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IPO vs Direct listing, an evolving listing environment.

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Contents

ABSTRACT

Direct listing became an option for companies getting listed in the US in 2018 with the NYSE being the first to allow the procedure. The study attempts to discover the effects of the alternate listing method has on the first day of trading. The initial hypothesis being lower first day gains and higher volatility and Bid-Ask spreads. With the rollout the NYSE has claimed that the direct listing improves the market quality of the stocks being listed, namely lower cost of capital, lower volatility, and tighter spreads, while opponents decry the risk of the exact opposite. The study uses data from companies first day of listing to assess these claims. The findings show evidence that first day gains are indeed smaller but little proof that volatility and spreads are affected, when controlling for factors such as size and business sector. The study also looks at theories of first day underpricing and finds evidence in line with predictions made by their writers. Keywords: Direct listing, IPO, NYSE, IPO underpricing, First day gains, Price impact regression

I. Introduction

Getting listed on a stock market has been something that companies do to attain funding for as long as there have been stock markets. In the US the main way to get listed is to have and IPO, and while laws have modified the IPO process over the years, but the material parts of the process have not fundamentally changed.

The introduction of a direct listing process to the current US stock market presents a tangible change to the conditions under which a company can list. This difference between an IPO and a direct listing will be fully explained in chapter 3. The new rules have been speculated to bring about changes for the companies wishing to list. The proponents, such as the NYSE have claimed that the new procedure brings great benefits to eligible companies, while opponents claim it can cause market failure.

Companies choosing to do direct listings means companies have reason to believe the process is superior to an IPO. The fact that the majority of companies did not list directly suggests that the benefits are limited. The winner's curse hypothesis of IPO underpricing suggests that rationing of stocks is the key friction behind IPO underpricing. We can therefore hypothesize that its removal will lead to a removal of first day gains. We should expect both Bid-Ask spreads and volatility to increase however, as the underwriter performs two actions that can be expected to stabilize prices, the underwriter provides price guarantees as well as certification on IPO companies.

Financial markets exist to offer financing to companies as well as enable investors to allocate their capital more efficiently. The cost of capital underpins companies' ability to function, with capital being one of the factors of production. A superior access to capital markets, and by extension capital, enables companies to take advantage of more opportunities to generate wealth. The potential for an IPO is a motivator for early investors to support projects even well before a company can potentially get listed. A more efficient listing process, therefore, can have beneficial knock-on effects on the economy at large.

On the other hand, ineffectual legislation can put investors in danger. The main reason for IPO processes being significantly expensive across legislatures is to protect investors from fraud and ensure the validity of financial markets. While certification is expensive it can be necessary in order to have a market at all.

The NYSE created a marketing material that claims direct listings have been quantifiably superior over IPOs, backing it with its own data of listed companies. Claiming "uninhibited price discovery [through direct listings] reduces the cost of capital and democratizes access and opportunity for all investors." as well as "NYSE Direct Listings have traded with superior market quality in both lower volatility and tighter spreads on Day 1 compared to IPOs." (NYSE, 2021)

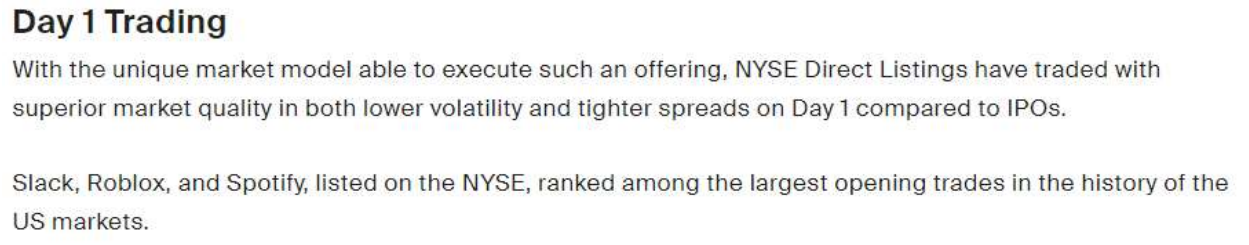


Figure 1 Testable claims made by the NYSE (NYSE, 2021)

If the claims by the NYSE are true, by extension the following hypotheses should be true as well.

1: Direct listings reduce the cost of capital gained from listing.
2: Direct listings reduce Bid-Ask spreads compared to IPOs
3: Direct listings have lower volatility compared to IPOs

On the contrary, market failure would lead failing or fraudulent companies being listed. Assuming markets are rational, investors would then demand a higher risk premium for investing in the directly listed companies. Market-makers would also be less willing to take risks with the newly listed companies and there would be more uncertainty of the "correct" price of a stock, further exacerbated by the lack of price guarantees. This could be expected to lead to higher spreads and greater volatility. The frictions of stock trading are explained in chapter 6 and the efficient market hypothesis that underpins the rationality of market participants is explained in chapter 5.

The contrary hypotheses that will be tested in this paper are as follows.

4: Directly listed companies open trading at a discount
5: Directly listed companies exhibit higher volatility
6: Directly listed companies have larger Bid-Ask spreads

The literature on IPO underpricing is extensive as is elaborated in chapter 4. This paper will look at what implications market-set opening prices have on theories of IPO underpricing discussed in chapter 10.

This paper runs regressions on cross-sectional data collated from the first trading day of IPO and directly listed companies. The goal being to study the effects of the listing method on our data. Our data is discussed in chapter 8. The theoretical foundations of price impact regressions are discussed in chapter 6 and the methodology for calculating our spread coefficients are explained in chapter 7. And the actual regressions are run in chapter 9.

The results of the paper show evidence of first day underpricing being much reduced, but it fails to find evidence for a change in Bid-Ask spreads or higher volatility, when controlling for company specific factors. The findings ae discussed in depth in chapter 10.

Furthermore, it looks at theories for first day underpricing and finds that our findings are in line with the lawsuit avoidance and prestigious underwriter hypotheses but especially the predictions made by Beatty and Ritter (1986) about the uncertainty hypothesis, discussed in chapter 10.

II. Related literature

Direct listings in the US being a recent innovation both data and research are limited. Miles Zheng (2021) has written a paper mostly focusing on the adverse selection implications of direct listings, and then testing them on a sample of stocks from the London stock exchange. (Zheng, 2021) There exists a list of executed direct listings in the US that is being updated by Jay R. Ritter, which also contains some of the basic data on direct listings. (Ritter, 2021) Most of the existing papers however focus on the legal implications of the direct listing process. A good example is a paper by Brent J. Horton (2019) who wrote a paper on the whether direct listings presented the risk of gatekeeper failure. (Horton, 2019)

Studies focusing on the market quality impact of a new development are not uncommon, a good example of this is a paper by Terrence Hendershott, Charles M Jones, and Albert J. Menkveld (2011), which will be referenced extensively later in this paper. Hendershott et. al. study the impact of algorithmic trading on stock liquidity. (Hendershott, et al., 2011)

Glosten (1987) develops the deconstruction of effective and realized spreads, also used in this paper as well as by Hendershott, et al., (2011) and will be gone in to more detail later in this paper. The paper presents a model with asymmetric information that breaks the Bid-Ask spread in to a effective-spread and adverse-selection component. (Glosten, 1987) (Hendershott, et al., 2011)

The more famous measure for measuring Bid-Ask spreads is Roll's measure. The benefit of Roll's measure is that it does not require any limit order data, but rather it can simply be calculated using price movements. (Roll, 1984) As limit-order book data is available to us, potentially providing a more detailed look into the data, Roll's measure was not used.

The paper will also take a look and comment on the well-known puzzle of IPO underpricing. The phenomena first drew attention in the late 60s and has been widely studied since. (Logue, 1973) In this paper we will selectively build on the work of Perera & Kulendran, who collate a large set of the theories developed over the years, of these we will look at some which our findings can shed some light on. (Perera & Kulendran, 2015)

The market microstructure perspectives of the paper build on the efficient market hypothesis created by Eugene Fama (1970). This paper builds on the foundation of EMH, into price discovery, mainly from the book Market Liquidity: Theory, Evidence and Policy (2013) by Thierry Foucault, Marko Pagano & Ailsa Röell.

For definitions of IPOs and listing processes the book IPO: A Global Guide, Expanded, by Philippe Espinasse (2014) is used as a guide.

III. IPOs and Direct Listings

IPO

An Initial Public Offering or IPO enables a company's stock to be traded at a stock market. Stock markets offer access to the stocks and other assets to third-party investors. Listing at a stock market is one of the most important decisions in the lifecycle of a company. (Espinasse, 2014, pp. 1-2)

Being listed gives a company access to an important source of financing for the company and liquidity for previous stockholders. Motivations for listing can be divided in to internal and external reasons. (Espinasse, 2014, pp. 1-2)

The primary internal reason for an IPO is to receive internal funding for a company's operations, this can be done by issuing new stocks, the proceeds of which go directly into the company's cash reserves. The raised cash can then be used to fund new investments, acquisitions or to pay off existing debt, reducing the gearing of a company. An IPO can also be carried out to increase the prestige of a company and raise its profile. (Espinasse, 2014, pp. 1-2)

The external reason for an IPO is for current stockholders to be able to sell and diversify their portfolios for personal gain. (Espinasse, 2014, pp. 1-2) An IPO does however feature a lockup period of either 6 or 12 months or more, where material shareholders (usually owning 5% or more outstanding shares) are not allowed to sell their shares. (Espinasse, 2014, p. 332)

Investment banks are an essential part of the IPO process, and they fulfill three key functions to ensure the success of a stock issue, these are underwriting, advising and distribution. The investment banker can create and build demand for a stock issue, either by directly advertising or simply by "certifying", that is lending its own credibility to the IPO. The investment bank involved will advise the company on pricing as well as legal concerns, while also providing guarantees, such as price guarantees at the time of issue. (Baron, 1982, pp. 955-956) (Banton, 2021)

A part of the distribution process of the underwriter contains book building, alongside an investor road-show. Book building means that the underwriter uses its existing connections to market and sell the IPO to institutional investors. Investors reveal their perception of the IPO to the underwriter by their choice to sign up, giving the underwriter valuable information on the quality of the IPO (Espinasse, 2014)

Underwriting serves an important purpose in certifying companies being listed. Giving companies free access to join the stock market exposes investors to the possibility of fraud. The legislation that requires the underwriting process was implemented to protect investors from fraudulent IPOs. In this case the underwriter acts as a gatekeeper. Normally when listing companies, the investment bank carries significant

economic and reputational risk, making them unwilling to underwrite the listings of companies with insufficient credentials. (Horton, 2019)

Direct listing

"On February 2, 2018, the SEC approved a proposed rule change to the NYSE listing standards designed to facilitate the direct listing of a company's shares without conducting an initial public offering." Later in February of 2019 another rule IM-5315-1 replaced what had been approved in 2018. The major effect of these rule changes was, that it is no longer necessary to conduct an IPO to be listed on the NYSE, but rather, now it is possible to do a direct listing under certain conditions. (Paul, Weiss, Rifkind, Wharton & Garrison LLP, 2018) (Paul, Weiss, Rifkind, Wharton & Garrison LLP, 2019)

In a direct listing the company does not issue new stock, instead already existing shares of previous stockholders are sold. The requirement for underwriting is lifted but an advisor is still required to provide a valuation of the company being listed. The minimum valuation for a company to be eligible for direct listing was set at 250$ million (Paul, Weiss, Rifkind, Wharton & Garrison LLP, 2019)

NASDAQ the major technology company marketplace in the US was quick to follow suit and enable its own direct listing process in 2020. In 2021 both NASDAQ and NYSE applied, and the SEC approved, a direct listing + capital raise procedure, where the minimum valuation for the company was set at 100$ million, allowing the company to raise capital, while simultaneously doing a direct listing. (Ran Ben-Tzur, 2021) (Espinasse, 2014, p. 335)

Direct listings are mainly targeted for tech "unicorns", large tech companies that already have sufficient funding either through revenue or previous private placements. The goal of the listing being mainly to create liquidity for the stock, for the benefit of stockholders. (Horton, 2019)

Direct listings also contain a unique risk where the opening price on the first day must be within the price range written in the prospectus for the Direct listing. When the initial trade creates a price that is outside the price range, trading has to be halted for that day and can be restarted once the prospectus has been amended. (Nasdaq, 2021)

Table 1 A summary IPO vs Direct listing

	IPO	Direct listing	Direct listing + capital raise
Minimum valuation	Small	250M (2018)	100M (2021)
Role of Investment bank	Underwriting	Advisory	Advisory
Pricing	Set price	Initial auction	Initial auction
Investment bank risk	Price guarantees + significant legal risk	Limited legal risk	Limited legal risk

Listing problems

Before the introduction of direct listings there was already discussion about the functionality of the IPO process. In a paper titled "The high cost of IPOs depresses venture capital in the United State" by Dale A. Oesterle the writer argues that IPOs being cheaper would increase their number and allow companies to manage their capital needs better. The total cost of a small IPO can go as high as 17% of the stocks sold, making funding through IPOs unattractive. (Oesterle, 2006)

A company conducting an IPO will lose on average 3% for accountants, lawyers, and advisers. This is followed by an average of 7% for underwriting, followed by another 7% as IPOs are generally underpriced. (Oesterle, 2006) Investment banks also unlikely to carry the risk of litigation in the event of a failed direct listing. It is unclear if investment banks will fulfill their function as gatekeepers when their personal exposure both monetarily and legally is reduced. (Horton, 2019)

With the changes brought about for the direct listing the gatekeeper role of the investment bank is diminished and may lead to gatekeeper failure. On the other hand, the minimum valuation set for direct listing aims to limit the process to well-known high-profile companies for which certification might not be necessary. (Horton, 2019) The risk of uncertified companies being frauds could lead to higher risk-premiums when listing.

IV. First day returns

IPO underpricing

Short-term IPO underpricing refers to the price set, for a stock, before trading starts, being significantly lower than what it is at the end of the trading day. This causes the company conducting the IPO to "leave money on the table", as it could have raised more money by having a higher starting price. (Perera & Kulendran, 2015)

IPO underpricing is a well observed phenomenon, observed by a multitude of studies. It is found in a number of countries with differing market conditions and legal surroundings. On average the effect is more prominent in developing markets, often tied to current market conditions. First day returns can go over 100% on average in developing economies and even developed economies can average close to 50% first day "pops". (Perera & Kulendran, 2015)

Theories for the underpricing

IPO underpricing has been studied extensively and it is one of the better-known puzzles in economics. (Perera & Kulendran, 2015) There exist a large number of theories for why the underpricing is happening.

In this paper we will explore a selection, specifically of those theories we can gain some insight on by looking at volatility and first day gains measures. A more comprehensive list of underpricing theories can be found in a paper by Perera & Kulendran (2015)

The winner's curse

The winners curse hypothesis, first proposed by Rock in 1986, and already mentioned in the introduction. The model in the paper postulates that the cause for IPO underpricing is information trading. The winner's curse causes companies with good prospects to be overbought, causing rationing, where investors only get some of the stocks they wanted. Companies with bad prospects can fall in price on the first day of trading, while all the stocks that were signed up for will be sold to investors. The "winner" therefore either buys a large quantity of stocks with bad prospects or a small quantity of stocks with good prospects. (Rock, 1986)

The winner's curse makes signing up for all IPOs, as an investment strategy, unlikely to be profitable. To encourage investors to buy IPOs they need to be compensated for the risk of signing up for an IPO, that can flop, this being the underpricing. (Rock, 1986)

Lawsuit avoidance hypothesis

All parties that sign an IPO prospectus have legal responsibility for any materially significant omissions. The underwriter faces significant risk, if it can be shown, that there is evidence of overpricing the IPO. To minimize these risks, it is not unreasonable to underprice the IPO. (Perera & Kulendran, 2015)

Prestigious underwriter hypothesis

According to the prestigious underwriter hypothesis, an underwriter can use IPO underpricing as a means to increase its prestige and ingratiate itself with investors. Evidence from Australia between 1994 and 1999 shows that IPOs with an underwriter showed more short-term underpricing than those without. (Perera & Kulendran, 2015) (Dimovski, et al., 2010)

The uncertainty hypothesis

The uncertainty hypothesis by Beatty and Ritter (1986) builds a model where underwriter tries to appease both its investors and the company having an IPO, one wanting the IPO price lower, the other higher, respectively.

The equilibrium created by the model encourages underwriters to price IPOs with more uncertain prospects lower. They then go on to find empirical evidence for their prediction in the US between 1977 and 1982. (Beatty & Ritter, 1986)

The paper then details the minimum conditions for the equilibrium to stand:
1: The underwriter is an imperfect predictor of aftermarket prices
2: The underwriter has reputational risk
3: The underwriter who prices “off the line” will lose customers

V. Efficient market hypothesis

EMH

The efficient market hypothesis or EMH, is a key idea modern of financial theory. First suggested by Eugene Fama, the EMH posits that stock prices which fully reflect all available information are efficient. An implication of the EMH is that it is impossible, on average, to receive above market returns without taking on extra risk. Fully efficient markets incorporate all available information into stock prices, and any price movement is due to new information being revealed. (Fama, 1970)

There are 3 forms of the efficient market hypothesis:

Weak form

The weak form posits that all historical price data is incorporated into prices. The weak form precludes investors from making profits by historical analysis. (Fama, 1970)

Semi-strong

The semi-strong form takes aim at how new developments, such as press releases, or world events, are incorporated into stock prices. In the semi-strong form, the prices immediately and accurately adjust to any new pertinent information being revealed. (Fama, 1970)

Strong

The strong from implies that even insider or monopolistic information is fully reflected in prices. The principle being that those possessing insider information can reveal their information to the market by trading. (Fama, 1970)

VI. Price Discovery

Bid-Ask spread

The Bid-Ask represents the difference between the bid and ask prices at stock exchanges. The bid is the price a trader will get when she sells her stock to the market-maker, while the ask is the price a trader will need to pay to buy the stock from a market-maker. Market-makers put up limit orders offering other traders the possibility to immediately sell or buy the asset. (Foucault, et al., 2013)

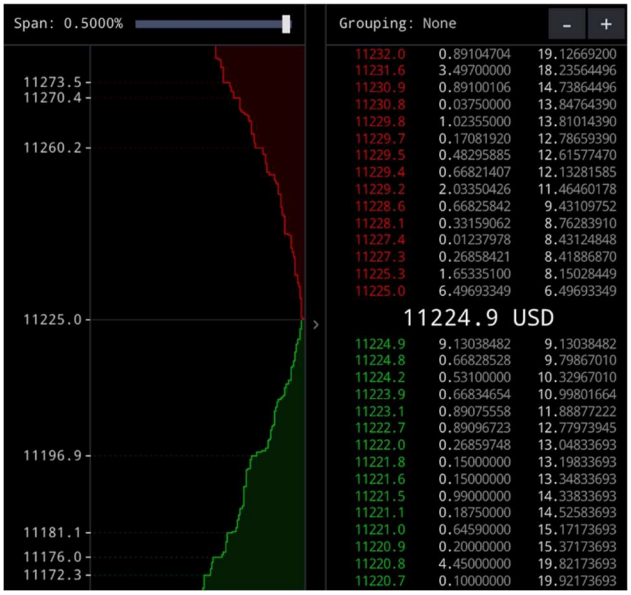


Figure 2 An example of a limit order book (Cryptowatch, 2021)

Limit orders are what create the limit order book, the collection of offers created by traders at certain prices. If a bid and ask offer are entered to the market at the same price, a trade is executed, and the Bid-Ask spread reverts to what is left over from other limit orders. It is therefore precluded that a bid and ask would simultaneously exist at the same set price, this implies that the bid is always lower than the ask price. (Foucault, et al., 2013, pp. 17-18)

Components of the Bid-Ask spread

Frictions are a fundamental part of financial markets. The term frictions encompass a multitude of costs incurred when trading assets at a stock market. Frictions in this case refers to a collection of factors causing Bid-Ask spreads. (Stoll, 2000)

Several factors influence the size of the Bid-Ask spread, these being:

Trading volume

The dollar volume of trade has been statistically shown to reduce Bid-Ask spreads. The theoretical foundation for this is that high trading volume reduces counterparty risk, in other words the market-maker can be more certain to find a counterparty to trade with. (Stoll, 2000)

Stock price

There is some evidence to suggest that higher priced stocks have smaller relative Bid-Ask spreads. The effect is small, but statistically significant. (Stoll, 2000)

Marketplace

The size of Bid-Ask spreads varies according to which exchange it is traded at. There exist a multitude of explanations for this, most significant explanations being the trade volume and the type of companies being traded at specific exchanges. (Stoll, 2000)

Volatility

When there is great uncertainty about the "true" value of a stock, the price of it can vary wildly, even withing a single day. A market-maker holds significant risk, both when selling a stock that's price has just increased, as well as having to hold a stock that's price might drop. To protect himself from this, he needs to increase the Bid-Ask spread. Bid-Ask spreads have, therefore, been shown to increase when the volatility of a stock is high. (Stoll, 2000)

Adverse selection

The EMH as mentioned before, is founded on informative order flow. From the perspective of an uninformed market-maker, it is necessary for him to protect himself from informed traders, who can have a more accurate estimation of the value of the asset. He can do this, through increasing the Bid-Ask spread, which in turn, reduces the profits of informed traders, and gives him more income from uninformed trades. (Foucault, et al., 2013)

Modelling Bid-Ask components

To measure the extent of different factors of the Bid-Ask spread we need a model which separates the different factors from trading data. One way to separate the frictions presented in the previous chapter, is to separate them in to 3 testable buckets, separated by their different effects on prices, illiquidity, adverse selection, and order processing costs. (Foucault, et al., 2013)

Adverse selection

Adverse selection is the part of trading that refers to price revelation in the market. As such better information on the true value of an asset should cause a permanent change in the price a stock is traded at. (Foucault, et al., 2013) This is illustrated in Figure 3

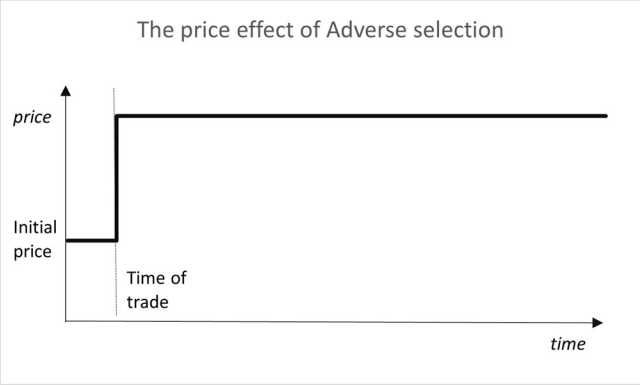


Figure 3 Effect of adverse selection (Foucault, et al., 2013)

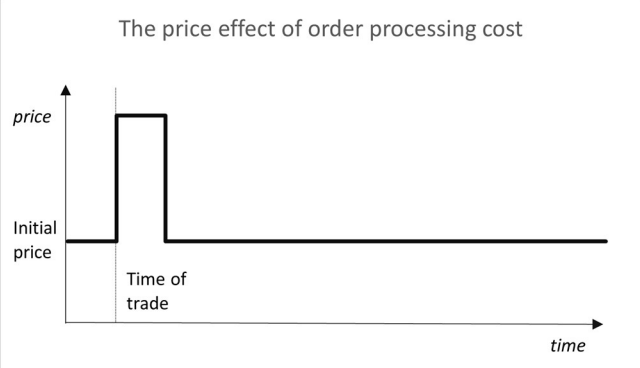


Figure 4 Effect of order processing cost (Foucault, et al., 2013)

Order processing cost

Order processing refers to 2 separate frictions. One is transaction costs, that are collected by the marketplace at which the equities are traded, the other is rents collected by market-makers. Order processing costs are a friction, that cause Bid-Ask spreads, but reveal no information as to the real value of the asset, therefore when a new trade is made, the trader bears the cost, but the transaction cost component of a price will revert to 0. (Foucault, et al., 2013) This is illustrated in Figure 4

Inventory holding costs

Inventory holding costs are due to market-makers building up inventories as trading progresses. This signal also contains little new information, but prices revert to original conditions slowly as the market-maker offloads excess inventory. (Foucault, et al., 2013) This is illustrated in Figure 5

Total effect

As trading effects don't happen in isolation, all 3 effects can be observed in a single trade, creating a combined move in the market, illustrated in figure 6. (Foucault, et al., 2013)

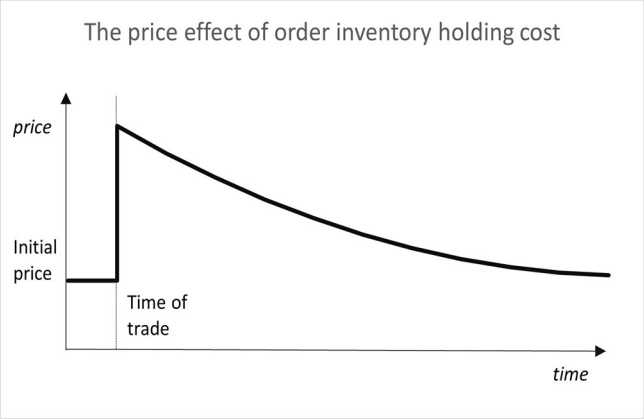


Figure 5 Effect of inventory holding cost (Foucault, et al., 2013)

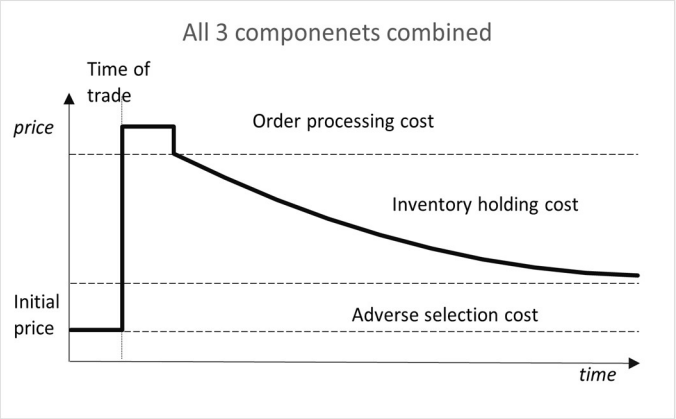


Figure 6 The combined effects on a trade (Foucault, et al., 2013)

VII. Estimating liquidity and spreads

This paper uses the method first created by Glosten (1987) and then added to by Terrence Hendershott, Charles M Jones, and Albert J. Menkveld (2011) in the paper "Does Algorithmic Trading Improve Liquidity?", to deconstruct trading data.

To estimate the liquidity components of our stocks in this paper we use quoted half spreads, effective half spreads and 5-minute effective spreads as well as 5-minute price impacts. (Hendershott, et al., 2011) Quoted spreads as well as quoted midpoint are calculated as follows:

$$Q_{jt} = a_{jt} - b_{jt}$$
$$m_{jt} = \frac{a_{jt} + b_{jt}}{2}$$

Where *j* stands for the stock traded and *t* for the current time. *Q* is the quoted spread and *m* the midprice (Hendershott, et al., 2011)

The effective 5-minute spread is calculated as follows:

$$espread_{jt} = q_{jt}(p_{jt} - m_{jt})/m_{jt}$$

q is an indicator variable and is +1 or -1 for buyer or seller-initiated trades, respectively, while p is the realized trade price. The realized price p is calculated as the average weighted price of stocks traded. This is necessary as a trade order might fulfill several limit orders at different quoted prices. For each stock on the first day of trading we calculate a share weighted average. (Hendershott, et al., 2011)

$$Effective\ spread = \frac{\sum(espread_{jt} * V_{jt})}{V_j}$$

Where V_j is the volume of the specific stock *j* traded on the first day of trading and V_{jt} is the volume traded in the single buy/sell order.

It is then meaningful to split the components of the effective spread into a realized spread component and an adverse selection component. (Glosten, 1987)

Realized spread is calculated as:

$$rspread_{jt} = q_{jt}(p_{jt} - m_{jt+5min})/m_{jt}$$

And then averaged as the transaction quantity weighted realized spread

$$Realized\ spread = \frac{\sum(rspread_{jt} * V_{jt})}{V_j}$$

Adverse selection component is calculated as:

$$adv\_selection_{jt} = q_{jt}(m_{jt+5m} - m_{jt})/m_{jt}$$

And averaged:

$$Adverse\ selection = \frac{\sum(adv\_selection_{jt} * V_{jt})}{V_j}$$

In order to have a richer understanding of spreads also more general measures of spreads are calculated. Average spread is the simple mean of quoted spread divided by midprice:

$$Average\ spread = \mu\left[\frac{Q_{jt}}{m_{jt}}\right]$$

While excess spread is calculated depending on the direction of trade.

$$Buy\ spreads = \mu\left[\frac{Ask - p_{jt}}{m_{jt}}\right]\ when\ q_{jt} = 1$$
$$Sell\ spreads\ = \mu\left[\frac{p_{jt} - Bid}{m_{jt}}\right]\ when\ q_{jt} = -1$$
$$Exess\ spread = Buy\ spreads + Sell\ spreads$$

These data points are then used as cross-sectional data for our data-analysis.

VIII. Data

The data used is taken from LOBSTER, a data service offering trade and limit order data, for both NYSE and NASDAQ stocks, from the NASDAQ database. Of the companies listed 7 were listed on NYSE and 1 on NASDAQ. The first day of trading, is often not a full day of trading, as a listing can take place at any point in the trading day. There is a decomposition of our calculated data points in the appendix. (NASDAQ, 2021)

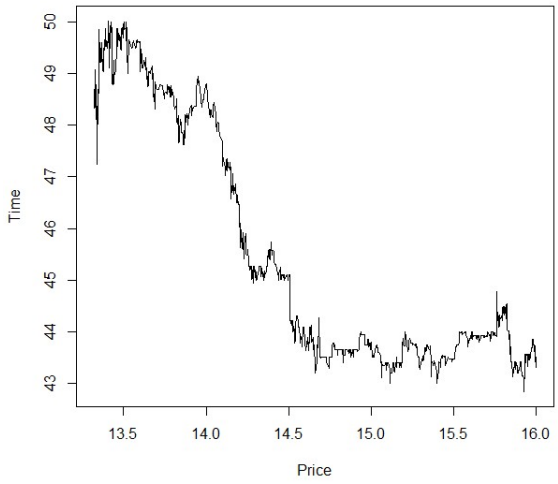


Figure 7 Squarespace price movements 19. Sept 2021

Companies

To select the companies that make up our data, we want to minimize external factors, that are not the listing method. To do this we select the 8 companies, that underwent a direct listing in the US, under the current rules, as our study group. All the 8 are high-profile tech companies, that could be described as "unicorns", with valuations over 1$ billion.

For the control group, therefore, the study selects 14 companies, that are similar is several respects. They all underwent IPOs on the NYSE, at similar times to the directly listed companies, to control for time specific market conditions. The valuations of the control group companies, are also well over 1$ billion, to control for the effects of company size, on the stock. All the companies in the control group, are also tech companies, and industry related differences should be minimal. The public perception of the control group is also controlled for, as they tend to often be of a similarly high profile, a good example for this is Squarespace and Pinterest, one underwent an IPO and the other a direct listing respectively.

Price improvements and liquidity

To study the effect of direct listings, on opening and closing prices, we take the opening price of a stock divided by its closing price minus one. In the case of companies that underwent an IPO, we take the IPO price, as opposed to the market-made opening price for the directly listed companies.

The method used to calculate the liquidity measures, allows effective spread, realized spread and adverse selection estimates to be negative. This can be caused by, realized trade prices outperforming the mid-price at the time. The reason for this can be twofold, first there can be a cross-trade in the marketplace or, the data is misaligned, and the trade is matched with a non-actual midprice. The effect of this can be that

our estimates are lower, than if we only allowed positive values in the calculation of the spread parameters.

Volatility

Volatility of stocks is usually calculated from daily data, using the closing or occasionally other specific data taken once a day for a period of months or years. For this study, focusing on only the data from the listing day, that approach was not useful. Instead, what is used, is the calculated volatility of a stocks price, taken every 5-minutes, on the first day of trading. The approach is similar to, what is often used to study intra-day data. The 5-minute volatility should not be compared to inter-day volatility, but it enables us to compare the volatility of the stocks chosen for our study.

Cross-sectional data

From these companies, we calculate a dataset, specifically, the estimators for volatility, liquidity, and first day gains detailed in chapter 7. To complete the data, we add data points such as opening prices, and market capitalization. The result being a dataset where the parameters or the first day of trading for each company are known and can then be used to run regressions. A breakdown of the data is in the appendix of this paper.

Study Group	Date	**Control Group**	Date
Asana	30/09/2020	Compass	01/04/2021
Coinbase	14/04/2021	Coursera	31/03/2021
Palantir	30/09/2020	DoorDash	09/12/2019
Roblox	10/03/2020	Shift4	05/06/2020
Spotify	03/04/2021	Lemonade	02/07/2020
Squarespace	09/05/2021	MediaAlpha	28/10/2020
Slack	20/06/2019	Cloudflare	13/09/2020
ZipRecruiter	26/05/2021	Pinterest	18/04/2019
		Cloopen Group	09/02/2021
		RLX Technology	22/01/2021
		Similarweb	12/05/2021
		Snowflake	16/09/2020
		Tuya	18/03/2021
		Unity Technologies	18/09/2020

Table 2 Companies selected for the study with date of listing

Table 3 The summary statistics describe the data of 8 directly listed and 17 IPO companies on their first day of trading.

	Summary Statistics	Average	Maximum	Minimum
Study Group	Average actual half Spread	0.1987%	0.4617%	0.0685%
Control Group		0.3252%	0.9453%	0.0691%
Study Group	espread, in bps	10.39	22.86	3.29
Control Group		11.86	25.58	1.53
Study Group	adv_selection, in bps	30.26	123.90	-3.66
Control Group		25.88	71.33	-3.33
Study Group	rspread, in bps	-19.87	10.34	-110.32
Control Group		-14.02	16.41	-52.61
Study Group	5-minute price volatility	0.1668%	0.5943%	0.0180%
Control Group		0.3431%	2.6866%	0.0107%
Study Group	5-minute price standard deviation	3.4943%	7.7090%	1.3411%
Control Group		4.3111%	16.3908%	1.0326%
Study Group	First day gains	-2.41%	7.75%	-13.84%
Control Group		65.93%	200.00%	-5.18%
Study Group	Volume traded in millions	79.75	339	5
Control Group		23.21	96	5
Study Group	Volume traded, in millions of dollars	5234	26591	217
Control Group		1669	9141	131
Study Group	Market cap at close, in millions of dollars	19912	72000	2400
Control Group		13707	60800	1200

IX. Analysis

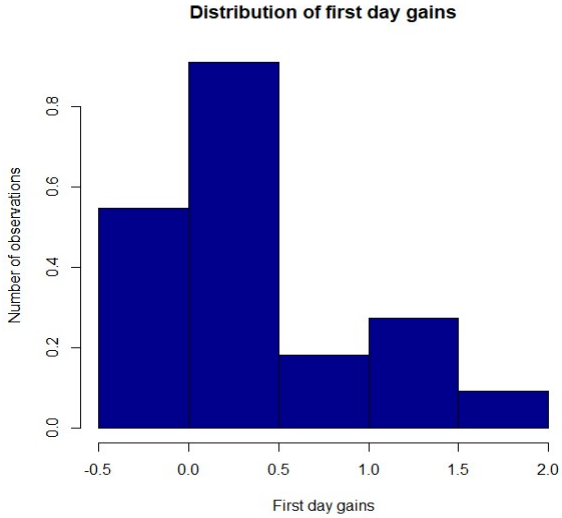
To study the effects direct listings, as compared to IPOs, we will use the data we have calculated in the previous chapter. We will now resolve, what conclusions can be drawn from our data regarding our initial hypotheses.

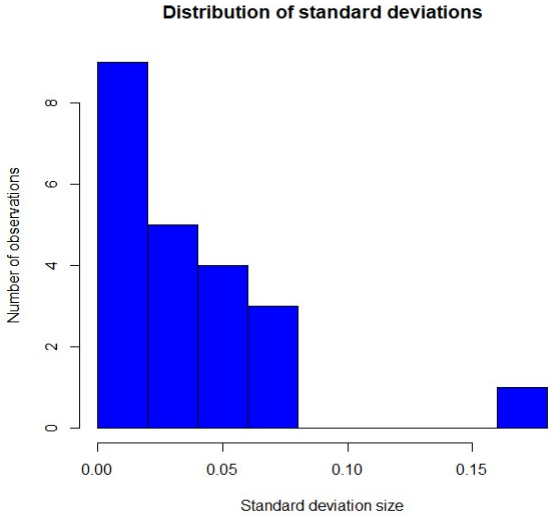
The small amount of data we have, only 22 samples, reduces the accuracy we can reach in our regressions. To have more reliable results, or in other words to create a better fitting model, we will keep the number of independent variables to 1. Less independent variables also reduces the risk of data mining.

Distribution assumptions

The generalized least squares regression makes the assumption that our variables are normally distributed. We will generally run generalized least squares regressions on our data unless mentioned otherwise. The GLS is chosen account for the heteroscedasticity of some of our data, mainly volatility measures. A second reason, for using GLS across the board, is to keep our results comparable across different regressions.

A problematic fact of stock market returns is that returns are not normally distributed, and the data is heavy in the tails, in other words the data has kurtosis. The fact that our data is not entirely normally distributed reduces the efficiency of our regressions. The log transformation of some of our variables such as volume and market cap reduces the kurtosis, nevertheless the efficiency of our regressions will be weakened by the kurtosis in our other measures such as first day gains as well as standard deviation.





First day gains

Table 4 Regressing first day gains on Study group

The NYSE claims direct listings offer lower costs

	Dependent variable:
	D1G
Studygroup	-0.683***
	(0.223)
Constant	0.659***
	(0.135)
Observations	22
Log Likelihood	-17.010
Akaike Inf. Crit.	40.020
Bayesian Inf. Crit.	43.008
Note:	*p<0.1; **p<0.05; ***p<0.01

The cost of capital is a factor in company choice to list on the stock market, as is discussed in chapter 3. for companies wishing to list. First day gains are labeled under D1G in our data and calculated as mentioned in chapter 8.

Lower cost of capital can be picked apart to 2 elements. Lower costs can mean fewer actual costs in terms of lawyers and accountants or lower first day gains as "money left on the table". We seek to answer statistically whether direct listing process reduces first day gains. We do this by regressing first day gains over studygroup.

Our model (Table 4) shows that first day gains are much reduced, -68% in expectation, when a company has been directly listed. This finding is to be expected from the summary statistics, (Table 3) as well, where the average direct listing has much lower first day gains.

The result corroborates the hypothesis that directly listed companies have lower first day gains, and that we can reject the null hypothesis that direct listings have no effect on first day gains, with significant confidence.

	Dependent variable:		
	espread	rspread	adv_selection
	(1)	(2)	(3)
Studygroup	-0.0001	-0.0001	-0.0001
	(0.0003)	(0.001)	(0.001)
Constant	0.001***	-0.001	0.003***
	(0.0002)	(0.001)	(0.001)
Observations	22	22	22
Log Likelihood	116.119	84.220	83.345
Akaike Inf. Crit.	-226.238	-162.439	-160.690
Bayesian Inf. Crit.	-223.251	-159.452	-157.703
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table 5 GLS regression for spread components

	Dependent variable:	
	(Avg_spread/2)	Act_spread
	(1)	(2)
Studygroup	-0.001	0.013
	(0.001)	(0.010)
Constant	0.002***	0.003
	(0.0004)	(0.006)
Observations	22	22
Log Likelihood	100.907	44.578
Akaike Inf. Crit.	-195.814	-83.157
Bayesian Inf. Crit.	-192.826	-80.169
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 6 Average quoted half spread and excess spread

Tighter spreads

To estimate the extent of spreads, we have calculated the 3 parameters detailed in chapter 7, espread, rspread and adv_selection. We run GLS regressions with the spread parameters as the dependent variable shown in Table 5 with studygroup as the independent variable for all 3 regressions.

To further verify our earlier results further, it is meaningful to check a more general measure for spreads. For this, we have calculated average quoted spread (Avg_spread) and exess spread (Act_spread). Average spread is divided by 2 so we get average half spread. The results of the 2 regressions are shown on table 6.

The regression results are generally not very reliable, as measures such as log likelihood are much worse than with first day gains in table 4. The poor performance of our models suggests that out models are bad at predicting spread measures through the lens of studygroup.

The calculated coefficients, in all the regressions, are very small, and their relative standard deviations, shown in brackets below the coefficients, are very high. Therefore we can not reject the null hypothesis, that being, direct listing does not influences spreads. It is likely the effect of being directly listed on Bid-Ask spreads is either zero or too small to be estimated with our small dataset.

Less volatility

Based on the claim by the NYSE we put forward the hypothesis that directly listed companies have less price volatility on their first day of trading. To study this claim we have calculated the volatility of the stock as described in chapter 8. The null hypothesis being that the effect of listing method is 0 for volatility.

Sigma5 standing for standard deviation and Sigma_sq_5 standing for variance in Table 7. To estimate the effect of the listing method on the volatility measures we run a GLS regression. The GLS regression is robust to the potential heteroscedasticity of our volatility as mentioned earlier.

Table 7 GLS Standard deviation and volatility

	Dependent variable:	
	Sigma5	Sigma_sq_5
	(1)	(2)
Studygroup	-0.008	-0.002
	(0.016)	(0.003)
Constant	0.043***	0.003**
	(0.010)	(0.002)
Observations	22	22
Log Likelihood	42.105	82.234
Akaike Inf. Crit.	-80.210	-160.468
Note:	*p<0.1; **p<0.05; ***p<0.01	

The regressions suggest no clear relationship between volatility and listing method. The standard deviations, in brackets under the coefficients, are larger than the coefficients in both regressions. As such we cannot reject the null hypothesis.

Table 8 Probit estimating the effect of company size on choice of listing type

	Dependent variable:
	Studygroup
log(MarketcapM)	0.222
	(0.238)
Constant	-2.363
	(2.187)
Observations	22
Log Likelihood	-13.985
Akaike Inf. Crit.	31.971
Note:	*p<0.1; **p<0.05; ***p<0.01

Market cap and our data

To verify whether company size has been correctly accounted for in our choice of data, as described in chapter 8, we can test if company size correlates with being in the study group. The way to do this is to regress Studygroup on the market cap of the company.

As the company leadership will have some idea of what their company valuation would be, it is the exogenous, independent variable in our regression. As Studygroup is a dummy variable it is better to run a probit regression. The resulting regression is shown on table 8.

The regression result shows that we cannot say with confidence that the size of the company is a significant factor that differentiates directly listed and IPO companies. While the average market cap of companies in the study group is higher 19$ billion compared to 14$ billion, as is shown in table 3, the regression result does not invalidate our data selection.

X. Discussion

Underpricing

The initial underpricing being reduced or eliminated is one of the initial hypotheses we find evidence for. As already discussed in chapter 4, companies leave significant quantities of "money on the table" when listing and a reduction in this amounts to a reduction in the cost of capital for eligible companies. The change has implications for theories of IPO underpricing.

The causes of IPO underpricing are discussed extensively in chapter 4.

The winner's curse

The direct listing process exposes listings to supply and demand and removes the rationing of stocks. As long as markets are efficient buying a directly listed company happens at the market-set price. The winner's curse rewards investors with superior information, instead in a direct listing there is price revelation. The reduced incentive to research companies could be expected to lead to higher uncertainty about company prices, leading to higher volatility, however we have no evidence of this being the case, as shown in chapter 9 Table 7.

Lawsuit avoidance hypothesis

We discuss the legal implications of the direct listing process in chapter 3. The underwriter has supposedly less legal risk when underwriting a direct listing, yet US court resolutions on actual cases are still hard to come by. As discussed before the prospectus, handed to the SEC contains a range of prices instead of a singular price in an IPO.

The impetus to avoid lawsuits can make companies select their IPO price conservatively and thus lose out when the listing actually happens. The risks involved in posting a price range can be considered less as the entities writing the prospectus need to have a less accurate estimate of the "right" price for the stock. As also mentioned in chapter 3, if the opening price fails to be withing the bounds given in the prospectus, the direct listing will be postponed, until the prospectus has been amended, in comparison to an IPO, where, if the IPO price is found to be unfair, the company faces significant legal risks.

As a result of the different risk structure, we can expect pricing to be less conservative, and thus be able to get more money when listing. Relating our findings to these differences, we found that directly listed companies have significantly less underpricing, and a partial explanation to this can be the reduced legal risk involved for the companies listing. This being correct would also imply that legal risk represents a cost, entirely carried by the listing company, for companies undergoing an IPO.

Prestigious underwriter hypothesis

According to the prestigious underwriter hypothesis, an underwriter tries to reduce IPO prices to attract future business to the underwriter. Underwriters have however been willing to underwrite direct listings, where first day gains have effectively been eliminated. A rational underwriter would refuse to take part in direct listings if it was sure to suffer reputational damage from doing so, thus undermining its own business.

In reality, investment banks have however supported the introduction of the direct listing process and partaken in them. Therefore, it seems reasonable to assume, that the reputational risk of direct listings to the underwriter are small, this is in line with Horton (2019) who claims direct listings greatly reduce the risks of an underwriter.

The uncertainty hypothesis

The uncertainty hypothesis, discussed in chapter 4, posits that it is the underwriters who maintain the underpricing of IPOs. The paper by Beatty & Ritter, 1986 mentions the conditions under which IPO underpricing would persist. These being:

1: The underwriter is an imperfect predictor of aftermarket prices
2: The underwriter has reputational risk
3: The underwriter who prices “off the line” will lose customers

The direct listing process changes the rules of the listing process, as discussed in chapter 3. As written by Horton, (2019) the underwriter faces significantly less reputational risk with direct listings. Secondly the underwriter does not set the opening price.

We find in our data, that direct listings shown next to no first day underpricing. The loss of these conditions bringing about the result predicted by Beatty and Ritter, lends credibility to the uncertainty hypothesis.

Less spreads and volatility

In the introduction, chapter 1, this paper introduces the contradictory positions on the direct listing process, one of these being tighter Bid-Ask spreads and less volatility. For our research we made a dataset of companies with the intention of reducing company specific characteristics effect on the data, as detailed in chapter 8.

Our results, presented in chapter 9 on tables 5-7, fail to give evidence for either reduced Bid-Ask spread or reduced volatility. The contradiction to the initial claims by the NYSE can be explained by the dataset

used, as the NYSE used a dataset containing all the companies listed in the time period, while we used a dataset of comparable companies. The NYSE dataset is likely to contain many small- and medium-cap companies, that can be expected to have larger spreads and more volatility.

Validity of data

Our data consists of a small number of data points those being form only 22 companies in total. 8 of them are directly listed companies, while 14 make up our control group. The small quantity of data reduces our ability to accurately assess some of our claims. Especially on the questions of Bid-Ask spreads and volatility the paper cannot refute the possibility of there being a difference in these parameters, nor can it reject the possibility that the listing method has no effect on the parameters.

To verify the validity of our data selection is also difficult. The data tries to take in to account the timing of listings, but there is no real way to exactly match our directly listed companies, with companies that listed exactly the same day and hour.

We can test if company size plays a major role in our data, as is done in chapter 9 Table 9, where no evidence is found, that company size plays a major role in our data. Nevertheless, the evidence does not prove that the data selection removes the effects of company size on our results.

XI. Conclusion

In this paper we looked at the effects of direct listings on the first day of trading. Including, claims made by the NYSE exalting the benefits of the direct listing process, these being the superior market quality and reduced cost of capital. We also looked at some theories of IPO underpricing.

The theoretical foundations of listing methods and price impact regressions are discussed in chapters 2-7. While the data work of this paper is presented in chapters 8-9 and analyzed in chapter 10.

Our research found evidence that direct listings do indeed reduce the cost of capital, as less money is "left on the table". For the higher market quality of directly listed stocks we managed to find no proof either in terms of Bid-Ask spreads or volatility.

The effective disappearance of first day underpricing, with the direct listing process, gives us meaningful perspectives on theories of underpricing. Our findings are in line with the prestigious underwriter hypothesis as well as the uncertainty hypothesis of IPO underpricing, while the lawsuit avoidance hypothesis, may also be a partial explanation for the reduction in first day underpricing found in our data.

Direct listings appear to be a worthwhile prospect for eligible companies, wishing to increase liquidity for their stockholders. The claim of lower cost of capital, can be seen as contentious, as a direct listing does not allow a company to raise capital, but instead only allows stockholders better access to capital.

Why investment banks are willing to support the allowing of direct listings is still unclear. IPOs are a major source of income for investment banks, while direct listings can be expected to reduce this income. The observed fact is however, that investment banks have been supportive of the introduction of these new rules. A meaningful qualitative study might look at the reasoning of companies to conduct direct listings, specifically, looking at whether companies chose to have a direct listing instead of an IPO or are only listing because direct listings are an option.

The future of direct listings is unclear, allowing a larger set of companies to list directly would make more companies able to benefit from the changes, while also potentially increasing the chance of market failure. We are yet to see a major failure in a directly listed company, either in the form of failed listing, fraud, or bankruptcy. As court cases answering some of the unclarities will eventually come in, we will have a more accurate picture of the exact risks that underwriters and companies face when directly listing.

The definitions and rules for direct listings can still be claimed to be in flux. The SEC has implemented several amendments to the direct listing process just between 2018-2021 and more will likely come. The change reducing the valuation cap from 250$ million to 100$ million when raising capital, is perhaps indicative of an intent to enable a more broad use of the direct listing method.

As the rules under which the direct listings in this paper have changed, future direct listings may have significantly different market qualities, therefore future reasearch of upcoming direct listings can produce meaningful insights into the effects of different regulations on market outcomes.

Direct listings are a superior listing option for companies that already have all the funding they need, due to the lower costs. Allowing direct listings may encourage companies to list that would not have done so otherwise, as of yet is it not clear, under these rules, what number of companies that would normally conduct an IPO would choose to conduct a direct listing instead.

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XIII. Appendix

Data/notation	Description	Source
Maximum	Daily maximum of price	NASDAQ
Minimum	Daily minimum of price	NASDAQ
Open	Opening price, IPO price for IPOs and opening auction for DL	NASDAQ
Close	Price of last trade of the day	NASDAQ
Quantity	Number of stocks traded that day	LOBSTER
VolumeM	The total $ value of trades on the day, in millions of dollars	LOBSTER
D1G	First day gains calculated as Open/Close -1	NASDAQ
Sigma5	5-minute Standard deviation	LOBSTER
Sigma_sq_5	5-minute volatility	LOBSTER
rspread	Realized spread calculated as detailed in chapter 7	LOBSTER
adv_selection	Adverse selection calculated as detailed in chapter 7	LOBSTER
Avg_spread	Non weighted average of the Bid-Ask spread from quoted prices	LOBSTER
Act_spread	Excess spread calculated as detailed in chapter 7	LOBSTER
Studygroup	A dummy variable for being in the studygroup, 1 in the studygroup, 0 in the control group	
MarketcapM	The value of the company calculated from stock prices at the closing of the trading day	LOBSTER
Date	Date of listing	NASDAQ

ABSTRAKT

Die Direktnotierung ist seit 2018 eine Option für Unternehmen, die in den USA an die Börse gehen, wobei die NYSE die erste ist, die dieses Verfahren zulässt. In der Studie wird versucht, die Auswirkungen der alternativen Notierungsmethode auf den ersten Handelstag zu ermitteln. Die ursprüngliche Hypothese lautete, dass die Gewinne am ersten Tag geringer sind und die Volatilität sowie die Bid-Ask-Spreads höher sind. Mit der Einführung hat die NYSE behauptet, dass die direkte Notierung die Marktqualität der notierten Aktien verbessert, d. h. niedrigere Kapitalkosten, geringere Volatilität und engere Spreads, während die Gegner das Risiko des genauen Gegenteils beklagen. In der Studie werden Daten vom ersten Tag der Börsennotierung von Unternehmen verwendet, um diese Behauptungen zu bewerten. Die Ergebnisse zeigen, dass die Gewinne am ersten Tag in der Tat geringer sind, aber wenig Beweise dafür, dass die Volatilität und die Spreads beeinflusst werden, wenn man Faktoren wie Größe und Wirtschaftszweig kontrolliert. Die Studie befasst sich auch mit Theorien zum Underpricing.

Schlüsselwörter: Direktnotierung, IPO, NYSE, IPO-Underpricing, Preiseinflussregression