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Underpricing of IPOs in Nordic countries

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## **1.0 Abstract**

In this thesis we will investigate if there have been underpricing of initial public offerings in Nordic countries between 2001-2016. We further investigate if there have been differences in underpricing between the countries.

The well-known phenomenon of underpricing of initial public offerings has been a topic for many research papers. Underpricing of IPOs is defined as the percentage difference between the offer price and the price the first day of trading.

The most relevant theories according to our problem statement and contribution are tested with different hypotheses. After the IPO data sample is gathered, we will use statistical estimation techniques to estimate the degree and significance of underpricing. We further use variables suggested by theory to investigate whether the relationship between the variables and underpricing can be confirmed or rejected, and discuss our results in the light of the selected theories and methodology in the analysis part.

## **2.0 Introduction**

In this section we specify the objective of the thesis, and introduce the underpricing phenomenon. We further define the problem statement and express the delimitations to the scope of the thesis.

### **2.1 Objective**

The fundamental objective of this thesis is to provide new knowledge about the Nordic IPO market regarding short-term market performance. Another goal is to get a broader understanding of the phenomenon of IPO underpricing, and be able to utilize theories and hypotheses to investigate the level of underpricing in a specific area. The specific aims of the study is as follows:

- To investigate whether Nordic IPOs are underpriced in the short run.
- To identify major determinants of the short-run market performance.
- To investigate differences or similarities in underpricing between the countries.

### **2.2 Underpricing phenomenon**

As a result of listing shares in order to go public on a stock exchange, a puzzling phenomenon often arises. The shares systematically appreciate the first day of trading. This means that the previous shareholders sell their shares with an incurred capital loss by selling their shares too cheaply to the public. This phenomenon is referred to as underpricing, and for decades several academics has developed theories and used different hypotheses trying to explain the pricing of initial public offerings.

### **2.3 Problem statement**

In this thesis we will investigate if there has been significant underpricing in the Nordic countries between 2001 and 2016. Earlier studies have confirmed the presence of IPO underpricing all over the world. We will analyse if there is some specific factors that can explain the underpricing of IPOs, and if some of the selected factors explain the phenomenon better in a particular country.

## **2.4 Delimitations**

Concerning that IPO underpricing is a wide subject with many hypotheses and theories, some limitations to the scope of this thesis is necessary. We will first of all focus only on the particular the stock exchanges in Oslo, Copenhagen, Stockholm and Helsinki. The time period is limited to the years 2001-2016. Our investigation further concerns the short-term performance of IPOs, and do not concern the long-term performance of IPOs.

## **3.0 Background and literature review**

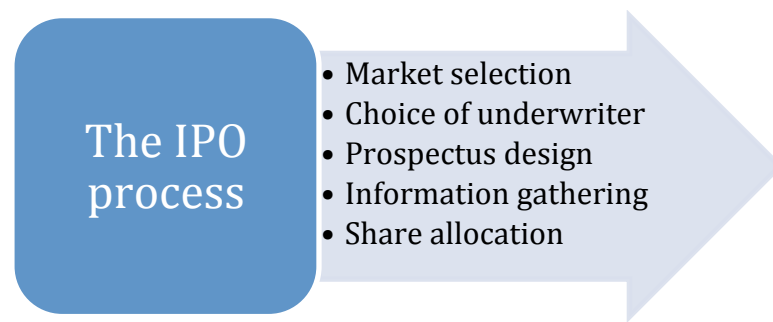
The essence of this part is to clarify the most fundamental information about initial public offerings. We start with defining initial public offerings, and then explain the stages in the IPO process. Further, we discuss the advantages and disadvantages of going public and describe the players in the IPO process. Finally, the hot issue market phenomenon and empirical evidence of underpricing of IPOs is specified.

### **3.1 Initial public offerings**

An initial public offering (IPO) is the procedure of the first sale of stock by a company in order to sell them to the public. Brealey (2011) distinguish between primary and secondary shares. Shares offered to the public are known as primary shares, and shares already existing on a stock exchange are known as secondary shares.

### **3.2 The IPO process**

One way of describing the IPO process is suggested by Jenkinson and Ljungqvist (2001). They divide the process into five stages: Market selection, choice of underwriter, prospectus design, information gathering, and share allocation. The steps are illustrated in figure 3.1.



*Figure 3.1: The IPO process (Jenkinson and Ljungqvist 2001)*

The process of selecting the market where the company wants to go public is the initial step for the issuer in Jenkinson & Ljungqvist's five step model. The issuer can either choose to go public on a stock exchange of the company's home country or decide listing their shares in foreign countries' stock exchange. Listing the shares on a foreign stock exchange can be chosen if the selected stock exchange has better liquidity, different listing requirements or higher industry relevance.

Secondly, the issuing firm needs to pick an investment bank that will be utilized as the lead underwriter. For large IPOs several underwriters often design what is known as a syndicate and cooperate on the same IPO. The issuing firm and its investment bank will set up the most fitting arrangement in regards to the commitment of each actor.

In Jenkinson and Ljungqvist's third stage, after the formalities with the underwriter are all together, the prospectus is designed. The prospectus is the document where the issuing firm is introduced to the equity market and potential investors. Any stock exchange requires the issuing firm to release a prospectus, which additionally works as advertisement to get investors to buy the shares.

The next step of the IPO process is the information gathering by the underwriter. Here, the underwriter begins pre-marketing the issue in order to get some information from the market (the potential investors). In order to determine the offer price range, the underwriter wants to get some feedback or input on the interest and demand of the IPO. Only when the



final prospectus is launched the price interval is set, and the initial price range will normally change during the process. Promoting the IPO can be done in various ways, and the most widely recognized activity is called “road shows”.

Here, the management of the company frequently travels across the country promoting the IPO as the main information gathering event, while the investment banker’s aim is to publicize and promote the new offer.

The final step of the IPO process is to set the offer price and deciding the allocation of issued shares. After the offer price has been determined, investors start to subscribe to buy the stock. The investment bank’s usually uses the book-building information to allocate the stocks of oversubscribed IPOs to the investors, and more often aim for large institutional investors asking them what number of issues they want to buy at what price. Another possible way for allocating shares on oversubscribed IPOs is through a lottery. During a fixed-price offering the offer price is set before the requests of shares has been submitted. Using fixed-price allocation, the request for larger numbers of issues will be reduced more often than requests for reasonable numbers.

### **3.3 Why go public?**

There are several reasons and intentions to conduct an IPO. Ritter and Welch (2002) describe the reasons why a firm wants to go public by the motive to raise capital and the desire to trade at a public market place. The principal aim of going public is to gain access to additional capital. As a result of being listed on a stock exchange, the company will attract more investors, both in the country of the listing and in foreign countries. There are further some other important advantages of being a publicly traded firm. The fact that the company’s stock price provides a readily available measure of performance, are one of the advantages. Rewarding the management of the issuing firm with stock options in order to align management incentives with those of the owners, is a result of having this available measure of performance (Brealey 2011). Being listed on a stock exchange also includes increased protection against hostile takeovers, and

allows the initial owners to use the IPO as an exit strategy, which can be seen as other benefits of going public.

Some substantial costs are also involved in listing the company's shares on a stock exchange, hereunder the fee paid to the underwriter, which sometimes can be huge relying upon the size of the IPO. In addition, there is also administrative cost. As the registration statement and prospectus needs to be prepared, costs incur for legal counsel, accountants, advisors and the time and attention of the management. The issuing firm also pay fees to the selected stock exchange for their listing (Brealey 2011).

### **3.4 The players**

There are three fundamental parties that play a vital part in the process of going public; the issuing firm (the issuer), the underwriter and the investor. These three parties and their main objectives are explained in the following section.

#### *The issuer*

The issuer are known as the company, or the company's management, that is deciding to go public. Cooperating with an underwriter that provides the stock for sale to the public, the issuing firm is still the final IPO decision maker regarding the price the shares are offered. The issuer's fundamental objective with the IPO is to get as high offer price as possible for the shares without the IPO failing. That means that if the offer price of the IPO shares is set too low, they won't receive the full potential value of the stock. In the IPO underpricing literature this is referred to as "leaving money on the table" (Thornton, Adams og Hall 2011).

#### *The underwriter*

Playing out the IPO on behalf of the issuer are the investment banks, known as the underwriter. Regularly, they are major investment banks or large commercial banks, and financial muscles and experience is critical factors for their success (Brealey 2011). Underwriters buy the shares at a discount to the offer price in order to make money, which makes a spread referred to as underwriter's margin. The underwriters are repeat players in

the IPO market, and if the offer price is set too low, they might lose future business from other issuing companies.

#### *The investor*

In addition to the underwriter and the issuer, investors play an important role for firms going public. The investor's objective is to get as large allocations as possible in IPOs that is underpriced. Several authors distinguish between retail and institutional investors within the IPO literature (Ljungqvist 2007). Retail investors are known as the regular, and usually small, private investors. Institutional investors are mutual funds, hedge funds, pension funds, banks and insurance companies. Both retail and institutional investors operates with the same objective and incentives when investing in IPO stocks.

### **3.5 Empirical evidence of underpricing**

The empirical evidence of short-run underpricing is to a large extent covered in previous literature. Reilly and Hatfield (1969) was one of the first to document the systematic underpricing of IPOs. They use two small subsamples, one from 1963-1964 and one from 1965, and find an average underpricing of 20.2%. Stoll and Curley (1970) found a difference between the offering price and the first market price of 42.4% using data from 1957, 1959 and 1963. Others who early documented systematic underpricing are Logue (1973) and Ibbotson (1975).

The presence of underpricing in the Nordic region is also previously documented. Keloharju (1993) finds an average market-adjusted initial return of 8.7% in the Finish IPO market between 1984 and 1989. Emilsen, Pedersen and Sættem (1997) use data between 1984-1996 and find an average underpricing of 12.5% in the Norwegian market. Similar results by Schuster (2003) documents a short-run average initial return of 18.46% in the Swedish market from 1988-1998. In Denmark, Jakobsen and Sørensen (2001) finds an average initial return of 7.4% in the time period 1984-1988.

### **3.6 Hot issue market phenomena**

Ibbotson and Jaffe (1975) first documented the concept of hot issue markets, defined as time periods of high average initial returns. Ritter's (1984) research suggests that the changing risk composition can be one possible explanation for the dramatic change in average initial returns over time, since cross-sectionally, riskier issues tend to be underpriced to a greater extent. After Ibbotson and Jaffe first documented the hypothesis of hot and cold markets, there have been several studies confirming the theory. Ritter (1984) studied the US market between 1960-1982, and found an average return in the "hot issue" market of 48,4 % between 1980 and 1981 while the initial return for the "cold issue" market from the remainder between 1977-1982 was found to be 16,3 %.

## **4.0 Theories of short-run underpricing**

This part covers the different theories and possible explanations of underpricing, and forms the basis for our work. The theories are divided into four groups, which according to Ljungqvist (2007) are asymmetric information theories, institutional explanations, ownership and control theories, and behavioral theories.

### **4.1 Asymmetric information theories**

Asymmetric information theories explain IPO underpricing as a result of asymmetric information between the involved parties in the IPO process. This key point in these theories is that the issuing firm, the underwriter or the investor in some way or another has superior knowledge of an IPO (Ljungqvist 2007).

#### **4.1.1 The winner's curse**

The winner's curse (Rock 1986) assumes that some investors are more informed than others, and can be separated into two segments in the market; "the informed" and "the uninformed" investors. Informed investors are those who have favorable information about the prospects of the IPO, and therefore only bid on the offerings that are priced below the fair value. Uninformed investors on the other hand make offers for both

underpriced and overpriced offerings. This causes a “winner’s curse” problem for the uninformed investors, because they will be allocated many shares only when there is no demand from the informed investors, that is, when the offering is overpriced. Similarly, they will receive few shares when the offer is underpriced, because there will be a high demand from the informed investors. Thus, conditional upon receiving a share allocation, the expected return for uninformed investors is negative if IPOs are priced at a fair value on average. This will lead to uninformed investors being unwilling to participate in the IPO market, because their conditional expected return from participation is less than zero (Ljungqvist 2007). Rock (1986) further assumes that the IPO market is dependent on participation from uninformed investors, because informed demand is insufficient to fill the subscription of the offered shares. Consequently, shares must be underpriced so that the conditional expected returns are greater than or equal to zero, in order to ensure participation from the uninformed investors.

Ljungqvist (2007) lists numerous ways of testing the Winner’s curse. If properly adjusting for rationing, uninformed investors will according to the model make zero abnormal returns on average. This is just enough to ensure their participation in the market. Koh and Walter (1989) tests this by using data from Singapore, where oversubscribed IPOs during the 1970s and 1980s were allocated by random ballot. They find that the likelihood of receiving an allocation was negatively related to the degree of underpricing, and that average initial returns fall substantially when adjusted for rationing. Levis (1990) uses data from U.K and finds that rationing reduced the initial returns among small investors. Keloharju (1993) provides imilar evidence from Finland, but also finds that investors placing large orders lose money on an allocation-weighted basis. Instefjord, Shen and Coakley (2005) also finds evidence consistent with the theory, however, rationing does not drive the underpricing to zero.

Rock’s model further assumes information heterogeneity among investors. Michaely and Shaw (1994) argue that as this heterogeneity goes to zero,

the winner's curse disappears and so does the reason to underprice. They test this by assuming that institutional investors are informed, while private investors are mainly uninformed, and study IPOs of master limited partnership (MLPs), which are largely avoided by institutional investors. They find evidence consistent with theory, showing that the average underpricing for MLP IPOs were 0.04% between 1984 and 1988, while underpricing among non-MLPs over the same time period was on average 8.5%.

Another implication of the model is that the expected underpricing should be increasing in ex ante uncertainty. Ritter (1984) and Beatty and Ritter (1986) provide the rationale of this way of testing: An investor who decides to engage in information production implicitly invests in a call option on the IPO, that can be exercised if the "true" price exceeds the strike price (the price at which the shares are offered). As all other options it increases with uncertainty, in this case valuation uncertainty. The greater the uncertainty, the more investors will become informed. This raises the required underpricing, since an increased in the number of informed investors increased the winners curse problem. A proxy for ex ante uncertainty is needed in order to test this implication. Lundqvist (2007) divides such proxies into four groups: Company characteristics (such as age, size or industry), offering characteristics (such as gross proceeds), prospectus disclosure (such as number of uses of IPO proceeds as disclosed in the prospectus or number of risk factors listed in the prospectus) and aftermarket variables (such as trading volume or volatility).

The theory further suggests that underwriters that underprice too much (too little) will lose business from issuers (investors). According to Beatty and Ritter (1986), underwriters coerce issuers into underpricing to prevent uninformed investors leaving the IPO market. Nanda and Yun (1997) find that overpricing lead to a decrease in the lead underwriter's own stock market value, while moderate underpricing increases the stock market value. Dunbar (2000) squarely supports Beatty and Ritter's claim,

providing evidence that banks lose IPO market share if they either underprice or overprice too much.

It can also be tested if reduced information asymmetry between informed and uninformed investors reduced underpricing. As underpricing represents an involuntary cost to the issuer, there are clear incentives to reduce the information asymmetry. Habib and Ljungqvist (2001) uses data from Nasdaq in the 1990s, and finds that issuers optimize, in the sense that spending an additional dollar on reducing underpricing would reduce wealth losses by 98 cents at the margin. Hiring a prestigious underwriter can also reduce information asymmetry. Here it is assumed that prestigious banks will refrain from underwriting low-quality issues. The information content of the firm's choice of intermediaries may therefore reduce investors' incentives to produce their own information, which in turn will mitigate the winner's curse. Carter and Manaster (1990) provides a ranking of underwriters by advertisements, while Megginson and Weiss (1991) rank underwriters by market share.

#### **4.1.2 Signaling theory**

Ibbotson (1975) is credited with the original intuition of signaling theory, and suggested that issuers underprice in order to "leave a good taste in investors' mouth". The theory assumes that there exist two kinds of issuers, high-quality and low-quality, which raises equity in two stages: first via an IPO and then at a later stage. Since the theory assumes that the issuer is more informed than investors regarding the present value of cash flows and the associated risk, rational investors fear a lemons problem: The firms that are willing to sell their shares at the average price are firms of low quality. In order to distinguish themselves from low-quality issuers, the high-quality issuers therefore signal the company's true high value. In these models, this signal is given by deliberately offering the shares below what the market believes they are worth, which deters lower quality issuers from imitating (Ritter og Welch 2002). The up-front sacrifice from the IPO can at a later stage be recouped in obtaining a higher price at a seasoned offering (Welch 1989), dividend announcements leading to favorable market responses (Allen og

Faulhaber 1989), or increased information production (Chemmanur 1993). If signaling is used to demonstrate high quality, it is still unclear why underpricing is the best way to do so. As pointed out by Ritter and Welch (2002), it can be just as efficient to spend money on charitable donations or advertising. Lungqvist (2007) further supports this, suggesting that by choosing a reputable underwriter or auditor, or by hiring a high quality board of directors, high quality can be signaled at a much lower cost.

Welch (1989) tests the theory, and documents substantial post-issuing market activity by IPO firms. There is however no reason to believe that any underpricing would induce firms to return to the market for a seasoned equity offering (Ritter and Welch 2002). Jegadeesh, Weinstein and Welch (1993) further finds that the post-IPO price better explain a firm's decision of a SEO than the degree of underpricing. Michaely and Shaw (1994) argues that the decision of how much to underprice and whether to offer equity at a later stage is not independent of each other, and therefore models this in an simultaneous equation model. They find that underpricing and the decision to offer equity at a later stage are not significantly related to each other, strictly rejecting the signaling models. They also find that firm's that underprice does not have a higher propensity to pay out dividends.

#### **4.1.3 Information revelation theories**

Information revelation theories also referred to as book-building theories, is based on the underwriter's process of gathering indications of interest from investors. The underwriter sets a preliminary offer price range, and then goes on a "road show" to market the company to potential investors. It is assumed that some investors are more informed than others, possessing information that is important for setting the final price. Thus, a key role of the investment bank is to elicit this information before taking the company public (Ljungqvist 2007). However, investors will not reveal this information unless they get something in return, since showing a high interest will result in a higher offer price. Underwriters therefore induce investors to truthfully reveal their information by offering them some



combination of more IPO allocations and underpricing (Ritter and Welch 2002).

According to Benveniste and Spindt (1989), Benveniste and Wilhelm (1990) and Spatt and Srivastava (1991), the bookbuilding process allows the underwriters to gather this information. They do so by allocation no or only little shares to investors who bid conservatively, and a large allocation to investors who bid aggressively and so revealing favorable information regarding the issue. The stock is underpriced in order to give incentives to investors for revealing their true interest.

Cornelli and Goldreich (2001) and Jenkinson and Jones (2004) use data from two different investment banks to directly test the bookbuilding theories. Their data contains of both bids from institutional investors and their share allocations. This data is usually confidential, so to test the theory in a similar fashion can be of very limited possibility. Cornelli and Goldreich find that more aggressive bids leads to higher share allocations than conservative bids, as predicted by the theory. Jenkinson and Jones finds less support for the theory, but in similarity with Cornelli and Goldreich, they find that frequent bidders are treated preferentially. Elsewise, their results provide little evidence of the theory. The differences between the two studies are according to Ljungqvist (2007) related to the differences in the deal flow the two banks has access to, which may have had influence on the underlying assumptions of the models.

The effects from revisions in the offer price during the filing period are a more commonly cited evidence of the theory (Ritter and Welch 2002). Hanley (1993) was the first to document this, and finds that when there is strong demand, the underwriters does not fully adjust the price upwards in order to hold underpricing constant. The underwriters partially adjust the price to compensate the investors for revealing their information, which allows for an upward revise in the price for the issuer. Thus, underpricing

tends to be higher for offerings where the price has been revised upwards, which is an implication that can be tested with publicly available data.

#### **4.1.4 Principal-agent theories**

Theories linking agency conflict and IPO underpricing go back more than two decades. Loughran and Ritter (2004) stress the “dark side” of the investment banks, by highlighting the potential for agency problems between the underwriters and the issuing firm. Early models concentrate on how a bank’s informational advantage over issuing companies may permit the bank to exert sub-optimal effort in advertising and distributing of the stock. Baron and Holmström (1980) and Baron (1980) construct screening models which concentrate on the underwriter’s benefit from underpricing. In such a model, the uninformed party offers a schedule of contracts, from which the informed party selects the one that is optimal given her uninformed party’s objective and/or hidden action.

One approach to test whether an agency problem causes underpricing was conducted by Muscarella and Vetsuypens (1989). They used data on 38 self-underwritten investment bank IPOs from 1980-1990. In this case there should according to theory be no information asymmetry and therefore no agency problems as the investment banks issues and underwrites by themselves. They do however find that investment banks had just as much underpricing as other new listings. This evidence is clearly not favorable for the theory, but it does not reject it either. It might just be that underwriters want to underprice their own offerings in order to make the case that underpricing is a necessary cost of going public (Ritter and Welch 2002).

## **4.2 Institutional explanations / symmetric information theories**

The second grouping of theories is the institutional explanations of underpricing. These theories focus on institutions related to marketplaces, such as lawmakers, banks and tax authorities.

### **4.2.1 Legal Liability**

The idea behind the legal liability model is that companies sell their shares

at a discount in order to reduce the likelihood of future lawsuits, or as a form of insurance as pointed out by Ibbotson (1975). Omitted or mis-stated information in the IPO prospectus might be ground for a lawsuit from investors, especially if the post IPO returns are poor. Tinic (1988) and Hughes and Thakor (1992) argue that the issuer underprices in order to reduce this risk, and both finds support for the theory. Lawsuits are costly to the investment bank directly through damages, legal fees etc., but also indirectly through potential damage to their reputation. Issuers also face the threat of having a higher cost of capital in the future (Ljungqvist 2007). The theory is however somewhat aimed at countries with strict liability laws, such as the U.S, making it less relevant for our study. This also provides evidence against the theory, as underpricing is similar in countries in which U.S litigative tendencies are not present. For instance, Keloharju (1993) uses data on the Finnish IPO market in a sample period where there were no strict laws regarding the content of the prospectuses or potential resulting liabilities. However, he still finds an average underpricing of 8.7%. In comparison, Ibbotson, Sindelar and Ritter (1988) find an average underpricing of 16.4% in the U.S. This may suggest that legal liability is a second order driver for underpricing of IPOs. Other authors have also found evidence against the theory in other parts of Europe (Ljungqvist 2007), including Sweden and Finland, which makes this theory of less relevance to our study.

Tinic (1988) proposes several testable implications to the theory. Underpricing should depend negatively on the experience of the underwriter, since experienced investment banks has superior expertise in originating new issues, and has smaller legal liabilities than a less experienced or less capable underwriter. Hughes and Thakor (1992) similarly propose that the degree of underpricing is decreasing in the underwriter's reputation. Tinic further suggests that small and risky firms should have a larger degree of underpricing than firms that are less risky to face legal liabilities. Hughes and Thakor generalizes this in their model, with the implication that the underpricing increases with the variance of cash flows.

### **4.3 Ownership and control**

In these theories the issuing firm selects their investors in order to allocate company control as the main strategy.

#### **4.3.1 Underpricing as a means to retain control**

By arguing that underpricing gives managers the opportunity to protect their private benefits by allocating shares strategically when taking their company public, Brennan and Franks (1997) discovered an interesting way of explaining IPO underpricing. They investigated how separation of ownership and control evolves as a result of an initial public offering and how insiders use underpricing to retain control.

One approach to test the principal implication of the model suggested by Brennan and Franks is that underpricing results in excess demand and thus greater ownership dispersion. By using detailed data and on individual bid and allocations in from 69 U.K. IPOs completed between 1986 and 1989, they confirm that large bids are discriminated compared to small bids. This finding supports the retained control argument as issuers avoid large owners.

### **4.4 Behavioral theories**

The behavioral theories speak to a vital gathering of clarifications for IPO underpricing. In these theories, different parts of behavioral finance are used to explain underpricing of IPOs. Since IPO companies have no earlier share price history, the IPO market is a good setting to study the impact of irrational investors on stock prices (Ljungqvist 2007).

#### **4.4.1 Cascades**

Informational cascades can occur when IPO shares are sold sequentially, where investors optimally ignore their private information and imitate earlier investors (Welch 1992). This leads investors to only request shares in the IPO when they believe the offering is hot. For the issuing firm, pricing the shares too high will lead to a higher probability of a complete failure, because investors will not subscribe to buy shares, further leading

other investors to abstain. The firm therefore underprices, which rewards the early investors for starting a positive cascade, in order to assure the success of the IPO. Amihud, Hauser and Kirsh (2003) finds support in favor of the theory, documenting that there are either a extremely high demand or an undersubscription, while very few offerings are in between. It is however important to notice that in a book-building practice, cascades will not be present, since the underwriter can keep secrecy over the demand for the issue. Free communication among investors will also hinder cascades from forming.

Welch (1992) provides several testable implications of the model. He argues that the issuer is better off with cascades than with perfect communication among investors, and further that underwriters with a larger geographical reach easier can prevent communication among investors than underwriters with a smaller geographical reach. Thus, according to Ljungqvist (2007), it is possible to test whether IPOs managed by national underwriters are less underpriced compared to locally or regionally distributed IPOs. A proxy for the underwriter's geographical reach can for example be their market share or a measure of their reputation. Of the many other testable implications suggested by Welch, it is very few that has been tested, and the theory remains one of the least explored in IPO underpricing Ljungqvist (2007).

#### **4.4.2 Investor sentiment**

The theory arguing that irrationality or sentiment of the investors could have an effect on the valuation of IPO shares, are known as the behavior theory of investor sentiment. Baker and Wurgler (2006) define investor sentiment as “a belief about future cash flows and investment risks that is not justified by the facts at hand”. This implies that investors do not rationally assess a fundamental value of an investment, but rather follow their emotions when buying or selling an asset.

Ljungqvist, Nanda and Sing (2006) developed an interesting explanation to the theory of overoptimistic investors, by assuming that investors have a sentimental belief about IPOs. The issuing firm will seek to take

advantage of the investors' behavior, but has to maintain a stable market with stocks in order to not depress the price. The main argument is that institutional investors receive underpriced shares as a bonus for taking risk.

Several models have been proposed to test the investor sentiment theory. As indicated by Ibbotson and Jaffe (1975), underpricing is higher in so called "hot markets". Sentiment theory can explain this phenomenon as issuing firms take advantage of periods with high optimism in the market. The investor sentiment can to a degree explain underpricing if there is significantly more underpricing during hot markets than cold markets. Despite of this, there may be different explanations to hot and cold markets. In this manner, the sentiment theory can at least be partly supported if there is a huge contrast between the two markets.

#### **4.4.3 Prospect theory and mental accounting**

Kahneman and Tversky (1979) speaks to an essential development in the context of prospect theory. Kahneman and Tversky (1979, pp.263) state that "Decision making under risk can be viewed as a choice between prospects or gambles". Unlike expected utility theory, prospect theory assumes that preferences rely upon on how an issue is framed. If the reference point is defined in a way that an outcome is perceived as a gain, then the subsequent value function will be concave and decision makers will tend to be risk averse (Plous 1993). Whereas utility is characterized only in terms of net wealth, value in the prospect theory is defined as deviations from the reference point in terms of gains or losses. Mental accounting, an idea developed by Thaler (1980), can be seen as one of two factors upon the entire behavioral economy rests, with the prospect theory as the second factor. The suggestion that the issuer only cares about total wealth gain or loss, is referred to as mental accounting. Money left on the table is perceived as a loss, while the appreciation in the price of the shares that the issuer did not sell is a gain (Thaler 1980).

Following Loughran and Ritter's (2002) behavior perspective, Ljungqvist and Wilhelm (2005) tests whether the CEO of recent IPO firms make subsequent decisions consistent with a behavior measure of their impression of the IPO's outcome. This tumbles down to examine whether CEOs are satisfied with their underwriter. There have been done quite little research on this behavior model, and the result of testing this theory might only partly explain IPO underpricing as there might be other factors involved.

#### **4.5 Theories that will be tested**

To be completed in the final thesis.

### **5.0 Methodology**

This part covers the details of research objectives, its scope, and our selected tools and techniques that will be used to determine the degree of underpricing. There are several ways to measure the difference between the first trading price and the issue price, as will be explained further. We will conduct an empirical study investigating the short-term performance of initial public offerings.

#### **5.1 Measures of short-run underpricing**

There are two common ways of measuring the short-run underpricing of initial public offerings. The raw initial return is defined as the difference between the offering price and the closing price on the first day of trading. An underpriced stock will have a positive raw initial return, as the offer price is set to low, and the stock appreciates the first day of trading. Similarly, an overpriced stock will have a negative raw initial return, and depreciate the first day of trading. The market-adjusted return adjusts the return on the stock for the general appreciation of the stock market, and is more commonly used to measure underpricing.

### 5.1.1 Raw initial return

The raw initial return is given by:

$$R_{R,i} = \frac{P_{1,i} - P_{O,i}}{P_{O,i}}$$

where  $R_{R,i}$  is the raw return in stock  $i$ ,  $P_{1,i}$  is the closing price of stock  $i$  the first day of trading, and  $P_{O,i}$  is the offer price of stock  $i$  at the last day of the offer period.

### 5.1.2 Market-adjusted initial return

The market-adjusted return is given by:

$$R_{A,i} = \frac{P_{1,i} - P_{O,i}}{P_{O,i}} - \frac{I_1 - I_0}{I_0} = R_{R,i} - \frac{I_1 - I_0}{I_0}$$

where  $R_{A,i}$  is the market-adjusted initial return on stock  $i$ ,  $I_1$  is the closing value of the index on the first day of trading of stock  $i$ , and  $I_0$  is the value of the index on the last day of the offering period for stock  $i$ . The market-adjusted return is often considered a better model to measure underpricing, as the effect of the general value appreciation in the market is accounted for. There are however a weakness of measuring underpricing this way, because it assumes that all IPOs has a beta-value equal to the average beta-value of the market. Ibbotson (1975) finds that the average beta-value for companies in the U.S was 2,18 at the initial offering. However, the beta-values rapidly fell to one in the months following the IPO. An error will occur if the true beta-value in our sample lies above one, causing the marked-adjusted initial return to be overstated. There is however numerous reasons why we do not estimate the “true” beta-value for each individual company. First of all, there is naturally no time series of the stock values before the IPO that can be compared to the market. Emilsen, Pedersen and Sættem (1997) also argue that estimating the beta-value after the IPO and using this as the “true” beta-value to measure the initial underpricing is far from problematic, as the beta-values fall dramatically the first months of trading. Additionally,



very few companies have significant beta-values in small markets such as in the Nordics, causing the “true” beta-value to lie within a relatively wide confidence interval.

## **5.2 Hypotheses development**

With the theories from part four, we form hypotheses in order to answer the thesis’ problem statement. Each hypothesis is expressed specifically to answer if we can find support for the selected theories. In addition, we form hypotheses to explore differences or similarities between the countries, both when it comes to the level of underpricing and theories that explains it. We would like to stress that data availability is of importance when it comes to testing each hypothesis. As discussed in part four, some theories will not be tested due to unavailable data. As our data is not fully collected or adjusted, the hypotheses are subject to change. New hypotheses might also be formed if the data allows us to. The first hypothesis is as test for general underpricing.

*Hypothesis 1: Nordic IPOs have been fairly priced in the short run.*

Hypothesis 1 tests the short-run market performance of the IPOs in our sample period. If we find significant over- or underpricing, hypothesis 1 will be rejected. As previous studies, both internationally and in the Nordics, confirm the existence of underpricing, we expect that hypothesis 1 will be rejected. We also expected the mispricing to be in direction of underpricing. The underpricing will further form the basis for all other hypotheses. The next two hypotheses relates to the winner’s curse.

*Hypothesis 2: Underpricing is unaffected by the reputation of the underwriter*

*Hypothesis 3: Underpricing is unaffected by ex post uncertainty*

If hypothesis 2 is rejected, we would in accordance with theory expect that underpricing decreases in the reputation of the underwriter. Similarly,

if we can reject hypothesis 3, we expect that underpricing is increasing in valuation uncertainty, in accordance with Beatty and Ritter (1986). Rejecting either or both of these hypotheses will support Rock's (1986) winner's curse theory. The next hypothesis is a test of the information revelation theory.

*Hypothesis 3: Underpricing is unaffected by upwards revisions in the offer price*

If we are able to reject hypothesis 3, we expect that upwards revisions in the offer price increases the underpricing, as first documented by Hanley (1993). As previously explained, an upward revision in the offer price suggests that positive information about the offering has been revealed. The underwriters then only partially adjust the price upwards in order to reward the investors with underpricing for truthfully revealing their information. If hypothesis 3 is rejected, and upwards revisions in the offer price increases underpricing, it supports the information revelation theory.

*Hypothesis 4: Underpricing is unaffected by "hot" or "cold" markets*

We would believe that during "hot" markets would have higher underpricing, while "cold" markets have less underpricing. A rejection of the hypothesis will be in accordance with Ibbotson's (1975) hot market theory, and will also support the investor sentiment theory. The investor sentiment theory is further tested with hypothesis 5.

*Hypothesis 5: Underpricing is unaffected by investor sentiment*

*Hypothesis 6: Investment bank IPOs are priced differently than other IPOs*

If we can reject hypothesis 6, we expect that investment bank IPOs have lower underpricing than other IPOs. This is in accordance with Muscarella and Vetsuypens (1989) hypothesis that there should be no information

asymmetry when investment banks goes public. In such a case, we would find support for the principal-agent theory. We will further form some hypotheses aiming to test the differences and/or similarities between the countries covered in the study. Hypothesis 7 is constructed to examine whether the underpricing differs in the Nordic countries.

*Hypothesis 7: The level of underpricing is equal in the Nordic countries*

If hypothesis 7 can be rejected the level of underpricing differs significantly between the Nordic countries. This would allow us to further examine the differences between the countries. If we find differences between the countries, it can form the basis for studying the underlying explanations.

*Hypothesis 8: The underpricing in each country can be explained by the same factors*

A rejection of hypothesis 8 means that there are different drivers of underpricing between the Nordic countries. In such a case, we can perform further regressions to examine what theories or drivers that best explains differences between the countries.

### **5.3 Identification and measurement of variables**

In this section we identify and describe the variables that will be used to test the hypotheses.

#### **5.3.2 Short-term underpricing**

Short-term underpricing is dependent variable in our regressions, and is directly observable in the data. The variable will be measured by the market-adjusted initial return. The market will be measured by an industry index that is relevant to each individual IPO, and the return on this index in the time period between offering and the closing price of first day of trading will be subtracted from the raw initial return. We naturally expect that the underpricing is positive, that is, the average market-adjusted

initial return is positive. The variable is given the name *Underpricing* in our model.

### **5.3.1 Underwriter reputation**

The reputation of the underwriter is used to test Rock's (1986) winner's curse theory, and can be measured in various ways. Carter and Manaster (1990) provides a ranking of underwriters by advertisements, while Megginson and Weiss (1991) rank underwriters by market share. We find it more convenient to measure by market share, both because the availability of data, but also because we believe that market share is a better proxy for the reputation of the underwriter. An underwriter with higher expertise and experience will naturally in most cases have a better reputation, leading to a higher market share. The sign of the variable is expected to be negative. That is, the higher the market share of the underwriter, the lower the underpricing. The variable for underwriter reputation in our model is *LN\_MCUR*.

### **5.3.2 Ex post uncertainty**

Ex post uncertainty is used to test Rock's (1986) winner's curse theory. A proxy for ex ante uncertainty is needed. We use firm age and firm size as company characteristics of ex ante uncertainty. Firm age is defined as the number of years between the year of creation and the time of listing. Firm size is measured by total assets in the year of the IPO. We further use issue price as an offering characteristic of ex ante uncertainty, which is a variable directly observable in our data. In accordance with theory, we expect the sign of all variables to be negative, as increased size, age and price is associated with less risk. The variables has been given the following names in the model: *LN\_AGE*, *LN\_SIZE* and *LN\_PRICE*, respectively.

### **5.3.3 Revisions in offer price**

We test the information revelation theory by including revisions in the offer price as an explanatory variable. Revisions in the offer price are publicly available in the prospect of each individual offering. Dummy? Or

revisions? – measures. The expected sign of the variable is positive. That is, offerings where the price has been revised upwards is expected to have a higher degree of underpricing. The variable for revisions in the offer price in our model is *LN\_REV* (If raw revision?) or *REV\_UP* (if dummy?)

#### **5.3.4 Hot and cold markets**

We include a variable for “hot” or “cold” markets, in order to test if hot markets have higher returns and the investor sentiment theory. We define a hot market using IPO volume and initial returns where the number of IPOs and initial returns are higher than the average in our sample period. It is created as a dummy variable, that denotes 1 for “hot” market and 0 “otherwise”. We further expect that issuing in hot markets will have a higher degree of underpricing, and hence, that the sign of the variable is positive. The dummy variable is given the name *HC*.

#### **5.3.4 Investor sentiment index**

We include the investor sentiment index developed by Baker and Wurgler (2006) as a proxy for investor sentiment to test the investor sentiment theory. The variables in the index is the close-end fund discount, share turnover, number of IPOs in the period, average initial returns on the IPOs in the period, the equity share in new issues and the dividend premium. The variable is expected to have a positive sign, as higher sentiment increases underpricing. The variable is given the name *LN\_SI*.

### **5.4 Regression analysis**

To identify determinants of short-run underpricing, multiple regression analysis, hereunder the Ordinary Least Squares (OLS), is by far the most commonly used method by researchers. The multiple regression model identifies the linear relationship between the dependent variable (underpricing) and the independent variables (explanatory variables), which has been specified in the previous part. We will in this part discuss the underlying assumptions of the classical linear regression model, and the diagnostic tests.

### 5.4.1 The classical linear regression model assumptions

There are five assumptions underlying the ordinary least squares estimation technique. These assumptions are required in order to validly conduct hypothesis tests regarding the coefficient estimates of the models. Violations of these assumptions can cause problems for the interpretation of our results, and ignoring them can among other things potentially lead to wrong estimates of coefficients. Given that the assumptions of the classical linear regression model hold, the OLS estimators are said to be the best linear unbiased estimators (BLUE), which are properties of the Gauss-Markov Theorem (Gujarati og Porter 2009). We will in the following describe the classical assumptions, consequences of violating them, how violations can be detected and how problems related to them can be dealt with.

- Assumption 1: The average value of the errors is zero
- Assumption 2: The errors are constant
- Assumption 3: The errors are uncorrelated with one another
- Assumption 4: The regressor are uncorrelated with the error term
- Assumption 5: The disturbances are normally distributed

Another implicit assumption is that there is no multicollinearity. If the necessary assumptions hold, the parameters are said to be BLUE, and will have the following desirable properties (Brooks 2014):

- Best: The estimated parameters have the minimum variance among the class of linear unbiased estimators.
- Linear: The estimated parameters are linear estimators.
- Unbiased: The estimated parameters will on average be equal to their true values.
- Estimator: The estimated parameters are estimators of their true value.

### 5.4.2 Diagnostic tests

In order to evaluate the validity of our results we will perform certain tests. The tests will be related to the significance of our results and

explanatory power, in addition to tests regarding the underlying assumptions.

F-statistic:

The F-test will be used to test the overall significance of the regression models, and tests all the included regression coefficients simultaneously. The null hypothesis of the test is that all the parameters in the model are equal to zero except the constant intercept. The null hypothesis will be rejected if the p-value of the f-test statistics are less than or equal to the significance level of 5%. A rejection of the null hypothesis will suggest that at least one of the variables in the model can explain some of the observed underpricing, and will confirm the validity of our model.

(Adjusted) R-squared:

The most common goodness of fit statistic is the R-squared, which is a scaled version of the residual sum of squares that the OLS seeks to minimize (Brooks 2014). How well the regression lines of the developed model approximate the real data points can be measured by the R-squared. A more formal definition defines it as the square of the correlation coefficient between the dependent variables values and the fitted values from the model. A high correlation suggests that the model fits the data well, while a low correlation indicates that the model does not fit the data well. There are however certain properties of the R-squared, such as that it will never fall with the inclusion of an additional variable, that suggests that another measure should be used. In order to come around this problem the adjusted R-squared will be used, which adds a penalty term for including additional variables. Unlike the R-squared, it takes into account the loss of degrees of freedom from adding an extra variable. It is therefore considered a more accurate goodness of fit measure than the unadjusted R-squared.

To check if the necessary assumptions hold we will further test for heteroscedasticity, autocorrelation and multicollinearity.

## **6.0 Data**

In this part, we describe how we will collect our data, where it will be collected, and what data that is needed in our analysis. We also discuss possible limitations due to the availability of data, and what data that is excluded.

### **6.1 Data selection**

After identifying and deciding how to measure the variables, these variables need to be collected. In order to collect a unique data set of Nordic IPOs, we will go through financial databases, notifications from the stock exchanges, IPO prospectuses and company websites.

Our data sample will consist of IPOs listed on the stock exchange in Oslo, Copenhagen, Stockholm and Helsinki. We believe that the time period between 2001 and 2016 is sufficiently long in order to include both hot and cold markets. The data on underpricing will primarily be collected from SDC Platinum. Backed by Thomson Reuters international team of expert analysts, SDC platinum is the industry standard for information on new bond and equity issues. Other data that we might not find there, such as industry index or closing prices, can for example be collected from Datastream. We might also need to collect some data from different sources depending on the information required. A list of all IPOs on each of the stock exchanges needs to be acquired. These lists will be merged in to one list with all IPOs in the four countries. Thereafter, we need to find information on each of the IPOs. Each stock exchange has a record of announcements for each of the listed companies. Usually, listing date, industry and often prospectus is identified on these lists. If the prospectus is not present in the database it can be found on the company website. Important variables such as the offer price, the offer period and the offer method, are included in a prospectus.



## 7.0 Analysis

To be completed in the final thesis.

## 8.0 Further progression

This thesis will require a high work effort and it is important that we focus on maintaining our deadlines. After the preliminary report we will focus on collecting data of Nordic IPOs, sorting and interpret our findings.

### 8.1 Temporarily time schedule

Task	Deadline	Comment
Collect all the data	15.02.2017	<ul style="list-style-type: none"> <li>- Collect the data from SDC Platinum.</li> <li>- Might use other databases, depends on available data.</li> <li>- Nordic IPOs, time frame: 2001-2016.</li> </ul>
Complete our data analysis	15.03.2017	- Quantitative results.
Roughly complete the analysis and interpret results.	15.04.2017	<ul style="list-style-type: none"> <li>- Use the theories, hypotheses and methodology to complete the analysis.</li> <li>- Statistical tests</li> <li>- Interpretation of results</li> </ul>
Last guidance from our supervisor	15.06.2017	- Last feedback.
Deadline for completing the thesis	01.09.2017	-Official deadline.

## 9.0 References

- Allen, Franklin og Gerald R. Faulhaber. 1989. "Signaling by underpricing in the IPO market." *Journal of Financial Economics* Vol. 23 (No. 2): pp. 303-323.
- Amihud, Yakov, Shmuel Hauser og Amir Kirsh. 2003. "Allocations, adverse selection, and cascades in IPOs: Evidence from the Tel Aviv Stock Exchange." *Journal of Financial Economics* Vol. 68 (No. 1): pp. 137-158.
- Baker, Malcolm og Jeffrey Wurgler. 2006. "Investor Sentiment and the Cross-Section of Stock Returns." *Journal of Finance* Vol. 61 (No. 4): pp. 1645-1680.
- Baron, David P. og Bengt Holmström. 1980. "The Investment Banking Contract For New Issues Under Asymmetric Information: Delegation And The Incentive Problem." *Journal of Finance* Vol. 35 (No. 5): pp. 1115-1138.
- Beatty, Randolph P. og Jay R. Ritter. 1986. "Investment banking, reputation, and the underpricing of initial public offerings." *Journal of Financial Economics* Vol. 15 (No. 1-2): pp.213-232.
- Benveniste, Lawrence M. og Paul A. Spindt. 1989. "How investment bankers determine the offer price and allocation of new issues." *Journal of Financial Economics* Vol. 24 (No. 2): pp. 343-361.
- Benveniste, Lawrence M. og William J. Wilhelm. 1990. "A comparative analysis of IPO proceeds under alternative regulatory environments." *Journal of Financial Economics* Vol. 28 (No. 2): pp. 173-207.
- Biais, Bruno, Peter Bossaerts og Jean-Charles Rochet. 2002. "An Optimal IPO Mechanism." *Review of Economic Studies* Vol. 69 (No. 1): pp. 117-146.
- Brealey, Richard A. 2011. "How Corporations Issue Securities." I *Principles of Corporate Finance*, redigert av Richard A. Brealey, Stewart C. Myers og Franklin Allen, pp. 362-389. McGraw-Hill Irwin.
- Brennan, M. J. og Franks. J. 1997. "Underpricing, ownership and control in initial public offerings of equity securities in the UK." *Journal of Financial Economics* Vol. 45 (No. 3): pp. 391-413.
- Brooks, Chris. 2014. *Introductory Econometrics for Finance*. Second ed. utg: Cambridge University Press.

- Carter, Richard og Steven Manaster. 1990. "Initial Public Offerings and Underwriter Reputation." *Journal of Finance* Vol. 45 (No. 4): pp. 1045-1067.
- Chemmanur, Thomas J. 1993. "The Pricing of Initial Public Offerings: A Dynamic Model with Information Production." *The Journal of Finance* Vol. 48 (No. 1): pp. 285-304.
- Chen, Hsuan-Chi og Jay R. Ritter. 2000. "The Seven Percent Solution." *Journal of Finance* Vol. 55 (No. 3): pp. 1105-1131.
- Cornelli, Francesca og David Goldreich. 2001. "Bookbuilding and Strategic Allocation." *Journal of Finance* Vol. 56 (No. 6): pp. 2337-2369.
- Dunbar, Craig G. 2000. "Factors affecting investment bank initial public offering market share." *Journal of Financial Economics* Vol. 55 (No. 1): pp. 3-41.
- Emilsen, Nina H., Kathrine Pedersen og Frode Sættem. 1997. "Børsintroduksjoner." *Scandinavian Journal of Business Research* Vol. 11 (No. 1): pp. 1-13.
- Gujarati, Damodar N. og Dawn C. Porter. 2009. *Basic Econometrics*. 5th ed. utg. International Edition: Mc Graw Hill.
- Habib, Michel A. og Alexander P. Ljungqvist. 2001. "Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence." *The Review of Financial Studies* Vol. 14 (No. 2): pp. 433-458.
- Hanley, Kathleen Weiss. 1993. "The underpricing of initial public offerings and the partial adjustment phenomenon." *Journal of Financial Economics* Vol. 34 (No. 2): pp. 231-250.
- Hughes, Patricia J. og Anjan V. Thakor. 1992. "Litigation Risk, Intermediation, and the Underpricing of Initial Public Offerings." *The Review of Financial Studies* Vol. 5 (No. 4): pp. 709-742.
- Ibbotson, Roger G. 1975. "Price performance of common stock new issues." *Journal of Financial Economics* Vol. 2 (No. 3): pp. 235-272.
- Ibbotson, Roger G. og Jeffrey F. Jaffe. 1975. "'Hot Issue' Markets." *Journal of Finance* Vol. 30 (No. 4): pp. 1027-1042.
- Ibbotson, Roger G., Jody L. Sindelar og Jay R. Ritter. 1988. "Initial Public Offerings." *Journal of Applied Corporate Finance* Vol. 1 (No. 2): pp. 37-45.

- Instefjord, Norvald, Jerry Coakley og Zhe Shen. 2005. "Testing the Winner's Curse Hypothesis: Evidence from IPOs in China." *SSRN Electronic Journal*.
- Jakobsen, Jan og Ole Sørensen. 2001. "Decomposing and Testing Long-term Returns: An Application on Danish IPOs." *European Financial Management* Vol. 7 (No. 3): pp. 393-417.
- Jegadeesh, Narasimhan, Mark Weinstein og Ivo Welch. 1993. "An empirical investigation of IPO returns and subsequent equity offerings." *Journal of Financial Economics* Vol. 34 (No. 2): pp. 153-175.
- Jenkinson, Tim og Howard Jones. 2004. "Bids and Allocations in European IPO Bookbuilding." *The Journal of Finance* Vol. 59 (No. 5): pp. 2309-2338.
- Jenkinson, Tim og Alexander Ljungqvist. 2001. *Going public, the theory and evidence on how companies raise equity finance*. 2 utg: Oxford University Press.
- Kahneman, Daniel og Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* Vol. 47 (No. 2): pp. 263-291.
- Keloharju, Matti. 1993. "The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland." *Journal of Financial Economics* Vol. 34 (No. 2): pp. 251-277.
- Koh, Francis og Terry Walter. 1989. "A direct test of Rock's model of the pricing of unseasoned issues." *Journal of Financial Economics* Vol. 23 (No. 2): pp. 251-272.
- Levis, Mario. 1990. "The winner's curse problem, interest costs and the underpricing of initial public offerings." *Economic Journal* Vol. 100 (No. 399): pp. 76-89.
- Ljungqvist, Alexander. 2007. "IPO Underpricing." I *Handbook of Corporate Finance: Empirical Corporate Finance*, redigert av Espen B. Eckbo, pp. 375-418. Elsevier / North-Holland.
- Ljungqvist, Alexander, Vikram Nanda og Rajdeep Singh. 2006. "Hot Markets, Investor Sentiment, and IPO Pricing." *The Journal of Business* Vol. 79 (No. 4): pp. 1667-1702.
- Ljungqvist, Alexander og William J. Wilhelm. 2005. "Does Prospect Theory Explain IPO Market Behavior?" *Journal of Finance* Vol. 60 (No. 4): pp. 1759-1790.

- Logue, Dennis E. 1973. "On the Pricing of unseasoned Equity Issues: 1965-1969." *The Journal of Financial and Quantitative Analysis* Vol. 8 (No. 1): pp. 91-103.
- Loughran, Tim og Jay R. Ritter. 2004. "Why Has IPO Underpricing Changed over Time?" *Financial Management* Vol. 33 (No. 3): pp. 5-37.
- Megginson, William L. og Kathleen A. Weiss. 1991. "Venture Capitalist Certification in Initial Public Offerings." *Journal of Finance* Vol. 46 (No. 3): pp. 879-903.
- Michaely, Roni og Wayne H. Shaw. 1994. "The Pricing of Initial Public Offerings: Tests of Adverse-Selection and Signaling Theories." *The Review of Financial Studies* Vol. 7 (No. 2): pp. 279 - 319.
- Nanda, Vikram og Youngkeol Yun. 1997. "Reputation and Financial Intermediation: An Empirical Investigation of the Impact of IPO Mispricing on Underwriter Market Value." *Journal of Financial Intermediation* Vol. 6 (No. 1): pp. 39-63.
- Plous, Scott. 1993. *The psychology of judgment and decision making*: McGraw-Hill Book Company.
- Reilly, Frank K og Kenneth Hatfield. 1969. "Investor Experience with New Stock Issues." *Financial Analyst Journal* Vol. 25 (No. 5): pp. 73-80.
- Ritter, Jay R. 1984. "The "Hot Issue" Market of 1980." *The Journal of Business* Vol. 57 (No. 2): pp. 215-240.
- Ritter, Jay R. og Ivo Welch. 2002. "A Review of IPO Activity, Pricing, and Allocations." *The Journal of Finance* Vol. 57 (No. 4): pp. 1795-1828.
- Rock, Kevin. 1986. "Why new issues are underpriced." *Journal of Financial Economics* Vol. 15 (1-2): pp. 187-212.
- Schuster, Josef Anton. 2003. *IPOs: Insights from Seven European Countries*.
- Spatt, Chester og Sanjay Srivastava. 1991. "Preplay Communication, Participation Restrictions, and Efficiency in Initial Public Offerings." *The Review of Financial Studies* Vol. 4 (No. 4): pp. 709-726.
- Stoll, Hans R. og Anthony J. Curley. 1970. "Small Business and the New Issues Market for Equities." *Journal of Financial and Quantitative Analysis* Vol. 5 (No. 3): pp. 309-322.
- Thaler, Richard. 1980. "Toward a positive theory of consumer choice." *Journal of Economic Behavior and Organization* Vol. 1 (No. 1): pp. 39-60.

- Thornton, Barry, Michael Adams og George Hall. 2011. "Do Underwriters Create Value In The Determination Of The IPO Final Offering Price?" *Journal of Applied Business Reasearch* Vol. 25 (No. 6): pp. 41-51.
- Tinic, Seha M. 1988. "Anatomy of Initial Public Offerings of Common Stock." *The Journal of Finance* Vol. 43 (No. 4): pp. 789-822.
- Welch, Ivo. 1989. "Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings." *The Journal of Finance* Vol. 44 (No. 2): pp. 421-449.
- . 1992. "Sequential Sales, Learning and Cascades." *The Journal of Finance* Vol. 47 (No. 2): pp. 695-732.

## **10.0 Appendix**