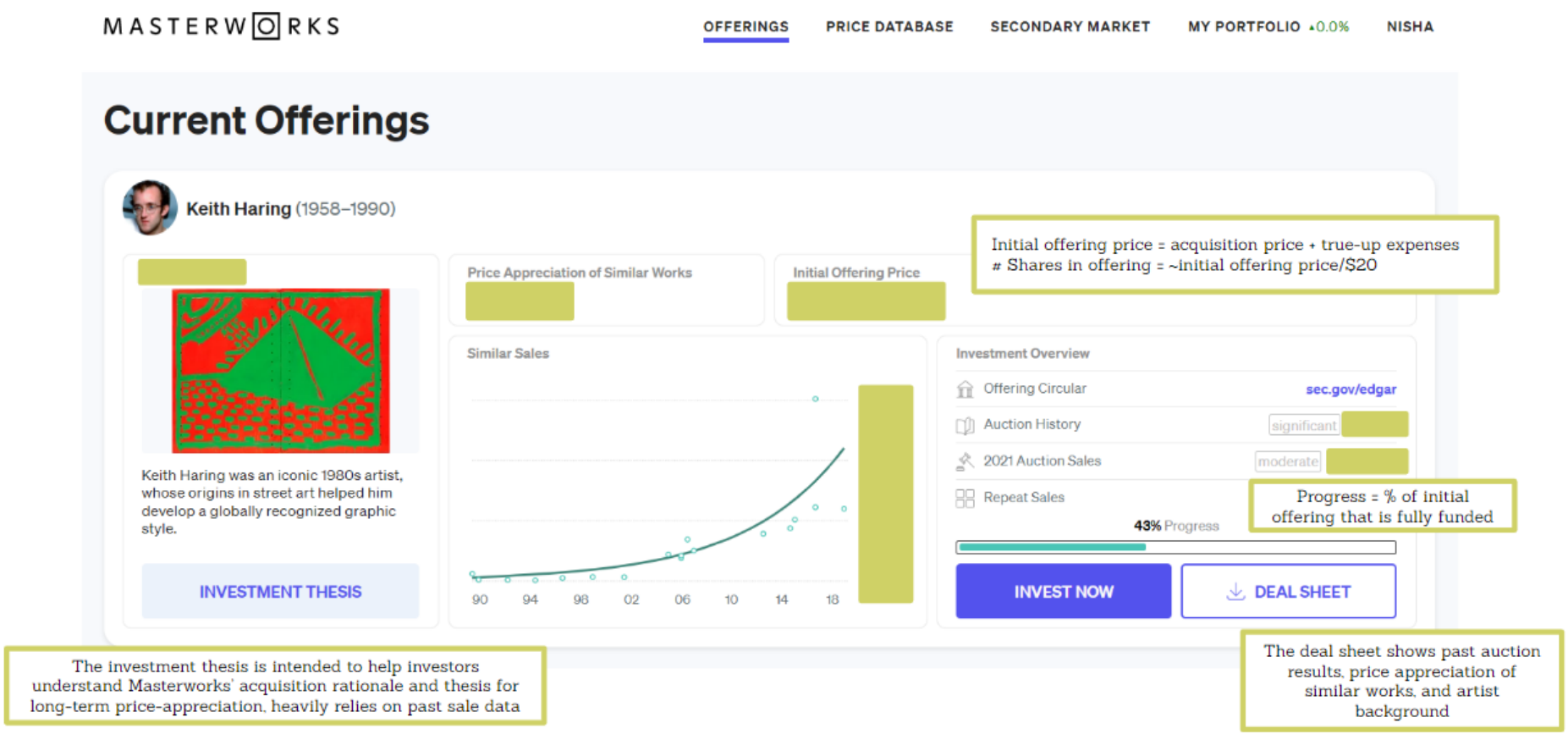


Figure 4. Investor View of Participating in Initial Offering (Masterworks; specific price/investment information is redacted)

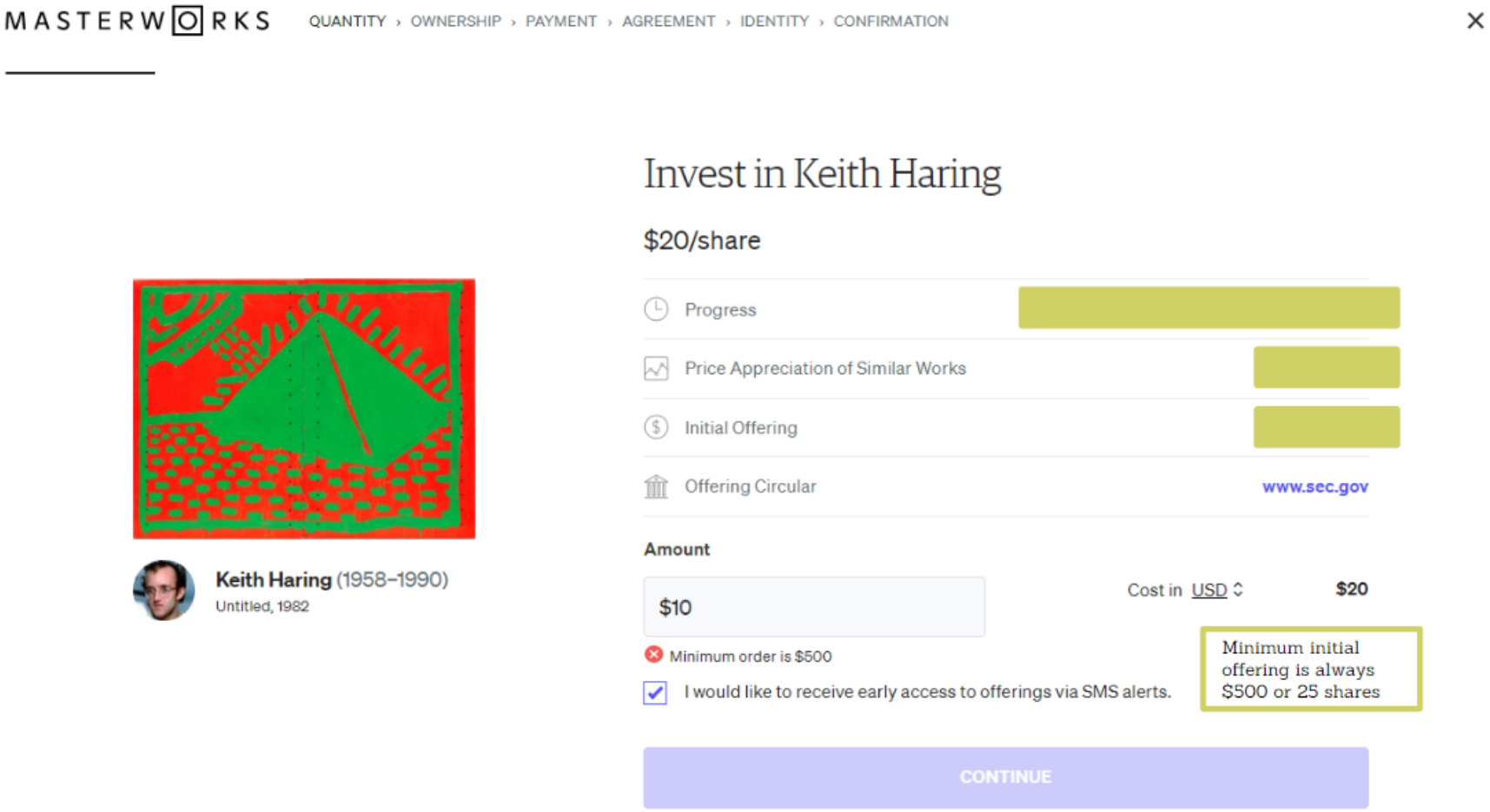


Figure 8. NYSE DMM Statistics (NYSE 2019)

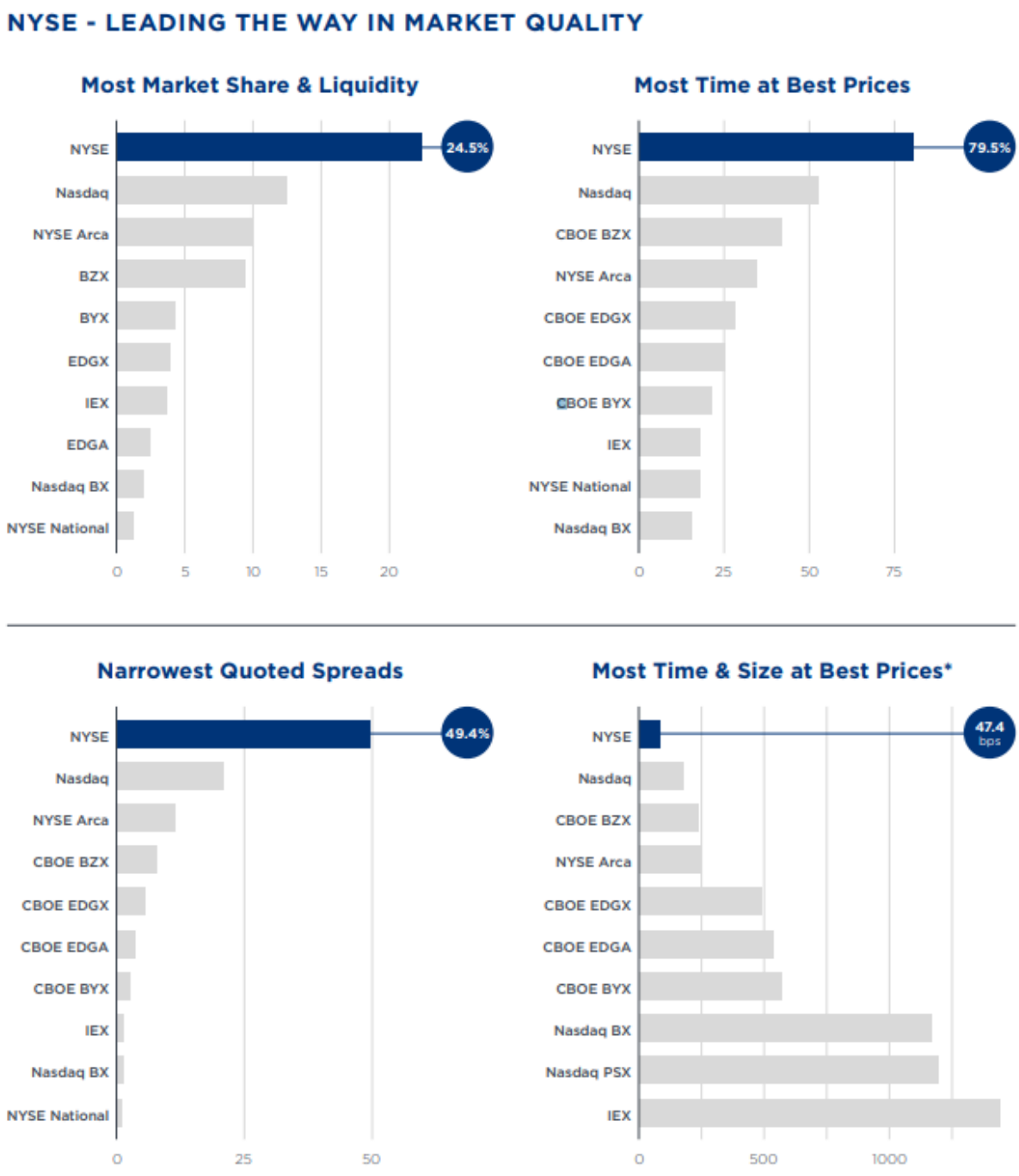


Figure 9. Masterworks' Secondary Market Trade History Page (Masterworks; specific price/investment information is redacted)

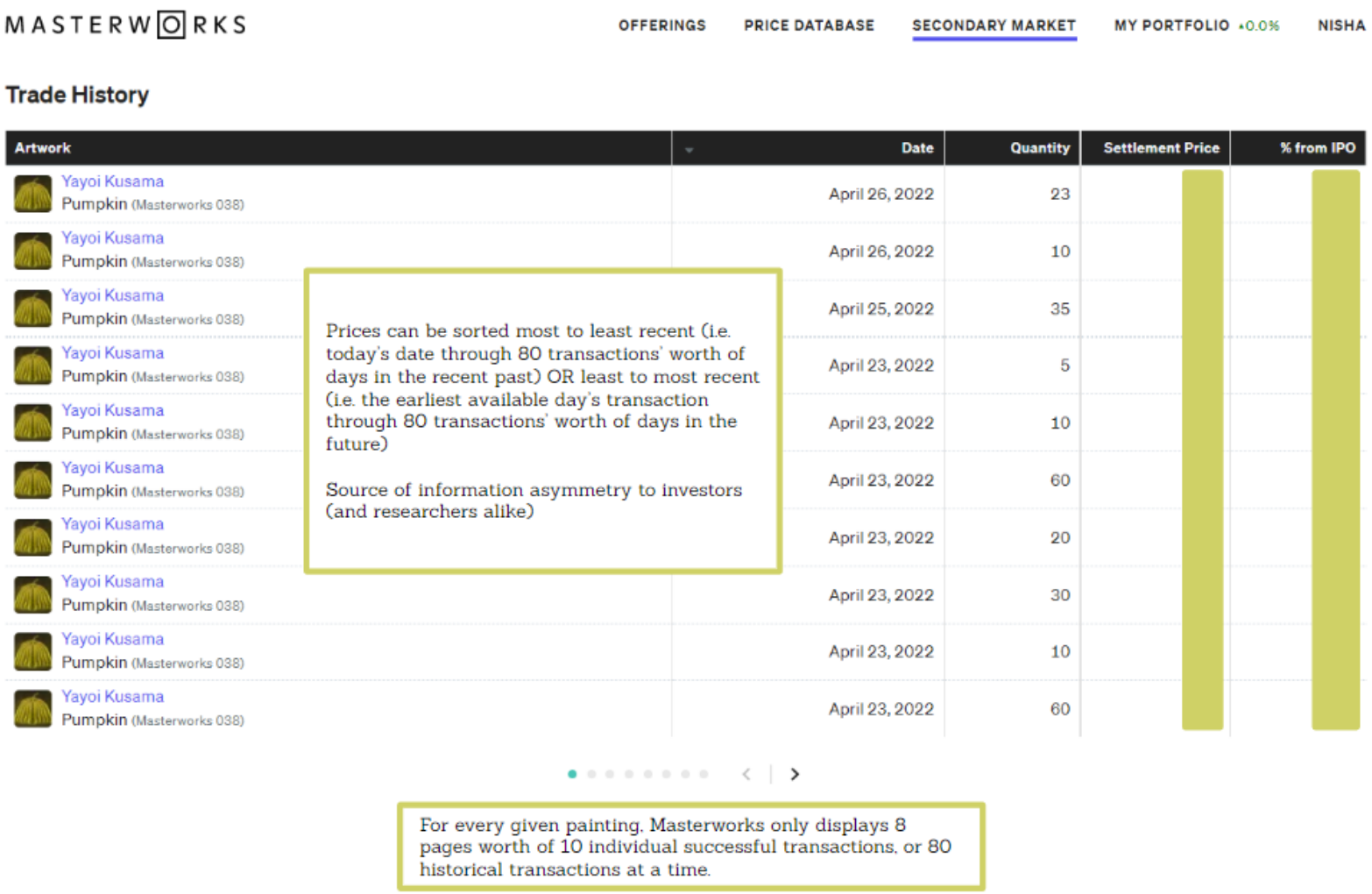
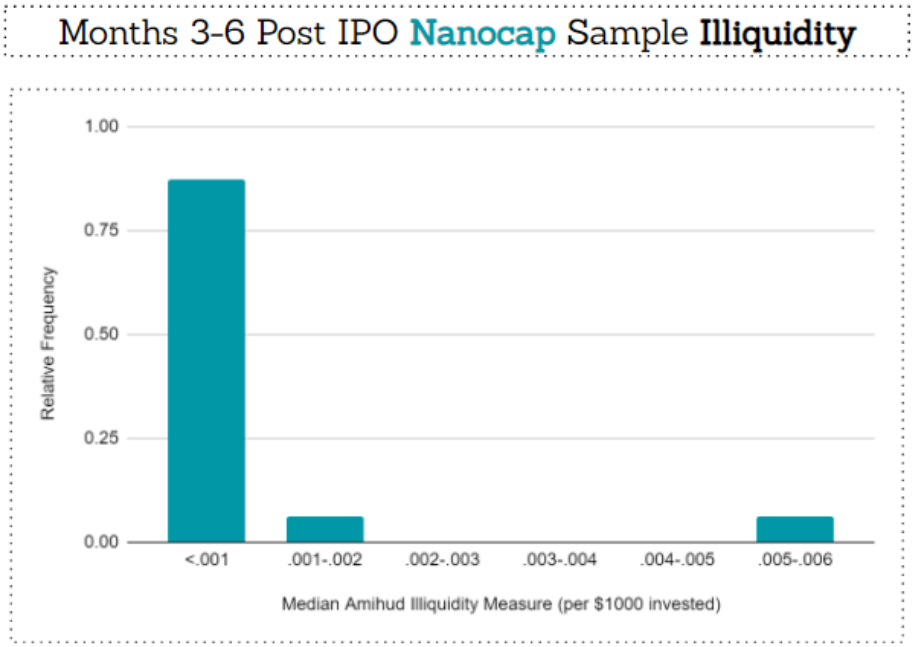


Figure 10. Illiquidity Per $1,000 Invested in Early Nanocap & Early Masterworks Data (*note difference in histogram scale)



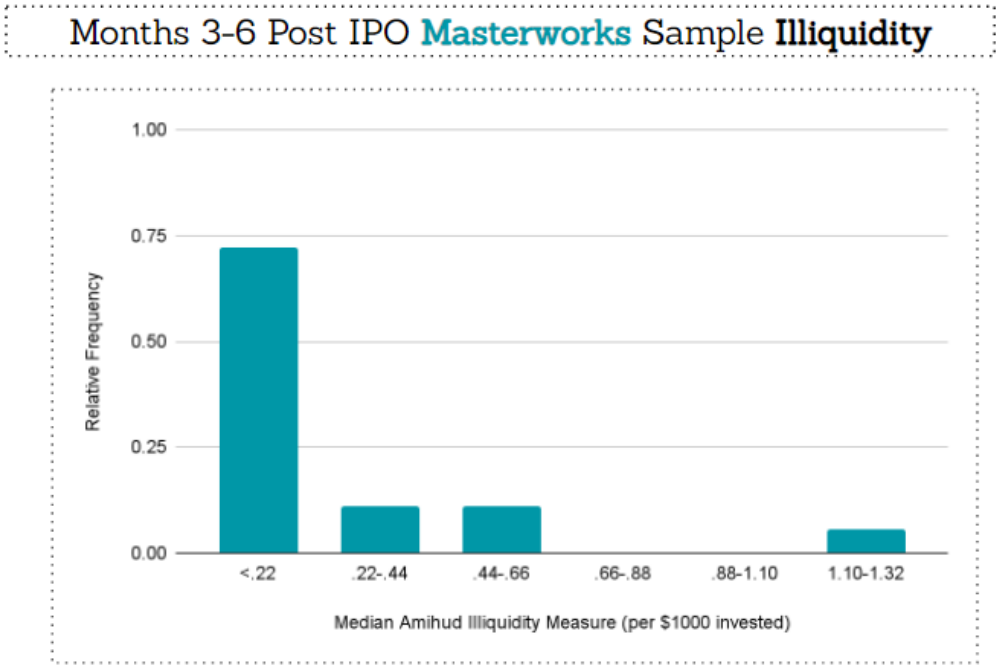


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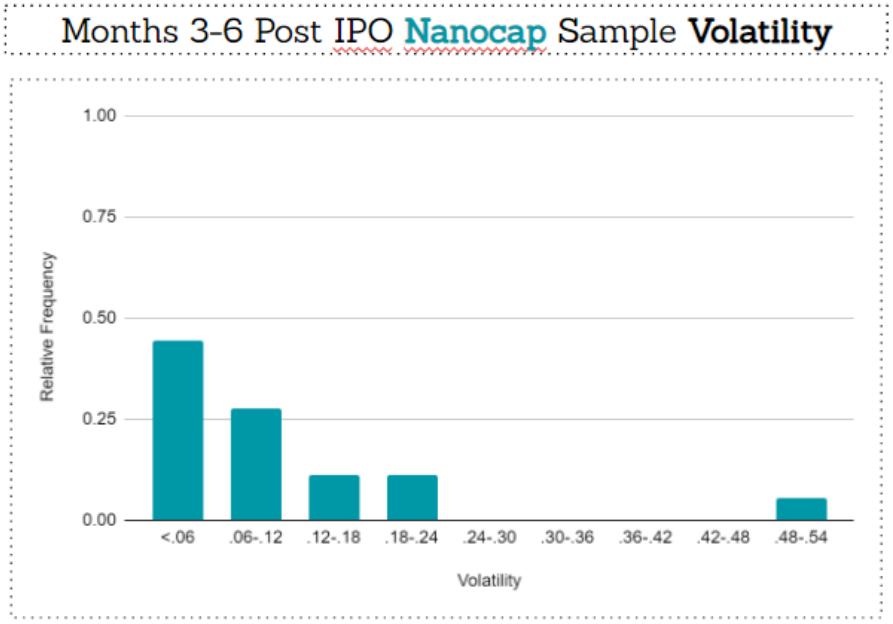
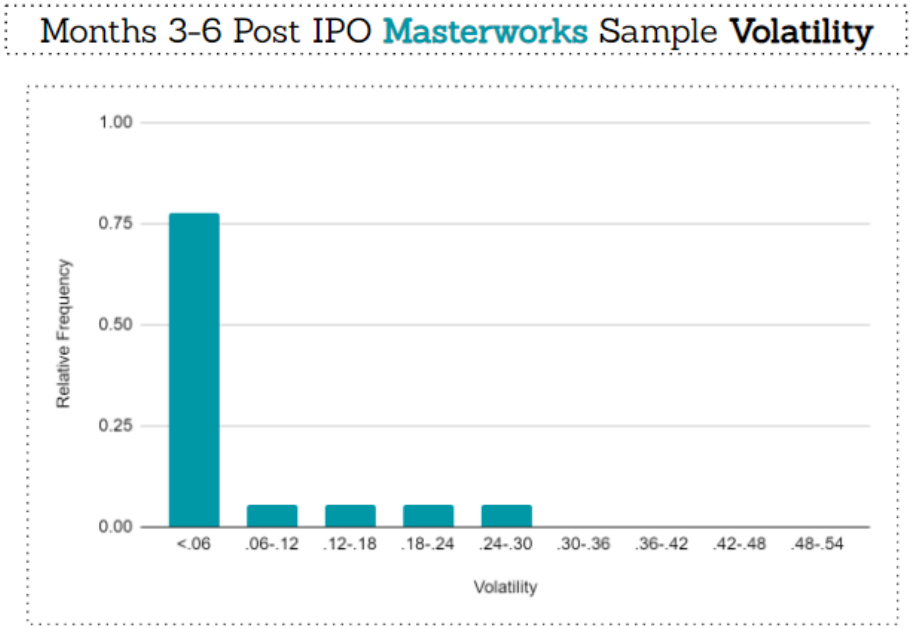
Figure 11. Volatility in Early Nanocap & Early Masterworks Data





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Median	0.06360619
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Max	0.51568811

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Average	0.06750343
Median	0.03595667
Min	0.01497777
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Median	0.03595667
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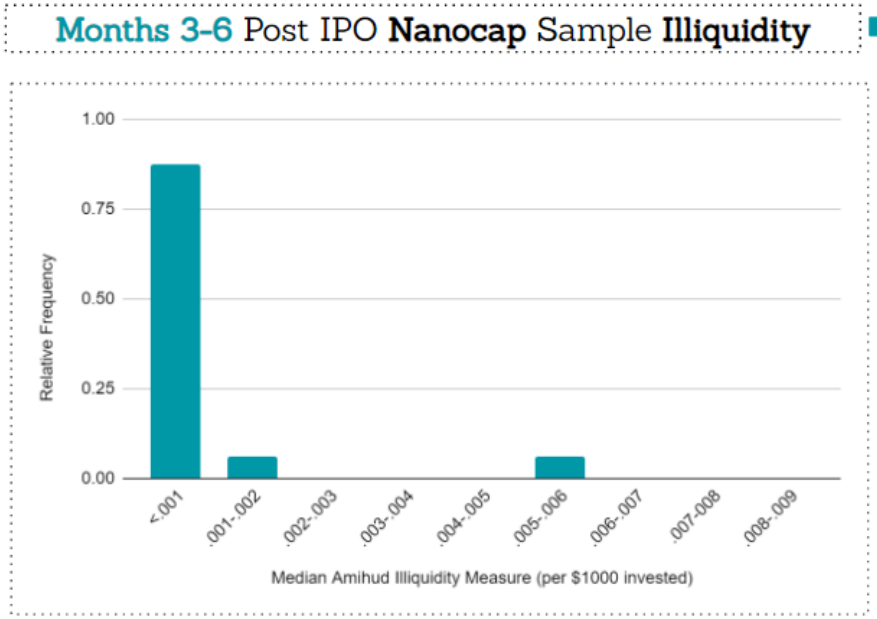
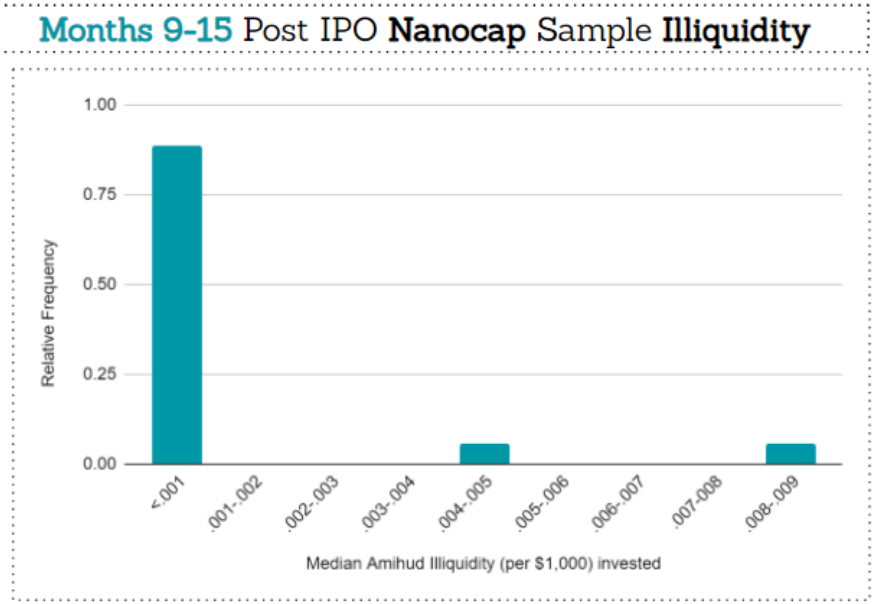
Figure 12. Illiquidity Per $1,000 Invested Over Time in Nanocaps





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Max	0.00535295

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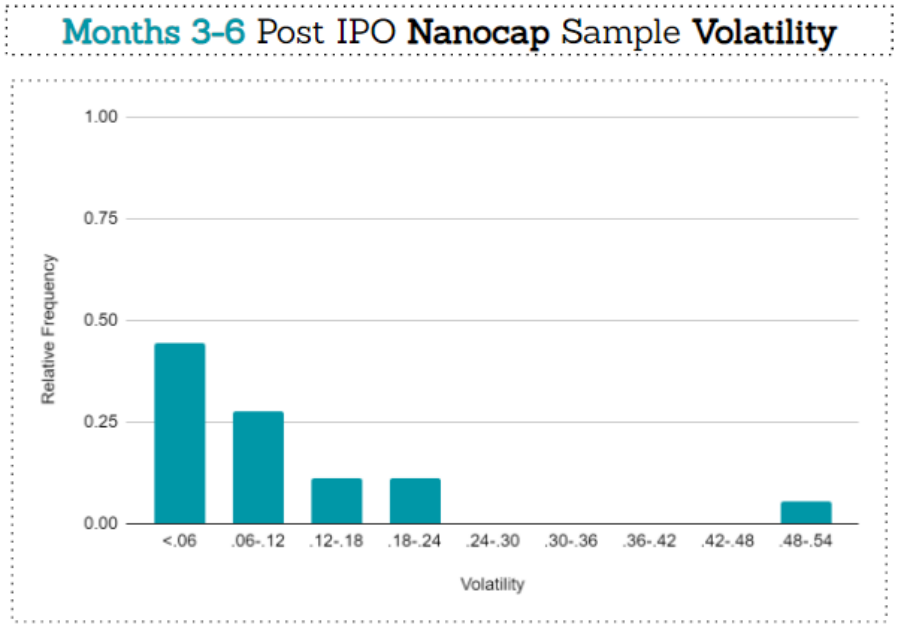
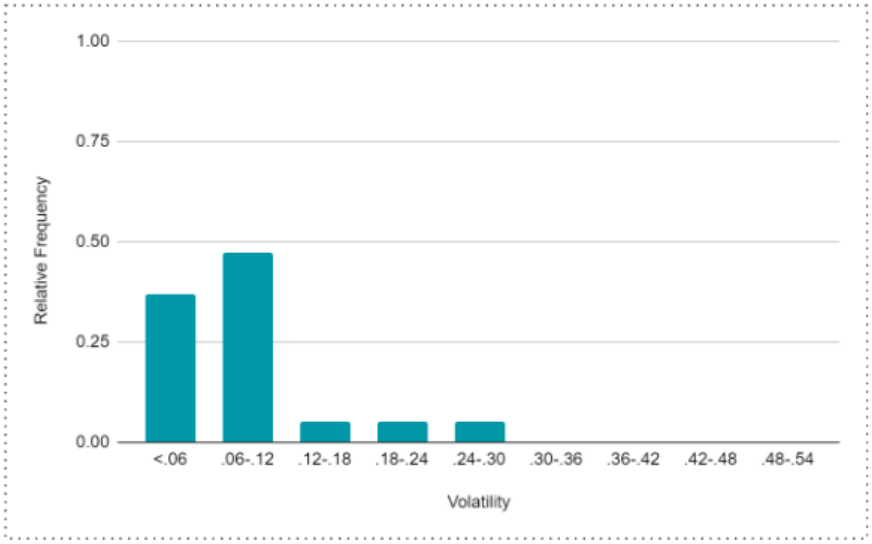
Figure 13. Volatility Over Time in Nanocaps





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First Quartile	0.03503143
Median	0.06360619
Second Quartile	0.06360619
Max	0.51568811

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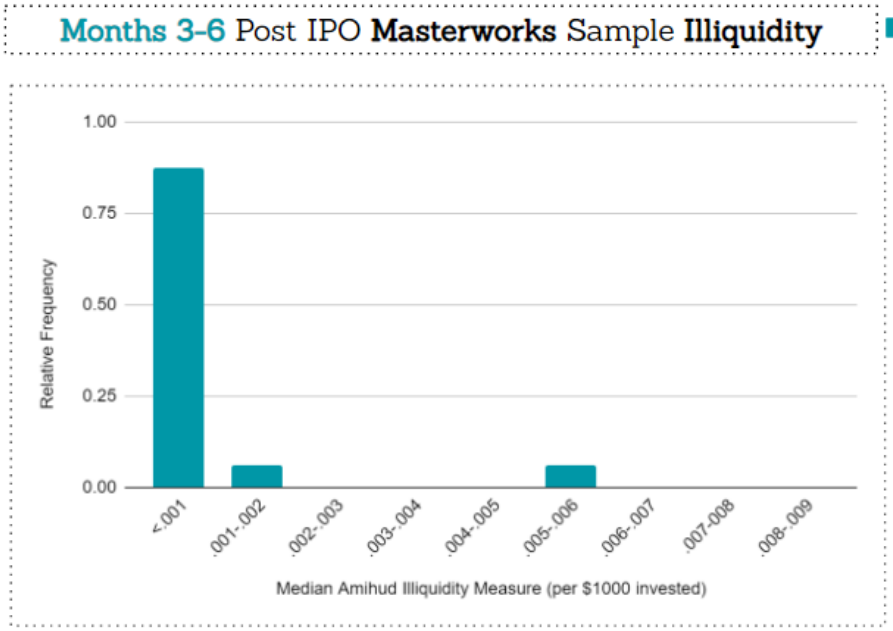
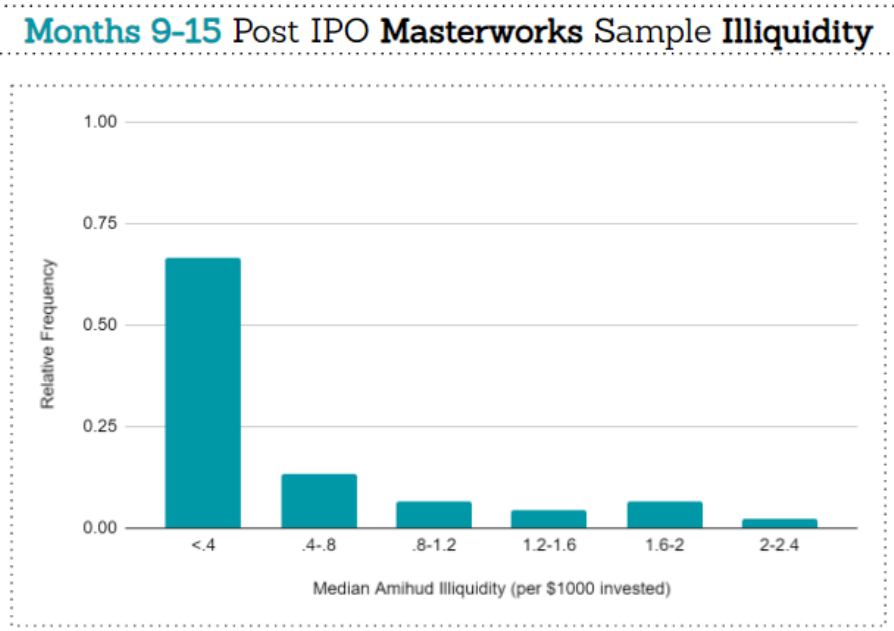
Figure 14. Illiquidity Per $1,000 Invested Over Time in Masterworks (*note difference in histogram scale)





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Second Quartile	0.25001054
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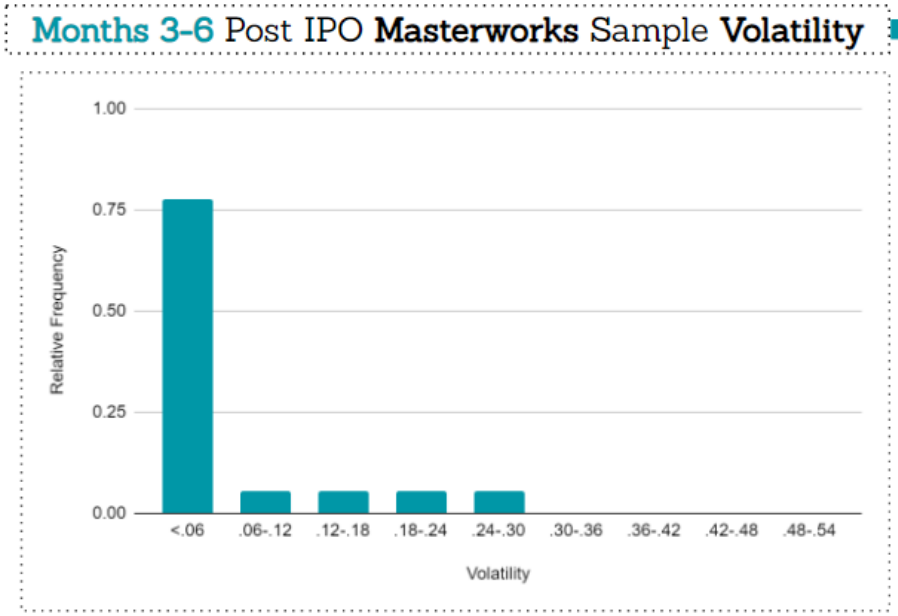
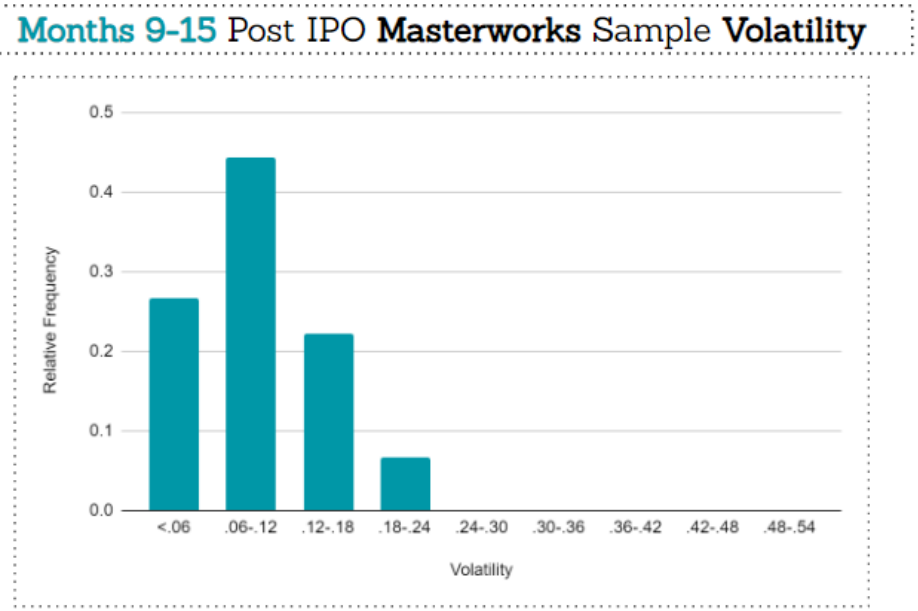
Figure 15. Volatility Over Time in Masterworks





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Second Quartile	0.03595667
Max	0.28321969

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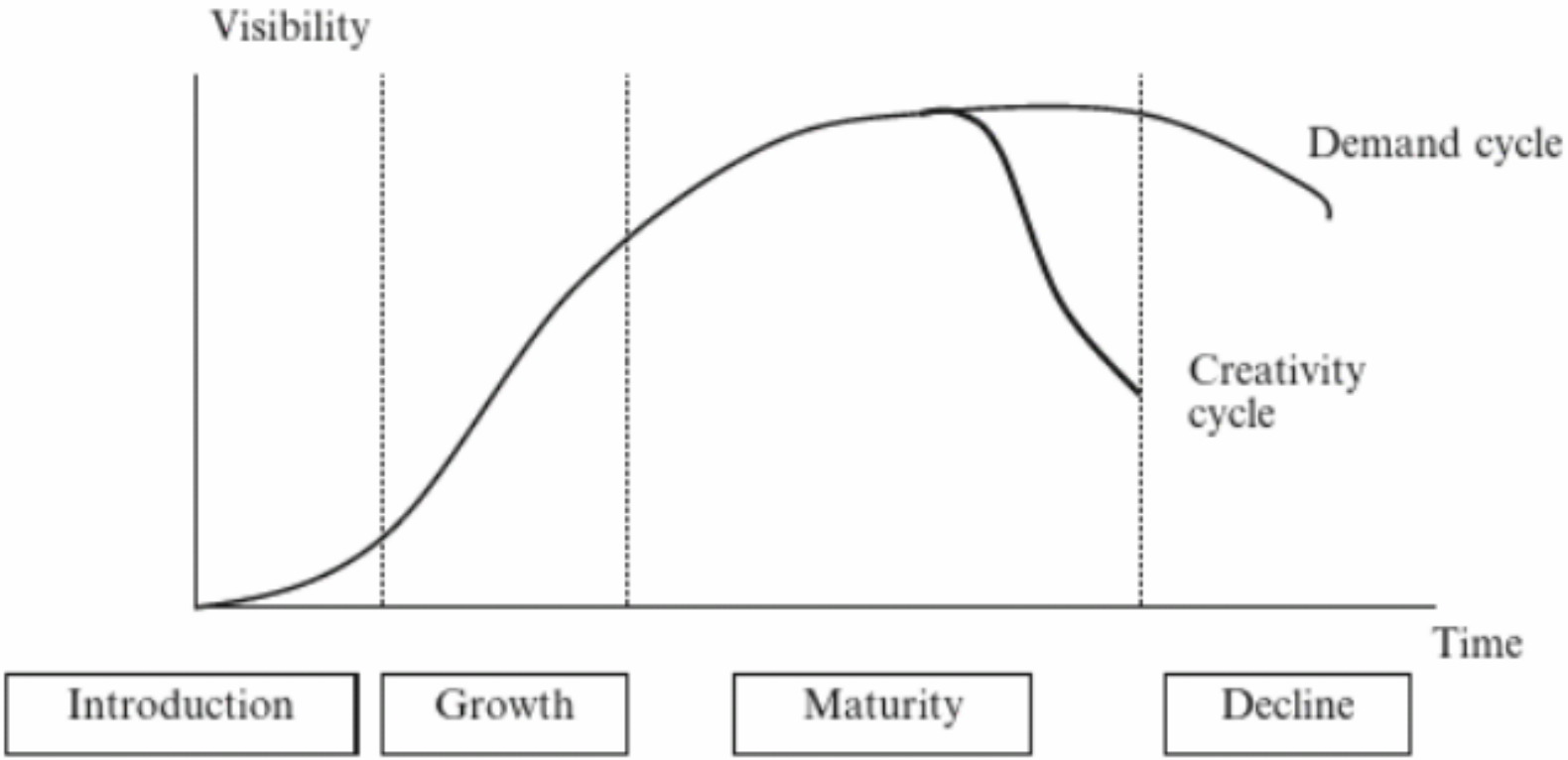
Figure 17. Artist's Popularity Life Cycle (Zorloni 145)



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