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Equity Markets and Alternative Investments

Empirical Identification of Variables Mostly Impacting Aftermarket Trading Liquidity Post-IPO: Evidence from Main Italian Firms Going Public

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Anno Accademico 2019/2020

*To the hearth and mind, ignorance is
kind.*

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1

Introduction

Most of the Financial Literature examining Initial Public Offerings focuses on analysis of two anomalies: The initial Underpricing of these offerings (Ritter and Welch 2002)¹ and the long-run underperformance that generally relates to investing in such companies. A few of the remaining literature has been focused on assessing the characteristics of IPOs that may have an impact on the Liquidity of the newly issued shares in the aftermarket. This fact is nevertheless surprising since the advantages of having a liquid stock are several: first, it increases the firm value acting directly on the required performance of the stock and secondly it has beneficial consequences on both governance and ownership structure of a company since it provides elements to construct better monitoring schemes for management and helps as a defense mechanism against potential hostile takeover bids. Nevertheless a high liquid stock may also involve some costs: first of all, when many investors are involved in the ownership structure of a company they may have less incentives to monitor the activity of the firm thus leaving the task to others shareholders that may as well be in the same position; this may eventually lead to a lack of control and the rise of agency conflict of 1st type. Furthermore, and later in the commentary the topic will be analyzed more thoroughly, a liquid stock may require a discount at the moment of the offering that goes under the name of “Initial Underpricing” that serves the purpose of attracting investors in participating in the newly issued stocks.

The rest of the analysis will deal with the topic of IPOs and Liquidity in the aftermarket under many perspectives and it will go through several of the theories in the topic trying to assess with the recourse to specific academic literature which of the hypothesis might be the most suited in order to explain relevant financial phenomena. In the first chapter some general theory on the IPO will open the discussion and will deepen the main aspects that may bring a firm to the public markets without specific reference to its aftermarket trading liquidity. Later on, the main features of market microstructure and liquidity measurement will accompany an extended part regarding the liquidity theory and how it affects the value of the firm as well as the strategies of corporate governance. The third chapter, instead, will present a wide set of the central theories and analysis that link liquidity and main IPO characteristics, trying to focus on

¹ (A Review of IPO Activity, Pricing, and Allocations, 2002)

the general aspects that may explain the causal relationship of the two in the simplest possible manner, Finally the fourth chapter will be dedicated to the analysis of a proprietary sample of Italian IPOs along the same dimensions that have characterized the financial literature in the topic previously exposed. The main results will be evaluated with the aid of generic financial theories as well as with the comparison of main academic ideas in order to assess similarities and differences. The outcomes will then convey the information regarding the entity and the quality of the relationship linking IPO aftermarket Liquidity and the main characteristic that may act as catalysts or inhibitors for its development in secondary markets.

2

IPO and Liquidity Theory

2.1 The IPO Decision

A firm's initial public offering (IPO) is deemed to be one of the most important milestones in an organization's lifecycle. Industry professionals offer many reasons why private firms may go public: among the main objectives for a successful IPO there are raising capital for expansion of operations, increasing Liquidity for the shareholders, improving the company's reputation and creating a valuable currency - the stock - that becomes by all means a tool to make acquisitions and compensate employees. Of course, going public entails also costs and benefits should be carefully weighed with expenses when deciding to perform an IPO. First of all, The issuing firm must confront with the direct costs of an IPO and with the distraction it imposes from management; what's more, among issuer's tasks there are disclosing proprietary information that may weaken it competitively and between new owners, managers and shareholders known agency conflicts could arise.

2.1.1 *Financing Options and Capital Access*

As already mentioned above, having a positive cashflow is extremely important for a company, especially if it is privately held and has limited access to sources of capital. As it often happens, many start-ups are not able to generate the entire revenue internally to fund all their financial needs so they become dependent from external suppliers. The attractiveness of an IPO depends on its ability to provide the issuer with a much larger pool of capital, though it may not be cheaper than other inflows. It is common opinion then that raising capital to grow the firm operations is among the main reasons to go public.

Additional evidence supporting the IPO as a way for firms to increase their business is provided by Boehmer and Ljungqvist (2001)² who examined a sample of German companies that had announced their

² (On the decision to go public: Evidence from privately-held firms, 2001)

intentions to go public; among these firms, the ones who intended to sell shares to raise capital for investments or to pay off debt were more likely to complete the IPO than issuers that would not receive proceeds from secondary shares sale. What is more, when companies happened to be capital constrained, they acted swiftly and faster with respect to the decision between IPO and Private equity, showing how high might be the cost of waiting in such circumstance.

Another important reason why an IPO is helpful is the increase in the set of financing options available for a firm. Additional information about the company provided by the listing makes it possible to issue several debt and derivative products such as convertible debt and warrants in addition to various equity-linked securities that rely on the newly publicly traded shares. In addition to the immediate capital inflow coming from the IPO proceeds, in general, such capital infusion also strengthens the equity base and leverage ratio making it easier for the firm to raise additional debt, thus having a positive effect also for future capital searches.

In the same framework, it is possible to say that the Italian Stock Market (Pagano, Panetta and Zingales 1998)³ retains some peculiar features. Here, companies appear to go public not much to finance future investment and growth, but rather to rebalance their accounts after high investment and growth. Even if companies' resort to public markets is relatively small, for example when compared to the United States or UK, it can still be considered similar, and for this reason explicatory, of that of many continental Economies such as Germany or France where public ownership is generally less adopted as well. As a matter of fact, for independent companies the decision to go public has a negative impact on capital expenditures and, even though a possible explanation for this tendency can be addressed to the high profitability of these companies right before the IPO, by comparing their pre-IPO investment levels with the ones of subsidiaries of already public companies that decide to carve out and list out separately, the most likely reason to go public becomes to rebalance the capital structure after implementing higher-than-normal investment plans.

Finally, the IPO provides the firm with an effective signaling tool through the price of its shares: the stock price becomes in fact a cost-effective way to gather information about the firm and make it available to investors who can become better informed and can come over the informational barrier pulling them off their investments. Moreover, the shareholders of a public company can utilize the information embodied in stock prices to design more efficient compensation schemes for their managers, by indexing their salaries to the stock price or through stock options. An active aftermarket trading can diminish also concerns about stock Liquidity and it can then increase investor appetite for buying firm shares.

³ (Why do Companies Go Public? An Empirical Analysis, 1998)

2.1.2 Liquidity and Optimal Governance Structure

The firm's decision to go public and the choice of its governance structure are two sides of the same coin; the need for external capital provides the initial stimulus for an IPO but then how the governance of the firms will be affected should be carefully considered. An efficient corporate structure serves the ultimate purpose of maximizing the firm value. By the same token, it entails the choice regarding how the monitoring of the management should be pledged to investors and, on the other hand, it should provide investors with correct control rights to admonish management in case monitoring reveals shirking or sub-optimal resource allocation. In few words, the choice between public and private ownership very much reflects how effective is the former or the latter structure in monitoring management, with respect to the occurrence of liquid or illiquid markets and with respect to the control rights given to investors.

As a matter of fact, the decision to go public greatly affects the Liquidity of a company stock as well as it gives the possibility to initial holders of the company to exchange claims with virtually countless counterparties and amplify their diversification ranges. Shares of public companies can be traded without the need of informal searching among privates and, for the same reason, this allows for considerably decreasing the cost of deal initiation; share trading on an organized exchange is also cheaper especially for small shareholders who want to trade swiftly and on short notice. As a result, additionally to raising money from all those investors who participate in the offer for public listing, the issuing company also retains the benefits of having a liquid stock listed on an exchange.

Aftermarket Liquidity lies at the core of the choice of the right capital structure in the context of an IPO. The way it concerns such a choice can be mainly analyzed considering two separated aspects: the first one regards the observation that the cost of Equity falls as Liquidity increases in the secondary market and the second one concerns the fact that Liquidity tends to undermine incentives for investors to monitor management. Therefore, the IPO decision has to account for both the benefits and the costs originating from Liquidity in public markets. It is possible to say that even though Liquidity is often regarded as a virtue of well-functioning markets, it also hides a contentious side since investors can sell their shares at low cost in liquid markets this way avoiding the burden monitoring management in order to induce an improvement in firm value and the cost associated to it. What's more, when an investor incurs in monitoring, he has the choice of disclosing its information in order to increase the value of the firm by acting on management behavior, or to trade upon it keeping the information secret and acquiring a substantial speculative gain. In the latter case, an investor will be better off as Liquidity increases since it will be easier for him to realize a sufficient gain on his buy and sell operations.

In practical terms, when a firm approaches the IPO the choices to dwell upon Liquidity-wise will enter two independent moments: the number of shares to include in the offering and the respective allocation among investors. In the first stage, selling more shares means increasing Liquidity in the aftermarket; however, differencing between informed and Liquidity traders, it often occurs that who buys and sells for short-term Liquidity purposes loses on average to the advantage of informed speculators. This means that the initial price of the IPO should comprise a discount, generally under the name of Underpricing, to compensate such asymmetric information and induce all investor to purchase newly issued shares (Holmström and Tirole 1993).⁴ Once the proportion of shares to include in the offering is set, the second decision deals with the allocation of the shares among investors. If a large block of shares is pledged to a single investor such a joint private placement, there will be more incentive to perform post-IPO monitoring. This happens on the one hand because a large stake points to a sufficient fraction of induced gain to recover from monitoring cost and, on the other hand, the lower Liquidity arising from a large capital concentration hinders the potential for trading speculative profits, biasing towards even more active monitoring. Having more Liquidity in the secondary market facilitates by far the accumulation of a block position while a wide and homogeneous distribution of shares at the IPO serves the ultimate purpose of obstructing the creation of a monitoring-wise single investor. When the exogenous level of Liquidity is low it is preferable to opt for the creation of a large shares blockholder since generating a large block in the aftermarket can be costly and the firm may encounter free riding issues by investors who, aware of the expected post-monitoring price might anticipate the increased monitoring value and trade shares at a premium, thus hindering the benefit accrued to the large blockholder. In the opposite way, when the level of Liquidity surpasses a certain threshold, a dispersed initial ownership can be preferred. In fact, a large blockholder can still be achieved without too heavy Liquidity costs in the secondary market and the firm can still retain the benefit of having a high liquid share.

On the same line of thought, Bolton and Von Thadden (1998)⁵ argue that the optimal governance structure depends on the characteristics of the firm and the environment where it operates: higher average Liquidity demand, lower cost of management control, higher potential benefit from monitoring and higher transaction costs point towards a dispersed ownership structure while opposite circumstances would favor concentration. In addition to this, they further support the argument that concentration of ownership, although improves the incentives to control the management, reduce the possibilities to trade for all shareholder through a diminished level of shares Liquidity. On the other hand, maximum dispersion among initial owners increases trading opportunities but may lead to a value reduction due to lack of control inherent in ownership dispersion.

⁴ (Market Liquidity and Performance Monitoring, 1993)

⁵ (Blocks, Liquidity and Corporate Control, 1998)

2.1.3 *Company Reputation and Strategic Externalities*

An IPO, as such as any other conduct within the life of a firm, is a strategic decision that should convey its effects on a wider market perspective. In particular, the long-term success of a firm highly depends on its reputation within the industry it belongs to, its customers, suppliers, employees and competitors. If a firm enjoys a renowned status in terms of product quality, customer service and other core operational activities it will surely have a competitive advantage. There are mainly two feasible ways to develop a good reputation: either by differencing for unconventional quality of own products and let the market gradually learn such superior skill through time, which can be costly in terms of time and for the inherent delay intrinsic to market mechanisms in identifying high quality firms or, alternatively, it is possible to earn a good reputation by signaling a greater quality through a costly action like an IPO. In the latter case, the market will consider the act of going public as a high-quality precursor. By the same token, the initiative of a costly action is a reference for elevated quality as lower quality firms would not be able to perform an offer of even terms: an IPO involves costs of every genre effectively limiting the pool of potential issuers; filing and registration fees, compensation to advisors, Underpricing and auditing and investor relation fees are only a small part of the total expenses a firm will have to go through if it decides to enlarge its investor base. In addition to the direct costs, the management will devote most of the time to organize the process making the act of going public an exclusive prerogative of solid and promising firms. In few words, the real and potential costs of the IPO send a strong signal that the company is of high quality (Welch 1993).⁶

Prior to the IPO, the pool of agents the company is exposed to is often limited to those who have direct access either by operational or consumption purposes; since a good reputation is often based on the amount of people who know about the company, going public enhances the value of the firm by expanding its social profile with media coverage and financial industry awareness. In particular, the stock price embodies the actual connection that allows a good reputation to be a proxy for an increased firm value. When setting the fair price for a company share, the market implicitly establishes the inherent quality of the business it pertains in that a high share price stands for superior value and a signal of good quality. This chain of assessments leads to additional business volumes which nourish and increase company valuation even more much like an auto-fueling loop. In addition to the improved reputation arising from going public, the increased exposure of the issuing firm allows for more efficient competition: the company becomes by all means a member of a selected pool of businesses that are part of public markets. An Italian manager once said: *“Being public really helped us in our external relationships. Now we are*

⁶ (An Empirical Investigation of IPO Returns and Subsequent Equity Offerings, 1993)

not one out of many anymore: we are a listed company and we are treated as such by our clients. Their respect for us has increased and we are regarded as trustworthy counterparts. Now we negotiate with them as peers.” (Marchisio and Ravasi 2001).⁷In the end, it may sometimes happen for initial returns to be larger for firms who built a strong reputation in the month preceding the IPO. These set of issuing firms, being aware of their quality, may want to inform the market through a greater Underpricing signaling their increased value and secondly, once the information has arrived to the market, the investor will be willing to a premium for the issuer’s reputation and reward it with a high stock price.

When it comes to reasons to undertake an IPO, reputational and status purposes often reside in the main factors evaluated by managers and executives willing to enhance company’s image. By combining evidence coming from a survey on 74 Italian IPOs, Marchisio and Ravasi (2001) provide indication for an increasing number of companies going public as a way to improve their reputational and social capital, bringing benefits to their capacity to access external resources and opportunities. After conveying that the most cited reasons to go public by firms are often related to financial aspects and the infusion of a significative amount of investment capital into the firm, they point out how going public tends to increase visibility as a consequence of press coverage, introducing the company in a restricted industrial pool with privileged relationship also with financial community. The fact that this indirect result is more pronounced for small companies or those operating in less visible industries as the ones within the manufacturing supply-chain provides additional evidence. Especially in Italy, the increased reputation is associated in part to a higher status, since until a few years ago only few and mostly large companies were listed and in part to an increased perceived trustworthiness that finds its justification in the tighter institutional controls that the company should meet. Finally, Marchisio and Ravasi (2001) were able to show that using as extraction method the principal component analysis it is possible to shed light on the substantial correlation existing between items related to issues of reputation and social networking and the reasons to go public: the first factor in the rotated component matrix made by accepting only those data with initial eigenvalues greater than 1 seemed in fact to support the argument about going public as a way to build and reinforce reputational and social capital.

The creation of a proprietary stock share is one of the primary externalities of the act of going public. An IPO provides a firm with cash and a liquid stock currency that investors can dwell upon to judge the quality of an issuer and its senior management. Furthermore, the increasing practice of resorting to stock options as a mean of compensation for employees and managers, in addition to their inherent function to attract investors, is becoming one of the main factors to evaluate when going public. Public equity is a liquid currency that is suitable to appeal and motivate workers and makes the difference for industries

⁷ (Family Firms and the Decision to Go Public: A Study of Italian IPOs, 2001)

where skilled workers are needed and often scarcely available. As a matter of fact, stock options grants pledged to CEOs have increased steadily more than tenfold from 1980 to 2000, in part due to their ability to reduce agency issues and alleviate detrimental disputes between management and owners, and are now a basic part of the compensation in many companies.

2.1.4 Control, Monitoring and Agency Conflicts

Accessing external equity promotes agency conflicts because of the separation between the ownership and the actual control of a company. Owners and managers may have objectives that can differ up to different scales from the value-maximizing priority of investors. To alleviate investors' concerns, mechanisms and structures should be implemented and the choice between public and private ownership much resides in the capacity of each of the structure to lower at their minimum the agency cost. In theory, it is possible to recur to the implementation of debt financing in order to mitigate the agency conflicts by compelling the manager to create enough value to avoid bankruptcy; this would be nevertheless at the expense of additional risk and potential dangerous exposure for the firm (Jensen and Meckling's 1976).⁸ Rooted managers who have a consolidated control over the company may well direct benefits of control towards private purposes rather than sharing those benefits with outside shareholders and may neglect firm value-maximizing behaviors. For these reasons, in an ideal world the manager's contract should comprise and specify all the appropriate actions for every possible contingency and should give the investors the right to enforce them. Practical constraints prevent the existence of such contracts and, in the end, investors hire managers to make decision that neither themselves nor a contract would be capable to make. It is due to say, however, that a position of control covered by managers need not always have a negative effect on firm value. If the sole private benefit arising from corporate control is the personal satisfaction of managing a corporation, investors should be no worse-off. The most frequent scenario is still that managers destroy shareholders value while consuming private benefits and this is one of the main threats preventing entrepreneurs and families from making their firms public through an IPO.

To estimate how high should be the price to pay to have a controlling interest within the life of a company it is necessary to detect the value of the cash flow right and the expected private benefits coming from the peculiar power position. Industry professionals have found three main ways to estimate the control premium:

1. The first measure is the takeover premium which is the difference between the market price or estimated value of a company and the actual price paid to acquire it. This premium represents the

⁸ (Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, 1976)

additional value of owning 100% of a company, reason why it is also known as the control premium. Brief assessments place it in the range of 20 to 45 % the share price and it consists in the upper bound to the control benefit since it already accounts for other estimates of it.

2. Alternatively, it is possible to estimate the value of a controlling interest with the premium paid to perform block transactions, which have less impact than a complete takeover. Averages of this premium are around 20% relative to the IPO post-announcement share price (Barclay and Holderness 1991)⁹
3. The difference between two classes of shares in a company that differ only in their voting rights reveals the third measure of the premium. In general, having superior voting rights translates into a 5% average premium with respect with the common voting rights shares. Other estimates place it in the range of 20 to 45% depending on the country where the company has its legal venue.

For a more thorough discussion on the implication of Agency conflicts on the decision to continue or postpone with the IPO, in their article Latham and Braun (2010)¹⁰ propose evidence for the connection between managerial ownership and risk attitude in weak capital markets. Their main finding is the existence of an inverse U-shaped relationship between CEOs' equity participation and the decision to proceed with the public offering: the probability of IPO cancellation in weak capital markets increases as managers hold too little or too much ownership. In the first case, the view that managers and ownership may have conflicting interests would suggest that, as public equity markets deteriorate, increasing CEOs' equity participation would provide incentives to proceed with the IPO for the long-term health of the firm. According to this argument, managers who have too little firm ownership will enact risk averse behaviors avoiding the increased market uncertainty and in order to preserve their status and availability for future governance positions. In the second case, when CEO ownership reaches high levels, managers will perceive too much of their personal firm stake at risk. In an effort to safeguard their individual wealth, managers will opt out from the IPO to reduce uncertainty of personal outcome, potentially at the expense of long-term performance of the firm and shareholders' value. An additional source of managerial risk that may alter the preferences in the context of an IPO is the firm debt level. Latham and Braun argue that as leverage increases, CEOs will find more attractive the perspective of going public in order to raise necessary funds to repay their lenders. Furthermore, a higher debt ratio could in some cases signal the fact that the leverage threshold has been reached and that may be associated with lower likelihood of withdrawal. More in general, the prediction is that as public equity markets weaken, firms with higher debt levels will be keener to carry on with their public offering. The main point is that, depending on the circumstances, there exists a trade-off between managerial and organizational risks that play out in the

⁹ (Negotiated Block Trades and Corporate Control, 1991)

¹⁰ (To IPO or not IPO: Risks, Uncertainty and the Decision to Go Public, 2010)

forms of agency conflicts and firm indebtedness levels. Thus, from a practical point of view, the practice of aligning operational interests by conceding part of the equity to managers should be managed with care: in both extremes, when too little or too much of equity is pledged, it could lead to inefficient forms of governance due to risk averse behaviors and selfish attitudes associated with CEOs preferences also related to firm's debt levels.

2.2 Market Microstructure and Liquidity Measures

The idealized picture of a frictionless and self-equilibrating landscape where all the participants of the trading process are present at the same time without being affected by actions of other agents and leaving the auctioneer the important task of balancing the demanded and supplied quantities at a “consensus price” is very far from the way securities are actually traded in real world markets. In the first place, market players are not all simultaneously present on the market; the direct consequence of this observation is that price formation is delegated only to those agents who happen to be present at any specific point in time. Professional intermediaries have the task of “making the market” by absorbing any temporary buy and sell order imbalances; to do so, the price has to be sufficiently attractive to allow them to perform the market clearing of a security. As a result, the equilibrium price will often deviate from the one that would prevail in case all investors participated and this circumstance will generate profit opportunities in the short-term, while over time price deviations are likely to reduce. Secondly, the information about security's fundamentals available to each agent may differ substantially depending on the nature of the investor and its ability to forecast future events. While some market participants may have at their disposal latest news and pricing models, others might struggle to have such up-to-date information and may try to infer it from other participants behavior. As a result, the flow of orders in the market arises and has its foundation on a complex mix of reasons and the consensus price about a given security fundamentals only emerges over time, as the trading process evolves and market participants have more time to decipher other agent's actions. Consequently, Price deviations from fair value may well find their justification in this asymmetry of information among all investors.

As a matter of fact, only a detailed analysis of Market Microstructure unveils concepts regarding Liquidity and Price discovery. In general, the extent to which it is possible to execute an order within a short time frame with the price closest to the asset consensus value goes under the name of Liquidity; in the opposite way, illiquidity refers to the price deviation from the consensus value of an asset in similar circumstances and time setting. When a market is illiquid, buy and sell order tend to push respectively the transaction price up and down; Eventually, when the deviation becomes too great the market freezes since investor are better off with leaving the trade behind. In other words, the ask price for a security is

considerably above the Bid price. While the extent to which an asset shows traits of trading inconvenience is fairly addressable, it is renowned that Liquidity may differ greatly among securities and over time. Differently, the idea of Price Discovery refers to the speed and the accuracy of transaction prices in incorporating information available to market participants. In general, Liquidity and Price Discovery tend to move in opposite ways: when price relevant information reaches the market, by any mean, it reflects into trading pressure and order imbalances that in turn hampers the Liquidity of the asset. The informativeness of a trading venue is then an important feature that also hampers the average levels of transaction fees that investor encounter alongside their trading activity.

2.2.1 The Dimensions of Liquidity

In addition to the ability to trade a security quickly and at a price close to the consensus value, that generally goes under the name of “market Liquidity”, the idea of Liquidity also embraces dimensions that are beyond the trading of a given asset. In the context of banks and firms financing, Liquidity refers to the ability to obtain credit at acceptable terms and to meet obligations without bearing too great losses; under these circumstances it is possible to refer to “funding Liquidity”. These two dimensions are interrelated in several ways: in the first place the reason why having more of both is convenient is the same. Much as people value better holding assets that can be immediately be realized into cash, since it may be difficult to foresee when a personal financing shock may incur so they end up prizing funding Liquidity, investors value better market Liquidity in the sense that they prefer assets that can be sold quickly and close to their fundamental value in case of need. Secondly, both dimensions serve as a precondition for the corresponding. It may happen that since market makers provide Liquidity for trading each asset, the higher the financing facilities available to them to create a large enough inventory for the covered securities, the greater will be the overall Liquidity in the markets, in the sense that investors will be able to purchase assets in larger amounts and at better prices. In the opposite way, a drop in financing ability for market makers may lead to a widening of Bid-Ask spreads and a reduction in maximum order size. Furthermore, the relation between the two dimensions may also be reversed: Market Liquidity may anticipate funding Liquidity because of the margins security traders must post to cover the risk that they may not be able to afford the securities they are buying in case they are borrowing money to do so. The amount needed for the margins depend on the securities expected market Liquidity and are typically lower for securities that have high expected Liquidity. This way, higher Liquidity in the market leads to cheaper funding for leveraged purchases and lower financing resources needed to operate, creating a feedback from market to funding Liquidity.

The third dimension along which Liquidity extends relates to money itself which can be seen in general as the cash held by people, households, firms and banks or as monetary aggregates such as bank deposits. As a matter of fact, when ranking assets by market Liquidity, cash obviously stands out as the most liquid as it is universally accepted in exchange for goods at ever stable terms. This idea of “monetary Liquidity” bears some relationship with the former two as well: an expansion of the money supply initiated by the central bank facilitates the retrieval of financial resources for intermediaries and increases funding Liquidity, enhancing market Liquidity with it as previously shown. By the same token, a monetary contraction is expected to reflect in both lower funding and market Liquidity. The former relationships involving the three dimension of Liquidity should lead in any case to an understanding that points towards a variable connection over time and that serves as a landscape to find causalities in their general evolution since the actions and the effects that monetary policies have on financial intermediaries may very well vary according to the specific behavior and needs of investors and the different amounts of funding Liquidity generated in presence of the same level of money supply.

2.2.2 Market Structures and Trading Mechanisms

Markets are spaces necessary to bring buyers and sellers together and set the conditions to operate safely. In theory trading mechanisms are not considered explicitly on the assumption that their impact for security prices is negligible; instead, there exist several types of mechanisms to trade and they can be extremely important in day-to-day activity as they affect markets efficiency and set the guidelines for allocating gains among investors. In this framework, different mechanisms determine the different actions that investors can undertake, their information on other participants’ actions and the outline to match buy and sell orders. Trading mechanisms then define the “rules of the game” that participants must follow and it is possible to summarize all the virtually countless combinations of rules that can concern this topic as variations of two basic structures: limit order and dealer markets. In limit order markets final investors interact directly in the sense that their offers constitute the limit order book (LOB) and rank according to price priority, so that higher Bids and cheaper ask offers will have priority over more expensive ones and will have precedence in execution. On the other hand, according to dealer markets final investors can only trade at predetermined price ranges and offer quotes posted by specialized intermediaries, called “dealers” or “market makers”, so that each quote is not consolidated in order to avoid price priority. In many cases, however, securities markets are a hybrid combination of features of these two basic mechanisms.

As previously shown, an essential feature of limit order markets is that buy and sell orders from investors find a direct match within a single marketplace, which can be the floor of a physical exchange or a simulated virtual trading venue ruled by a computer. Once posted, all orders constitute the LOB,

whose rules affect the priority guidelines to process and match them according to the market features and the characteristics of the orders themselves. Additionally, limit order markets differentiate according to whether incoming orders are stored in the LOB and matched at discrete intervals, creating call limit order markets, or, in the opposite case, orders are matched immediately with an already present quote in the LOB, generating continuous limit order markets. The design of an order applying to a continuous limit order market can vary substantially depending on the needs and the nature of the investor who posts it. In the most basic case, the order will go off at market conditions determining both speed and price of execution, and it will match an already present limit order in the book. The market order then only specifies an amount to buy and sell so it will operate immediately whatever the price will be on the market. On the other hand, a buy limit order will specify the maximum price at which the trader is willing to accept to buy a given amount of the security and a sell limit order will similarly specify the minimum price the trader will accept for a given amount of the same security. The main difference between limit and market orders is that limit orders do not guarantee immediate execution, nor the assurance that they will ever find a matching counterparty, while market orders execution is granted upon submission. Thus, the choice between a market and a limit order involves, above all, the evaluation of the trade-off between immediate execution at available market prices or a more favorable transaction price at the expense of delayed and uncertain execution conditions.

| | Shares | Price |
|----------------|---------------|--------------|
| Asks -----> | 1900 | 34.56 |
| | 1700 | 34.54 |
| | 1200 | 34.53 |
| | 400 | 34.52 |
| | 300 | 34.51 |
| <----- Bids | 1000 | 34.49 |
| | 1100 | 34.48 |
| | 1400 | 34.47 |
| | 1500 | 34.46 |
| | 2200 | 34.45 |

Figure 1: Illustration of limit order book, at any point in time all buy limit orders (Bids) and sell limit orders (asks) awaiting execution are presented following a hierarchical order.

Another possible arrangement for limit order markets operates in such a way that orders match at discrete point in time – say, once a day. If this is the case, the market goes under the name of “call auction”; orders are placed before the auction takes place, gradually accumulating in the LOB. Eventually, all the executable orders will meet with at the same price and, for this reason, the call auction is often called

uniform price auction. Since with this mechanism it is possible to know beforehand the quantities that traders are prepared to buy at each possible level, the final realization is made at the market-clearing or equilibrium price that is determined by the point where the Bid and ask total schedules intersect; all the Bids with a price higher and the asks with a price lower than the market-clearing will find execution within the auction. Limit orders matching the equilibrium price may be partially executed instead depending on the residual demand and supply after filling all residual orders with a better price position. Call auctions are important and frequently in place for stocks that are traded rarely. With this technique, market directors make sure to build enough interest on both sides of the market before completing the deals reducing this way the risk that the price may reflect temporary distortions caused by unilateral and temporary imbalances between supply and demand.

The case for dealer markets is substantially different: final investor must contact a dealer in order to be able to trade with the transaction price being unilaterally determined by him. This way, this trading mechanism implies that there are two different sections in dealer markets: the retail segment, where dealers communicate directly with final investors and act as an actual counterparty much like participants in limit order markets do, and a wholesale segment, the so called “interdealer market” in which dealers are allowed to exchange securities in order to modify their inventories and lessen their exposure towards particular instances when needed. Dealers’ markets are generally in use only for a limited number of shares so that a large order can be executed by splitting it among several dealers that provide sufficient resources to withstand it. Because of the required disclosure of prices, an investor with a large order may have the advantage of speeding up the execution of the deal by agreeing to the quoted price; this may be important for some arbitrageurs who need to enter long and short position in different markets and, for them, speed is just as important as the cost of trading itself represented by the transaction price.

| 2 | ALPHA ZETA 326-329 GAMMA EPSILON IOTA | | | 3 |
|----------------------------|---------------------------------------|-------------|------------|-----------------------------|
| Market Maker Identity Code | Bid Price | Offer Price | Quote Size | Time of Latest Quote Update |
| ALPHA | 326 | 330 | 75 × 75 | 08:53 |
| BETA | 324 | 330 | 75 × 75 | 09:14 |
| GAMMA | 325 | 329 | 75 × 75 | 09:16 |
| DELTA | 323 | 332 | 75 × 75 | 08:53 |
| EPSILON | 325 | 329 | 25 × 25 | 09:36 |
| ZETA | 326 | 330 | 75 × 75 | 11:30 |
| ETA | 325 | 330 | 75 × 75 | 09:45 |
| THETA | 325 | 330 | 75 × 75 | 09:23 |
| IOTA | 324 | 329 | 75 × 75 | 10:27 |
| KAPPA | 323 | 330 | 75 × 75 | 09:45 |
| LAMBDA | 325 | 330 | 75 × 75 | 08:53 |

Figure 2: Example of trading dealer in a hypothetical dealer market. Each one of them has a Bid and an ask price and the quantities relative to each type of offer

The extent to which trading rules affect markets and their correct functioning may also be evaluated in terms of speed of incorporation of new information and, eventually, the Liquidity and price discovery of the market in general. As a matter of fact, limit order and dealer market have noticeably different trading costs, much lower in the former especially for small orders. As cleverly pointed out by Huang and Stoll (1996)¹¹ the differences in the two types of trading mechanisms affect trading costs by several points of view. They found that dealer markets tend to have higher average transaction fees than limit order book. This may be due in particular to higher inventory costs bore by intermediaries in dealer markets. It is possible that the greater depth, i.e. the greater supply for each security provided by agents in dealers markets translates into higher spreads. Furthermore, each dealer must raise his spread to compensate not only for his inventory accumulation but also for that of other dealers since his ability to undo his inventory depends on the inventory position of his competitors. In addition to the effects on transaction costs of different types of market structures, the amount of information on prices and investors available to all participants, idea that generally goes under the name of market transparency also has implications for Liquidity. As documented by Boehmer, Saar and Liu (2005)¹² changes in market transparency anticipate a drop in the price impact of market orders, which is a way to measure illiquidity parallel to the usual Bid–ask spread. Ultimately, the effects of different markets design may have a great impact on the performances of the strategies carried over by investors and should not be taken for granted when developing new ones.

2.2.3 Liquidity and Trading Activity Measurements

In several prominent theories about the functioning of the markets and their evolution through time it is often assumed that the most important elements to take into account in the context of investment decision sum up to the long-term risk, that is generally proxied with the variance or the standard deviation of returns, and the expected performance of the selected portfolio. Reality is more complex than this simplified theoretical framework and, as a matter of fact, Liquidity is just as important in evaluating assets as it is performance and it should be accounted as an additional key source of risk. The typical definition of a liquid asset refers to the cost necessary in order to convert it into cash or to trade it with some other security, and it can be divided into an explicit and one implicit component. Among the explicit cost it is possible to list all the expenses necessary operate such as broker commission, transaction taxes, trading and clearing fees. On the other hand, implicit costs consist of all the additional expenses arising from the actual illiquidity of the market and that are variable through time. The easiest way to take notice of implicit

¹¹ (Dealer versus auction markets - A paired comparison of execution costs on NASDAQ and the NYSE, 1996)

¹² (Lifting the Veil: An Analysis of Pre-trade Transparency at the NYSE, 2005)

costs is making a simple round-trip transaction, involving an initial buy and an immediate resell of the same amount and type of a particular security and measure the cost of doing so in terms of spread between the actual ask and Bid price. However, in order to have a more comprehensive and precise idea about the cost of trading in a particular market there exist several advanced measures of Liquidity that are sensitive to more elements such as the transaction volumes and the price impact of an order that are essential to have an accurate measurement of the trading costs. To estimate empirically these expenses it is necessary to have at hand all detailed data on past orders, including the time of their submission to measure the delay cost, and on past quotes, which is fundamentally the entire schedule of the LOB in the specified trading venue. Once the data are collected, it is possible to carry over all the previous measures on trading Liquidity and all the slight variations relative to each one.

As previously shown, the typical framework to analyze Liquidity involves the ability of a security to be readily converted into another asset such as cash. The natural consequence of such a statement requires to focus on a series of attributes that are closely connected to the act of trading a particular security and that are inherent to the place where the operating activity takes place which are the depth, breadth and resiliency of the market. Concerning the first two, a market is said to be deep and broad if there is a sufficient amount of orders at an array of prices in the close neighborhood of the price at which securities currently trade, so that the chances to encounter best buy and sell orders are sufficiently high even if volumes are large; direct consequence of this is that Bid-Ask spreads tend to be tight and the price impact of an order small whenever the market has depth and breadth. By the same token, resiliency relates to whether temporary order imbalances are able to be counterpartyed by an equivalent but opposite amount of orders so that the market can restore the reasonable price levels for all securities trading; If so, trades will be performed at more appropriate levels on average. Each of the mentioned attributes relative to the correct functioning of the market has its own measurement but, if they were to be combined together in order to create a single comprehensive index to measure Liquidity, some conflicting assessments may arise. This is due to the fact that markets can be ambiguous in their functioning and single measures may point towards different assessments of Liquidity in similar circumstances. Nevertheless, evaluations like the asset's average Bid-Ask spread can still be implemented as proxies in academic investigation.

In order to avoid misunderstandings in setting the guidelines for a correct framing of Liquidity, it is important to list some of the measures that are misleading when dealing with this topic. The first misconception regards a measure that relates the number of shares traded in a given period of time with the absolute value of the percentage change of their price in the same interval and goes under the name of "Liquidity Ratio". By the same logic, the larger this ratio the deeper the market is presumed to be and hence the more liquid. As a matter of fact, this measure is meaningful only for a small part since it neglects the fact that prices may also change after an unexpected advent of news that have the potential to initiate

a change in trading levels. Thus, a large trading volume associated with a small price change may not be necessarily an evidence for a liquid market as it may also point towards an inefficient price adjustment after a significative informational change. The second misconception about Liquidity deals with the Market Power of large traders. Every time a seller faces a downward-sloping demand curve or a buyer an upward sloping one he has some relative market power; it often happens that institutional investors or large shareholders own percentages large enough of a given security that they end up having some potential on its long-run price level and, as a consequence, they may consider the market for that specific security to be illiquid for them. Of course, this is a misuse of the term: the illiquidity of a market depends only on the short-run consensus price deviations addressable to actual trading costs such as the spread existing between the Bid and the ask quotes. Whenever a trader presents a large portion of a security in the market, either in the guise of a buyer or a seller, it is utterly conceivable that it will change the equilibrium price of the asset; such a price change is not to be considered as a manifestation of market illiquidity. Finally, the illiquidity of a market, although classifiable as one among many sources of risk, is different from the idea of price uncertainty that may still exist in a perfectly liquid market. The concept of illiquidity is distinct from the concept of risk intended as the inherent unpredictability of asset returns featuring virtually all securities in the markets.

In light of what previously seen about Liquidity and its connection with some important market features such as depth and the Bid-Ask spread, an ideal index should comprise at least some information on volumes, price and time of selected transactions. However, measures arising from each of these attributes are unable to involve the residual as well so there is no exact index for Liquidity and the attributes are just proxies for predicting and estimating the Liquidity of a given security. Furthermore, it is possible to differentiate between measures devoted to assessing Liquidity and ways to calculate trading activity. The first following three are all methods relative to evaluating Liquidity while afterwards will be presented the main methodology in order to evaluate the trading activity for a particular security in a selected period of time and finally the main measure to proxy illiquidity will be discussed.

i. The Bid-Ask Spread

The easiest and most intuitive way to measure the cost of a small round-trip transaction resorts in the average fee of simultaneously buying and selling one stock i on trading day t . This measure, that goes under the name of the Bid-Ask spread (S_{it}), and is one of the main appreciated methodologies to calculate Liquidity, can also be defined as the average quotient obtained by dividing the price spread by the average price as shown in equation (1).

$$S_{it} = \sum_{t=1}^T \frac{\left(\frac{P_{it}^{Ask} - P_{it}^{Bid}}{(P_{it}^{Ask} - P_{it}^{Bid})/2} \right)}{T} \quad (1)$$

The only drawback of this method is that it requires data on limit orders as well as on quotes posted in the market at multiple times and on several occasions within a designated trading period of time. Moreover, whenever the trade sizes are large enough that they consume all the Liquidity available at the best Bid or ask price, it is necessary to have information on the LOB at price levels beyond the top of the book and these kind of data may not always be completely available and depend greatly on the specific trading venues and relative transparency.

ii. *The Relative Depth*

The relative depth of the market (RD_{it}) reflects the average number of shares of company i available at each side of the market on trading day t at the top of the book (N_{it}^{Best}) compared with the number of total shares outstanding for company i on trading day t (N_{it})¹³. The resulting equation is simply the ratio of these two quantities as shown in (2):

$$RD_{it} = \frac{N_{it}^{Best}}{N_{it}} \quad (2)$$

The idea of market depth is relevant in all those circumstances where a buyer or a seller encounters a respectively upward or downward sloping curve of available limit orders when filling his order. Whenever larger purchases¹⁴ are associated with an increasing difference with the execution price for the respective market order, causing the weighted average Bid-Ask spread to be greater than the best quotes spread, the market is considered to be thin and costly to operate in. On the other hand, if an investor can trade large quantities without substantially moving the price, so the spread remains the same as trade size increases, it is possible to refer to the market as deep and cheap in terms of implicit transaction fees. Market depth has thus an inversely proportional relation with the average spread for large trade size. As it is easily

¹³ Since the number of shares outstanding may vary greatly across different companies it is of utmost importance, in order to keep the data comparable, to employ relative values obtained by dividing the numerator for the total number of shares outstanding.

¹⁴ In any case, not large enough to be able to affect the long run price equilibrium of that particular security.

conceivable, this has great implications for institutional investors who may operate mainly through the implementation of sizeable orders and who can see their transaction fees increase exponentially as the market depth for a particular security decreases.

iii. Market Quality Index

Finally, it is possible to compute an aggregate measure of Liquidity that considers both the information coming from prices as well as those relative to the number of shares available for a particular company available at best price levels. The market quality index for share of company i at trading time t (MQI_{it}) is the ratio between the average relative depth and the Bid-Ask spread. It can be written as follows:

$$MQI_{it} = \frac{RD_{it}/2}{S_{it}} \quad (3)$$

According to this composite measure, Liquidity increases every time the Bid ask spread tightens, the relative depth increases or the ratio between the two increases as well.

Although Liquidity and trading activity generally move in the same direction, meaning that they show positive signs of correlation, it is true that up to a certain degree a more pronounced trading activity may combine with lower Liquidity. This is due to the fact that the spread may become wider whenever several traders become operative simultaneously, especially if there happens to be a significant imbalance in one of the sides of the market.

iv. The Relative Trading Volume

In order to assess correctly the amount of the trading activity of some security in a certain period of time it is necessary to be aware of some characteristics concerning its nature: in particular the relative trading volume (RTV_{it}), i.e. the trading turnover, represents how many shares of company i are traded on day t (N_{it}^{Trade}) with respect to the total number of shares outstanding (N_{it}). As follows:

$$RTV_{it} = \frac{N_{it}^{Trade}}{N_{it}} \quad (4)$$

By the same logic, it is important to stress that the level of the trading volume of a particular security should be separated from its Liquidity evaluation. The reason for that resides in the observation that trading volume tends to increase whenever new information become available to the market, and generally this is a time in which volatility increases as well. This increase in the uncertainty about future assets performances is commonly followed by a widening of Bid-Ask spreads that, as previously shown, are one of the main indicators to evaluate Liquidity does. Ultimately, trading turnover might rise when trading costs happen to be high and behave differently from what Liquidity. In any case, the absolute lack of trading volume relates, up to a certain extent, to a rough assessment of actual illiquidity: in some very thin markets prices may just be stuck to a stale level that reflects the lack of transactions and trading activity; this is the case of emerging markets or dealer markets where Bid ask spreads are prohibitively costly and unrepresentative of trading opportunities.

v. *The Probability of Informed Trading PIN*

A substantially different approach in evaluating the importance of transaction costs in day-to-day trading activity has been developed by Easley et al. (1996)¹⁵ and, differently by previous methods, it resorts to actual imbalances of buy and sell orders to estimate the illiquidity of the market. The idea behind the Probability of Informed trading or PIN is that it is possible to roughly proxy the amount of fees necessary to carry over a transaction depending on the flow of new information that slowly become that available throughout the trading day. As a matter of fact, the following methodology substantially approximates the likelihood of an increase in Bid-Ask spreads with the probability that informed and active traders actually exploit their superior knowledge causing an order disproportion in either side of the market. The PIN measure contains some basic parameters which are: the probability of arrival of new information α , the percentage of informed traders μ and the percentage of uninformed buyers and sellers respectively ε_s and ε_b . With this notation in mind, the probability of informed trading can be written as:

$$PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_s + \varepsilon_b} \quad (5)$$

As already mentioned, the PIN is the ratio between the orders percentage of informed traders over the total amount of trades; in the unlikely case where all operating traders are informed the PIN will equal 1

¹⁵ (Liquidity, Information, and Infrequently Traded Stocks, 1996)

and the market illiquidity will be the highest due to presumably high transaction cost following the presence of such unusual order flows.

2.3 Benefits of Liquidity

When considering the various aspects of Liquidity and its implication on portfolio selection and on stock returns, as in part previously shown, it is important to remember that its consequences extend both on the side of investors and on the one companies whose shares eventually trade on the markets. Under the point of view of market participants in the vests of traders, the main feature to keep in mind when investing in liquid or illiquid stocks is that this trait may considerably alter the performance of any investment, simply due to the fact that illiquid securities are more expensive to buy, and sell for less. Furthermore, the more illiquid is the market, the less are the chances for investors to jump out of their investments shall they need to do so, as it may be the case in a Liquidity squeeze or a credit crunch, and the less are the opportunities to have large absolute returns due to the average Bid-Ask spread increasing in the size of transactions. By the same token, other agents interested closely throughout their operating activity in the evolution of Liquidity and its long term establishing are all those professional who offer and specialize in providing security trading services such as mutual funds, hedge funds or pension funds; considering also their size and the average proportion of their orders, choosing the right trading venue in terms of Liquidity provision may be vital to avoid losing significant percentage points in expected returns.

Another important issue to manage regarding any trading activity deals with the risks associated with it and all the sources of danger that may hinder its profitable continuation. Since Liquidity is inherently changing, and in large part variable, it may constitute one important element keen to increase the fundamental unpredictability of future asset performance and consequently it may act as a motive for higher compensation when holding any particular security. Thus, asset prices and equilibrium levels of all securities trading in a particular venue should reflect both the future cash flows that each asset is expected to generate at any point in time, as generally accepted to be the most reliable estimation of the fair value within the lifecycle of a security, and the costs, with the associated risks, that may eat into returns every time a transaction will take place in an illiquid market, reflecting the additional performance that investing in a riskier asset should generate, the so called illiquidity premium. In this framework, there exist several theories that link the evolution of asset prices to market microstructure and that are able to explain how Liquidity affects returns. In particular, Hasbrouck and Seppi (2006)¹⁶ find evidence, through the implementation of principal component analysis, of the presence of some common factor able to explain significantly the evolution of Liquidity for different assets within the same trading venue; this finding

¹⁶ (Common Factors in Prices, Order Flows and Liquidity, 2001)

suggests that the Liquidity risk, and the associated higher expected performance, should generate a return that also accounts for the facts that part of the risk cannot be diversified away and contributes to the increasing of the overall systematic exposure of the security. With this in mind, it is utterly conceivable that the link between Liquidity and asset prices have a great impact on the investment decisions of market participants.

From the standpoint of Companies, on the other hand, the opportunity cost generated by having a stock that trades badly in terms of transaction fees in the markets may end up with decreasing the firm value as a whole unless swift decision on capital expenditure are taken in order to avoid such depreciation. Since having more liquid securities require lower expected rate of return, all companies will try to lower implicit transaction fees in order to decrease their cost of capital, and presumably boost investment. By the same token, another significant scope of stock market Liquidity entails all those companies that become public for the first time with execution of an Initial Public Offering. When a company initially offers a public listing, investors and market participants have little information at their disposal to evaluate how good of an investment such a company may represent. Since the value of a newly listed firm is highly uncertain, it is particularly exposed to asymmetric information issues. This reflects on a high market illiquidity at the very beginning of the trading activity, while it tends to attenuate in time as new information become available and secondary stock market trading carries on, which implies that the more illiquid the primary market the more expensive will be the cost of equity capital for all those companies that tap into public ownership for the first time. When it comes to proper corporate governance choices, for purposes related to managerial compensation, all investors, issuers and shareholders of a company might prefer to trade in a venue where asset prices reflect an important part of the information available on a security; if this is the case, these superior knowledge may serve as a benchmark to evaluate performance of the firm and choose managerial compensation as well as future investments decisions. Price discovery, the feature that tracks how well a trading market incorporates newly information into prices, is then another relevant feature for companies choosing the venue to list in. In this framework (Luo 2005)¹⁷ it often happens that companies examine the stock reaction regarding an hypothetical deal prior to execute it; if after the news has become public the reaction turns out to be positive, and the company may take advantage of the a superior positioning at completion of the deal, then there are higher chances that the governance of the company will carry on with the agreement otherwise it may terminate it beforehand. This behavioral tendency is possible only if the prices on the market react swiftly to informational changes happening in the real world, and this states once again the centrality of price discovery in managerial investment decisions as well as in corporate strategies.

¹⁷ (Do Insiders Learn from Outsiders? Evidence from Mergers and Acquisitions, 2005)

periods equal to h with the security's payoff and future cash flows being equal to just the additional value generated throughout the holding period. The illiquidity of the market is such that there exists two different quotes, one for the Bid price b_t and one for the Ask price a_t generating a spread equal to s_t with respect to the security's fundamental value m_t . The equation for the Bid and the ask quote is as in (6):

$$a_t = m_t \left(1 + \frac{s_t}{2}\right) \quad (6)$$

and for the Bid quote as in (7):

$$b_t = m_t \left(1 - \frac{s_t}{2}\right) \quad (7)$$

In order to hold any security for a number of periods equal to h , any investor will require at least a return that is equal to the riskless rate and an additional premium given by the unique risk originating from that asset. Therefore, the fundamental value m_t should increase on average at a rate equal to r ; with this in mind it is possible to pin down the maximum price the investor is willing to pay that is as in (8):

$$\underbrace{m_t \left(1 + \frac{s_t}{2}\right)}_{a_t} = \underbrace{m_{t+h} \left(1 - \frac{s_{t+h}}{2}\right)}_{b_{t+h}} \frac{1}{(1+r)^h} \quad (8)$$

Which expressed in terms of m becomes as in (9):

$$m_t = m_{t+h} \frac{1}{(1+r)^h} \left(\frac{1 - \frac{s_{t+h}}{2}}{1 + \frac{s_t}{2}} \right) \quad (9)$$

and substituting the gross return R as a function of m turns into:

$$(1 + R)^h = (1 + r)^h \left(\frac{1 + \frac{s_t}{2}}{1 - \frac{s_{t+h}}{2}} \right) \quad (10)$$

The first term in the previous equation denotes the average per period percentage change in security's fundamental value required by the investor to hold the security; it is feasible to note that the gross return R is greater than the net return r since it also accounts for changes in price determinants other than just those referring to the fundamental value of the security. The last term in (10), on the other hand, is what we have called at the beginning the illiquidity premium: this fraction increases in both s_t and s_{t+h} meaning that the higher the actual and the future expected spread on the security, the higher the gross return demanded by the investor to hold the asset. This asymmetry in the required performance is what explains anomalies in price levels of two securities that seem to have the same risk profile and fundamental value. As a matter of fact, it is possible to evaluate the necessary additional demanded premium in case the fundamental value m of the selected asset is uncertain as well. In this setting, the discount rate will depend on the associated systematic risk of the security. According to the Capital Asset Pricing Model CAPM, the most renowned methodology to estimate the additional expected return when assets' future value is uncertain, the risk adjustment in the additional premium relates to the β of the security, that is, the covariance between the return on the stock and that of the market portfolio M , divided for the variance of the latter in addition to a minimal performance equal to the risk-free rate r_f . The expected rate of return for any asset i is then:

$$E(r_i) = r_f + \beta_i(E(r_M) - r_f) \quad (11)$$

The former equation, as previously said, states that the risk premium generated by an asset is the product between the contribution of asset i to the risk of a well-diversified portfolio, that is its β , and the expected excess return r_M over the risk free rate that the market portfolio itself is expected to generate; The asset's β denotes the proportion of the risk that cannot be diversified away by holding the asset in concomitance with several other securities, and so determines an increase in its systematic exposure. Now, it is possible to add the derived required return according to the CAPM in the equation (10) seen before to determine the Liquidity premium of the asset as in (12):

$$[1 + E(R_i)^h] = [1 + E(r_i)^h] \left(\frac{1 + \frac{S_{it}}{2}}{1 - \frac{S_{it+h}}{2}} \right) \quad (12)$$

So, the expected gross return R for asset i , considering the spread s to be constant in time and with some additional approximation consisting in averaging the holding period h among all investors becomes:

$$E(R_i) = r_f + \beta_i(E(r_M) - r_f) + \frac{S_i}{h} \quad (13)$$

This expression decomposes the sources of return in three main components: the first is the minimal return that even a riskless security would deliver and stands for the risk-free rate r_f . The second term $\beta_i(E(r_M) - r_f)$ comes from the correlation of assets' specific covariation with market movements and represent the systematic exposure that involves trading in the security, while the last component refers to the illiquidity premium.

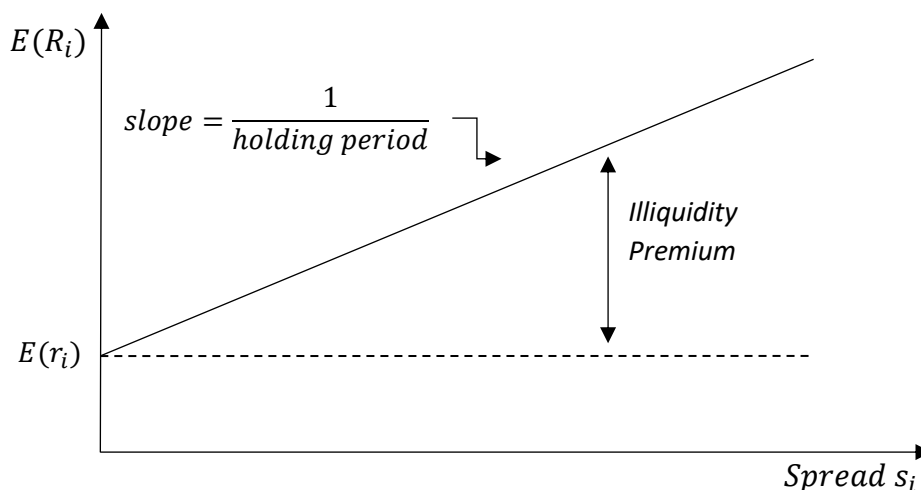


Figure 4: graph of the relation between expected return and spread for asset i . The intercept of the line corresponds to the expected net return $E(r_i) = r_f + \beta_i(E(r_M) - r_f)$, the slope equals to $1/h$ that is the inverse of the holding period. If all market participants have the same investment horizon the linear relation is an adequate approximation of their joining function.

By the same logic, as shown in figure 4 the additional compensation demanded for bearing transaction costs throughout the trading activity is represented by the ratio between the spread and the average holding period s_i/h , that increases linearly with the former, and decreases similarly as the investment horizon

becomes wider. The line joining the spread and the asset expected gross return has an intercept that equals the standard CAPM required return as shown above, and a slope equivalent to the inverse of the holding period $1/h$.

ii. *Clienteles effects*

The clientele effect discussed in Amihud and Mendelson, stating that different types of investors will prefer different holding periods, can be further developed by saying that equilibrium returns should be a concave increasing function¹⁹ of the spread rather than a linear one. To ascertain this, it suffices considering two securities differing in both the spread, call s_1 the spread for the first one and s_2 the one for the second, with $s_1 > s_2$, and two investors differing for their preferential holding period h , where $h_2 > h_1$. Assume further the investors with the shorter holding period will prefer buying more liquid assets and investors with longer awaiting preference will prefer higher spread securities and that the expected gross returns are R_1 for the liquid security and R_2 for the illiquid one. The equilibrium of this arrangement clearly depends on the absence of incentives for either participant to switch from their current positions. This is true only if the net return r_1 for the shorter holding period group, investing in the liquid security, and the net return r_2 of the long term investor preferring the illiquid asset are no worse off than in the case where they would both switch securities with respect to the relatively liquid or illiquid one. These statements translate in the following equation (6):

$$R_1 - \frac{s_1}{h_1} \geq R_2 - \frac{s_2}{h_1} \quad (14)$$

and (7):

$$R_2 - \frac{s_2}{h_2} \geq R_1 - \frac{s_1}{h_2} \quad (15)$$

that when considered together also imply:

¹⁹ If so, the returns will increase at a decreasing rate causing the graph of the function joining returns and bid-ask spread to slowly decrease in slope as spreads increase.

$$\frac{1}{h_2} \leq \frac{R_2 - R_1}{s_2 - s_1} \leq \frac{1}{h_1} \quad (16)$$

When these conditions are satisfied then it is possible for each investor to legitimately prefer remaining in their favored investment horizon and behave rationally with respect to expected returns and asset Liquidity. In order to have a graphical representation, the stated requirements determine that the line connecting all the equilibrium possible combinations of spread and asset returns to lie below the indifference curves relative to each clientele, where the indifference curve for a group of investor denotes all those combinations of asset spread and return that are equally remunerating in terms of net return r . Since the net return is a decreasing function of the holding period, the indifference curves for clientele i has slope $1/h_i$.

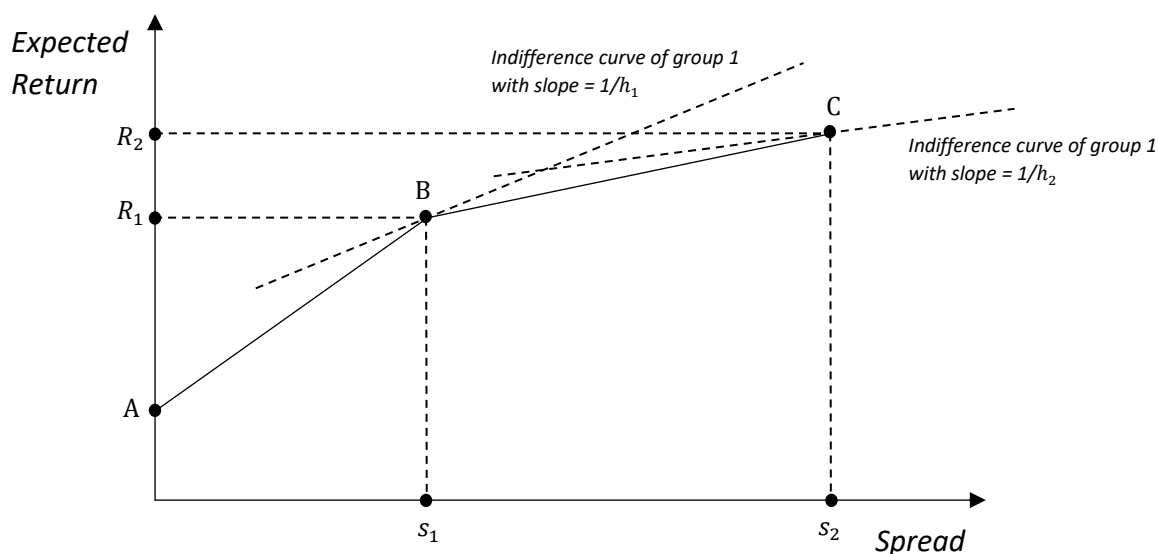


Figure 5: Example of possible combinations of expected return and spread for a given asset. The line connecting the spread-return pairs is an increasing and concave function of the spread due to the unique preferences of holding periods of different types of investors

As it is possible to note in the figure, each type of investor is assigned a particular pair of return-spread combination depending on his exclusive preference about the investment horizon to delve in. If an investor has a preference for a shorter holding period then he will prefer the combination of spread and return relative to point B over both A and C while clienteles choosing longer holding periods will select the expected return relative to C. In between, All possible different combinations of spread and expected return will lead to different coincidence points and as the number of available assets increases, the slope

of the curve joining all securities ranked by Liquidity in their equilibrium levels with respect to expected return will form a weakly concave shape. For these reasons, it is possible to consider the asset return as an increasing and concave function of the expected spread in the market.

iii. Evidences

After giving details on why the function linking returns and spread is increasing and concave, meaning that expected returns rise at a decreasing rate, Amihud and Mendelson test the significance of this hypothesis on real-world stocks. Their aim is to verify that returns significantly improve as spreads on securities increase in order to develop a sound basis for stating that a liquid stock increases firm value by lowering the expected cost of capital. Going back to what previously stated about the demanded performance of an asset with respect to the covariance with the market portfolio and the illiquidity premium, the gross return R for any security i should in any case comply with (17):

$$R_i = \lambda_0 + \lambda_1\beta_i + \lambda_2s_i + \varepsilon_i \quad (17)$$

Where λ_0 is an estimate of the riskless rate, λ_1 is an alternative expression for the excess return of the market portfolio over the risk-free rate, λ_2 is a measure of the inverse average holding period and ε_i is a zero-mean error term. Amihud and Mendelson test equation (17) on a cross section of real world stocks by implementing a regression of returns R_i on asset betas β_i and relative Bid-Ask spreads s_i and they obtain (18):

$$R_i = 0.0036 + 0.00672\beta_i + 0.211s_i + \varepsilon_i \quad (18)$$

(6.18) (6.83)

With these results, Amihud and Mendelson have been able to show that a one percentage point increase in the Bid ask spread of the security triggers a 0.211% higher monthly gross return that means up to 2.5% per year, and the coefficients are significant as shown by the t-statistics in the parentheses in (18). The coefficient for the Bid-Ask spread, as shown above, is also an approximation of the average holding period according to their estimates happens to be around 5 months. Furthermore, they found that the coefficient for the β of the estimates decreases when the Bid-Ask spread variable is added into the regression. Meaning

that part of the return addressed to the systematic risk may in fact come from extra transaction costs²⁰. Finally it is interesting to mention that the coefficient 0.00672 of the β in the regression is very close to the average monthly excess return of common stocks in the period relative to the development of their assessment, meaning that it well resembles the excess return of the market portfolio implied in the CAPM framework.

The second part of Amihud and Mendelson initial task was to verify whether the relationship between expected returns and Bid-Ask spread was concave, so if returns tended to increase at a decreasing rate with higher spreads. In order to verify this, the authors divide the stocks in a cross-section of portfolios organized by increasing β and spread and tested the hypothesis with the recourse of a piecewise linear regression. Also this time they found that the coefficients for the spreads in the regression generally decrease as higher spread portfolios are evaluated, consistently with the hypothesized concavity of the return-spread relation and, because of the clientele tendency to select portfolio according to preferred investment horizons, with the lower sensitivity of long-term portfolios to the spread. These results, combined with an expanding interest in the topic of asset pricing and market microstructure, were extremely important because started to shed light on the neglected importance that transaction fees may have on company values; the higher yields required on higher Bid-Ask spread stocks would give firms incentives to manage the Liquidity of their shares, thus reducing their opportunity cost of capital and eventually adopt policies that may expand the value of the firm. In particular the numerical examples indicated a reduction of the Bid-Ask spread from a high to a low level may increase firm assets by up to 50%, suggesting a strong incentive for firms to invest in growing company-specific Liquidity. In particular, actions such as the issuing of an IPO, the choice of the exchange listing venue and information disclosure may all be seen, in the end, as an investment to increase Liquidity.

Another article linking firm value and Liquidity is proposed by Fang, Noe and Tice (2009)²¹ that in particular assesses that market-to-book values of firms tend to be higher as the transaction costs measured with the average spread becomes lower. In particular they focus on an exogenous event, such as the decimalization of stock market that consisted in the reduction of the tick size for traded securities in the year 2000, that increased the Liquidity for all assets publicly traded and above all privileged the already most liquid ones. In order to assess the nature of the above relation they divided the possible explanation in two groups:

²⁰ and this is in part sustained by the fact that there exists a high positive correlation between the spread and the β , resulting in an upward bias of the estimates of the coefficient of the assets' covariance with the market.

²¹ (Stock Market Liquidity and Firm Value, 2009)

1. Performance Based Theories: the higher performance linked with higher Liquidity derives from a superior operating performance originating from an advantage in having lower transaction fees
2. Pricing-Based: the performance effect originates from an illiquidity premium or mispricing that relates to an increased expected return whenever higher transaction costs affect firm's securities.

Differently from what discussed above, they argued that a more liquid market tends to induce managers to bring over better investments and consequently increase firm value. The mechanism responsible for the different worth of firms is then to be addressed to an increases operational profitability rather than to the classical cost-of-capital channel that, for them, plays a minor role compared with the managerial one.

2.3.2 Liquidity and Performance Monitoring

An important feature of stock markets, As pointed out by Holmström and Tirole (1993), and surely unforeseen at the time they institution was first created, is that it ultimately serves several purposes. One of these relates to the improvement in managerial monitoring that markets pledge to investors and companies' shareholders. As a matter of fact, Stock markets perform an important role as monitor of management, by assessing and evaluating directly how well a manager has operated in terms of value creation and indirectly constituting a market for corporate control. By the same token, it is possible to argue that stock markets are better informed about managerial performance than the actual board of directors of the company itself. This may happen for a series of reasons: first of all, it is difficult for a board to punish a chief executive officer, or fire him, since directors should have a tendency to cooperate with management within and along several dimensions. Additionally, conflicts can take on various forms and managers may ultimately have objectives that are not completely in shareholders' best interests. Managers may decide to shirk and alleviate their tasks without seeking best profit opportunities, and it can be difficult for shareholders, especially when their stakes are just too small, to justify the costs of active monitoring and opportunistic restraining policies. even in the case shareholders may verify such neglecting corporate behavior, it may be just too much of an effort to prevent and stop it since there is no such a measure to describe how much of an effort a manager should commit as well as no parameter to compare with personal manager allegiance. In order to anticipate this unpleasant circumstances, shareholders can mitigate moral hazard and improve company value by pledging to management some incentive schemes to induce to put more effort. When setting a compensation according to some company performance measure²² shareholders can give an incentive to managers to try more and eventually increase firm positioning. In this framework, stock markets become the vehicle through which investors and

²² Alternatively, it may be possible to establish executive incentives according to risk termination or career concerns i.e. performance-based advancement

speculators could gain valuable information about the company and its effective value; the more precise the information conveyed by the firm's stock price, the more effective will be the incentive schemes based on such superior knowledge and eventually the greater the firm performance.

Although incentive schemes and pay for performance policies surely have a boosting effect on managerial discipline and narrow the gap existing between officers and shareholders interests, they also have drawbacks and potentially detrimental effects on firm value. Above all, Holmström and Tirole point out that, as previously said, stock prices are a reliable tool when it comes to establish elaborated compensation policies only if they actually are reflective of future performance and have a reliable informational content. The question with price discovery and reliability consists in the fact that they come at the expense of lower Liquidity since superior profits coming from informational rents are in part sustained by uninformed investors. If prices become more informative about the true fundamental value of a security, the probability that informed traders will perform transaction will increase, and assuming that they behave rationally, they will command a higher discount and a greater illiquidity premium. This transforms into a higher spread that in turns decreases the asset value of the firm, and of its performance according to several measures. In the end, while price informativeness tends to increase the value of the firm by enabling shareholders to construct higher-quality management incentive schemes, it also points towards lower Liquidity as more informed trading will begin triggering the firm value to drop once again. This relationship much resembles the long-lasting conflict existing between Price discovery and market Liquidity and results in the tradeoff between superior management effort and higher discount originating from the illiquidity premium. In the end, having high liquid sock allows companies to perform better for two reasons: At first, they have an advantage operationally, under the point of view of increased contractual power in forming managerial agreements, and second, as shown above, the premium required to their stock in terms of expected return is considerably lower whenever average transaction fees decline.

3

Evidence on Prices and Liquidity after IPOs

Generally, firms that are artificially kept private offer very little possibilities to their owners or shareholders with respect to selling their shares and jump off their investments since no liquid market exists when companies raise capital from a small number of investors. If a Company prospers, however, at a point in time it may need some additional capital and the most basic choice to make in this respect is whether it may find it preferable to ‘go public’ by allowing a large number of investor to acquire shares; by doing so, it also increases the Liquidity of its stock on the markets and this, as largely shown in previous parts, allows the company to raise even more additional capital on more favorable terms as it is no longer necessary to compensate shareholders for the lack of Liquidity generally associated with privately held ownership structures i.e. lower illiquidity premium. Of course, the benefits come alongside with some costs: following an IPO expenses associated with the need to provide additional information to investors and regulators come along on a regular basis. Furthermore, there exist some one-time listing costs directly related with initial public offering that include legal, auditing and underwriting fees as well as all the time and effort that management gives to conduct the offering. These expenses should be counted since they also affect the cost of capital for firms that aim to go public.

When it comes to evaluate the benefits that arise after an IPO, Liquidity is surely the most valuable gain that a company receives after listing on a public market: the trading platform acts as a coordination tool that allows potential investors to meet and trade instead of searching informally for counterparties and it also allows for reputational improvements since many investor may not even be aware the existence of a firm until it lists (Merton 1987).²³ However benefits of Initial Public Offering also extends beyond Liquidity and easier access to capital financing: in particular the stock becomes a useful and effective tool to control the management performance and to strategically construct schemes in order to alleviate the persistent agency conflict that generally stands between management and ownership. Therefore, going

²³ (A Simple Model of Capital Market Equilibrium with Incomplete Information, 1986)

public is above all a strategy that a company takes on and it should be evaluated carefully also in light of future performance objectives.

When a company access the public markets through an IPO a series of patterns and trends regarding pricing levels and secondary market Liquidity tend to show making it a topic of particular importance. In particular some themes are associated with IPOs: i) the Underpricing relative to new issue claims ii) the long run underperformance of newly issued share iii) the development of secondary market Liquidity and its relation to Underpricing and other IPO features. Various theories have been advanced in order to mitigate and explain the effects of these trends in order to test a sound landscape that may help companies to decide when and if is convent to turn to public markets.

3.1 Initial Underpricing

The most renown fact about the initial public listing of companies is the frequent incidence of abnormally large initial returns measured as the percentage difference the offering price with the market price within a few weeks from the offering date i.e. tendentious initial Underpricing. A large empirical literature document this pattern. For instance, Ibbotson finds that initial returns are highly skewed, tend to have positive mean and median close to the 0. What is even more than just a coincidence is that the Underpricing phenomenon exists in virtually every country where a stock market allows for initial public offerings, whereas the Underpricing amount tend to vary across different nations.

3.1.1 Underwriting Misprice or Market Inefficiency

Aggarwal and Rivoli (1990)²⁴ document the phenomenon of Underpricing for a sample of common initial public offerings. They go over two possible explanation for the initial abnormal returns of IPOs: On the one hand it is possible that Underwriters systematically price IPOs below their intrinsic values, this being the predominant explanation among academic literature. On the other hand, a second possibility is that IPOs are subject to market overvaluation, which they call a fad, in early aftermarket trading. If this would be the case, then the cause for initial overperformance should be addressed on market inefficiencies rather than systematic Underpricing. Providing support for the hypothesis about the presence of fads is the fact that intrinsic value is more difficult to estimate when great uncertainty surrounds the company shares, as it is the case for IPOs. Furthermore, investors who acquire shares in newly listed firms tend to be

²⁴ (Fads in the IPO Market, 1990)

inherently more speculative than other groups of investors, and more speculative traders usually lead to even higher uncertainty about fundamental values and larger price deviations.

In order to assess the presence of Underpricing at all, Aggarwal and Rivoli first find a way to evaluate the abnormal return X_t for each IPO as in (19):

$$X_t = \left(\frac{P_t - P_0}{P_0} - \frac{I_t - I_0}{I_0} \right) 100 \quad (19)$$

where P_t is the closing price of the security t trading days after the initial offering, adjusted for dividends and splits, and I_t is the value of the NASDAQ index i.e. the Market Index on date t . The amount of abnormal appreciation arising from the offering price is calculated over 1, 2, 20 and 100 trading days after the issuance of the IPO for the considered sample. The results are consistent with the presence of Underpricing as the average rate of return for holding the investment for 1 day would be 10.67% higher than the relative return on the market index for a similar holding period.

To further evaluate the fad explanation, they examine the aftermarket returns on the long run i.e. for one year, or 250 trading days, following issuance of the IPO. The hypothesis is that if the market is immediately efficient in evaluating new issues, as common knowledge, then the returns pledged to investors who buy the newly issued securities at the closing price of the first trading day should be no higher than the returns on the relative market index. If instead IPOs tend to be systematically overvalued in early days of trading, so supporting the point standing for the fad explanation and the market inefficiency in evaluating new issues, investors purchasing at the first aftermarket price will underperform the market index later on. In order to establish this, Aggarwal and Rivoli estimate the market adjusted performance of IPO Y^* as in (19):

$$Y^* = \left(\frac{P_{250} - P_1}{P_1} - \frac{I_{250} - I_1}{I_1} \right) 100 \quad (20)$$

If the aftermarket is efficient in evaluating newly issued shares, the value of Y^* should approximate 0 and the Underpricing should be addressed to Underwriting mispricing. In this case the returns for an investor purchasing the IPO at the closing price of the first trading day and holding onto the investment for one year should approximate the returns from a similar investment in the market index. If, on the other

hand, the initial aftermarket systematically overvalues IPOs, then negative values for Y^* should emerge. Figure 2 shows the value of Y^* for the considered sample and the years

| Year | Mean | Standard Deviation | Median | t-statistic | N |
|------|--------|--------------------|--------|-------------|-------|
| All | -13.73 | 60.72 | -20.39 | -8.56* | 1,435 |
| 1977 | 5.53 | 49.83 | 8.75 | 0.45 | 16 |
| 1978 | 4.58 | 73.21 | 9.13 | 0.26 | 17 |
| 1979 | 8.22 | 120.23 | 8.72 | 0.38 | 31 |
| 1980 | -16.05 | 70.83 | -23.03 | -2.01* | 79 |
| 1981 | -15.24 | 50.21 | -23.29 | -4.47* | 220 |
| 1982 | -18.63 | 71.36 | -23.56 | -2.01* | 71 |
| 1983 | -11.85 | 49.62 | -17.41 | -4.69* | 385 |
| 1984 | -11.42 | 65.20 | -17.04 | -2.23* | 162 |
| 1985 | -21.43 | 58.31 | -25.25 | -4.54* | 153 |
| 1986 | -15.23 | 64.08 | -22.41 | -4.10* | 297 |
| 1987 | -36.78 | 81.73 | -41.84 | 0.90 | 4 |

Figure 6: value of Y^ calculated according to equation (19) for the IPO sample in Aggarwal and Rivoli (1990)*

The mean value of the long- run market adjusted performance represented by Y^* is -13.73 %. This strongly supports the point that investors purchasing IPOs in the opening markets during the first day of trading act according to the presence of fads. Although abnormal returns in the initial days after the IPO are significantly positive, prices decline substantially in the year afterwards. In particular prices tend to decline within 5 and 12 months following the offering. In the end results have a double effect both for finance professional and for investors. For the former, the results provide defense against the claim of systematic Underpricing and therefore the initial abnormal return should no longer be considered as intentional “money left on the table”. For market traders instead, the findings reveal that IPOs tend to be a profitable investment in the short terms up to 5 month, but tend to mean revert over longer periods

3.1.2 Underpricing and After-Market Liquidity

In addition to the renown explanations for Underpricing as emerging from the asymmetric information and the risk regarding the true fundamental value of the companies listing, other theories relate the presence of initial abnormal returns and Initial Public Offerings to the amount of aftermarket Liquidity featuring each of the issuing firms. This line is supported by Ellul and Pagano (2006)²⁵ and Bateni et al (2014)²⁶ who complement traditional explanations with a new theory where investors also worry about

²⁵ (IPO Underpricing and After-Market Liquidity, 2006)

²⁶ (The Relationship between IPO Price and Liquidity: Empirical Evidences from Iran, 2014)

the after-market Liquidity resulting always from asymmetric information when deciding to invest in some issuing company. In order to provide a sound basis for the hypothesis, they claim that the less liquid the aftermarket is expected to be, as well as the less predictable, the more Underpricing should feature the IPO. For instance, some of the investors who acquire shares during first day of trading are the so-called flippers, who buy the stock at the IPO with the intention of selling it immediately after. Such investors will also require some form of compensation for the trading cost that they expect to incur into, so the association between initial Underpricing and after-market Liquidity should be greater where many initial buyers are flippers. Finally, IPOs where a form of price stabilization in the aftermarket is allowed should, for the same reason, present lower initial Underpricing as the Liquidity risk as well as the overall uncertainty over price levels is partly reduced.

In order to obtain estimates on the measures of Liquidity necessary to verify the impact on Underpricing, Ellul and Pagano proxy the expected Liquidity of an IPO with measures based on the first four of aftermarket trading. The first measure they purpose is the probability of informed trading PIN, already seen before as well as the adverse selection component of the Bid-Ask read which measure the amount of illiquidity due to informational asymmetries among market participants. Also, by considering the variability of the prior measures they estimate the Liquidity risk of the IPO. In general, both measure estimate that the Liquidity tends to increase as more time passes starting from the initial listing. This is consistent with what said about the information on the market and the fact that illiquidity generally stems from a lack of valuable information about the company, that tends to become available as time passes as shown in figure 7 and 8.

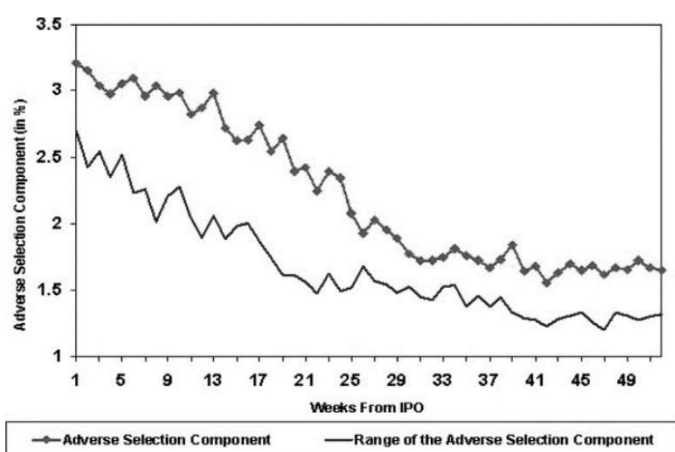


Figure 8: The figure shows the average adverse selection part of the spread component that aims to estimate the average illiquidity in the sample.

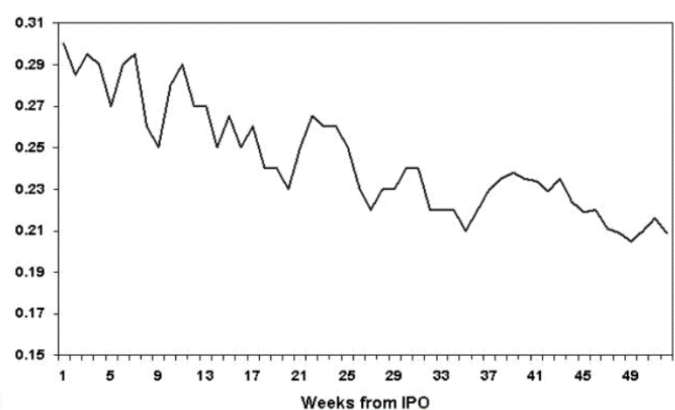


Figure 7: The figure shows the average Probability of Informed Trading PIN in the first after issuing for the 295 firms making the sample.

This pattern suggest that Liquidity and its variability i.e. its risk, are more problematic in the immediate aftermarket trading than in a more mature market, so trading concerns about transaction costs should entail all those investors who will be in the position to liquidate or to buy shares in the short period following the IPO. For these reasons, it is vital to know the relationship, if there is any, between after-market Liquidity and IPO Underpricing. By looking at simple correlations, Ellul and Pagano already conclude that IPO Underpricing tends to be larger for those companies that feature a greater aftermarket illiquidity. As a matter of fact, the correlation between the average probability of informed trading during the 4 weeks after the IPO and the initial Underpricing equals 0.25, being statistically significant at the 1% level as shown in figure 9:

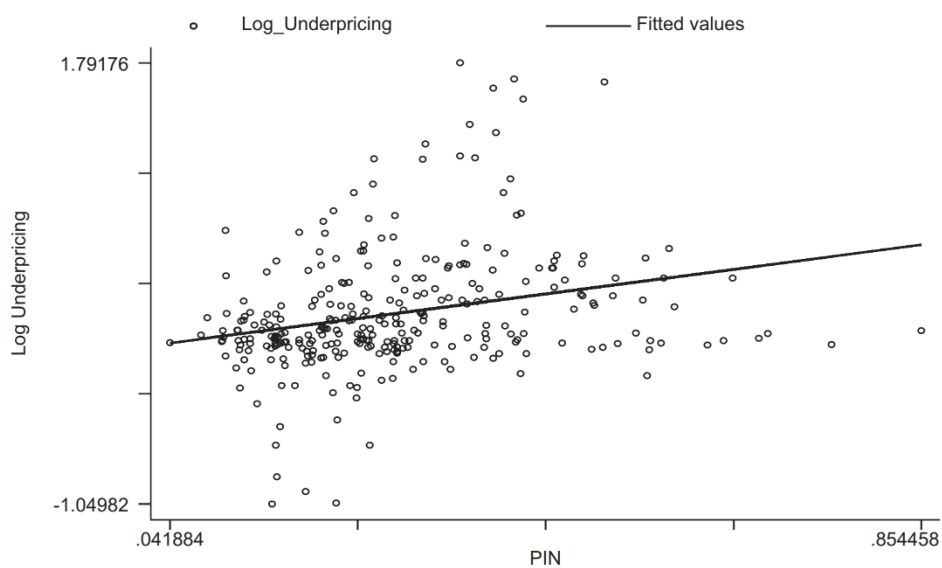


Figure 9: The figure is a plot for the data joining Initial Underpricing and PIN. The straight line has slope = 0.25 that indicates a positive relationship between the two variables.

Finally Ellul and Pagano estimate the coefficient of a regression that tries to explain Underpricing with the recourse to the expected Liquidity of the secondary aftermarket just after the occurrence of the IPO. To do so, in addition to control for various firm-specific variables that may as well partly explain the amount of the Underpricing such as fundamental risk level, company sector, size and age of the companies, they proxy the expected Liquidity of the firm with the Liquidity of previously listed company that pertain to the same sector, have similar size, similar leverage ratio and IPO mechanism. Since the PIN relies only on asymmetric information to estimate the illiquidity of a given security, adding control variables in the regression favours the outcome even more towards the expected Liquidity as the main cause of Underpricing; if the relationship turns out to be significant that means hat even after including for many

other possible explanations the effects are still valid instead of having less value. The results of the estimation are in figure 10:

| Liquidity measure | PIN | Adverse selection component | Effective spread |
|-------------------------------|--------------------|-----------------------------|--------------------|
| Intercept | 1.1845 (3.55) | 0.7598 (2.97) | 0.8165 (3.15) |
| Liquidity | 0.5041* (1.91) | 0.0254** (2.70) | 0.0195** (2.03) |
| Variability of liquidity | 1.788* (1.88) | 0.0446* (1.80) | 0.0235* (1.91) |
| Directors' options holdings | -0.0065 (-1.21) | -0.0080 (-1.58) | -0.0067 (-1.28) |
| Venture capitalist's presence | -0.0832** (-2.15) | -0.0951** (-2.54) | -0.1008*** (-2.63) |
| Firm age | -0.0645*** (-3.12) | -0.0566*** (-2.78) | -0.0657*** (-3.22) |
| Total assets | -0.0060 (-0.79) | -0.0026 (-0.37) | -0.0012 (-0.16) |
| Governance | 0.0004 (0.25) | 0.0008 (0.53) | 0.0010 (0.65) |
| Return volatility | 1.4632*** (3.76) | 1.3198*** (3.40) | 1.4405*** (3.70) |
| IT sector | 0.0092 (0.20) | 0.0165 (0.36) | 0.0110 (0.23) |
| IPOs in the same quarter | -0.0879 (-1.06) | -0.0632 (-0.82) | -0.0859 (-1.09) |
| IPOs in the previous quarter | -0.2127*** (-2.70) | -0.2253*** (-2.81) | -0.2200*** (-2.67) |
| Underwriter stabilization | 0.0458 (1.05) | 0.0852** (1.95) | 0.0860** (2.00) |
| Underwriter reputation | -0.0138** (-1.98) | -0.0126* (-1.81) | -0.0151** (-2.15) |
| Bookbuilding | 0.1124* (1.83) | 0.1037* (1.81) | 0.1095* (1.84) |
| R ² | 0.28 | 0.32 | 0.27 |
| Number of observations | 337 | 337 | 337 |

Figure 10: The table reports the estimated coefficients for the variables in the regression on initial Underpricing. The correlation with expected Liquidity are positive even after controlling for a set of additional explanatory variables.

All the measures of Liquidity, as it is possible to see in figure 10, are positively correlated with initial Underpricing and are both statistically and economically significant. This means that not only investors participating in IPO want to be compensated for company's fundamental risk, but also for the expected Liquidity of the shares that they are buying and for the liquidity risk in secondary market as well since coefficients for the variability of Liquidity are also positive. The reason for this relates to the asymmetric information that investor will face when starting to trade in uncertain circumstances with other participants since all the measures of illiquidity arise from the informational unbalance that can act as a catalyst for the Bid-Ask spread.

3.1.3 Ownership Dispersion and information effects of Underpricing

An opposing view to that of Ellul and Pagano, that maintains that initial underpricing and liquidity in the secondary market are negatively correlated, comes from Bouzouita, Gajeski and Gresse (2014)²⁷ who instead provide evidence for the fact that initial abnormal returns and Liquidity are in fact positively linked. They compare two possible explanations for this:

²⁷ (Liquidity Benefits from IPO Underpricing: Ownership Dispersion or Information Effect, 2014)

1. The “Ownership dispersion hypothesis” states that the positive relation between initial Underpricing and Liquidity is due to the creation of a broader ownership structure that follows the issue offer. Since shares are cheaper more investors can afford to acquire stocks in the company and this is supposed to increase the firm’s overall Liquidity in the following month
2. Alternatively, the positive relationship can be addressed to an “information production hypothesis” of analyst coverage initiated by Underpricing. Having a cheaper issue attracts costly information production by outsiders and these additional knowledge helps in reducing the informational asymmetries in the post offer period as well as in increasing Liquidity.

In order to select which one of the two hypothesis better explains and is related to Underpricing, Bouzouita, Gajeski and Gresse initially perform a regression including Underpricing as an explanatory variable on both measures of ownership dispersion and analyst information production. While the former turns out to be too loose to provide a sound basis for additional suppositions, the regression results obtained by joining information production and Underpricing turns out to be positive and that increases in Underpricing stimulates analyst coverage by much, providing support for the information production hypothesis. By the same token, it is possible to construct a second stage regression in order to find a connection between Liquidity and analyst coverage intensity. As a matter of fact, Liquidity positively correlates with the amount of information produced at the time of the IPO, and the relation is both economically and statistically significant at the 1% level. These findings suggest that initial Underpricing should generate more Liquidity benefits if it achieves to attract several analysts and great coverage in its initial trading days, and that the channel through which it mainly operates is the information rather than the ownership dispersion alternative.

3.2 Secondary Market Liquidity Trends and Patterns

After Initial Public Offerings take place, it often happens that Liquidity in the secondary aftermarket follows predictable patterns and trends that can be in part foreseen, especially if the IPO presents specific features. In particular, regardless of the type of IPO, limit order submission and trading depth relative to total value tend to be unusually low during the first days of trading, with a peak on the very beginning of the trading activity. Having a large pool of Underwriters, the dimension of initial syndicates and high premarket demand can partly affect the development of secondary market Liquidity. Also, it can happen that some particular offer designs can help in increasing secondary market Liquidity and affect initial order flow as well.

3.2.1 Hot, warm and cold IPOs

A liquid secondary market is a critical component in a successful initial public offering: a liquid market, as extensively said before, can help in reducing transaction costs, lower volatility in the aftermarket and eventually lower the cost of capital for the issuing firm by improving its access to capital markets and its attractiveness towards analysts and investors. Even if little academic research has been devoted to the examination of secondary market Liquidity, Corwin, Harris and Lipson (2004)²⁸ provide one of the first analysis of limit order book Liquidity and its interaction with traders and Underwriters strategies according to different types of IPOs, namely hot, warm and cold ones. Hot IPOs are those that open 15% above their offer price, warm are the one that open at 15% or less than the offer price and cold the ones that open below the offer price. Figure 11 reports the summary statistics for firm and offer characteristics. At first, they analyse the determinants of first-day Liquidity for NYSE-listed IPOs according to different firms characteristics, offer design and market conditions. Then they analyse the mid-term changes in Liquidity within 30 trading days from issuing date according to market conditions, IPO features and the implementation of limit book orders. Finally, the long run returns and Liquidity levels are examined according to first day information content and preopening order flow.

| | All IPOs | By IPO Category | | | p-Value |
|------------------------------------|----------|-----------------|---------|--------|---------|
| | | Hot | Warm | Cold | |
| Panel A: Firm Characteristics | | | | | |
| Number of IPOs | 220 | 78 | 106 | 36 | |
| Market capitalization (\$millions) | 688.93 | 897.66 | 635.87 | 392.90 | 0.191 |
| Total assets (\$millions) | 1841.85 | 2838.24 | 1557.16 | 521.24 | 0.266 |
| Total sales (\$millions) | 751.60 | 955.33 | 680.16 | 520.51 | 0.414 |
| Book-to-market | 0.61 | 0.54 | 0.64 | 0.69 | 0.399 |
| Debt-to-assets | 0.60 | 0.60 | 0.59 | 0.61 | 0.961 |
| Panel B: Offer Characteristics | | | | | |
| Offer price (\$) | 17.69 | 18.86 | 17.91 | 14.51 | 0.000 |
| Offered shares (millions) | 9.44 | 8.88 | 9.69 | 9.92 | 0.853 |
| Offer proceeds (\$millions) | 182.74 | 193.62 | 186.75 | 147.34 | 0.670 |
| Float (%) | 40.75 | 39.21 | 40.51 | 44.81 | 0.551 |
| Inside ownership (%) | 45.31 | 50.38 | 43.84 | 38.68 | 0.091 |
| Insider sales (%) | 7.20 | 5.18 | 7.66 | 10.23 | 0.363 |
| Underwriter market share (%) | 13.13 | 13.68 | 13.36 | 11.23 | 0.453 |
| Syndicate size | 27.49 | 28.31 | 27.74 | 24.94 | 0.561 |
| Gross spread (%) | 6.43 | 6.53 | 6.36 | 6.39 | 0.269 |
| Direct expenses (%) | 1.83 | 1.64 | 1.69 | 2.66 | 0.016 |

Figure 11: This table present summary statistics for a sample of 220 IPOs listed on the NYSE stock exchange between 1195 and 1998. Panel A contains firm Characteristics and Panel B IPO features.is divided along hot, warm, and cold IPOs according to initial level of trading with respect to the offering price

²⁸ (The Development of Secondary Market Liquidity for NYSE-Listed IPOs, 2014)

Another important aspect to include in the evaluation of aftermarket Liquidity is the incidence of Underwriters in secondary market activity. IPO trading is expected to be a period of high uncertainty and price fluctuations and deviations from fundamental value may be limited by Underwriter stabilization: Different Underwriter may purchase shares in the initial days of trading in order to keep the stock price close to the offer price and avoid too great losses of firm value. This action also affects Liquidity and it does it in several ways: if investor are confident that Underwriters will provide support in case of weak IPO, the demand for the share price during the initial trading days will increase and prices will have a virtual low boundary that prevent them from falling too much as well aa transaction costs will also tend to decrease. For these reasons, investors will take advantage of the utilization of limit orders exactly at the offer price in all those cases where underwriters will provide support and have a stabilizing role as well as this behaviour might create incentives for investors to post orders just above the offer price profiting from the small appreciation over the offer level.

In order to assess Liquidity in the days after the IPOs Corwin Harris and Lipson implement the total share depth and the total share depth relative to volume. As a matter of fact, these calculation focus on the availability of shares at best Bid and ask prices according to the mechanism of a limit order book that, in any case is the way the NYSE actually operates so it agrees with she sample chosen for the estimation of their task. By looking at the evolution of such measures on the first trading days it is possible to assess that all categories of IPOs exhibit unusually high Bid and ask depth and for hot IPOs the results are even significantly relevant until the 25th day of trading. Figure 12 plot the share depth for all categories of IPOs throughout the first 30 trading days:

Panel A: Share Depth

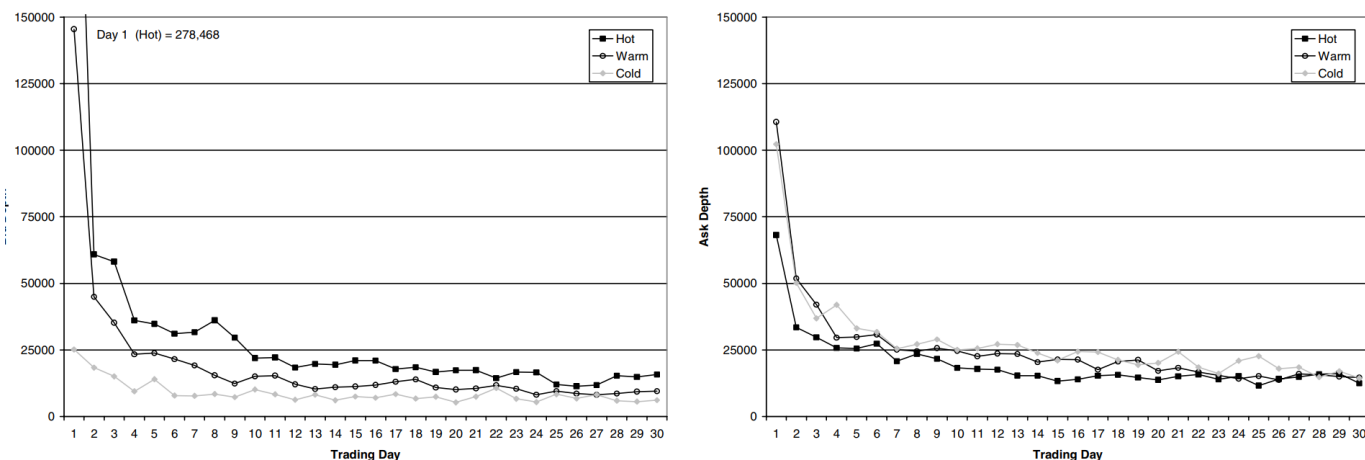


Figure 11: the figure plots the median share depth for the IPO sample relative to Crowing, Harris, and Lipson. The sample includes 220 listed IPOs from 1995 to 1998

Consistently with prior evaluations, total limit book depth is symmetric for hot and warm IPOs up until a few trading days and continue to decrease over time at a fairly similar rate over the following trading weeks. What is more, the pattern on Total share depth mirrors the one in trading volume, with extremely high initial values that tend to smooth over time. For this reason, the Liquidity calculated according to the adjusted share depth by volume is instead significantly lower on day one than on the whole second month of trading from day 31 to 60 as in figure 13:

Panel B: Depth Divided by Daily Volume

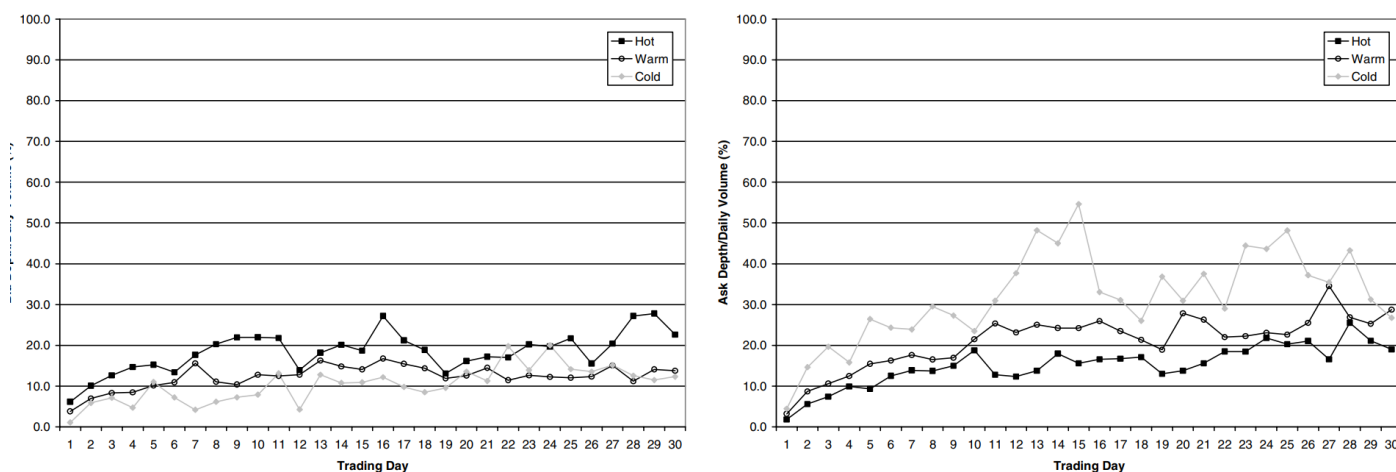


Figure 13: The figure plots total depth divided by daily volume where values are the average across a 30-minute period from the open through the close values

Although total share depth is greatest on the first trading day, total share depth adjusted by volume is actually lowest on the first moments. When considering both measures at the same time, it appears clear that the provision of Liquidity tends to stabilize quite rapidly in about 2 or 3 trading days, after an initial shortage due to an unusually high trading volume even if that is complemented by an equally high share depth.

In addition to examine in which way the Liquidity tended to evolve after the initial trading days, Corwin, Harris and Lipson analysed the determinants of the Liquidity departing from a firm specific point of view in order to assess which of the main features of a company may affect the provision of aftermarket Liquidity. The hypotheses related extensively to firm characteristics that may proxy the level of asymmetric information, that is generally the most effective source of illiquidity when trading, such as the firm size, technology level and leverage ratio. With respect to firm size, it is feasible that larger companies with more publicly available information tend to have lower levels of uncertainty and thus higher Liquidity than smaller firms. With a similar point, the higher the technology level of the firm, the higher the expected growth option and the higher the uncertainty on it. In all cases, if price uncertainty and asymmetric

information increase the necessary costs needed to operate a transaction then it is likely for the Bid-Ask depth to be lower in case of small, high technology and high leveraged firms. In addition to variables related to firm features, Initial Liquidity level may also be affected by choice made by the firm and firm's insider regarding the evolution of the listing such as the design of the offer, the primary market demand level and IPO general conditions. Namely, the selection of a high-quality underwriter may enhance the confidence regarding future maintenance of price stability in secondary markets. If the promise of an Underwriter is expected to maintain high level of price and stability, then it is likely that Underwriter quality will be related to Liquidity in secondary markets. By the same token, when large, renowned syndicates are involved in the initial public offering it is feasible to expect a greater buy-side Liquidity. The last factors considered as catalysts for a decrease in trading costs after the IPO are those that relate to capital structure and inside ownership of the issuing firm. To ascertain how these can affect aftermarket Liquidity it is useful to add three proxies related to insider ownership the first one, *float*, reflects the fraction of shares sold to the public is determined by the number of shares offered N_{it}^{IPO} by firm i over the total number of shares post IPO N_{it}^{Total} as in (20):

$$float_{it} = \frac{N_{it}^{IPO}}{N_{it}^{Total}} \quad (21)$$

The second proxy, *ins sales*, deals with the amount of insider sales of shares N_{it}^{Ins} of company i at the time of the offer with respect to the total amount of company shares as in (21):

$$ins\ sales_{it} = \frac{N_{it}^{Ins}}{N_{it}^{Total}} \quad (22)$$

The third variable represents the percentage of shares owned by insiders after the IPO and relates to the amount of ownership dilution that the issuing firm wants to achieve. In particular, there are two possibilities in which share retention can affect trading costs in secondary markets: in the first case, it can stand for a positive signal and consequently be negatively correlated with *float* and *ins sales*. On the other hand, share retention by insiders can proxy higher asymmetric information thus increasing the costs expected to achieve valuable information about the value of the company and then relate negatively with initial buying interest and Liquidity in the aftermarket. This issue related to asymmetric information can

affect especially IPOs since there is already a great uncertainty about the issuing company and its fundamental value. Finally, in order to account in differences related to the characteristics of an IPO such a hot, warm and cold initial public offerings, and thus account for differences in circumstances in the book-building period and in primary market demands, Corwin, Harris and Lipson add four dummy variables in their regression on aftermarket Liquidity that relate the placement of the offer price relative to the initial filing range. The first two variables after “float” variable in Figure 14 are equal to 1 if the offer price is equal or above the maximum of the initial filing range respectively and are expected to be positively correlated with Liquidity since higher initial demand pressure should anticipate higher Bid-Ask depth. The last two variables, instead, identify those IPOs with weak primary-demand and are equal to one if the offer price is equal or below the minimum of the initial pricing range. By the same token, these proxies are expected to be negatively correlated with aftermarket Liquidity. The results of the regression are in figure 14:

| | Bid Depth | | | Ask Depth | | | Depth Imbalance |
|----------------------------------|-----------|--------------------|----------------------|-----------|--------------------|----------------------|-----------------|
| | Shares | Relative to Volume | % Floor Contribution | Shares | Relative to Volume | % Floor Contribution | |
| Intercept | 0.114 | 2.288*** | 0.920 | -3.448*** | 0.784** | -0.118 | 1.483*** |
| Ln(day 1 volume) | 0.454*** | | -0.000 | 0.773*** | | -0.010 | -0.139*** |
| Ln(total sales) | -0.004 | -0.100*** | -0.009 | 0.095*** | 0.022 | -0.032 | -0.034 |
| Debt/assets | 0.016 | 0.030 | -0.010 | 0.076 | 0.026 | -0.013 | -0.032 |
| Technology firm dummy | -0.014 | -0.067 | -0.188 | -0.179 | -0.145** | 0.132 | 0.075 |
| UW market share | 1.432* | 0.433 | -1.877** | 0.705 | 0.256 | -0.750 | 0.317 |
| Ln(syndicate size) | 0.255** | 0.133** | -0.085 | 0.049 | 0.029 | -0.159 | 0.067 |
| Ln(insider sales) | -1.233*** | -0.682*** | 1.701*** | 0.110 | 0.015 | 0.230 | -0.410** |
| Insider holdings | -0.461* | -0.347** | 0.425 | -0.019 | -0.038 | -0.094 | -0.187* |
| Float | -0.031 | -0.063 | -0.423 | 0.327* | 0.218** | -0.536* | -0.109 |
| Below filing price range | -0.231 | 0.122 | 0.053 | 0.261** | 0.269*** | -0.547* | -0.151 |
| At minimum of filing price range | 0.138 | 0.386** | 0.187 | 0.260* | 0.286** | -0.104 | -0.061 |
| At maximum of filing price range | 0.252* | 0.048 | -0.267* | -0.221 | -0.205** | 0.221 | 0.157* |
| Above filing price range | 0.330** | 0.062 | -0.535** | -0.421*** | -0.317*** | 0.529** | 0.292*** |
| Underpricing of recent IPOs | -2.315** | -1.391*** | 0.626 | -0.126 | -0.067 | 0.364 | -0.655 |
| Number of recent IPOs | -0.005 | 0.000 | 0.008 | -0.002 | -0.001 | 0.008 | -0.001 |
| N | 216 | 216 | 213 | 216 | 216 | 213 | 216 |
| Adj. R ² | 0.227 | 0.081 | 0.077 | 0.474 | 0.210 | 0.102 | 0.105 |

***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively.

Figure 14: The above table reports the coefficients for the OLS regression on aftermarket Liquidity. The sample includes 220 IPOs from 1995 to 1998. Source: Corwin, Harris and Lipton (2004)

The first important thing is that trading volume, as expected, is positively related to aftermarket Liquidity, though the effect is not particular large and in any case greater for ask depth than Bid depth. Instead, the results suggest that ask depth is higher for large firms and adjusted depth smaller for technology firms. However, and surprisingly, aftermarket Liquidity is only weakly correlated with initial firm characteristics and in any case too weakly to be statistically and economically significant. In only one case the results appear to be significant and opposite to what was expected: larger firms are associated with lower rather than higher Bid-depth. Things are different when it turns to initial IPO characteristics: Initial Liquidity is significantly related to both Underwriter and syndicate differences. Underwriter market

share is significantly positively related to Bid depth, that stands for higher Liquidity, while syndicate size is positively and significantly related to both depth and adjusted depth by volume. Taken together, these results are consistent with the hypothesis that high quality Underwriters and large syndicates effectively attract interest and demand from investors probably resulting from better marketing skills and a larger client base, in addition to positive reputational turnarounds associated with being connected with renowned Underwriters. Also, these results account for the possibility that aftermarket Liquidity is higher when there is a legit expectation of price stabilization on the first trading weeks after the IPO. For what concerns the conclusions regarding ownership structure, these are in line with the effects of increased asymmetric information following a higher share retention in the issuing of an initial public offering. As a matter of fact, the third variable that relates to the percentage of insider ownership is negatively and statistically significantly related to both share depth and adjusted share depth by volume on the buy side. On the other hand, the Insider sales are associated with a reduction in Liquidity as reported by the negative coefficient -1.233. The outcome relative to *float* suggests a significant relationship with aftermarket Liquidity, but this result may simply reflect the fact that a larger offer relative to the total amount of shares increases the stocks available for Bid and ask thus it may neglect to consider the associated costs such as the spread. Finally, the coefficient regarding the IPO characteristic in terms of primary demand suggest that Initial Public Offering that priced at or above the maximum of the initial filing range tend to have higher Bid depth and the findings suggest that demand during the primary market is carried over into the secondary market as well, leading to an increase in the Liquidity of the limit order book.

In conclusion, with a unique data set Corwin Harris and Lipton analyse the Liquidity provision after initial public offerings and the role of limit orders and limit order books in its development. In particular, depth in the LOB turns out to be particularly high in the starting days and it tends rapidly to reach an even level. This behaviour is accompanied by trading volume so that the net result in adjusted depth tends to smooth out and, if any, the adjusted depth seems to be lower in the first trading day stabilizing in the second trading day. Furthermore, the result on the regression for Liquidity provision suggest that it is positively related to Underwriter characteristics and to price stabilization in the secondary market, as well as being significantly linked to a few variables regarding the ownership structure of the issuing firm.

3.2.2 Liquidity and Trading Activity

In the academic literature, most of the inquiries about Initial Public Offerings focused mainly on two relatively similar topics: the initial Underpricing that has already been subject of prior exposition, and the tendency for public issuing companies to underperform on a long-term period of time. Literature regarding the evaluation of post IPO Liquidity is then oddly neglected by a great deal of academic literature, even

though a successful IPO also entails the facility with which shares trade in the secondary market with respect to transaction costs and fees. As a matter of fact, the positive effects of Liquidity involve, among other things, a decrease on the cost of capital and, in addition to this, better monitoring of the management through superior incentive schemes and a better diversified ownership structure. In particular, how exactly ownership structure affects Liquidity is by now still blurry; one might argue that a less concentrated ownership structure favours the decrease of information asymmetries and so helps in reducing adverse selection costs bore by investors and eventually increasing Liquidity, but more evidence is still needed to furtherly support this argument and no direct connection is accepted by now. Nevertheless, if this claim was right, firm insiders may decide to set the level of the Underpricing a priori so as to manage with more precision the amount of ownership dispersion that it wants to achieve, keeping at the same time an eye on the trade-off between the Liquidity that will mature alongside a more dispersed shareholder base and the loss of company control that arises when favouring a dispersed owner's composition. Among the costs of having too liquid stocks, on the other hand, there are the low incentives for small shareholders to monitor the activity of the management due to their little stakes in the operating activity and the additional cost related to initial Underpricing, whenever it is considered as a necessary fee in order to entice investors to participate in the trading activity. Supporting this hypothesis, Miller and Reilly (1987)²⁹ and Hanley (1993)³⁰ observed that the most severely underpriced IPOs were the ones that ended with having more Liquidity in the secondary market expressed as trading turnover i.e. the number of shares traded with respect to the total number of shares, but offered no clear argument for their point.

In this context, Angel and Ramirez (2008)³¹ propose a more complete and complementary approach to assess the evolution of secondary market Liquidity after the IPO by implementing several proxies in order to measure Liquidity as well as trading activity. Furthermore, they aim to secure a wider picture of this topic by analyzing the impact of Underpricing on Liquidity and trading activity as well as the relative size³² and the retail composition of the offering as features combining with the IPO. Finally, they succeed in providing satisfactory evidence for the effects of stock allocation, that is relative size and retail composition of the offer, Underpricing and Ownership structure on the evolution and level of aftermarket Liquidity and trading activity of newly issuing firms in the Spanish stock Exchange. Even if the recourse to public markets for raising new capital in Spain is low on average, this should not harm the results obtained. As a matter of fact, all major European continental economies such as Germany, Spain and Italy have similar dimensions of public markets with respect to the total value of the countries' Economies and even if the proportion of the recourse to public ownership is surely smaller than in Anglo-axon Countries

²⁹ (An Examination of Mispricing, Returns, and Uncertainty for Initial Public Offerings, 1987)

³⁰ (The underpricing of initial public offerings and the partial adjustment phenomenon, 1993)

³¹ (Does Initial Public Offering Have Influence on Liquidity and Trading Activity?, 2008)

³² That is simply the number of shares offered with respect with the total number of shares outstanding.

such as USA, the outcome of the research might still be valid in all those realities where a more concentrated ownership prevails over forms of governance more inclined towards public structures.

The sample of the study consists of only IPOs listed on the Spanish continuous market, which represents almost 98% of the total market trading in the country, from 1993 to 2004. Figure 15 shows the year-by-year distribution of IPOs and the descriptive statistics of the main IPO features as well as a brief overview of the main IPO variables:

Table 1.- Summary statistics for sample of IPOs in Spain (1993-2004)

| Panel A: Distribution of IPOs by year | | | | | |
|---------------------------------------|--------|----------------|--|--|--|
| Year | Number | Proportion (%) | | | |
| 1993 | 1 | 2.326 | | | |
| 1994 | 3 | 6.977 | | | |
| 1995 | 0 | 0.000 | | | |
| 1996 | 3 | 6.977 | | | |
| 1997 | 7 | 16.279 | | | |
| 1998 | 9 | 20.930 | | | |
| 1999 | 9 | 20.930 | | | |
| 2000 | 4 | 9.302 | | | |
| 2001 | 2 | 4.651 | | | |
| 2002 | 1 | 2.326 | | | |
| 2003 | 1 | 2.326 | | | |
| 2004 | 3 | 6.977 | | | |
| Total | 43 | 100.000 | | | |

| Panel B: Descriptive statistics of IPO characteristics | | | | | |
|--|------------|------------|---------|-------------|--------------------|
| Variable | Mean | Median | Minimum | Maximum | Standard deviation |
| Number of shares offered | 39,231,698 | 14,400,000 | 640,020 | 482,430,511 | 79,818,206 |
| Relative size of offering (%) | 41.157 | 35.000 | 2.620 | 100.000 | 22.093 |
| Retail composition of offering | 33.405 | 30.326 | 0.000 | 100.000 | 25.119 |
| Underpricing of offering (%) | 14.412 | 5.000 | -6.553 | 94.979 | 23.223 |

Figure 15: The table report the main descriptive statistics for the sample of Spanish IPOs from 1995 to 2004 as well as a brief overview of the main IPO variable that will be part of the regression on aftermarket Liquidity. Source: Angel and Ramirez (2008)

As it is possible in to see Panel A of Figure 15 the highest concentration of IPOs happens in the year between 1997 and 1999, that exactly coincides with the best performing years in terms of asset returns of the Spanish market. By contrast, Panel B gives a brief overview of the main features of the IPO variables that will be part in the regression on aftermarket Liquidity. The first is the absolute number of shares in the issue that when divided by total number of shares outstanding becomes the relative size of the offer in

percentage of the total. The average value of the relative size of the offer is 41.15% with a standard deviation of 22.09% that is fairly high. The third variable reflects the amount of the retail composition of the offer and measures the ratio of shares offered in the retail tranche with respect to the total shares offered. As already said before, the relevance of the variable resides in the fact that it is a good proxy for ownership dispersion since, presumably, the retail offer will fuel short term and speculative strategies by investors who seek a swift return and have low investments horizons. The average value of the retail tranche is 33.40%. Finally, the fourth variable concerns the Underpricing which is the difference in percentage terms between the prevailing market price on the first day of trading and the initial offering price. The variable has an average positive value around 14.41%, supporting that IPOs constitute an anomaly that have been formerly shown.

After stating the variables and composition of the features about the actual IPOs, it is necessary to assess the methodologies to measure the Liquidity in the aftermarket and the period where the evaluation of the Liquidity evolution will take pace. Angel and Ramirez propose three way to measure trading activity and three ways for Liquidity and propose a short to medium term horizon consisting in the first 135 trading days. the variables assessing Liquidity are respectively the average Bid-Ask spread, market depth and market quality index and those calculating trading activity are the relative trading volume or trading turnover, relative number of transactions RNT_{it} and relative trading volume per transactions $RTVT_{it}$ that have been all discussed in the first part of the present text except the last two. Here, the former represents how many times shares i are traded on trading day t , N_{it}^{Times} , with respect to the total number of shares outstanding N_{it} as in (22):

$$RNT_{it} = \frac{N_{it}^{Times}}{N_{it}} \quad (23)$$

and the latter evaluates the average amount of shares i that are involved in every single transaction on trading day t , N_{it}^{Amount} with respect to the total number of shares outstanding as in (23)

$$RTVT_{it} = \frac{N_{it}^{Amount}}{N_{it}} \quad (24)$$

Finally, since trading volume is excessively high in the first 10 days of trading, the assessment of Liquidity actually start from day 11 and this post-listing period extends from day 11 to day 135 excluding the very initial moments of trading that may have deviations and distortions for a correct calculus of the aftermarket Liquidity. The main objective of Angel and Ramirez is then to focus on the evaluation of the possible sources of aftermarket Liquidity. In order to do so, because of the limited history of the issuing firms and the restricted information about their value, they analyse variables regarding the offer characteristics and aim to explain the Liquidity and trading activity in the secondary market trading with these. To analyse the relationship between IPO features and average transaction costs as well as trading volumes the following cross-sectional regression (23) has been run for each of the Liquidity measures formerly shown in the sample:

$$X_i = \alpha + \beta_1 RS_i + \beta_2 RC_i + \beta_3 U_i + \varepsilon_i \quad (25)$$

where X_i is the post-IPO average value of the relative Liquidity measure for firm i , RS_i is the relative size of the offer i , RC_i is the retail composition of offer i and U_i refers to the Underpricing of offer i where ε_i is a zero-mean error term. The results of the former regression are in figure 16:

Table 3.- Post-IPO liquidity and trading activity in relation to relative size, retail composition and underpricing of the offerings

| Dependent variable | Regressions results: Independent variables | | | | |
|--|--|---|---|--|------------------|
| | Constant (t-statistic) | Relative size of offering (t-statistic) | Retail composition of offering (t-statistic) | Underpricing of offering (t-statistic) | R-squared (%) |
| Liquidity | | | | | |
| Bid-ask spread | 0.009402 (3.062)** | 0.001786 (0.561) | -0.005586 (-1.382) | -0.005044 (-2.092)* | 15.379 |
| Relative depth | -5.37E-05 (-1.143) | 0.000233 (2.524)* | 0.000185 (2.211)* | 8.97E-06 (0.160) | 20.499 |
| Market quality index | -0.003483 (-1.196) | 0.013402 (2.425)* | 0.015945 (2.929)** | 0.005965 (1.435) | 27.582 |
| Trading activity | | | | | |
| Relative trading volume | 0.001107 (2.583)* | 0.002915 (6.037)** | -5.41E-05 (-0.096) | 0.001846 (4.870)** | 39.904 |
| Relative number of transactions | -9.27E-06 (-3.024)** | 1.88E-05 (4.339)** | 1.71E-05 (2.915)** | 2.47E-05 (2.353)* | 50.769 |
| Relative trading volume per transaction | 1.61E-05 (0.969) | 4.61E-05 (1.505) | -1.28E-05 (-0.462) | -1.86E-05 (-1.560) | 14.270 |

Figure 16: The table above report the results for the cross-sectional regression on every measure of Liquidity. Source: Angel and Ramirez (2008)

The coefficients for the variables in the regression reveal that, in general, the Relative size of the offering RS_i has a good explanatory power for aftermarket Liquidity as suggested by the statistically significant correlations with all Liquidity measures except the Bid-Ask Spread and the relative trading volume per transaction. As a matter of fact, the higher the relative size of the offer, the lower the share retention i.e. the amount of shares that are excluded from the offering; for this reasons, the results of the regression proposed by Angel and Ramirez suggest the hypothesis that a decrease in the number of shares retained from the IPO by the management of the issuing firm actually has a positive effect on the Liquidity in the secondary market and increases the trading activity as well. While the relative size of the offer is a proxy for the amount of control that pre-IPO firm wants to keep, the Retail Composition of the offering variable relates to the amount of the ownership structure as it determines the quantity of shares pledged to small and momentary shareholders who may invest in the company for speculative reasons and who are willing to sell their stocks according to attractive profit opportunities. This variable shows significantly positive correlation with relative depth, market quality index and relative number of transaction. All these findings are consistent with the hypothesis proposed by Pham et al. (2003)³³ who maintains that a less concentrated ownership structure increases the level of post-listing trading activity. Finally, for what concerns Underpricing, the outcome of the regression made by Angel and Ramirez shows that it has a significant negative correlation with Bid-Ask spread and significant positive with relative trading volume and relative number of transactions. The results are consistent with hypothesis put forward by Corwin, Harris and Lipson (2014) who suggest that aftermarket Liquidity is a positive function of the Underpricing, and sets a point of disagreement with Ellul and Pagano (2006) who instead sustain that a higher Aftermarket expected Liquidity relates to lower Underpricing switching the cause-effect relationship between the two variables. The correct answer is still uncertain and blurry since there is no conclusive evidence about which one of the hypothesis is correct, however it seems more likely for aftermarket Liquidity to relate with a higher Underpricing as it lowers the costs associated with the adverse selection and information asymmetry of investors buying the newly issued stock.

In the end, the authors also account for movement in the markets that may be able to generate a superior trading in particular times but these external sources of Liquidity does not totally erase the outcome of the previous regression, neither they are able to invert the cause-effect relationship of the proposed variable even if the effect tend to be smoother and weaker after controlling for generalized market trends. Nevertheless, the results obtained by looking at three components of IPO characteristics, namely Relative Size, Retail Composition and Underpricing have a strong explanatory power for the Liquidity and trading

³³ (Underpricing, Stock Allocation, Ownership Structure and Post-Listing Liquidity of Newly Issued Firms, 2003)

activity of the shares outstanding, even if it is greater before isolating for market effects. For these reasons, Angel and Ramirez have been able to provide satisfactory evidence of the influence of stock allocation and Underpricing on post-listing Liquidity and trading activity for newly listed firms in the Spanish stock market.

3.2.3 *Share Retention and Aftermarket Trading Costs*

To ascertain the effect of Share Retention, i.e. relative size of the offer, on IPO aftermarket Liquidity it is necessary to revise two opposite hypothesis on the relationship between the two variables:

1. The “Signaling Theory” proposed by Leland and Pyle (1977)³⁴ suggests that a higher retention rate would provide a greater Liquidity in the secondary market as it would, as a matter of fact, signal a higher value for the firm; the management of a firm would be willing to offer only a small part of the shares of the issuing company if the actual value of the company was high, and this would provide sufficient information for it to acquire a privileged reputation on the markets and lower its average transaction costs
2. On the other hand, the “Ownership Dispersion Hypothesis” proposed by Booth and Chua (1996)³⁵ supports that a great Underpricing, as well as the retail composition of the offering, is a catalyst for a more dispersed ownership which in turn increases the Liquidity in the secondary market which in turn decreases the transaction costs in the secondary market. The higher investor-borne information costs required to have a broad ownership justify the larger initial returns required by firm who want to acquire a broad ownership and therefore justify a larger initial Underpricing. This hypothesis proposes the opposite direction of the relationship between share retention and Liquidity with respect to the former one.

Also, the way Underpricing affect after market Liquidity is blurry, in that there exist hypothesis altering the cause and the effect, On the one hand suggesting that a high after-market Liquidity provides input for a lower Underpricing and, on the other hand, some theories support the idea that a large initial return increases the secondary market Liquidity switching also in this case, as a matter of fact, the cause and the effect with respect to the former. In the end, for what concerns initial share retention, the main topic is to determine which one of the two hypothesis is prevalent in the determination of the Aftermarket Liquidity level following an Initial Public offering, if it is the signaling theory that prevails or the ownership dispersion hypothesis. Li, Zheng and Melancon (2005)³⁶ assess these topics by evaluating the

³⁴ (Informational Asymmetries, Financial Structure and Financial Intermediation, 1977)

³⁵ (Ownership Dispersion, Costly Information and IPO Underpricing, 1996)

³⁶ (Underpricing, Share Retention and the IPO Aftermarket Liquidity, 2005)

effects of both Underpricing and Relative Size of the offer on the aftermarket Liquidity of an Initial Public Offering, calculated as the percentage Bid-Ask spread and the turnover ratio of newly issued stock. Their main finding is that, first, initial return is positively related to turnover ratio and negative related to percentage spreads and the relation remain significant even after controlling for firm specific and ambient factors. This indicates that there a positive relation between initial return and Liquidity in the secondary market. Second, the proportion of shares retained by the pre-IPO owners is positively related to the turnover ratio and negatively related to percentage spreads and this indicates that Liquidity in the aftermarket behaves according to the signaling Theory, suggesting that a high retention rate sends positive feedback on the market which attracts more trades and is able to generate a discount on the average price of transactions . Finally, Market Liquidity is also affected by other factor such as market volatility, size of the firm and reduction in the tick size of market microstructure.

3.3 Underwriter and Market Maker Effects on Liquidity Evolution

The Role of Underwriters in the Initial Public Offering can often be controversial but is always vital for its success. When a company initiates an IPO, having an high offering price may have important repercussion on its cost of capital and on its value in general, and a liquid share is surely one of the determinant of the success of the issuing as well. The Underwriter is in part responsible for ensuring the tradability of shares at reasonable costs as well as its initial pricing level so, for these reasons, there exist various arrangements when deciding the preferred Underwriter agreement. Liquidity is so important to managers of pre-IPO firms that there even exist institution that go under the name of “market makers” whose main objective is to ensure that a certain level of Liquidity will remain on a given stock and for this reason they have been steadily increasing in popularity especially among small firms, whose recourse to public market may presents unexpected turnarounds.

3.3.1 Price Stabilization and Short Selling

What often happens in Initial Public Offerings is that the Underwriters, who usually take care of the whole deal and act as guarantees of the success of the issuing in terms of share pricing and allocation, often engage in secondary market trading aimed at supporting the price of IPOs that happen to meet weak demand and who risk a drop in their value unless a price stabilization circumstance comes over. As a matter of fact, there exist plenty of academic literature that bring upon argument about the tendency of investors to buy and hold newly issued shares if they expect Underwriter price support. On the other hand,

the security and exchange commission (SEC)³⁷ refers to Underwriter price support as an “effective mechanism for fostering an orderly distribution of securities and promotes the interests of shareholders, underwriters and issuers.” The way Underwriters actually intervene is with pure price stabilization or, preferably, with secondary market short covering. This latter methodology happens when Underwriters sell more shares than actually agreed in the offering this way incurring in a short position on the company stocks, then, when the price rises, the Underwriter exercises the overallotment option in order to close its short position previously opened. In this framework Boulton and Alves (2018)³⁸ assess the impact of Underwriter price stabilization on secondary trading costs and Liquidity of companies listing on the NASDAQ stock exchange. In particular they evaluate several hypotheses about the likelihood of the occurrence of price support and its impact on the development of secondary market trading in the days following the IPO; it is worthwhile to state that IPOs present a diriment challenge for Market Makers and Underwriters, whose task remains to establish a market and guarantee for Liquidity provision in concomitance with substantial information asymmetry. Finally, it may happen that underwriters incur in shares failure to deliver when facing a too weak demand: if part of the investors turn out to be flippers who sell their newly issued shares right after the initial trading days, the Underwriters can find themselves with the short positions necessary to increase the offer size still open and this combination lead to the inability of Underwriters to provide the actual shares to investors. Consistent with price stabilization policies, Boulton and Alves find that failures to deliver have a positive effect on measures of Liquidity such as the Bid-Ask spread while short selling brought upon by initial investors who look for a short term return has a significantly negative effect on the same variable relating to trading cost and fees.

The main Hypothesis of Boulton and Alves relate to the correlation between failure to deliver short selling and Liquidity in the aftermarket trading. One debated point regarding failures to deliver relates to the fact that those usually happen when investor demand is low. If the interested participants in buying new shares consist in a narrow base, the average information cost borrowed by each one of them actually increases and this reflects on a higher illiquidity premium pledged to continue with their investments. For these reason failures to deliver may associate with a higher Liquidity rather than a lower, even if their aim is to lubricate the mechanisms underlying trading activity. In any case, the lower Liquidity that associates with failures to deliver would present endogeneity issues since the actual source of the higher trading costs would come from the narrowed base of investors rather than the actual effect of shares scarcity. On the other hand, short selling may be a good thing for the development and the level of secondary market Liquidity. Beber and Pagano (2007)³⁹ argue that the lower the constraints on short selling, the higher will be the informational content present in the market since no distortion would hamper the development of

³⁷ (Regulation M, SEC Release N. 34-38067 , 1996)

³⁸ (Price Stabilization, Short Selling and IPO Secondary Market Liquidity, 2018)

³⁹ (Short-Selling Bans Around the World Evidence from the 2007-2009 crisis, 2013)

secondary trading, This fact would in turn lower information costs and trading costs in general, favoring the Liquidity. In particular Beber and Pagano found that short-selling bans during the financial crisis of 2007-2009 were associated with an increase in the average Bid-Ask spread in 30 countries. If the relation is similar In IPOs then short selling might be positively correlated with secondary market Liquidity.

On a sample based on all newly listed NASDAQ companies, Boulton and Alves then calculate the average number of shares outstanding, given that they are more than 10.000, in all these cases where Underwriters encounter failures to deliver in the post-listing trading days as well as the average number of short sales in the trading days after the IPO. In all cases they divide the result or the total number of shares outstanding to evaluate it as a percentage of the total shares issued. Figure 17 reports the results of the calculation of those variables:



Figure 17: Image above represents the evolution of failures to deliver and short selling in a sample based on IPOs listing on the NASDAQ stock Exchange. Source: Boulton and Alves (2018)

As it is possible to see in the former figure, both short selling and failures to deliver are prevalent on the first days of trading and tend to smooth as time passes. Short Sales and Failures to deliver average on the first trading days is much higher than the following weeks respectively being 4.63% and 2.903%. This is consistent with the argument that short selling tends to be higher when price might be inflated, as the case of IPOs.

In order to assess the impact of failures to deliver and short selling on trading costs Boulton and Alves implement panel data regressions on the effective Bid ask spread as the primary measure for Liquidity evaluation. The executions of such methodologies allows for controlling for variations in firm-specific characteristics and rule out spurious correlations. Furthermore, they divide the investment horizon in several subperiods among the first 31 trading days and through which the level of Underprice support, as

seen in figure 16, changes on average. The first subperiods corresponds to the first trading day, links to the dummy variable Day_1 and is the span of time where trading volume usually happens to be highest as a result of the great information asymmetries on the value of the newly issuing firm. The second subperiod, the “Stabilization Period”, corresponds to interval between the 2nd day of trading and the 11th and relates to the variable Day_{2-11} . Most likely, the Underwriter price support is going to concentrate in this period, even if extensions on later points in time are also possible. The third subperiod assesses the “Transition Period” which goes from trading day 12 to 21 during which Underwriters tend to remove price support in order to let the price set by itself; the relating variable is Day_{12-21} . The last subperiod, called the “post-stabilization period” extends from trading day 22 to trading day 31 and there is no relating variable since it is the period of time that all the other subperiod variables actually bypass. With all of the components of the subperiod set the regression interacts the short sale and failures to deliver factors in order to assess where the effect on Liquidity is most present. Figure 18 reports the results of the regression on trading costs performed:

Table 2
 Effective spread.

| Panel A | <i>Effective spread</i> | | |
|------------------------------|-------------------------|------------------------|------------------------|
| | Full sample | \geq median | $<$ median |
| Fails to offer size | -2.1555** (-2.25) | 0.4893 (0.85) | -3.9749*** (-2.95) |
| Short to offer size | 2.0177*** (2.94) | 1.4445** (2.36) | -1.9500 (-1.28) |
| Reciprocal of price | 3.8547*** (19.57) | 2.7092*** (8.50) | 4.3295*** (14.38) |
| Price range | 6.2369*** (36.59) | 4.7520*** (24.48) | 7.2243*** (26.18) |
| Ln(volume) | -0.2387*** (-39.66) | -0.1987*** (-27.97) | -0.2613*** (-28.74) |
| Ln(market value) | -0.0192** (-2.46) | -0.0244*** (-2.66) | -0.0463*** (-3.38) |
| Day ₁ | 0.1028*** (3.31) | 0.0845** (2.51) | 0.1862*** (3.88) |
| Day ₁ × fails | 1.3520* (1.90) | -0.3865 (-1.26) | 2.4656*** (2.85) |
| Day ₁ × short | -0.6683 (-1.64) | -0.4507 (-1.39) | 1.8454* (1.78) |
| Day ₂₋₁₁ | 0.0393*** (3.33) | 0.0734*** (6.12) | 0.0027 (0.12) |
| Day ₂₋₁₁ × fails | 1.5818* (1.68) | -0.0911 (-0.13) | 2.9847** (2.49) |
| Day ₂₋₁₁ × short | 1.1393** (2.52) | 0.1346 (0.50) | 6.9017*** (3.54) |
| Day ₁₂₋₂₁ | 0.0048 (0.37) | 0.0298** (2.06) | -0.0113 (-0.50) |
| Day ₁₂₋₂₁ × fails | 2.7556** (2.17) | 1.5099 (1.03) | 3.7660** (2.27) |
| Day ₁₂₋₂₁ × short | 0.2780 (0.29) | -1.0215 (-1.07) | 3.5884 (1.22) |
| Intercept | 3.0463*** (30.14) | 2.7760*** (23.84) | 3.5523*** (19.93) |
| N | 8,463 | 4,278 | 4,185 |
| Adjusted R ² | 0.507 | 0.447 | 0.505 |

Figure 18: The table reports the coefficients of the regression on effective Bid-Ask spreads. Source: Alves and Boulton (2018)

In particular, Failures to deliver are negatively correlated with effective spreads during the post-stabilization period as the statistically significant coefficient -2.1555 actually attests. By contrast, short sales present an equally significant but opposite relationship with a coefficient equal to 2.0177. The division of the sample between greater lower than median present in both figures 18 and 19 refers to the level of Underpricing in the initial offerings. In particular, according to this additional classification, all those company whose Underpricing is below the median are the ones that most likely are going to receive benefits of price support. Consistent with this, the under the median group of the sample is the one that drives the relation between failures to deliver and Liquidity in the secondary market, where those are negatively correlated with effective spreads with a coefficient of -3.9749 in the post-stabilization period. Furthermore, the IPOs with Underpricing equal or above the median value are those that present a higher correlation between short selling and secondary market effective spreads, the two being significantly positively correlated in all investment windows except the transition period. As additional evidence Boulton and Alves then perform an F-test for the null hypothesis that the relation between failure to deliver and effective spread is equal to 0 during each subperiod by interacting the dummy variables relating to the subperiods with the failures to deliver and short selling variables. The results are in Figure 19:

| Panel B | Effective spread | | |
|--|------------------|----------|----------|
| | Full sample | ≥ median | < median |
| $H_0: \text{fail} + \text{Day}_1 \times \text{fail} = 0$ | (0.094) | (0.813) | (0.033) |
| $H_0: \text{fail} + \text{Day}_{2-11} \times \text{fail} = 0$ | (0.092) | (0.398) | (0.028) |
| $H_0: \text{fail} + \text{Day}_{12-21} \times \text{fail} = 0$ | (0.473) | (0.143) | (0.830) |
| $H_0: \text{short} + \text{Day}_1 \times \text{short} = 0$ | (0.010) | (0.063) | (0.911) |
| $H_0: \text{short} + \text{Day}_{2-11} \times \text{short} = 0$ | (0.000) | (0.001) | (0.000) |
| $H_0: \text{short} + \text{Day}_{12-21} \times \text{short} = 0$ | (0.008) | (0.625) | (0.541) |

Figure 19: The table above reports the results for the joint F-test for the significance of the relationship between both failures to deliver and short selling on aftermarket Liquidity

In this case the outcome for the F-tests generally indicate that the negative relationship between failures to deliver and effective spreads is statistically significant with exception of the transition period, while the positive relationship between short sales and effective spreads remains significant during the entire 31 trading day window.

In the end, Boulton and Alves manage to provide enough evidence for the importance of the Underwriting role in the Initial public offering as being one of the main contributors to the establishing of secondary market Liquidity as well as asset prices levels. They find that the average IPO has failures to deliver in stocks, that generally happen when the Underwriter intervenes in the market in order to support the prices of the newly issued shares, equal to 2.9% of the offer size after the first trading day. Short selling

is also common for IPOs and the average level is about 4.6% of the offer size after the first trading day. Both failures to deliver and short selling tend to deliver rapidly as time passes in any case. Secondly, failures to deliver are associated with greater secondary market Liquidity; on the other hand short selling is correlated with larger effective Bid-Ask spreads and lower market Liquidity especially when there is strong investor demand and price support is less likely, since the strength of the correlation is higher for IPOs belonging to the above median group according to their initial Underpricing.

3.3.2 Market Makers impact on Liquidity

As soon as companies publicly list, some peculiar facts may characterize the pricing of their initial stock: according to the value of future Liquidity, firms whose shares are cheaper to trade in secondary markets generally afford a higher price at the IPO stage. This means that policies that aim to improve the Liquidity of the stock increase the value of the firm as well as they allow for a higher initial pricing. In this sense, it becomes vital for a company to choose the right Underwriter in order to boost the new Liquidity of the stock and decrease their future cost of capital. Firms often happen to pay for a better underwriting service for this very motive that is particularly valuable at the IPO stage. As a matter of fact, the Liquidity of the stock is so important that companies tend to hire designated market makers DMM, for instance, to keep the spread below a certain agreed level. This designated Market Makers have been increasingly active in all major Continental Economies sometimes operating aggressively with the recourse to limit buy and sell orders whose aim is to increase the Liquidity for future transactions if necessary. As a consequence, the increasing introduction of DMMs has been associated with a reduction of Liquidity risk as well, that also adds a component of the return for a particular asset, and it led to statistically significant abnormal returns that are nevertheless variable across different types of markets and countries. For instance, abnormal returns are associated with the service of an additional DMM vary from 1% to 7%. In particular, Skjeltrop and Øderganrd (2011)⁴⁰ find that the firms that access more to the market-making service are exactly those ones that are relatively illiquid, while bigger and more easily tradable ones often save this type of arrangement as they are confident they their stock will actually have acceptable Liquidity in the secondary market. Figure 6 from Skjeltrop and Øderganrd shows how the involvement of a Designated Market Maker impacts the development of the spread for companies in the year before and after the arrangement. When companies have already a low compared to the average market spread decide to hold back since they believe their Liquidity will suffice anyways, while comparing the year before and after the implementation of the market makers in Panel B and C the distribution of the spread shifts

⁴⁰ (When Do Listed Firms Pay for Market Making in Their Own Stock, 2011)

importantly to the left. As a consequence, firms that hire a market-maker will have the chance to raise cheaper external equity capital and issue more shares to more convenient price levels.

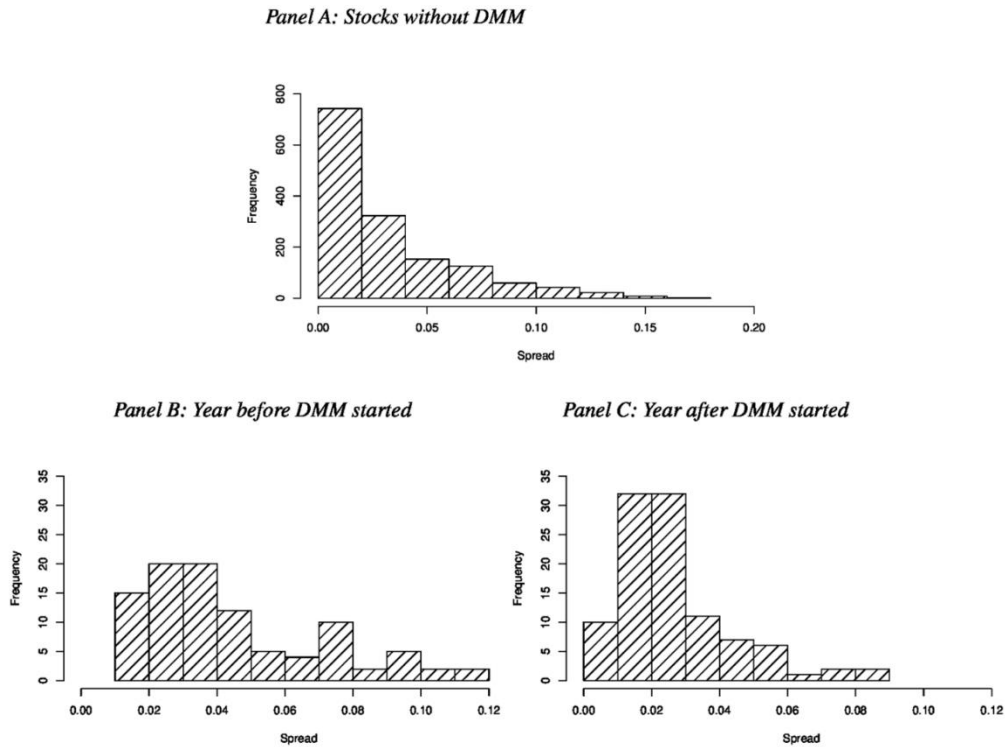


Figure 20: Example of distribution of stock spreads for companies with and without the implementation of Designated Market Makers DMM. Panel B and C show the change in average levels after the DMM is hired: the distribution shifts significantly to the left showing the great impact that these types of arrangement

4

Variables and Data Evaluation on Italian IPOs

While previous chapters were devoted to the analysis of past evidences and the discussion of prominent theories about the evolution of Liquidity in the context of an IPO, the present part deals with actual Data and tries to assess if the points listed throughout can find some comparison in the Italian public market during initial public offerings. At first, the main indicator variables and the relative theory will be exposed with particular attention to the relation with IPOs and the possible impacts on aftermarket trading, afterwards the relation with Liquidity will be analyzed and it will be possible to compare actual outcomes with past studies and find, if there will be any, existent similarities.

4.1 Theoretical Framework

In order to provide satisfactory evidence on the presence of relevant effects of IPO characteristic over aftermarket trading Liquidity, it is necessary to provide additional background on the elements that distinguish each of the potential effective variables as well as the theoretical background that acts as a basis for the following case study. The main factors that will be analyzed as potentially distorting aftermarket trading Liquidity are both ownership level and dispersion that relate to the size and retail composition the offering as well as initial Underpricing with respect to the initial pricing range.

4.1.1 *Ownership Level and Dispersion*

The link between the Liquidity of a firm's stock and its ownership structure, in particular how ownership is distributed between firm insiders and external investors such as institutions and how concentrated is the ownership, is a long-lasting topic in Finance. Rubin (2007)⁴¹ finds that the Liquidity-ownership relation is especially driven by the nature of the main shareholder: Liquidity is positively

⁴¹ (Ownership Level, Ownership Concentration and Liquidity, 2007)

correlated to institutional holdings and negatively related to insider holdings. At the same, if there happens to be above average block holding, either it belongs to insiders or external institutions it tends to have a negative effect on Liquidity. In this way, it seems that the ownership level dimension happens to have importance when institutions are involved because of their tendency to trade more with respect to typical insiders. By contrast, the more concentrated the ownership, the less the Liquidity.

When considering the above-mentioned relation, the academic literature in finance generally devise the link between the two variables as originating from two main hypothesis:

1. The adverse selection hypothesis posits that if informed investors exploit their superior knowledge in order to get a benefit from trading compared to outside shareholders or retail investors, an information asymmetry arises and this contributes to lower the Liquidity. The relationship between ownership structure and trading costs then stands on the relatively different available data about the true value of the company as well as possible price distorting events.
2. On the other hand, the Trading Hypothesis suggests that the Liquidity differentials may arise from the different turn over in the management of investment portfolios by participating investors; if a shareholder trades more often transaction costs will be reduced and Liquidity will increase. The mechanism in this case would then attribute a greater weight to the behavior of trading rather than to the disposal of relevant information

In any case, the two hypotheses are in a sense overlapping: on the one hand, it may be difficult to distinguish between insider, institutional and informed shareholder when all of these may have a block position in the ownership composition of a firm as well as may drive the observed relation in Liquidity. On the other hand, depending on which of the possible groups of investors is informed, the outcome of the two hypothesis may be similar or different as insider ownership increases. One possible solution to this controversy is that the trading behavior explanation may proxy for all those circumstances where the ownership level is the prevailing dimension, such as those cases where pre-IPO owners decide to sell a small part of the company to the public, while the ownership concentration factor proxies for information asymmetries among potential investor since it measures the incentives that small shareholders have to analyze, trust and trade on their information.

To analyze the relation between Liquidity and ownership level and to compare the two main possible explanation for the outcome of such relationship, Rubin measures the evolution of Liquidity measured by various methodologies such as turnover, depth and spreads, with the development of various groups ownership level. The results of his assessment are both supportive for the trading hypothesis and the adverse selection one; in particular, the Liquidity in the aftermarket is much correlated to the level of institutional ownership rather than to the insider ownership. In Figure 21 it is possible to appreciate that

changes in the average spread for a famous company listed in the US public markets tend to mirror changes in ownership level only when institutional holding are present, and there is no apparent link with insiders holding:

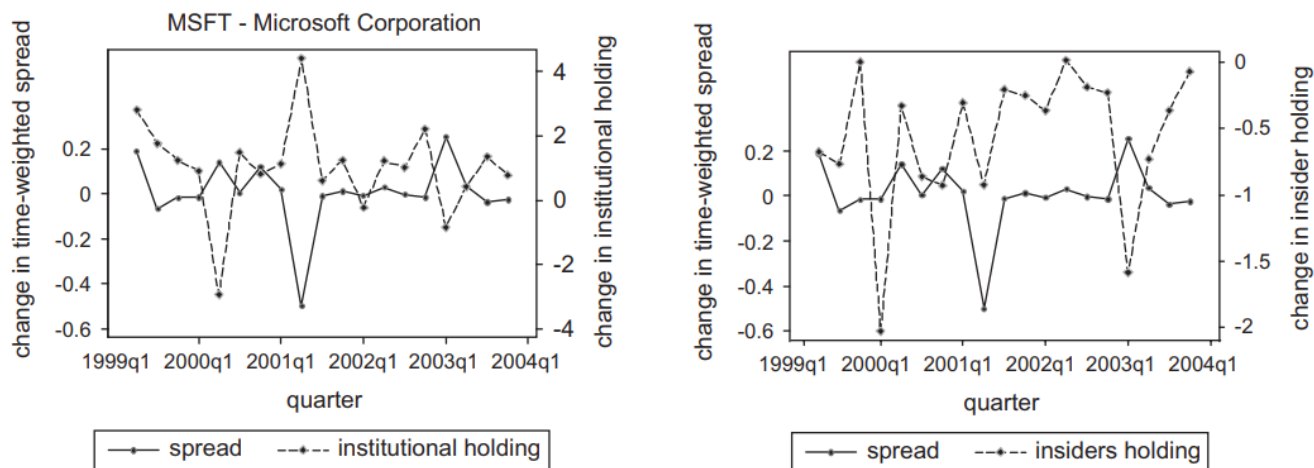


Figure 21: Changes in Ownership levels of insiders and institutional groups compared to evolution of Liquidity. The figure shows a relevant correlation only when the Institutional holding vary in time.

In particular, institutional holding are positively related to Liquidity, and this suggests that they trade more frequently than typical other investors, supporting that the trading hypothesis is a good explanation for Ownership levels.

In a similar fashion, Brockman, Chung and Yan (2009)⁴² argue that Block Ownership, meaning large portion of a company belonging to few investors, impairs firm’s market Liquidity. In particular, by implementing a two-stage type of analysis they first assess the frictions caused by block ownership by evaluating its impact on trading activity measured with trading turnover, number of trades and average trade size. Here they find the Block ownership significantly reduces the firm’s trading activity by significantly lowering the average number of trades rather than trade size. In the second part, in order to evaluate whether a concentrated ownership structure also have consequences on Liquidity they analyze the impacts of block on Bid-Ask spreads, depth and adverse selection components. Also in this case they find that ownership significantly increases the firm’s quoted depth and spread but, surprisingly, adverse Liquidity effects disappear or change sign after controlling for block holder’s direct impact on trading activity, meaning that the actual reduction in Liquidity should be addressed to an intermediate and equal reduction in trading activity rather than to a straight impairment. Thus, these evidence is supportive for

⁴² (Block Ownership, Trading Actiity and Market Liquidity, 2007)

the hypothesis that ownership level acts on Liquidity especially through the trading channel rather than through the information one.

4.1.2 IPO Underpricing and post-listing Liquidity

As extensively seen in previous chapter, the tendential underpricing of Initial Public Offering, the associated short-term overperformance and the long-term underperformance of IPOs is one of the most debated topics in academic literature. Furthermore, the effects that this anomaly has on Liquidity are largely addressed by an equal number of practitioners and field specialists. For the present it suffices focusing on why the relation still takes place, with particular attention to the causes that may lead Underpricing to have a determining role in the evolution of Liquidity in secondary markets post-IPO

In this context, Booth and Chua (1996) develop an explanation for IPO underpricing where the issuer's demand for ownership dispersion crates an incentive to underprice; For this reason, promoting oversubscription allows for an initial enlarged investor base which in turn increases secondary market Liquidity. In order to do this, initial ownership requires higher investor-borne costs which can be only offset through a lower offering price that leads to higher Underpricing. The relationship between initial abnormal returns and Liquidity is intermediated always by Ownership structure considerations.

By contrast, Ellul and Pagano (2006) argue Underpricing to be a negative function of aftermarket Liquidity: in their optic, the causal relation linking the two variables would find its starting point and logical beginning on the expected Liquidity of the initial public offering. If the newly issued shares have low expected trading costs, then investors would require a decrease in the premium needed to buy those shares, and the Underpricing would decrease as a consequence. As it is possible to note, the mechanisms linking abnormal initial return with trading fees would then be reversed with respect to what supported by Booth and Chua. In any case, the majority of Financial literature support the Ownership dispersion hypothesis as to be the most valid explanation for Underpricing as well as the reason why Liquidity increases when newly issued shares are offered with a discount.

4.1 Methodology and Results

In the following part an evaluation on a sample consisting of 28 Italian only IPOs listed between 2010 and 2020 will be evaluated in order to assess the validity and the impact of IPO characteristics on the evolution and development of aftermarket trading activity and Liquidity. Though relatively small in dimensions, the set of IPOs reveals discrete similarities with what previously seen about the going forward

relationship and stands as an additional hint for the correctness and legitimacy of the mechanisms driving investors and market participants in their main investments decision.

4.2.1 Variables Description and IPO Information

All the data relative to the IPO characteristics as well as those necessary to devise the Liquidity evolution and levels for the same companies entering in an initial public offerings have been retrieved through Bloomberg and Eikon DataStream. The list of companies participating in the IPOs as well as their issuing date and the relative business sector are shown in figure 22:

| Summary on sample of IPOs in Italy (2010-2020) | | | |
|---|--|-----------------------------|----------------|
| <i>Pricing date</i> | <i>Issuer</i> | <i>Industry</i> | <i>Ticker</i> |
| 16/06/2020 | GVS SpA | Chemicals | GVS IM Equity |
| 06/12/2019 | SanLorenzo SpA | Transportation | SL IM Equity |
| 12/04/2019 | Nexi SpA | Computers & Electronics | NEXI IM Equity |
| 17/10/2018 | Piovan SpA | Machinery | PVN IM Equity |
| 07/06/2018 | Carel Industries SpA | Construction/Building | CRL IM Equity |
| 29/09/2017 | Pirelli & C SpA | Auto/Truck | PC IM Equity |
| 28/09/2017 | GIMA TT SpA | Machinery | GIMA IM Equity |
| 12/07/2017 | doBank SpA | Finance | DOB IM Equity |
| 05/04/2017 | Banca Farmafactoring SpA | Finance | BFF IM Equity |
| 21/07/2016 | ENAV SpA | Transportation | ENAV IM Equity |
| 11/05/2016 | COIMA RES SpA | Real Estate/Property | CRES IM Equity |
| 28/04/2016 | Technogym SpA | Consumer Products | TGYM IM Equity |
| 23/10/2015 | Poste Italiane SpA | Transportation | PST IM Equity |
| 29/06/2015 | Banca Sistema SpA | Finance | BST IM Equity |
| 17/06/2015 | Infrastrutture Wireless Italiane SpA - Inwit | Telecommunications | INW IM Equity |
| 29/05/2015 | Massimo Zanetti Beverage Group SpA | Food & Beverage | MZB IM Equity |
| 25/02/2015 | OVS SpA | Retail | OVS IM Equity |
| 13/11/2014 | RAI Way SpA | Telecommunications | RWAY IM Equity |
| 30/06/2014 | Fincantieri SpA | Transportation | FCT IM equity |
| 27/06/2014 | FinecoBank SpA | Finance | FBK IM Equity |
| 18/06/2014 | Cerved Information Solutions SPA | Professional Services | CERV IM Equity |
| 11/04/2014 | Anima Holding | Finance | ANIM IM Equity |
| 03/12/2013 | Moncler SpA | Retailing | MONC IM Equity |
| 26/03/2013 | Moleskine | Consumer Products | MSK IM Equity |
| 23/04/2012 | Brunello Cucinelli S.p.A | Consumer Durables & Apparel | BC IM Equity |
| 23/06/2011 | Salvatore Ferragamo Italia SpA | Consumer Durables & Apparel | SFER IM Equity |
| 01/11/2010 | Enel Green Power SpA | Utilities | EGPW IM Equity |

Figure 22: The table above reports the main information on the sample of IPOs between 2010 and 2020. The years of issuing and the business belonging sector of the issuing companies are evenly spread supporting the outcome of the present query.

As it is possible to see in the Figure, the distribution of IPOs is approximately even throughout all the years in the sample period without concentration in any specific point in time. This fact combined with the virtually flat cumulative performance of Italian Markets within the sample period makes it possible to neglect the effects of market movements when trying to assess the impact of IPO characteristics on Liquidity measures. If this had not been the case, it may have been possible that the concentration of IPOs during bullish market years may have compromised the evaluation of aftermarket Liquidity relationship since there has been relevant evidence (Chordia, Roll and Subrahmanyam 2001)⁴³ of the existence of commonality in Liquidity for stocks during overperformance market investment periods. Furthermore, the presence of several provenience sectors for companies listing in years between 2010 and 2020 is an additional element that corroborates with the results of the present analysis since no business operating segment may explain variations in Liquidity after accounting for the explaining factors included in the aftermarket Liquidity assessment.

i. Dependent Variables

The sample variables accounted for in this query can be classified according to their logical positioning within the object relationship: Dependent variables are those measures dealing with Liquidity and Trading Activity while independent variables are all those features regarding IPOs and the issuing companies that may have a potential explanatory power in the mechanism connecting IPO features and Aftermarket trading costs. First, to measure Aftermarket Liquidity the average Bid-Ask spread in the first 4 weeks of trading can be considered satisfactory a proxy and has been implemented throughout the analysis as the main measure akin to evaluate such quantity. As already seen before, this is a measure that evaluates the average cost incurred by investors and professional during trading and for thus reason can be addressed as an accurate assessment of the post-listing Liquidity of a newly issued stock. Its calculation follows the one in Equation (1) for each stock in the sample of Initial Public Offering. On the Other hand, both Trading volume and Relative trading Volume take into account the number of shares that are traded, either by themselves, or with respect to the total number of shares outstanding of a company in order to proxy for the amount of interest surrounding an initial public offering. As a matter of fact, both these measures refer more precisely to the Trading activity in the first 4 weeks after the IPO rather than to the costs involved in trading, even if they do it in independent ways. In case the interest variable is Relative trading Volume, its calculation resembles the one in equation (2) and it may be argued that it carries a flawless picture of the amount of activity in the public markets since it removes implicit size differences, accounted for in its

⁴³ (Market Liquidity and Trading Activity, 2001)

absolute counterparty, that may hamper the correct evaluation of the relationship between IPO features and their effect on the aftermarket liquidity evolution. On the other hand, if the dependent object variable is Trading volume, its assessment will just refer to the amount of shares traded in a day where each share is going to weight up to n times when it sequentially participates in n different transaction, thus potentially increasing to very high thresholds the boundaries of this variable. Figure 23 reports the main descriptive statistics of these measures for the Italian IPOs present in the sample:

| Variable | Descriptive Statistics on Liquidity Measures | | | | |
|-----------------------------|--|-----------|---------|------------|--------------------|
| | Mean | Median | Minimum | Maximum | Standard Deviation |
| Liquidity | | | | | |
| Average Bid-Ask Spread (%) | 0.7406 | 0.4525 | 0.2061 | 3.5927 | 0.8119 |
| Trading Activity | | | | | |
| Trading Volume | 2,605,137 | 1,184,904 | 108,322 | 18,663,116 | 3,732,787 |
| Relative Trading Volume (%) | 0.2399 | 0.1022 | 0.0249 | 3.2851 | 0.6027 |

Figure 23: the measure for trading activity and Liquidity are calculated according to Equation (1) and (2) in previous chapter except trading volume that is nevertheless a close comparison of the relative trading volume.

Figure 23 shows the value of the variables after the execution of the IPOs. Liquidity Data reveal that the Bid-Ask Spread has an average value of 0.7406% and a variation ranging from 0.2061% to 3.5927% with a standard deviation of 0.8119%. Meanwhile, Trading activity Data reveal an average Relative Trading Volume of 0.2399% with a variation ranging from 0.0249% to 3.2851% and a standard deviation of 0.6027%. trading Volume in absolute terms has an average of 2,605,137 shares traded with a standard deviation of 3,732,787 shares. In order to have a visual representation of the evolution in time of these variables, it is possible to compute the average along the first 30 trading days after an IPO for each of the interested measures and plot them against their time coordinate points.

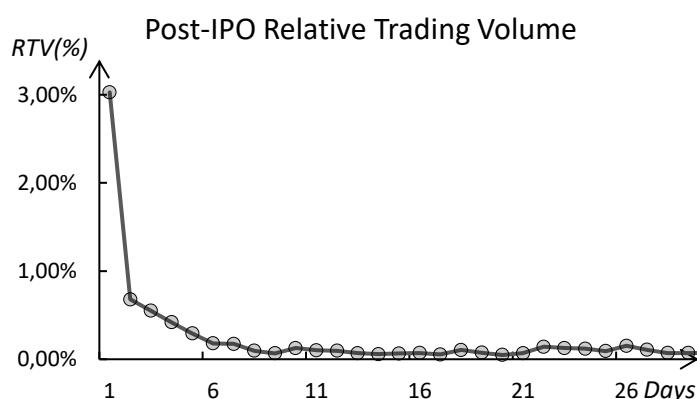


Figure 24: Figure above plots the average relative trading volume for all firms having an IPO against their trading days

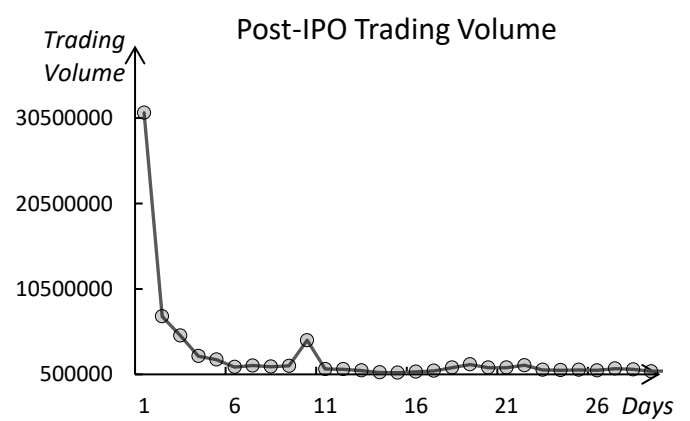


Figure 25: The Figure above plots the average relative trading volume for all firms in the sample against their trading days

Figure 24 and 25 show the development of average Relative Trading Volume and average Trading Volume as to be the most representative evaluators of the abnormal activity that follows an Initial Public Offering; In particular it is possible to see how both measures have a peak during the first day after the IPO and tend to achieve lower levels smoothly with passing time. Similar results can be found in the academic literature several times (Corwin, Harris and Lipson 2004).

ii. *Independent Variables*

By contrast with the just seen dependent variables for Liquidity and Trading Activity, the Independent variables that serve the purpose to explain part of the variation in previous measures are the IPO Size, the Relative IPO Size, the Underpricing of the Offering and the presence or not of a retail tranche directed to the private investors at the moment of the issuance. The first two quantities refer to the same item, once expressed in absolute terms and once in relative terms. The introduction of the double assessment addresses two slightly different aspects. An Absolute formulation of IPO Size is likely to be correlated more with absolute trading volume rather than its relative counterparty; as a matter of fact, the higher the Dimension of an IPO the higher the shares available to be traded. A relative assessment of the Size of an offering, on the other hand, will convey more precise information on the actual relationship existing between Initial Public Offering Characteristics and aftermarket Liquidity since it discards firm specific disturbances and normalizes the measures in terms of percentages of the total. This variable is particularly linked to the observations about ownership structure: a higher percentage for the relative size of the offering will have an impact on the future capital and ownership structure of the firm so if a higher proportion of shares offered is correlated with higher Liquidity the Ownership dispersion hypothesis can be addressed as the reason for it. Alternatively, if a higher percentage or Relative Size happens to be correlated with lower aftermarket liquidity the signaling Hypothesis is going to prevail and explain the mechanism joining the two variables. Furthermore, Relative Size of the offering is perfectly correlated with the Share retention dimension since they are one the inverse of the other and convey exactly the same type of Information. The third independent Variable is the Underpricing of the offering and is calculated as the difference between the average market price of each share on the first 4 weeks of trading and the offering price divided by the offering price of the relative IPO. Finally, the last factor that will be considered as potentially causing changes in aftermarket liquidity is the retail composition of the offer, or better, the presence or less of a tranche devoted to the retail investors. This variable is a proxy for the amount of ownership dispersion that the company tries to achieve in the post offering trading days: as a matter of fact distributing shares to retail investors is likely to increase the liquidity of the stock because of the high turnover in investing habits of private investors as well as lower informational asymmetries

that will generate having many shares trading among the public. Figure 26 shows the descriptive statistics of the main IPO characteristics:

| Variable | Descriptive Statistics on IPO Characteristics | | | | |
|---------------------------------|---|-------------|-------------|---------------|--------------------|
| | Mean | Median | Minimum | Maximum | Standard Deviation |
| IPO Size (€) | 706,277,002 | 378,920,000 | 135,000,000 | 3,112,000,000 | 792,844,468 |
| IPO Relative Size (%) | 39.4081 | 38.2000 | 25.0000 | 60.6600 | 9.1079 |
| Number of Shares Offered | 179,662,539 | 76,820,000 | 11,000,000 | 1,541,437,500 | 296,522,378 |
| Underpricing (%) | -0.9044 | -0.8157 | -27.3195 | 38.6676 | 17.9187 |
| Retail Composition (%) | 62.9630 | - | - | - | - |

Figure 26: This table shows the results for the final sample which is formed by 28 IPOs. Relative Size is the number of shares offered divided by the number of shares outstanding. Retail composition of offering indicates whether the offering was accompanied by a retail tranche. The Underpricing is the difference between the prevailing market price and the offering price divided by the offering price.

The first of these variables is the IPO absolute Size a variable that summarizes the size of the IPOs in the Italian market. Its average is 706,277,002 € which is discrete and in order to have the value of the average price at which the companies listed it would be possible to divide it for the average number of shares offered, nevertheless the outcome would have poor meaning in the context of Aftermarket trading Liquidity. As a matter of fact, it is more convenient to deal with the relative counterparty of the prior variable which the Relative Size of the offering that is the ratio of shares offered to shares outstanding. This variables shows that the average size of IPOs is 39.4081% which is consistent with many examples in the academic literature supporting the hypothesis that the average relative size of the offering is around 40%; the variation of the variable is ranging between 25% at its minimum and 60.66% at its maximum with a standard deviation of 9.1079%. Li et al. (2005) name his variable Share retention that is exactly the inverse of this measure, that is $1 - RS(\%)$ where $RS(\%)$ stands for Relative Size and represents the ratio of shares retained to shares outstanding. The third key variable is the is the Underpricing of the offering whose assessment is previously shown. It is necessary to say that its negative average value represents an anomaly in that the academic literature it appears with even large average values. In any case, after assessing the prevailing market price in several ways and interpreting it as the average price in the first 4 weeks of trading, it is almost certain that the value here reported is an accurate measurement. This might be a point against the statistical validity of the Underpricing, even if the Italian market may represent an irregularity in a bigger context. This variable has an average value of -0.9044% and a variation ranging between -27.3195% i.e. overpricing (Anima Holding S.p.a) and 38.6676% (Brunello Cucinelli S.p.a). The last variable considered is the retail composition of the offering, or better, the presence of a tranche devoted to the retail public. Its average value represents the total number of firms that have a retail portion of shares

in their Initial Public Offering to the total number of IPOs and is 62.9630%. The importance of this variable stems from the fact that it helps in assessing the ownership structure of the companies and allows small investors, whose trading habit are often different from institutional and professional ones, to be part and trade in the newly issued shares.

4.2.2 Influence on Liquidity and Trading Activity

In the following part the main results of the analysis for the influence of IPO characteristics will be presented; in most cases, the results align with previous observation and with all the academic literature in the topic. In any case, the results are to be intended as an additional evidence for the importance of the Liquidity in the secondary aftermarket and even if the correlation and the relationship happen to be weak, that could be addressed to the sample construction and the contingent period extensions given that the strength of the relation may well depend from that under many additional aspects. Even though the results may be too loose to provide definitive information and conclusions, the framework should provide valuable information and could reinforce the already present theoretical basis on the matter.

i. Correlation Analysis

The first part of the analysis of the impact of IPO characteristics on Aftermarket Trading Liquidity will delve into the correlation of all the variables already shown. It is important to remind that most of the literature in the academic context has focused mainly into assessing either the causes of the Underpricing of the Initial Public Offerings, or on the long-run underperformance of newly issued companies. Here the Aftermarket Liquidity will be considered as the consequence of IPO characteristics so it can be useful to look at static correlation between the variables. Figure 27 reports the simple correlation for all the 28 IPOs in the sample along all features, both dependent and independent:

| Variable | Sample Correlation of Pairs of Variables | | | | | | |
|-----------------------|--|-----------|------------------|---------------------|-----------------------|-----------------------|------------|
| | <i>IPO Size</i> | <i>RS</i> | <i>Retail C.</i> | <i>Underpricing</i> | <i>Bid-Ask Spread</i> | <i>Trading Volume</i> | <i>RTV</i> |
| IPO Size | 1.0000 | | | | | | |
| RS | -0.1276 | 1.0000 | | | | | |
| Retail C. | 0.1878 | -0.1133 | 1.0000 | | | | |
| Underpricing | -0.2252 | -0.3450 | -0.1807 | 1.0000 | | | |
| Bid-Ask Spread | -0.2475 | -0.3156 | 0.1674 | 0.3401 | 1.0000 | | |
| Trading Volume | 0.8012 | -0.1693 | 0.2556 | -0.2427 | -0.1412 | 1.0000 | |
| RTV | 0.0225 | 0.4584 | 0.1806 | -0.3174 | -0.1198 | 0.1276 | 1.0000 |

Figure 27: Table above shows the average cross-sectional correlation between pairs of the selected variables.

The first thing to notice in the table is the fact that Underpricing is negatively correlated with both IPO Size and IPO Relative Size. In both cases the correlation is above the threshold of -0.2 placing once at -0.2252 for IPO Size and at -0.3450 for Relative Size. This finding indicates that while the absolute dimension of an offer offers some control power in price positioning, it does it even more if the amount of the offer is bigger with respect to the total value of the company. This finding is consistent with Pham et al. (2003) and Zheng and Li. (2008) who also argue that the size of the firm as well as the relative dimension of the Initial Public offering contributes to widen the investor base thus reducing the incentives to Underprice the offering. Market liquidity that follows a wider ownership dispersion in this sense may act as a catalyst for lowering the Illiquidity premium required by investors who face lower adverse selection cost and this requires a lower initial abnormal return. What is even more pronounced is the relationship between Underpricing and the average Bid-Ask Spread: here the correlation equals 0.34. A positive value indicates that more Underpricing points toward a higher spread. This result is consistent with the finding of Ellul and Pagano (2006) who argue that the more the aftermarket Liquidity the less the required Underpricing for a given IPO. This actually switches the causal relation from Liquidity to Underpricing, that is, the expected liquidity influences the Underpricing of the Initial Public Offering and not the opposite. Figure 28 and 29 plot the Underpricing against Relative Size of the offering and average Bid- Ask Spread in the first 4 weeks of trading:

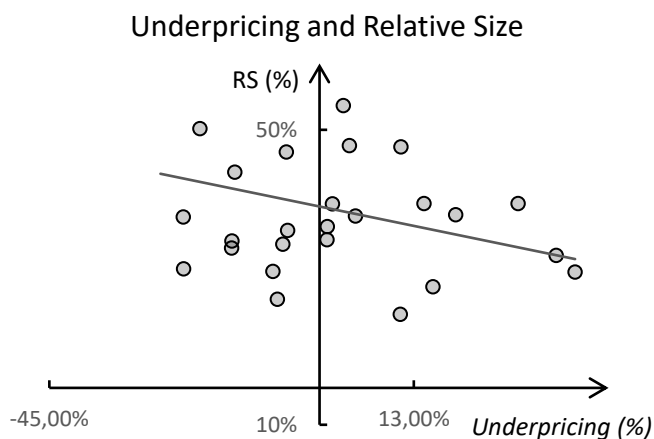


Figure 28: Plot of Average Relative Size of the Offering Spread against Underpricing (%). The data show a negative correlation.

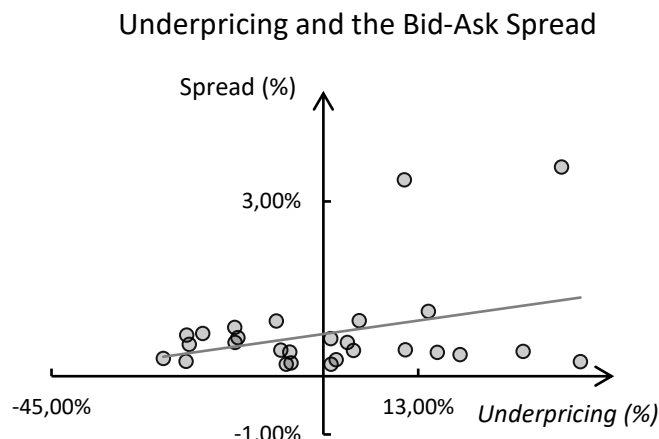


Figure 29: Plot of Average Bid-ask Spread against Underpricing (%). The data show a positive correlation.

Another important relationship is the one between relative trading volume and Underpricing. Here, consistently with what said about the Bid-Ask spread, so that higher underpricing is required for those companies who expect to have a lower liquidity in the secondary aftermarket, the correlation between the two variable, 0.3174, supports the argument that Underpricing is a negative function of expected trading activity. Firms that expect a higher trading activity in the secondary market can afford to require a lower

abnormal initial return since they already have enough interest on them that underprice the offering would be superfluous. Figure 32 plots the two variables together:

Underpricing and the Relative Trading Volume

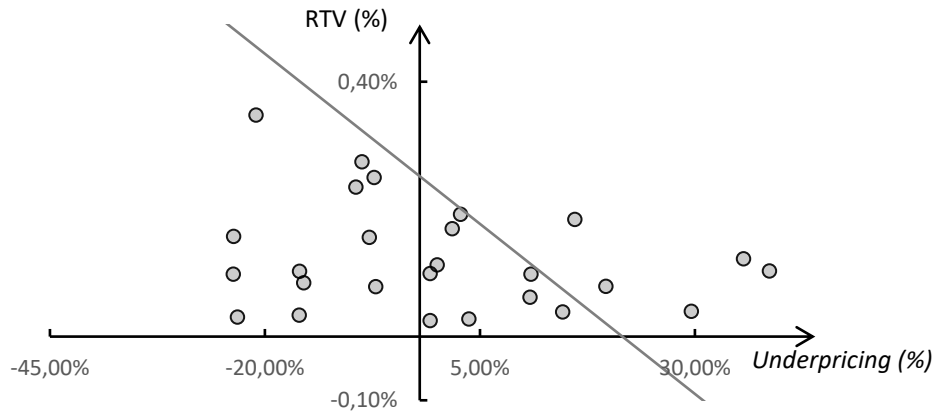


Figure 30: Figure above shows the correlation between Underpricing and relative trading volume. Negative correlation shoes that firms that have higher initial abnormal return tend to have higher trading volume

The next Relevant correlation that can be found in the table is about the relative size of the offering and the average relative trading volume. In this case it is possible to see that the correlation amounts to 0.45. This is consistent with previous findings supporting the idea that a higher portion of the company offered in the IPO creates incentives for investors to trade in it. By the same token, a lower percentage of shares retained promotes a greater ownership dispersion that favours the trading activity in the secondary markets. Similar arguments can be expressed for the Liquidity in terms of the average Bid-Ask Spread. Here, the relative size of the offering is negatively correlated with the spread further supporting the hypothesis that the percentage of shares retained at the moment of the offering is a great predictor of the aftermarket trading Liquidity. Figure 30 and 31 plot the relative size of the offering against both the spread and the relative trading volume in the first 4 weeks of trading after the IPO:

Relative size and the Bid-Ask Spread

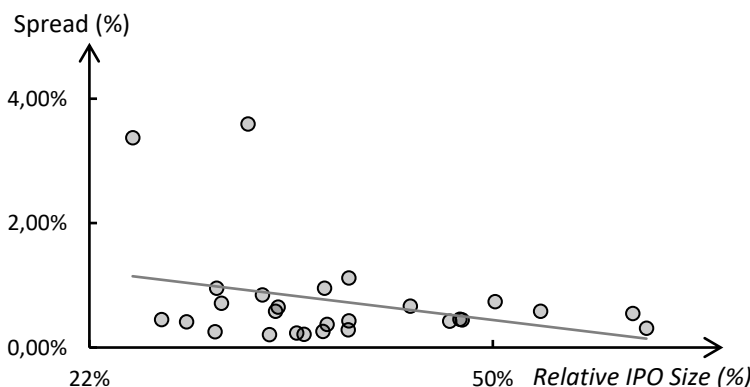


Figure 31: plot of the Relative size of the offering against the average bid-ask spread.

Relative size and RTV (%)

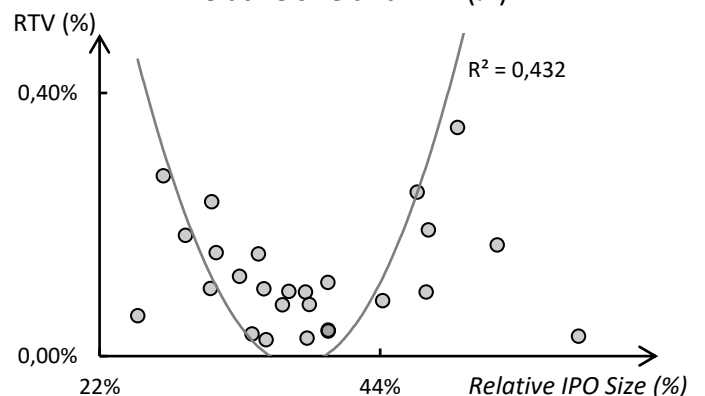


Figure 32: plot of the relative size of the offering against the relative trading volume.

A peculiar fact of the relationship between the relative trading volume and the relative IPO Size is that it much resembles a polynomial of second order. As a matter fact, the R-Square in case the regression allows for a second term becomes 0.432. Apparently when the relative size of the IPO is below 30% the signaling effect proposed by Leland and Pyle (1977) prevails in the sense that investors consider a small percentage as a proxy for high-quality companies and they are more willing to trade on it. By contrast, as more percentage of the company becomes available in the initial public offering the Ownership dispersion Hypothesis takes over and more trade is motivated by lower adverse selection costs and higher trading incentives as previously shown. Finally, it is possible to notice how the trading volume in the 4 weeks after the IPO is positively correlated with the IPO size, expressed both in absolute terms, with a coefficient equal to 0.8012. As matter of fact, this is clearly explainable: the higher the size of an offering, the higher will be its trading volume in the secondary market. In any case the relationship tends to smooth out when one of the two variables is expressed in relative terms, in particular it lowers down to 0.025 when relative trading volume is considered instead of trading volume.

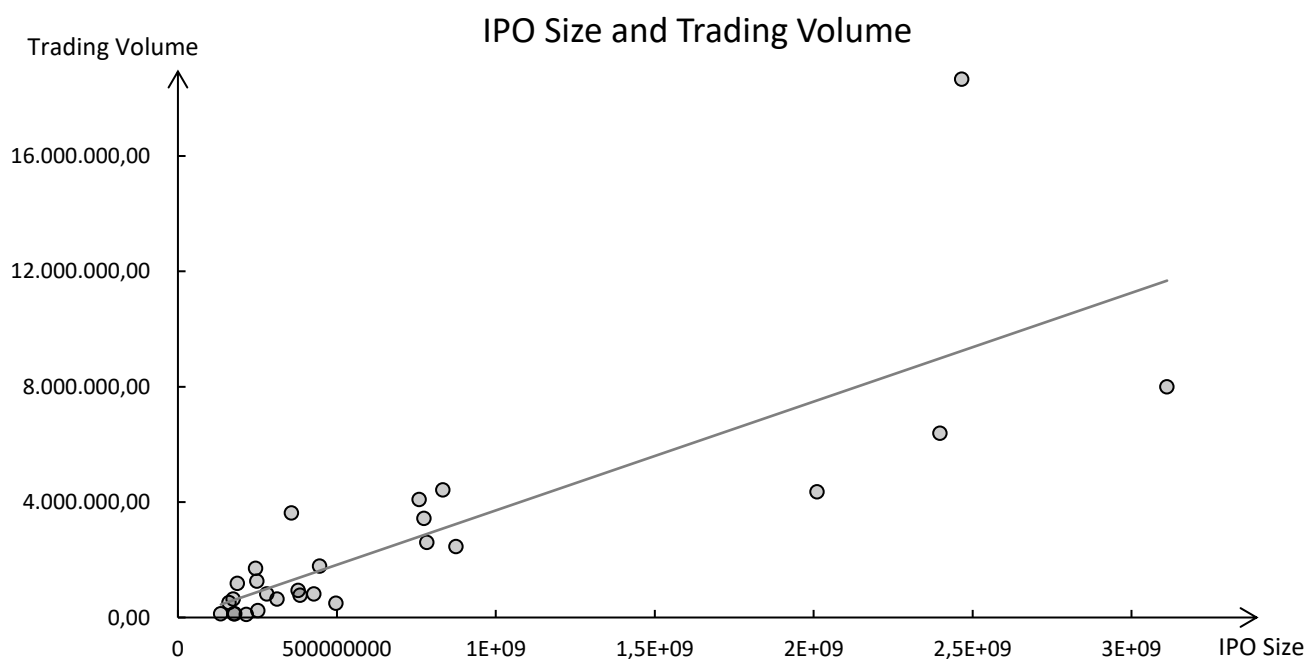


Figure 33: plot of the IPO Size Against the trading volume. The graph shows a highly significant and positive correlation of the two variables.

ii. Cross-Sectional Regression

All the correlation just shown above indicate only direction and the size of the relationship between the object variables. In order to have an idea of how significative these relationship are, that is, how likely that this links happened for a reason without being there by just chance it is necessary to compute a cross-sectional regression for all the observation on the sample and evaluate the significance of the coefficients

that are likely to show similar results to simple correlations but may also shed light on more informative effects between the variables. Therefore, to examine the relationship between the IPO characteristics and the liquidity and trading activity of shares outstanding after the execution of these operations, the following cross-sectional regression was run for both the average Bid-Ask Spread and the Relative trading Volume

$$X_i = \alpha + \beta_1 S_i + \beta_2 RS_i + \beta_3 RC_i + \beta_4 U_i + \varepsilon_i \quad (26)$$

Where X_i is the post-IPO average value of the relative Liquidity measure for firm i , S_i is the absolute size of the offering I , RS_i is the relative size of the offer I , RC_i is dummy variable for the retail composition of offer i that is = 1 if the offering had a tranche devoted to the retail investors and U_i refers to the Underpricing of offer i where ε_i is a zero-mean error term. The cross-sectional regression results on both Average Bid-Ask Spread and Relative Trading Volume are shown in figure 33:

| Dependent Variable | Regression Results: Independent Variables | | | | | |
|-------------------------|---|--------------------------------------|---|--|-------------------------------|------------------|
| | Constant (t-statistic) | Size of Offering (t-statistic) | Relative Size of Offering (t-statistic) | Retail Composition of Offering (t-statistic) | Underpricing (t-statistic) | R-squared (%) |
| Liquidity | | | | | | |
| Average Bid-Ask Spread | 0.0154* (1.89) | -2.75E-12 (-1.38) | -0.0214 (-1.18) | -0.0039 (-1.22) | -0.0108 (-1.14) | 26.278 |
| Trading Activity | | | | | | |
| Relative Trading Volume | -0.0107* (1.80) | 8.84E-14 (0.06) | 0.0290** (2.19) | 0.0025 (1.08) | -0.0042 (-0.61) | 27.891 |

Figure 34: The figure above reports the results for the cross-sectional regression on all liquidity and trading activity measures.

*: Statistically significant at 10% Level.

** : Statistically significant at 5% Level.

First, both the regressions show a significant intercept up to 5% level. This means that even though only some of the independent variables actually have statistical meaning, in general the average value of the dependent variable measuring either liquidity or trading activity after controlling for all the independent factors is significantly different from a result that could have been obtained by chance.

The most relevant relationship that is consistent with both previous literature as well as theory regarding Initial Public Offerings is the one existing between relative size of the offering and relative trading volume that is statistically significant up to 5%. This result confirms that the positive correlation seen before is actually due to a causal relationship. The most prominent explanation for such an outcome is that a less concentrated ownership structure increases the value of post-listing trading activity through the incentives that arise when a large investor base is actually part of the newly issuing company. If this is the case, there will be lower adverse selection costs as well as investors will fear less the presence of large informed shareholders who may exploit their superior information to trade against them and earn abnormal profits. These results have been constantly coming up in academic literature and have been proposed several times in chapter 3 in the analysis of the main features impacting aftermarket trading activity and Liquidity.

Another relevant fact about the results of the present regression is the negative, although not significant, correlation that exists between Underpricing and both measures of trading activity and Liquidity. This finding supports the idea that, as shown before, in the Italian public markets the level of post listing liquidity has a predictive effect on underpricing rather than the opposite. This suggests that those firms that expect a lower trading cost can afford to underprice less. Furthermore, another peculiar fact about the outcomes concerns the Retail Composition of the offering; although the relationship also in this case are not statistically significant, the direction of the prediction is consistent with previous literature. By the same token, allowing retail investor to participate in the initial public offering has a positive effect on the Liquidity in the aftermarket as the negative correlation with spread and the positive correlation with the relative trading volume suggests. This result is consistent with theories arguing that trading costs arise from the informational asymmetries between different groups of investors and the more the retail participation the less the trading costs associated with adverse selection issues. Finally the only variable that seem not to be correlated with aftermarket liquidity is then Absolute IPO size: as a matter of fact this result is explained in the premises since the dimension of the IPO only can give an idea of the amount of absolute trading volume in the aftermarket while in order to have more accurate assessments on aftermarket Liquidity it is relevant to rely on its relative counterparty: Relative IPO Size.

5

Conclusion

At the beginning of the present commentary the importance of the Initial Public Offerings has been stressed several times. After all the considerations made, it seems even more reasonable to judge the effects of the Decision to go public within a wider spectrum of possible consequences. When a firm chooses to issue for a public listing it surely needs to delve in a series of secondary considerations regarding the costs that it will require as well as the benefits that will generate. Among the main disadvantages that going public presents, the management time needed in order to prepare everything inherently represents a heavy cost as well as the increased external control over the life of the company and the higher disclosure requirements that public markets command in order to remain present on a stock exchange. On the other hand, the advantages of having a public ownership are several: first of all, the ease with which it is possible to collect capital increases exponentially in both equity and debt financing. Furthermore, the reputational effects extend over the simple operating activity of the firm and contribute for the reach of higher dimension objectives and targets. When considering the advantages of being public, one the of the main points that even financial specialist would list surely regards the increased liquidity of company's stock. In this sense, Liquidity has the power to increase firm value by reducing the premium associated with the expected returns on the securities, thus allowing firm to raise cheaper capital and invest their money in more profitable investments. Furthermore, The Liquidity of the shares also has several impacts on the corporate governance of a company since it allows for better management policies and control incentive schemes.

In particular, one of the main topics regarding the decision to go public involves the ease with which future stock will be traded in public exchanges. Under this perspective it is important to state that there are particular features of IPOs that recursively tend to impact the outcome of the Initial Public Offering in terms of its Liquidity dimension. One of these features, probably the most relevant, is the relative size of the offering, or the quantity of shares retained at the moment of public subscription. It is important to know that the way it influences Liquidity varies long several dimension among which the ownership dispersion hypothesis and the associated adverse selection costs evaluation are the main drivers. Trading

habits of different group of investors also partly explain the average trading costs affecting particular shares after IPO, and it seems obvious that higher trading turnover will reflect in lower trading costs since more shares are available on the market at the same time. The second important IPO feature affecting Liquidity is its average Underpricing. Though no explanation for the existence of the Underpricing has yet found definitive confirm, it seems generally accepted that Underpricing is a constant in the Initial Public Offering listings. The way it impacts on Liquidity is still discussed: on the one hand some theories argue that a higher underpricing will provide incentives for investors to participate in trading by lowering the adverse selection costs of trading with more informed investors, thus increasing secondary market liquidity, on the other hand more modern and accurate lines of thought support the idea that those companies that await a higher expected liquidity can afford to underprice less, thus inverting the cause effect relationship between the two variables. Finally, the last key factor in explaining the Liquidity in secondary markets are the actions performed by Underwriters and Market Makers. When a company files with a renowned Underwriter, the reputation of him as well as the expectancy of a higher price support in the secondary market will favor the trading activity, having as a consequence an increase in liquidity and lower average trading costs.

When it comes to evaluate all these points in an actual sample of IPOs it is important to clearly state the information on the variables available. In the sample of 28 Italian IPOs all the measures on Liquidity and trading activity were provided. By the same token, all the main characteristic on the IPOs were accessible so it was possible to assess the extent of the relationship between the two groups of quantities. It turned out that exactly as predicted from the financial literature the relative size of the offering had great potential explanatory power on the average trading activity in the post listing period, especially in the first 4 weeks of trading. Secondly, Underpricing seemed to follow those theories suggesting that the actual relationship had to start from liquidity decreasing the value of Underpricing rather than the opposite. In the end, results partly confirmed the main points of the existing analysis and can be stated to have tendentially aligned with main financial prominent theories.

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Abstract

The Financial Literature on the Topic of IPOs generally focuses on two main anomalies: the tendential Underpricing of them and the long-run Underperformance that characterizes all newly issued companies. Oddly, only a few of the academic literature focuses on the analysis of the development of post listing Liquidity in relation to the main IPO features. This strangely goes along with the fact that liquidity is primary component of the risk concerning a company and that its levels determine both firm value and most of the policies and strategies about firm management. For this reasons, the present analysis will delve in the assessment of the main IPO characteristics and their relation with Post-listing Liquidity in order to ascertain which firms are more likely to benefit from having a high liquid stock in the secondary market after an Initial Public Offering.

Chapter 2 – IPO and Liquidity Theory

2.1. The IPO Decision

A firm's initial public offering is a milestone in the organizational life of a company. Among the reasons why firms should go public industry professional bring upon many arguments: an IPO allows for the collection of new capital for operational expansion as well as it increases the stock liquidity for all shareholders, it improves the company reputation with banks and other financial institutions and the new public stock becomes a mean of compensation by all effects. However, going public entails also costs such as the additional disclosing requirement that a firm is subject to by financial authorities as well as all direct costs involved in the organization and management of the offering.

- Under the financial point of view, an IPO can affect a firm in many ways:
 - Companies tend to go public as a way to increase the dimensions of their businesses: especially if a firm is young and struggles to collect all the capital it needs to finance its projects, going public is an easy and effective strategy to allow management to have additional capital in a fairly simple manner. For this reasons all those companies that file for a public listing in order to collect capital to pay off debt or investment purposes are more likely to accomplish the task rather than firms issuing for other reasons
 - In Italy, firms that go public tend to do so after a period of high investment and growth, which is consistent with what said about the general motivation to go public as it ascertains that public markets are seen as a way to rebalance account after a period of high financial stress.

- The IPO provides the firm with a useful tool, the stock, that can serve multiple purpose among which it acts as a mirror of the company's reputational state as well as it serves the function of allowing ownership to create better constructed policies for management control.
- When a company decides how many shares to include in its IPO, it should carefully consider its implication on the corporate structure of the firm, in particular the decision line should encounter two moments:
 1. The number of shares to include that determines the amount of liquidity a company wants to achieve, the more the shares the more the pledged liquidity in the secondary markets.
 2. The allocation of the shares among the public: if a large block of shares is pledged to one single investor this may create incentives for monitoring purposes but may hamper secondary market liquidity.

A Firm needs to set its relative size of the offering also in consideration of the level of liquidity it wants to achieve, keeping in mind that while a dispersed ownership structure favors liquidity, it also makes it harder for shareholders to control management thus incentivizing the bear of agency conflicts. The relation between liquidity and corporate structure is this very important and it should also take into account the external environment characteristics.

- Among the benefits of an IPO there is surely the increased reputation that a company acquires. This reflects on its stock as well as on its capabilities to relate with financial institutions. By looking just at the stock of the company it is possible to list some peculiar facts about the newly issued company:
 - The stock acts as an indicator of the firm value. When a company is publicly traded it conveys its value through the level of its stock price. This way investors can have information on the life of a company by just looking at its share price.
 - The stock becomes an effective tool to compensate managers, institution and even suppliers. It grants a reputational status to the company and helps reducing the conflicts between ownership and management by acting as a compensation for CEOs.

2.2 Market Microstructure and Liquidity Measures

Public markets present several friction during the daily trading activity of investors and these are not always present at the same time on markets. The consequence of this is that price formation is delegated only to those agents that are present at any point in time. Professional intermediaries have the task of “making the market” by absorbing temporary buy and sell order imbalances and adjust the

price formation consequently. When markets are illiquid, a buy or a sell order tends to push price respectively up or down. Eventually when the deviation becomes too great the market freezes. Two main characteristics of markets are present:

1. Liquidity is the extent to which an asset shows traits of trading inconvenience.
2. Price discovery, instead, refers to the speed and the accuracy with which transaction prices are able to incorporate information available to market participants.

Liquidity and Price discovery tend to move in opposite ways: when price relevant information hit the market, this reflects into trading pressure and following order imbalances hamper the liquidity of the asset.

- Several types of mechanisms of trading exists and they determine the different actions that investor can make; trading mechanisms define the “rule of the game”.
 - In Limit Order Markets (LOB) investors interact directly and their offers rank according to price priority. Here, buy and sell order find direct match with a counterparty and the floor can be a physical exchange or a simulated virtual trading. While a market order operates immediately whatever the price will be on the market, a limit order specifies a maximum price at which the trader is willing to accept the purchase or sell a security
 - In dealer markets, on the other hand, investors can only trade at predetermined price ranges and offer quotes posted by the specialized intermediaries called “dealers”. This way dealer markets imply two different sections: the retail segment where dealers communicate directly with final investors and a wholesale segment where dealers can exchange securities to modify their inventories with other market makers.
- When evaluating the determinants of the risk of a portfolio, standard deviation of returns is not sufficient and more elements contribute to the overall risk return performance: Liquidity is one of these elements. The typical framework in which it is possible to analyze liquidity consist in evaluating the ability of a security to be readily converted into another asset such as cash. An ideal index of liquidity, however, should comprise some information on volumes, price and time of transactions. A global index of liquidity, however, almost always needs to trade off one feature for another:
 - Measures to assess Liquidity are the Bid-Ask Spread, the Relative Depth which measures the available number of shares of a company at each side of the market at best prices with respect to the total number of shares and the Probability of Informed Trading that estimates the liquidity of a stock by assimilating it to the number of informed and uninformed investors on

the market, given that the former tend to increase average cost as a consequence of adverse selection.

- Measures for trading activity instead are the relative trading volume which measures the number of shares traded in a day with respect of total number of shares outstanding the relative number of transactions and the relative trading volume per transaction.

2.3 Benefits of Liquidity

Consequences of a liquid stock extend both on investors and on companies. The first will care having a liquid stock since it may alter the return of their portfolios by decreasing the premium associated with having low high fees. On the other hand, firms will look at their liquidity in order to estimate consistently future cash flows since having high or low transaction fees may alter their future expected cash flows associating it with higher expected performance. Furthermore, commonality in liquidity for stock trading on the same venue makes it even riskier for companies to have illiquid stock since they may encounter price devaluation when market movements tend to decrease the general liquidity.

- The way in which transaction fees affect the value of a company are several. In particular asset returns, that determine the value of companies, are a concave and increasing function of the bid-ask spread. Asset returns should increase with expected holding periods, and the greater the investment horizon the lower the liquidity requested to trade in some security.
 - The "illiquidity premium" of a security are all those costs that act as an additional charge during the trading activity of a security. Two securities that have the same expected cash flows may have different price levels because of their differences in trading expenses. The additional compensation required for bearing transaction costs throughout the trading activity is represented by the relationship between the spread of the security and the average holding period in the market. If the spread was equal to 0, the expected return on the security would equal the CAPM prediction.
 - Different types of investor will have different preferred holding periods. This point can be furtherly developed in stating that equilibrium returns should be a concave function of the spread. To reach this conclusion it suffices saying that there should be no incentives for the short-term horizon group to switch to higher spreads securities as well as no incentives to high investment horizon group to prefer low spread securities.

Chapter 3 – Evidence On prices and Liquidity after IPOs

If a private company prospers, at some point in time, it may need to collect some additional capital in order to enlarge its business and the most basic choice to make in this respect is to go public; by doing so it also increases the liquidity of its shares on the market and this allows the company to raise even more additional capital on more favorable terms. Liquidity is thus one of the main benefits arising from an IPO and one of the most valuable gains that a company receives after public listing. However, the way a company access public markets makes a relevant difference in the evolution and development of liquidity and asset prices in secondary markets.

3.1 Initial Underpricing

One of the most debated topics on Initial Public Offerings is the abnormal short-term initial return after the offering date, the “Initial Underpricing” and several theories link this to aftermarket Liquidity.

- The reason for Underpricing can be attributed to the presence of fads, or inefficient market momentary overvaluation arising from asymmetric information, in early aftermarket trading. This finding is both relevant for industry professional since they can no longer be blamed for intentionally “leaving money on the table” at the moment of the offering and for investors, that can exploit this momentaneous overvaluation to earn abnormal average profit investing in IPOs.
- Other theories relate underpricing to the expected level of aftermarket Liquidity. This arguments complement traditional explanations with more modern theories where investors also care about aftermarket trading cost that may result from asymmetric information. So, The less liquid the aftermarket, the greater the initial Underpricing.
 - The most accurate Liquidity measures that relate to the costs of asymmetric information are the Probability of Informed Trading and the adverse selection component of the Bd-Ask Spread. The variability of these measures also can give a sense of the Liquidity risk of a particular security. These two measures tend to be higher in the immediate aftermarket.
 - By looking at simple correlation it is possible to see that these liquidity measures are negatively correlated with the Underpricing. Also, proxying the level of expected liquidity for the issuing company with the level of the measures for similar companies in the first 4 weeks before the offering it is possible to see that they are significantly correlated with Underpricing. This means that investors want to be compensated for a company’s expected illiquidity in the secondary markets that may arise from the inherent asymmetric information.

3.2 Secondary Market Liquidity Trends and Patterns

Liquidity in the secondary markets often follows trend related to IPO specific characteristics. In particular, regardless of any feature of the Initial Public Offering, Trading depth tend to be low during the first days of trading. The pool of Underwriters, the syndicate size and premarket demand can alter the value of secondary market liquidity Particular offer designs can also affect secondary market liquidity.

- A liquid secondary market is a critical component for the success of an IPO: it helps reducing transaction costs as well as it lowers cost of capital for the issuing firm
 - Differencing Initial Public Offerings in hot, warm and cold with respect to the prevailing market price distance from the offering price it is possible to note that for all categories of IPOs the market depth tends to be highest in the in the first week of trading until the 25th trading day. However, if the results of share depth are divided for trading volumes the Liquidity of the markets actually tends to be lowest in the first trading days since that is the time where most of the activity happens.
 - Initial liquidity is significantly correlated with both Underwriter and syndicate features. Market share of the underwriter is positively corelated with depth of the market and syndicate size is positively correlated with both depth and trading volume. Liquidity is also positively related to the number of shares offered relative to the total of shares outstanding.
- How ownership structure affects Liquidity in the aftermarket is still blurry, it is arguable however that the more concentrated the ownership structure the higher the adverse selection costs for investors and the higher the illiquidity in the secondary market.
 - The Relative size of the offering, or the number of shares offered with respect to the total, has good explanatory power on the development of secondary market liquidity: the higher the size of the offering the higher the liquidity in the aftermarket. By the same token, offering some shares to the retail public increases liquidity in the secondary market
 - Underpricing of the offer also has a significant negative correlation with aftermarket liquidity showing that initial abnormal returns are an effective way to attract initial investors in buying newly issued stocks. The relation between the variables are consistent with market movements that may hamper the strength of the connection between the variables.

The effects of share retention on Liquidity may align with two different theories that anticipate opposite outcomes:

1. The first one is the “Signaling Theory” and says that the greater the share retention the greater the Liquidity as this would stand for higher share value.
2. The “Ownership Dispersion Hypothesis”, on the other hand, suggests that higher retention rates are a source for more scarce liquidity that arises from higher investor borne adverse selection costs and informational asymmetries.

3.4 Underwriter and Market Maker Effects on Liquidity Evolution

- The role of underwriting can be controversial but always crucial for the success of an IPO. The Underwriter is partly responsible for ensuring the tradability of the security as well as its initial price range.
 - In order to measure the amount of interference of the Underwrites in the allocation development it is possible to resort to the amount of shares failures to deliver, that proxy the level of presence of Underwriters in the IPO relationship with investors. The average IPO has failed to deliver equals to 2.9% of the offer size.
 - Failures to deliver are associated with greater secondary market liquidity measures with the average effective Bid-Ask Spread supporting the fact that the role of Underwriters acts as a catalyst for increased tradability and lower transaction costs in the secondary market.
- Policies that improve the Liquidity of a stock can improve the value of the firm by lowering the expected cost of capital. Firms then happen to pay better Underwriting services just for the sake of, for instance, keeping the spread below a certain threshold.
 - Designated Market Makers (DMM) have been increasingly active in all major European Economies in order to fulfill this task. Their introduction has been associated with a tendential decrease in in Liquidity Risk and thus with the reduction of the component of the stock returns associated to future expected cost of capital.

Chapter 4 – Variables and Data Evaluation on Italian IPOs

While previous chapters have been devoted to the analysis of past evidences and the theory behind liquidity and IPO, the present part deals with actual data and assesses whether the points listed before actually have similarities with the Italian public market in the context of an IPO. The relation between IPO features and Liquidity will be analyzed to assess if the outcomes have similarities with past studies.

4.1 Theoretical Framework

The main factors that will be analyzed as potentially distorting the aftermarket Liquidity are both ownership level and dispersion that relate to the size and retail composition of the Initial Public Offering and the Underpricing with respect to the initial pricing range.

- The ownership can impact the Liquidity in the aftermarket can relate to two different hypothesis:
 1. The adverse selection hypothesis posits that informed investors exploit their superior knowledge in order to get a benefit from trading compared to outside shareholders. The relationship between trading costs and ownership structure then finds its source on the different available data about the true value of the company among investors.
 2. The Trading Hypothesis, on the other hand, suggests that Liquidity differentials arise from the different turn over in the management of investment portfolios by investors. Trading more often will reduce transaction costs so this mechanism would attribute more weight to trading patterns rather than information available in the formation of Liquidity in the secondary markets.

4.2 Methodology and Results

- The sample consisted in 28 Italian IPOs listed in the years 2010-2020. The distribution of IPOs was even throughout all the years without concentration in any particular point in time. Furthermore, the presence of several provenience sector for companies listing provide additional elements to consider the independent variable in the analysis as the main factors explaining aftermarket Liquidity.
 - The dependent variables to measure liquidity are the average bid-ask spread in the first 4 weeks of trading after the initial public offering and both the relative trading volume and the absolute trading volume. The trading activity data clearly shows that both relative trading volume and absolute trading volume have a peak during the first days of trading and gradually tend to smooth out and lower their value as time passes.
 - The independent variables are the ones relating to IPO characteristics, namely, both absolute and relative IPO size, the Underpricing and the retail composition of the offering.
- The results of the analysis of the influence of IPO characteristics on the development of the aftermarket Liquidity can be addressed both on existent relationship as well as to sample construction and contingent period extensions.

- By the simple correlation analysis of the variables it is possible to see that underpricing relates negatively with aftermarket trading liquidity. This means that the higher the expected liquidity the lower the initial abnormal return that should be pledged to investors. Furthermore, there exists a positive correlation between the relative size of the offering and both trading activity and liquidity in the aftermarket. This supports the ownership dispersion hypothesis since a lower portion of shares retained decreases information asymmetries and this boosts the trading in the secondary market while lowering the average costs involved.
- The results of the regression on these variables show that the only statistically significant impact is the one of relative size of the offering on the trading activity. While all other coefficients are consistent with the simple correlation analysis, they lack sufficient statistical significance to be considered relevant in an economical point of view. In any case the intercepts of the regression on both Liquidity and Trading activity are statistically significant.