



The Board of Directors and Underpricing in the Nordic Countries

*The Relationship Between Board Characteristics and Short-
Term Underpricing of IPOs*

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Abstract

This thesis examines the relationship between the characteristics of the board of directors and short term underpricing of initial public offerings, using a sample of 326 firms from the main listings of Norway, Sweden, Denmark, and Finland. The thesis explores these relationships in the context of information asymmetry theories, which attempts to explain underpricing as a result of the parties involved having different information.

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1. Introduction

1.1 Overview

An initial public offering (IPO) is a hallmark event in the life cycle of any company. It is the process in which a firm offers ownership shares in its company to the wider public on the stock market for the first time, thereby transitioning from a private into a public entity. Due to its importance, IPOs have been a subject of much academic interest, resulting in numerous research papers related to various elements in the process of going public, such as the decision to go public (e.g. Pagano, Panetta & Zingales, 1998; Aggarwal, Krigman & Womack, 2001; Jain & Kini, 1994; Booth & Smith, 1986).

Among these well-researched areas, one of the most noteworthy is research on the phenomenon that firms going public frequently experience positive returns on the first day of trading its stock. This regularity of positive first day return among listing firms indicates that there are mechanisms that make firms going public price their stock below the market value of the firm, thereby giving investors a discount and the firm leaving money on the table. The phenomenon of listing firms pricing their shares below their market price is most commonly referred to as short-term underpricing, or simply underpricing, in much literature.

There are many theories on what causes underpricing, and scholars recognize that there is a multitude of different factors leading to its occurrence. Some researchers point to the relationship between institutions, such as lawmakers, regulators and banks, and marketplaces in their theories, most commonly referred to as institutional theories (e.g. Ibbotson, 1975; Tinic, 1988). Other authors (e.g. Rock, 1986; Ljungqvist, 2007) attempt to explain underpricing as a consequence of asymmetric information between the primary parties involved in the IPO, including the board of directors, resulting in agency costs. A third set of theories utilize behavioral economics, assuming irrational investors or bias among issuers (Ljungqvist, 2007). Finally, some authors view underpricing as a means for insiders to retain firm control through strategically allocating the shares (e.g. Brennan & Franks, 1997; Field & Karpoff, 2002).

This thesis explores the relationship between the characteristics of the board of directors and the degree of underpricing in the context of information asymmetry theories. Using two of

the most prevalent information asymmetry theories, the winner's curse theory and the signaling theory, the thesis whether board characteristic

1.2 Research question

The question that this thesis sets out to answer is whether certain characteristics of the board of directors can partake in explaining some of the underpricing that occurs in the Nordic Market.

1.3 Outline

To successfully resolve the research question at hand, it is necessary to build a cohesive theoretical foundation that manages to create a link between the characteristics of the corporate board and the determinants of short-term underpricing, and then test the hypothesized relationships between them.

To accomplish this, the paper begins with a chapter reviewing relevant literature. In this chapter, the paper will first look at previous research on the relationship with board characteristics and short-term underpricing. The chapter then goes on to examine theory on the responsibilities and impact of the board of directors, before evaluating different theoretical perspectives that seeks to explain the role and behavior of the corporate board. The two next chapters explores the data that the thesis uses to explore the research question and explains the model and assumptions that will be used for this purpose. Finally, the thesis reviews and discusses the results from the regression, before concluding.

1.4 Delimitations

Due to the small size of its IPO market, the Icelandic stock exchange is not included in the study. The time frame is also limited to the time period 2001 to 2021, as it is difficult to gather the necessary information about IPOs occurring before this.

2. Background and literature review

In this chapter, the paper will review literature related to the corporate board and IPO performance. It will begin by an assessment of previous research on the relationship between board characteristics and IPO underpricing. The second section will first look at why firms go public, the IPO process, and the parties involved. In the third section, the paper delves deeper into the concept of short-term underpricing and reviews theories on its causes in a governance context. The fourth and final section studies the role and responsibilities of the board of directors and the individual variables in the context of the information asymmetry theories.

2.1 Previous Literature

Although both short-term underpricing of IPOs (e.g. Miller & Reilly, 1987) and the relationships between board characteristics and firm performance (e.g. Fama & Jensen, 1983; Muth & Donaldson, 1998; Daily, Dalton, & Canella, 2003) has received much academic attention over the years, there are still relatively few who have combined the two topics and researched the relationship between short-term underpricing and the characteristics of the board of directors, and it has yet to be researched at all in the Nordics.

Table 1 provides an overview of the published literature on the subject. From the table, it is evident that focus on the subject matter has shifted geographically from western countries towards Asian markets over the last decade, hereunder primarily to India and Indonesia. Considering how the business-environment in Western countries has changed much throughout these years, such as having seen a stark increase in female directorships, it should be of interest to put more focus on western countries once more.

Table 1: Research on the relationship between board characteristics and underpricing

Research on the relationship between board characteristics and underpricing

Author(s)	Variables	Country
Finkle (1998)	<i>Board size, affiliated top 20-venture capitalists, affiliated directors from prestigious underwriter,</i>	United States

	<i>reputation of affiliated university scientists, CEOs who were former university professors, CEOs who have a background in finance</i>	
Howton, Howton & Olsen (2001)	<i>Board size, executive board members, non-affiliated non-executive board members, affiliated non-executive board members, number of annual meetings, executive share ownership, non-affiliated non-executive share ownership, affiliated non-executive share ownership,</i>	United States
Certo, Daily, & Dalton (2001)	<i>Board size, board independence, board reputation, CEO duality</i>	United States
Filatotchev & Bishop (2002)	<i>Non-executive directors, CEO duality, executive ownership, non-executive ownership</i>	United Kingdom
Cohen & Dean (2005)	<i>Top management legitimacy, top management experience, industry experience, age, education</i>	United States
Chahine & Filatotchev (2008)	<i>Board Independence, management ownership, management power</i>	France
Anis (2010)	<i>Board size, board independence, CEO duality, audit committee, share retention among founders, managers, and family</i>	France
Hearn (2011)	<i>Board size, board independence, CEO duality, founder CEO, board committees, retained share ownership</i>	West Africa
Yatim (2011)	<i>Board size, board independence, CEO duality, board reputation, director shareholdings</i>	Malaysia
Darmadi & Gunwan (2013)	<i>Board size, board independence</i>	Indonesia
Thorsell & Isaksson (2014)	<i>Interlocking, founder participation, director experience, average tenure, employee representation, managerial experience, director age, female participation, share ownership</i>	Sweden

Hidyat & Kusumastuti (2015)	<i>Board size, board independence, audit committee</i>	Indonesia
Handa & Singh (2015)	<i>Gender diversity, board size, board independence, family related board members</i>	India
Dolvin & Kirby (2016)	<i>Board size, outside directors, CEO duality</i>	United States
Kubíček, Strouhal & Stamfestová (2017)	<i>Gender diversity, director age, director nationality, board size, board independence</i>	Austria, the Czech Republic, Poland & Slovenia
Singh & Gupta (2018)	<i>Foreign directors, board independence, director education, professional associations, director age, tenure, interlocking, board size, board duality</i>	India
Singh, Maurya & Mohapatra (2019)	<i>Gender diversity, board independence, board leadership</i>	India
Tanjung, Juni, Subing & Lestari (2019)	<i>Board size, board independence, executive ownership</i>	Indonesia
Arora & Singh (2020)	<i>Board size, board committees, board independence, gender diversity, director age, family related board members, interlocking</i>	India
Setiawan, Prabowo, Trinugroho, & Noordin (2021)	<i>Board size, board independence, female representation</i>	Indonesia
Teti & Montefusco (2021)	<i>Board size, board independence, gender diversity, board ownership</i>	Italy
Rau, Sandvik & Vermaelen (2021)	<i>Board size, gender diversity, female director age, female bio length, skills</i>	United States

Finkle (1998) was the first to examine the relationship between the board of directors and the underpricing of initial public offerings. He investigated how the size and composition of the corporate board affected the initial offering size and long-term aftermarket performance of firms in the United States biotechnology industry between 1980 and 1994 and found a moderately significant relationship between director expertise and underpricing. Howton, Howton, & Olsen (2001) was however the first to research the relationship between board

characteristics and short-term underpricing, studying a sample of 412 firms in listed in the U.S. between 1986 and 1994. The study divided director ownership into quartiles and could show that the share ownership among both executive and non-executive directors had a positive relationship with short-term underpricing, although with a stronger relationship for executives. Furthermore, the paper found a negative relationship with board size and a positive relationship with CEO duality.

The size of the board of directors has perhaps been the most common research subject when looking at the relationship between the corporate board and underpricing, but results from previous studies is mixed. Howton et al. (2001) found a positive relationship between board size and underpricing, while Certo, Daily and Dalton (2001), who published their research on the U.S. market the same year, found a negative relationship between board size and underpricing. In the following years, several authors have found either a positive relationship (e.g. Li & Naughton, 2007; Anis, 2010; Isaksson & Thorsell, 2014) and a negative relationship (e.g. Yatim, 2011; Darmadi & Gunwan, 2013; Kubíček, Strouhal & Stamfestová, 2017).

A less researched, but increasingly more popular subject, is the effect of female directors on underpricing. Isaksson and Thorsell (2014) were the first to research the subject, in their examination of the Swedish IPO market. Their research showed that female board members increased underpricing, although the results were not significant. Studies researching the subject in the following years all showed mixed, but insignificant results, except from a paper by Kubíček et al. (2017) on the Central European market that gave resulted in a positive and significant relationship.

2.2 Initial public offerings

An initial public offering is the act where a private company offers its shares to the general public on a stock exchange for the first time, thereby transforming it from a private to a public company. To create a framework for understand underpricing, it is necessary to understand the fundamentals of the initial public offering. This section will therefore explore the motivation for why firms go public, the parties involved in the IPO, and the process itself.

2.2.1 Why companies go public

Going public is both a time consuming and a costly process, yet still a desirable option for many firms (Ritter, 1998). According to Ritter and Welch (2002) are two primary reasons why firms choose to go public: The first is that the owners wish access to more capital from investors to fund further expansion. The second reason is to increase the liquidity of the firm by creating a market for the company shares to be traded in.

2.2.2 The parties

There are three primary parties involved that are fundamental in understanding the mechanisms at play in an initial public offering. The firm that issues the shares (the issuer), the company that does the due diligence and prepares any required documents (the underwriter), and the investors who bids on the issuing firms shares (the investors). The interaction between the three players are central elements in theories about underpricing and it is therefore of interest to explain their role in the IPO process.

The issuer

The issuer is the firm going public through the issue of shares on a stock exchange and is the primary catalyst of the IPO. The issuers' primary goal with the IPO process is to maximize the proceeds by offering the stocks at a price that is neither too high, which would offput investors, or too low, which would be an indirect cost for the firm as they leave money on the table (Thornton, Adams & Hall, 2011). To achieve this goal, the issuers typical responsibilities is to enlist and cooperate with one or more underwriters throughout the process.

The underwriter

An underwriter is typically an investment bank, a commercial bank, or a large shareholder responsible for performing a due diligence on behalf of the issuing firm. The responsibility of the underwriter includes performing a due diligence investigation of the firm, assist the issuer in the pricing of the share, write the listing prospectus, marketing of the share, and file any necessary documents.

The investors

Investors that operate in the financial market can broadly be divided into two groups in accordance with the size and purpose of their investments. These two are individual investors and institutional investors. Individual investors, sometimes referred to as retail investors, typically buy a smaller number of shares for themselves and therefore have little to no effect on firm value. These investors are often considered amateurs, using non-fundamental information and by some being considered gamblers (Martin & Wigglesworth, 2021). Institutional investors on the other hand are larger entities such as banks, insurance companies or investment funds. These investors are often regarded as sophisticated and proficient in financial analysis and is expected to have an advantage over individual investors with regards to accessing information (Field & Lowry, 2009).

2.2.3 The IPO process

Jenkinson and Ljungqvist (2001) describes the process of an IPO in four stages, typically lasting between four and eight months. According to them, the first stage in the process is the market selection, where the firm must decide on which stock market to issue the shares. This might involve choosing between listing on different national stock markets or on other nations stock markets.

After deciding on a listing market, the second stage of the process is choosing one or more underwriters and an initial design of the prospectus. An underwriter is typically a firm specialized in services related to public listings. Larger companies going public often hire multiple underwriters, whom in turn often create syndicates when working on the IPO. In its work to prepare for the IPO, the underwriter or underwriter team perform due-diligence examinations.

2.3 Short-term underpricing

The first day return of a stock is defined as the percentage difference between its offering price and closing price on the first day of trading. When the first day return of an IPO-firm's share is positive, it entails that it was priced below its market value. This is defined as short-term underpricing (e.g., Rock, 1986; Booth & Chua, 1996; Daily et al. 2003).

Economists such as Logue (1973) and Ibbotson (1975) discovered the tendency of firms to sell their shares well below market value when going public. This puzzled researchers, as underpricing signifies a direct transfer of wealth from the ex-ante share owners to the new external investors in the form of a discount (Filatotchev & Bishop, 2002). This discount is often described as “money left on the table”, signifying the money a firm misses out on by pricing itself too low, and is calculated as the first day returns multiplied by the number of shares offered (Loughran & Ritter, 2002). The discovery led to a plethora of authors documenting the occurrence of underpricing on different markets all over the world, creating a vast collection of empirical literature on it. With the empirical research came the theoretical literature trying to explain the reasons for its occurrence. From there on, the literature has become more sophisticated, with researchers empirically testing the relationships between underpricing and variables derived from different theories (Ljungqvist, 2007).

The library of literature on both the empirical evidence of underpricing and the theories of why it occurs is today quite mature, but the literature on theory-testing is less exhaustive, with markets yet to be tested and often inconclusive results.

2.3.1 Evidence of underpricing

Reilly and Hatfield (1969) documented the presence of systematic underpricing in the U.S. market between 1963 and 1965 and found this to average 20.2 percent. Stoll and Curley conducted a study in 1970 on the U.S. market, using data from the years 1957, 1959 and 1963, and found underpricing to average 42.4 %.

Loughran, Ritter and Rydqvist (2021) compiled evidence of underpricing in 54 countries from different empirical research papers and presented their equally weighted average initial returns. Table 2 is an overview of the research results of 50 countries, excluding the Nordic countries.

Table 2: Underpricing of non-Nordic IPOs

Underpricing of non-Nordic IPOs

Country	Time Period	Avg. Initial	Country	Time	Avg. Initial
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		Return		Period	Return
Argentina	1991-2018	5.7 %	Mauritius	1989-2005	15.2 %
Australia	1976-2018	19.8 %	Mexico	1987-2017	9.9 %
Austria	1971-2018	6.2 %	Morocco	2000-2011	33.3 %
Belgium	1984-2017	11.0 %	Netherlands	1983-2017	13.3 %
Brazil	1979-2019	29.6 %	New Zealand	1979-2018	15.9 %
Bulgaria	2004-2007	36.5 %	Nigeria	1989-2017	12.8 %
Canada	1971-2017	6.4 %	Pakistan	2000-2013	22.1 %
Chile	1982-2019	6.8 %	Philippines	1987-2018	17.3 %
China	1990-2020	170.2 %	Poland	1991-2019	11.7 %
Cyprus	1997-2012	20.3 %	Portugal	1992-2017	11.5 %
Egypt	1990-2017	9.4 %	Russia	1999-2013	3.3 %
France	1983-2017	9.7 %	Saudi Arabia	2003-2011	239.8 %
Germany	1978-2020	21.8 %	Singapore	1973-2017	25.8 %
Greece	1976-2013	50.8 %	South Africa	1980-2018	17.2 %
Hong Kong	1980-2017	44.5 %	Spain	1986-2018	9.2 %
India	1990-2020	84.0 %	Sri Lanka	1987-2018	28.9 %
Indonesia	1990-2020	56.0 %	Switzerland	1983-2018	25.2 %
Iran	1991-2004	22.4 %	Taiwan	1980-2019	37.2 %
Ireland	1991-2013	21.6 %	Thailand	1987-2018	40.0 %
Israel	1990-2006	13.8 %	Tunisia	2001-2014	21.7 %
Italy	1985-2018	13.1 %	Turkey	1990-2014	9.6 %

Japan	1970-2020	48.8 %	United Arab Emirates	2003-2010	270.1 %
Jordan	1999-2008	149.0 %	United Kingdom	1959-2020	15.7 %
Korea	1980-2018	55.2 %	United States	1960-2020	17.2 %
Malaysia	1980-2019	50.3 %	Vietnam	2005-2017	33.3 %

As is evident from the table, underpricing is a global phenomenon with substantial economic effect.

Underpricing has also been researched in the Nordic countries. Keloharju (1993) found evidence of Finnish IPOs between 1984 and 1989 being underpricing by 8.7 %. Emilsen, Pedersen and Sættem (1997) researched the Norwegian stock market between 1984 and 1996 and found underpricing to be 12.5 %. Jakobsen and Sørensen (2001) found danish IPOs to be underpriced by 7.4 % between 1984 and 1988, and Schuster (2003) found Swedish IPOs to be underpriced by 18.46 %

Table 3: Underpricing of Nordic IPOs

<i>Underpricing of Nordic IPOs</i>			
Author(s)	Time period	Market	Underpricing
Keloharju (1993)	1984-1989	Finland	8.7 %
Emilsen, Pedersen & Sættem (1997)	1984-1996	Norway	12.5 %
Jakobsen & Sørensen (2001)	1984-1988	Denmark	7.4 %
Schuster (2003)	1988-1998	Sweden	18.46 %

2.3.2 Theoretical perspectives on underpricing

Much research has been done to understand what causes underpricing. In accordance with previous literature by Eckbo (2007) and Ljungqvist (2007) the theories are divided into four groups. These are asymmetric information theories, institutional explanations, ownership and control reasons, and behavioural theories. Information asymmetry theories attempt to explain underpricing because of uneven information between the parties involved, including the board of directors.

Information asymmetry theories

Several studies have found information asymmetry between the three IPO parties to be one of the main drivers of short-term underpricing, starting with Ibbotson and Jaffe (1975). Information asymmetry theories attempt to explain underpricing as a result of asymmetric knowledge between the parties, resulting in non-optimal decision making. Several information asymmetry theories have been developed, but two of the most prominent ones are Rocks' (1986) "winner's curse"-theory and Ibbotson's (1975) signaling-theory.

The winners' curse

In his much-cited paper *Why new issues are underpriced*, Rock (1986) extrapolated Akerlof's lemon problem to the IPO market and argued that underpricing occurs due to informational asymmetry between informed and uninformed investors, resulting in what he names "the winners curse". According to his model, informed investors have extensive knowledge of the value of IPOs and therefore only make bids on the shares of companies that they know are priced below their real value. Uninformed investors on the other hand, are unaware of the fair value of the listing companies, thus making bids on both underpriced and overpriced shares. As listing companies offer a finite number of shares to investors, they must ration their shares out to investors in cases of excess demand, sometimes increasing the number of shares offered by exercising what is known as an overallotment option. The result is that uninformed investors are allocated a lower portion of the high-demand underpriced shares and a higher portion of the low-demand overpriced shares. If the companies on average are fairly priced, the uninformed investors will in total receive many overpriced shares and few underpriced shares, thus having a negative expected return on investment. According to Rock, the IPO market requires the participation of both informed and uninformed investors to fill the listing subscriptions, and a negative expected investment

return will cause uninformed investors to withhold investing in the IPO market, thereby reducing the capital that IPO firms can raise from investors (Ljungqvist, 2007). To ensure the participation of both groups of investors, firms therefore need to underprice their shares so that the expected return on investment for uninformed investors is no longer negative.

The model assumes the existence of information heterogeneity between the investors, meaning that they all have access to the same information. An implication of this model is that the bias towards informed investors increases with the uncertainty of the real value of the shares (the information asymmetry), thereby increasing the disadvantage of the uninformed investors and negatively impacting their expected returns. This increases the discount that firms must offer to keep the uninformed investors in the market and increases the money left at the table. Thus, underpricing increases with ex ante valuation uncertainty (Johnston & Madura, 2009).

Signaling theory

Signaling theory was initially developed by Spence (1973) in his paper *Job Market Signaling*, where he modelled how job applicants can reveal information about themselves to employers through signals, such as education. This revealed information reduces the employer's ex ante uncertainty when investing in a new employee, making it simpler to distinguish between high ability employees and low ability employees.

Signaling theory quickly expanded into the field of economics and IPO research. Ibbotson (1975) was the first to research the theory in an IPO context in his Leeland and Pyle (1977) expanded the research on the role of signals in the IPO market and found that companies that were expected to do well in the future should (high-quality issuers) send clear and reliable signals of their quality to the market, such as retaining a high degree of share ownership. They found that to ensure reliability, the signals should be costly to imitate for companies that are not expected to do well in the future (low-quality issuers). Daily et al. (2003) and Lang and Lundholm (2000) found that high-quality issuers may disclose private beneficial information about competitive dynamics and intended use of proceeds in the listing documents in order to communicate the firms true value.

Daily et al. (2003) and Filatotchev and Bishop (2002) argues that listing firms can use board characteristics and other corporate governance indicators to signal firm value to investors.

2.4 The board of directors

The corporate board is a publicly listed corporation's highest ranked and most visible governance mechanism (Fama & Jensen, 1983; Johnson, Daily & Ellstrand, 1996), consisting of a team of directors functioning as representatives of the owners, voted in by the shareholders at the company's general assembly. In a contemporary business environment, the corporate board plays an important role in the long-term operations of companies, making decisions about recruitment and dismissal of company executives (Hermalin & Weibach, 1998), the strategic direction of the company (Fama & Jensen, 1983; Kemp, 2006; Tricker, 1984), initiation and implementation of organizational change, and access to and distribution of resources (Hillman, Canella & Paetzold, 2000; Hendry & Kiel, 2004). Additionally, corporate boards monitor top management to minimize agency costs and protect shareholder interests (Eisenhardt, 1989; Schleifer & Vishny, 1997; Ingley & Van der Walt, 2001; Roberts, McNulty & Stiles, 2005; McIntyre, Murphy & Mitchell, 2007).

2.4.1 Agency theories and the corporate board

Agency theory derived out of research on property rights and contracts and has become a prominent theory used in economics to explain conflicting interests between two or more parties. In corporate governance, it is frequently used in discussions about the conflicting interests between shareholders and firm managers and the costs derived from this conflict between ownership and control. According to Fama and Jensen (1983) the biggest responsibility of the modern-day board of directors is to minimize these costs.

The effectiveness of a corporate board in solving these complex and challenging responsibilities is shown to have a positive effect on the financial performance of the firm it governs and are among the key determinants of board effectiveness is its characteristics (. (Hawkins, 1997; Gompers, Ishii, & Metrick, 2003).

Among the more commonly researched board characteristics is the size of the board, its independence and gender diversity, the director stock ownership and CEO duality (e.g. Bathula, 2008; Merendino & Melville, 2019; Pucheta-Martinez & Gallego-Alvarez, 2019).

Based on the frequent research and established relationships between the aforementioned characteristics and firm performance, it is only natural for these characteristics to be the subject of this paper.

2.4.2 The board as a signal

In an IPO-process, both the listing firm and the external investors face the challenge of information asymmetry (Rock, 1986). However, the two parties stand on different sides of the optimal solution. The firm on one hand reduces the information asymmetry by sending costly, but reliable signals of firm quality to the investors, while external investors on the other hand face costs when assessing the firm as a possible investment (Fazzari, Hubbard, & Petersen, 1988; Hoshi, Kashyap, & Sharfstein, 1991).

Certo et al. (2001) claims that the quality of the board is an observable characteristic and Lawless, Ferris and Bacon (1998) argues that the quality of the top management and the board of directors is among the most reliable signal of the potential future quality of the firm. Certo (2003) and Chahine and Filatotchev (2008) both argue that investors scrutinize the corporate board in order to know if its directors are composed to maximize shareholder interests. This claim was further supported by Arthurs, Busenitz, Hoskisson, and Johnson (2008b) who found that effective corporate governance mechanisms provide assurance to investors that the company management will maximize firm profits instead of personal utility.

This research indicates that investors care about the board's ability to monitor the firm management. There must therefore be certain characteristics of the board of directors that signal an increased ability to do so.

2.4.3 Board characteristics and hypothesis

Among the most dominant issues discussed in the literature regarding the board of the directors is the size of the board, the constellation of dependent and independent directors, and the leadership structure of the board, and these variables have come to be seen as important determinants for the protection of shareholder interests (Fama & Jensen, 1983). Typically, scholars have considered certain board traits, such as a high proportion of independent directors or the separation of CEO and chairman, to be indicators of better

performance (Li & Naughton, 2007). However, as previously outlined, the empirical results are less conclusive.

To better understand the importance of board characteristics and underpricing in the context of information asymmetry theories, it is of interest to extensively discuss previous research of each board characteristic to develop the theories that this thesis will test.

Board size

The size of the board of directors has received much attention in corporate governance-research, resulting in an extensive library of literature on the subject. Research on the relationship between board size and underpricing of IPOs is however still relatively immature, as several studies have put the spotlight on smaller industry sectors or have experienced challenges tied to small sample sizes (Dolvin & Kirby, 2016).

Empirical research on the relationship between board size and firm value is inconclusive. Dehaene, de Vuyst, and Ooghe (2001) found a positive relationship between firm value and the number of board members, and Connelly and Limpaphayom (2004) found a negative relationship.

Organizational theorists argue that the size of the board of directors can partake in mitigating the costs associated with the conflict between the owners and the management, as its size will affect its monitoring capabilities (Dalton et al., 1999; Coles et al. 2008). However, larger sized corporate boards might also result in poor communication and cooperation between the members, harming the monitoring abilities and general performance of the board. Hiner (1967) argues in favor of such theories, stating that the relationship between the size of the board and the performance of the firm is non-linear and concave, meaning that optimal number of directors is at a specific point on the curve. In an IPO context, the results from researching the relationship between board size and underpricing has been mixed, with studies finding positive relationships, negative relationships, and no relationships.

On this basis, the study will research the following hypothesis.

Hypothesis 1: There is a relationship between the size of the board of directors and underpricing

Gender diversity

Nordic countries have seen a surge in women entering the boardroom in the last decade, with the social and political climate in the region being a catalyst for change. Today, more than one-third of all directors in the Nordic countries are women. A high number compared to the rest of Europe, and a number that is still growing. Out of the four countries, Norway is leading the way, with 44 % percent of board members being female and 20 % of public companies having female chairs (Spencer Stuart, 2021).

With the gradual increase in female board members, their effect on firm performance has received more attention. Several researchers have found a positive relationship between female board representation and key financial indicators such as the return on total capital, gross profits, and ROE (Carter, Simkins & Simpson, 2003; Joy, Carter, Wagner & Narayanan, 2007; Gao, 2018), while others have found a negative effect (Adams & Ferreira, 2009; Bøhren & Strøm, 2007).

Ahern & Dittmar (2012) researched the effect that the announcement that the gender quota laws in Norway had on the Tobin's Q and found a significant reduction in the following years. This was however not necessarily due to gender, as the study concluded that reduced board capabilities were the cause of the drop in Tobin's Q, as the new female board members on average were younger, had less experience, and had were less educated than their male counterparts.

If women have an effect on firm performance by virtue of their gender, the question that arises is why they have an effect. One theory is that women and men are fundamentally different and therefore inherit different knowledge, experiences, and perspectives, resulting in gender diverse boards taking more well considered and ultimately better decisions (Dezsö & Ross, 2012). This was supported by Schwartz-Ziv (2013) who discovered that boards containing at least three members of each gender takes more initiative and requests information from management about twice as often as boards with less than three board members of each gender. Furthermore, Brown, Brown and Anastasopoulos (2002) found that gender diverse board would be more likely to focus on clear communications with employees, corporate social responsibility, and customer satisfaction. This can perhaps be explained by research conducted by Woolley et al. (2010), who found that a higher ratio of women in a group increases the groups social sensitivity. Additionally, women are on

average more risk averse than their male counterparts (Katz & McIntosh, 2016; Navarro & Gallo, 2014), which in turn should reduce firm risk. This assumption is supported by Yang et al. (2019), who found that especially idiosyncratic risk was reduced with an increased in female directors.

In a corporate governance perspective, Watson, Kumar and Michaelsen (1993) and Fondas and Salsalos (2000) argues that female board participation increases the monitoring capabilities of the board, as self-interests and groupthink is reduced with diversity. In the context of signaling theory, this indicates that the inclusion of female board members should demonstrate a reduction in agency problems to external investors therefore also reduce underpricing. Additionally, Leland and Pyle (1977) argue that the presence of female directors sends out signals to investors about a firm's distinct capabilities, which attracts certain investors. This is supported by Bilimora (2000) who claims that the inclusion of women in the top management signal that the firm show concern for equity and female empowerment, which communicates both the credibility and potential of the IPO firm.

Although the effect of female board representation on firm performance is disputed, the research does indicate that female board members reduce investor uncertainty about the agency problems between shareholder interest and management interests. On these grounds and on the basis of previous research on the subject, the hypothesis that will be tested is the following:

Hypothesis 2 (H2): The number of female directors has a negative relationship with underpricing

Board independence

Several authors have researched the effect of independent board members on firm performance. Rosenstein and Wyatt (1990) found a positive relationship between the company stock price and the number of independent directors. This finding was later supported by in studies by both Peng, Buck and Filatotchev (2003) and Bhagat and Bolton (2008). Other studies by Christensen, Kent, and Stewart (2010), and Agrawal and Knoeber (1990) have found a negative relationship.

In a study of 969 stock exchange listings in Europe between 1995 and 2011, Bertoni, Meoli, and Vismara (2014) found board independence to be a critical factor in external investors

valuation of the firms share when going public. They showed that director independence reduced underpricing by signalling improved effectiveness in monitoring top management.

Several authors have used the percentage of independent directors as a measure of monitoring effectiveness (Baysinger & Butler, 1985; Byrd & Hickman, 1992, Brickley, Coles & Terry, 1994). These studies hypothesised that a board with a majority of outside directors will have the ability to stop any actions from inside directors that would lower shareholder wealth. In their research they concluded that boards dominated by external directors are considered by external investors to be superior at monitoring than boards dominated by internal directors.

However, several studies have found a positive relationship between the proportion of external directors and underpricing (Certo et al., 2001; Howton et al., 2001; Filatotchev & Bishop, 2002). The theorised explanation for this relationship is that a higher proportion of external directors' functions as a signal to investors of higher firm quality, resulting in an increase in underpricing.

On this basis it is assumed that an increase in external directors is viewed by external investors to reduce agency-problems and protect shareholder interests, thereby reducing underpricing. On this basis, the thesis will test the following hypothesis:

Hypothesis 3 (H3): Board independence has a negative relationship with underpricing

CEO duality

CEO duality is a situation where a company's CEO also holds the position of chairman of the board. This dual role is viewed by many scholars as a clear agency problem, as the CEO has the responsibility of monitoring him- or herself. Research on the separation of the two roles have shown that the potential ability of the board to reduce opportunism and objectively evaluate firm performance is lower when the CEO holds this dual role (Jensen & Meckling, 1976; Eisenhardt, 1989; Fama & Jensen, 1983). According to Hung (1998), an external chairman also increases the legitimacy of the board of directors. This increased legitimacy is likely not unfounded, as studies have shown that U.S. firms with CEO duality are more likely to face accounting and auditing enforcement actions from the Securities and Exchange Commission (Dechow et al., 1996) or litigation against their auditor (Goyal & Park, 2002).

By empirically showing that firms where the CEOs that do not also inhabit the role of chairman have a higher CEO turnover following low stock prices, Mary (2006) argues that the structure of the board of directors affects the disciplining of the firm's CEO.

3. Data

This purpose of this chapter is first to explain the process that was used to gather and process the data, and then to present the descriptive statistics of the final data sample.

3.1 Data selection

For the thesis, I gathered data on XXX firms listed on the Norwegian, Swedish, Danish, and Finnish main stock exchange between 2001 and 2021. The data was primarily retrieved from two sources. Technical data such as listing dates, share prices and firm value was mainly gathered from SDC Platinum, while data on board characteristics was primarily gathered from the listing prospectus. Additionally, secondary sources were used to correct or supplement the data in cases where the primary sources lacked data or was incorrect.

SDC Platinum

Securities Data Corporation (SDC) Platinum Database is a database provided by Thompson Reuters. The database contains large quantities of historical data on financial transactions, hereunder IPOs. The program was used to retrieve information about the firm's nationality, listing date, founding date, pricing technique, SIC code, industry, offering price, first day highest price, first day lowest price, and closing price. Due to uncovering incorrect observations on several occasions, SDC Platinum was not deemed to be completely reliable, and the data was therefore cross referenced with other sources that was considered more reliable, such as the stock exchange websites, Google Finance, Nordnet, prospectuses, and annual reports.

Stock exchanges

To ensure the reliability of the data, the historical stock information of the individual companies was downloaded from the stock exchange websites. Additionally, the historical stock information of the four main indexes was downloaded to calculate the daily market return, the 30-day market return, and the 30-day standard deviation.

Prospectuses

The prospectuses were used to gather data about the characteristics of the board of directors, and was primarily retrieved from company websites, IPO databases, and by contacting the issuing firms or the underwriters. The prospectus design and content were mostly the same between the firms, although with some deviation, thereby demand the information to be retrieved elsewhere.

Several firms published information about board members that would leave or join the board right before or after the IPO date in the prospectus. In all these cases, the firm included the same information about those that would join as those already on the board. As theory stated that external investors view the board as a signal of future shareholder earnings, it was considered meaningful to include oncoming board members, as they can have an impact on shareholder earnings, and exclude departing board members, as they directors would have limited to no impact.

Two issues arose when gathering prospectus information. First, the extent of available information gradually decreased with the age since the IPO occurred. It was more difficult to get a hold of the older prospectuses, and in many cases, these also lacked the relevant information. Second, Finnish prospectuses were mostly published only in Finnish, requiring translation using Google Translate.

Other sources

Data on ex ante total assets was retrieved from the prospectuses, intermediary reports, and annual reports of the listing companies. As the currency used in these presentations varied between Norwegian Kroner, Swedish Kroner, Danish Kroner, Euros, and US Dollars, it was necessary to transform the data to one common currency to analyse it. The currency of choice was the US Dollar. Historical currency prices were downloaded from DNB Markets and used to convert the total assets. Furthermore, to adjust the total assets for inflation, monthly consumer price index data for the four countries were retrieved from the Federal Reserve Bank of St. Louis. Finally, monthly data on consumer confidence was retrieved from the European Commission Flash Consumer Confidence Indicator.

In cases where necessary information was absent from the prospectus or needed to be cross referenced with other sources due to uncertainty, information was gathered from the firms' intermediary reports, annual reports, annual report summaries, or Proff Forvalt.

3.2 Excluded data

Foreign-registered companies listed on the Nordic stock exchanges were excluded from the data set. Several companies were also excluded due to missing data on share prices or board characteristics.

4. Research design and methodology

The thesis seeks to explore the relationship between characteristics of the board of directors and short-term underpricing by testing hypothesis developed in the context of information asymmetry theories. This chapter will present the research design and the method that will be used to test the hypothesis presented in the previous chapter.

4.1 Hypothesis development

Founded on the knowledge on underpricing and corporate governance laid out in the previous chapter, a set of hypotheses have been developed for testing. The hypotheses are all derived from information asymmetry theory, and it follows from this that firms can use board characteristics as a signal to external investors of both the quality of the firm and the ability of the board of directors to affect agency conflicts between investors and firm management, thereby reducing or increasing the necessary degree of underpricing.

The first hypothesis that will be tested is the relationship between the size of the board of directors and underpricing.

4.2 Regression variables

4.2.1 Dependent variable

In accordance with previous research (e.g., Ibbotson & Ritter, 1995; Pham et al., 2001) the dependent variable that should be used to measure underpricing is the market adjusted first-day returns, which utilizes the following formula:

$$MAR = \frac{P_1 - OP}{OP} - \frac{M_1 - M_0}{M_0}$$

Where *MAR* denotes the listing firms' first-day market adjusted returns, P_1 denotes the first day closing price of the share, *OP* denotes the offer price of the share, and M_0 and M_1 is the opening and closing values of the selected market. If the market adjusted return is positive, it

means that the IPO firms' stock is underpriced and if it is negative it means that the stock is overpriced. Mathematically, we can define the three possible states as following:

$$\begin{aligned} \textit{Underpricing:} & \quad \textit{MAR} > 0 \\ \textit{Fair pricing:} & \quad \textit{MAR} = 0 \\ \textit{Overpricing:} & \quad \textit{MAR} < 0 \end{aligned}$$

To proxy the market returns, the paper uses the average returns from the main indexes of the four stock exchanges.

4.2.2 Independent variables

The variable used to measure the size of the board of each firm is denoted *BS* and is simply the number of directors at the date of the IPO. The variable for gender diversity is denoted *GD* and is the proportion of female directors at the board. Board independence is denoted *BI* and is the proportion of external directors at the board. The variable *DUO* is a categorical variable, where 1 equals CEO duality and 0 does not. Finally, the variable *INTERLOCKING* is the average number of board memberships held by each member of the board at other companies, functioning as a proxy for experience and reputation in the corporate world.

4.2.3 Control Variables

To avoid spurious correlations in the regression analysis, this study uses several control variables that are believed to affect underpricing. Previous literature on underpricing have used several different control variables, such as systematic and idiosyncratic risk (Bernile, Bhagwat & Yonker, 2018; Perryman, Fernando & Tripathy, 2016), ROA (Matsa & Miller, 2013), Tobins's Q, and price-to-book ratio (Post & Byron, 2015). Using the correct control variables can contribute by increasing the robustness of the analysis but using incorrect variables can have the opposite effect (Angrist & Pischke, 2009). This study will use the five control variables LNASSETS, LNAGE, CCI, MC, PRICING, INTERNATIONAL, RANK, and TECH.

In accordance with previous literature (e.g. Certo et al., 2001; Ritter, 1984; Ljungqvist, 2004) the paper utilizes the natural logarithm of firm size and firm age. Firm size is in this case the total assets of the firm as published in the IPO prospectus, adjusted for inflation

using the consumer price index in the four countries. The age of the firm is simply the natural logarithm of the IPO date less the founding date of the firm.

Studies have also shown that the IPO market experiences periods of overoptimism, with a stark increase in both the number of IPOs and short-term returns. In periods of overoptimism, the market is often labelled as “hot”, and several models based on the theories of asymmetric information consider this a period where the cost of asymmetric information to be at its lowest (Helwege et al, 2002). One example of this is the model developed by Allen and Faulhaber (1989), which predicts that a “hot” market occurs when firms experience a positive shock to expected future earnings. When this is not the case, the market is labelled as “cold” (Espenlaub & Tonks, 1998; Ibbotson & Jaffe, 1975; McBain & Krause, 1989). This study defines a market as “hot” when the number of IPOs in a quarter is above the average number of IPOs and otherwise as “cold”.

When deciding on the issue share price, Nordic firms primarily choose between either using the book-building method or the fixed price method. Previous studies on the relationship between the choice of pricing method and the degree of underpricing found that using book-building resulted in considerably less underpricing compared to the fixed pricing method (Ljungkvist, Jenkinson, & Wilhelm, 2003). To control for this effect the model includes the categorical variable *PRICING*, where 0 equals a firm using the book-building method and 1 that the firm uses the fixed pricing method. Based on the research of Ljungkvist et al. (2003) the relationship with the dependent variable is expected to be positive.

4.2.4 Omitted variables

Even though this study uses many control variables to decrease the risk of spurious relations, IPO underpricing is a complex matter likely decided by a very large number of factors and the number of control variables that can be included in the study is limited.

4.2.5 OLS Assumption

In order to explore the relationship between underpricing and the independent variables of our model, this thesis will utilize a linear multiple regression analysis, which is a commonly used method in econometric research. The method does this by finding a linear relationship

between the dependent variable, in this case underpricing, with the independent variables. This method is dependent on certain assumptions, not being violated

To ensure valid hypothesis testing when using OLS, it is necessary to that the methods five main assumptions are fulfilled. If this is not the case, there is a risk of m

Assumption 1: Linearity

The first assumption defines the model and claims that the population model estimating the relationship between the dependent variable and the independent variables should be written as:

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k + u$$

Assumption 2: Random sampling

The second assumption of the model is that there is a random sampling of observations, meaning that they must be drawn randomly from a population of n observations.

Assumption 3: No perfect collinearity

The third assumption is that there should be no exact linear relationship between the independent variables.

Assumption 4: Zero conditional mean

The average variance of the error term is constant along the X-axis. The assumption can be written as:

$$Var(u|x_1, x_2, \dots, x_k) = \sigma^2$$

According to the theorem, the OLS-estimators are BLUE (Best Linear Unbiased Estimators) when the five assumptions hold.

5. Results and analysis

In this part I will discuss the descriptive statistics of the analysed data and the results of the regression. The data and results will be analysed both as a whole and for each individual country.

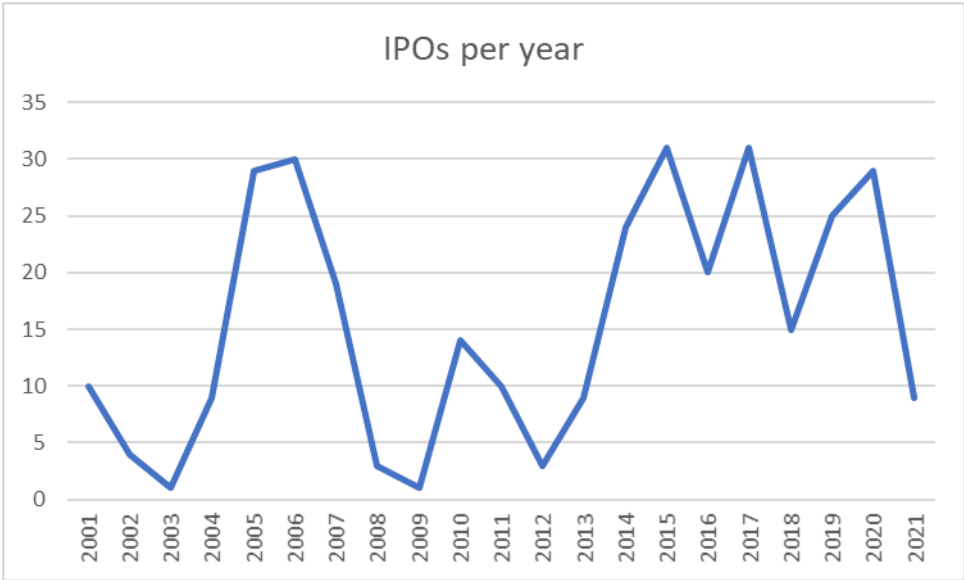
5.1 Descriptive statistics

Table 5: Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
MAR	327	.045	.14	-1.001	.95
BS	327	6.483	1.945	3	12
GD	327	.244	.155	0	1
BI	327	.779	.215	0	1
DUO	326	.202	.402	0	1
INTOWNERSHIP	327	.001	.007	0	.13
EXTOWNERSHIP	327	.001	.003	0	.042
AC	327	.878	.328	0	1
NC	327	.92	.303	0	3
INTERLOCKING	327	5.309	2.972	.4	24.625
LNASSETS	327	5.411	1.857	-1.615	11.662
LNAGE	327	2.585	1.118	0	5.298
CCI	327	-9.977	6.915	-31	.6
MC	246	.74	.44	0	1
PRICING	327	.284	.452	0	1
INTERNATIO~L	327	.19	.393	0	1
RANK	327	.722	.449	0	1
TECH	327	.138	.345	0	1

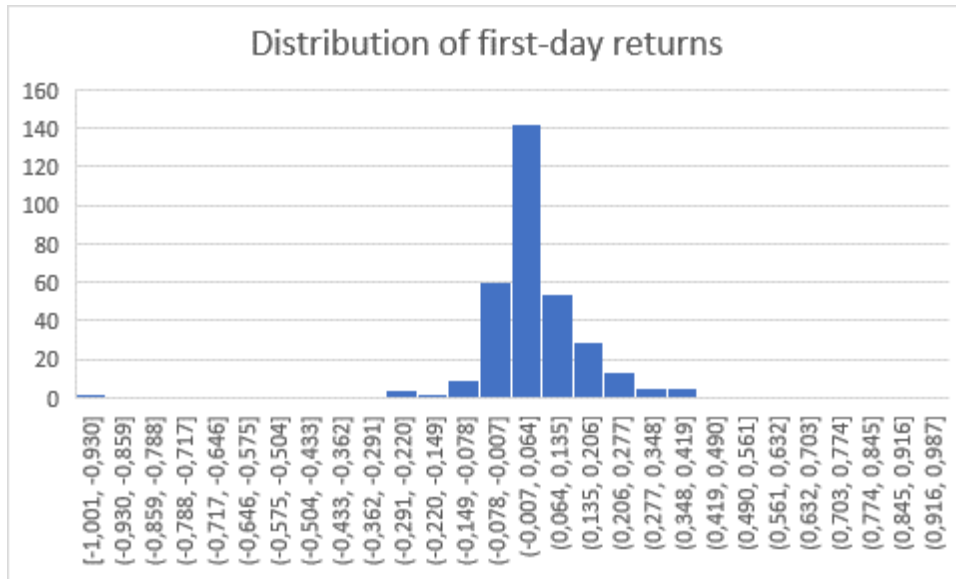
Table 5 shows the summary statistics for the dependent and independent variables used in the regression model. There was an average of 16 IPOs per year on the main exchanges in the Nordics between 2001 and 2020, and as shown in figure ??? the number varied considerably during these years.

Figure 1: IPOs per year



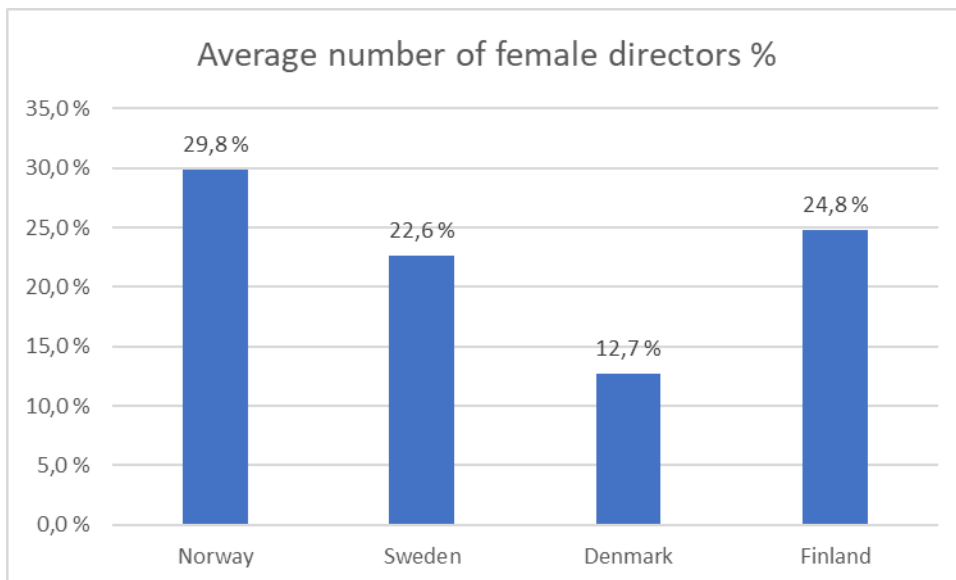
As we can see from the summary statistics, the average underpricing on the main Nordic stock exchanges is 4.48 %. Comparing this number to the results from previous studies in other countries, it becomes clear that the Nordic main listing IPOs has a relatively low degree of underpricing.

Figure 2: Distribution of first-day returns



The average number of board directors across the four countries during the select period has been 6.5, with all four countries averaging somewhere between 6 and 7 members. The four markets also have an average representation of female directors of 24.4 %, with Norway having the highest representation of 29,8 % and Denmark having the lowest of 12,7 %.

Figure 3: Average number of female directors



5.2 Diagnostics

In order to know if the regression assumptions hold, it is critical to test the spread of the dataset and test the model specification. The variables and the model will therefore be tested for normality, collinearity, homoscedasticity, and independence.

5.2.1 Normality

Residual normality is required to conduct hypothesis testing when using OLS-regression, as this ensures that the p-values are valid. If this is not the case, we cannot conclude on our findings as the p-values cannot be used to ensure how likely it is that the coefficient values are not zero (Kim, 2015). Normality involves the residuals being identical and spread independently. To visually assess if the assumption of normality holds it is necessary to estimate the residuals of the regression and then use these values to graph a normal probability plot and a Q-Q plot, as shown in figure 4 and 4.

Figure 4: Normal probability plot

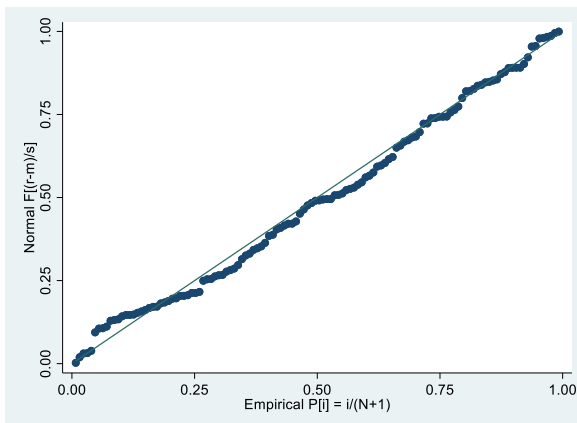
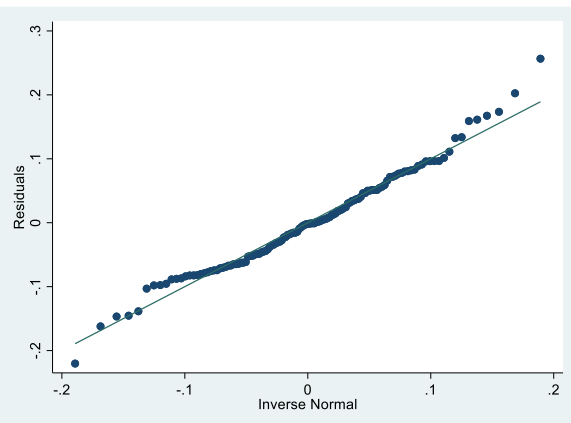


Figure 5: Q-Q-plot



A normal distribution of the residuals is indicated by the linear pattern in both the normal probability plot and the Q-Q plot, whereas the normal probability plot is sensitive to reduced normality in the middle of the data set, while the Q-Q plot is sensitive to reduced normality in the tail ends of the plot. Both graphs show some sign of a non-linear distribution, but these are so small that it is most likely safe to claim that the residuals are normally distributed. To confirm this, the Shapiro-Wilk W-test is also conducted on the residuals. The test has a null hypothesis that the residual spread, denoted r , is normally distributed. The result of the test is shown in table 5 below.

Table 5: Shapiro-Wilk W test

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
residual	326	0.98435	1.570	1.013	0.15549

As table 5 shows, the hypothesis is not significant and can therefore not be rejected. The result of these tests clearly indicates that the residuals are normally distributed.

5.2.2 Homoskedasticity

To test if the assumption of homoskedasticity holds a Breusch-Pagan test is conducted. The method tests the null hypothesis that there is constant variance in the error term, and as figure 4 shows the null hypothesis is rejected for the test, and homoskedasticity can therefore be assumed

Figure 4: Breusch-Pagan test for heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of MAR

chi2(1) = 13.25

Prob > chi2 = 0.1951

5.2.3 Multicollinearity

If two or more independent variables are highly correlated with each other, the estimates of the regression model become unstable, and the standard deviation of the estimated coefficients can be blown out of proportion. A common method of testing for multicollinearity is by estimating the variance inflation factor (VIF). The rule of thumb for this method is at any variable with a VIF-value above 10 or a 1/VIF-value below 0.1 requires further examination. The result of this test is presented in table 6.

Table 6: VIF-test

	VIF	1/VIF
MC	2.081	.48
CCI	1.761	.568
BI	1.687	.593
DUO	1.59	.629
NC	1.575	.635
AC	1.516	.66
LNASSETS	1.489	.671
BS	1.44	.695
INTOWNERSHIP	1.306	.765
GD	1.292	.774
	1.287	.777
INTERNATIONAL		
RANK	1.268	.788
LNAGE	1.252	.799
EXTOWNERSHIP	1.168	.856
PRICING	1.164	.859
TECH	1.139	.878
INTERLOCKING	1.133	.883
Mean VIF	1.421	.

As is clear from the table, there are no indications of multicollinearity among the variables.

5.2.4 Model specification

Model specification errors can occur when relevant variables are omitted, or irrelevant variables are included in the model. In cases where relevant variables are omitted from the model, their variance can be included in the estimated coefficients of included variables. And when irrelevant variables are included in the model, they can be attributed with the variance they share with other included variables. These forms of specification errors can have a large impact on the estimated regression coefficients. To test the specification of the model the thesis will use the Ramsay RESET-test, which tests the null hypothesis that the model has no omitted variables. The results from the RESET-test are presented in figure 5.

Figure 5: Ramsay RESET

Ramsey RESET test using powers of the fitted values of MAR

Ho: model has no omitted variables

$F(3, 224) = 16.26$

Prob > F = 0.5759

As figure 5 shows, the test is not significant and the hypothesis that the model is correctly specified can therefore not be rejected. It can therefore be assumed that the model that utilized in this study is specified correctly.

5.3 Regression results

In this section I will present and discuss the results from the regression. The first part of the section will present the results from the regression of the full sample of IPOs across the four countries and for each individual country. The second part of this subchapter will discuss the results of the regression in relation to the theoretical foundation and hypotheses previously presented.

5.3.1 Full sample

The result from regressing the full sample is shown in table 7. Initially, we see that the value of the F-statistic is 0.000, indicating that the overall model is significant at a 1 % level. The regression also has an adjusted R-squared of 0.174, indicating that the model explains 17.4 percent of the variance in the market adjusted return. The table shows the regression coefficients for each of the independent variables, with their value indicating the numeric relationship it has with the dependent variable. The significance level of the relationship between each independent variable and the market adjusted return is presented using asterixis next to the coefficient values. Additionally, the standard deviation of the coefficient values is presented in a parenthesis below.

Table 7: Regression output

VARIABLES	MAR
BS	-0.006*** (0.005)
GD	-0.004* (0.056)
BI	0.045** (0.043)
DUO	0.001* (0.001)
INTOWNERSHIP	0.023 (1.153)
EXTOWNERSHIP	-1.896 (2.566)
AC	-0.033** (0.018)
RC	0.003 (0.024)
NC	0.039 (0.030)
INTERLOCKING	0.001** (0.003)
LNASSETS	-0.004** (0.005)
LNAGE	0.018*** (0.008)
CCI	0.000 (0.001)
MC	0.002 (0.004)

PRICING	0.018
	(0.018)
RANK	0.037*
	(0.019)
TECH	0.011
	(0.024)
Constant	-0.024
	(0.065)
Observations	326
R-squared	0.331
Adj. R-squared	0.174
Prob > F	0.000

The regression output shows that the coefficient for the size of the board of directors is significant at a 1 % level and negative with a value of -0.006. This result tells us that an increase in board directors is correlated with a lower degree of underpricing. The coefficient for gender diversity is also negative, but only significant at a 10 % level. Board independence is significant at a 5 % significance level, and has a positive relationship with underpricing, indicating that an increase in independent board directors result in a higher degree of underpricing. CEO duality has a marginally positive relationship with underpricing of 0.001, indicating that firms with CEOs that also hold the role as chairman of the board is expected to experience a 0.1 % higher degree of underpricing. Of the three committee variables used in the regression, only the audit committee variable was within a 10 % significance level, having a negative relationship with underpricing of -0.033. Finally, interlocking has a positive relationship with underpricing of 0.1 % as well, with the regression result being significant at a 5 % significance level.

6. Discussion of results

In this chapter I will discuss the empirical results from the regression in relation to the theoretical foundation and hypothesis presented previously. The chapter begins by discussing the results from each of the variables tested. It will then move on to discuss the

6.1.1 Board size

The hypothesis for the regression of board size was that it would have a relationship with underpricing, and the results is therefore in line with this. The hypothesis did not specify the direction of the relationship, as neither the literature or previous empirical research showed any direction clearly. The negative relationship for the full sample is very marginal with a coefficient value of -0.006, indicating that an increase of one director reduces underpricing with 0.6 %.

The ambiguity of the relationship is further confirmed by looking at the regression results from the individual countries, where Norway and Finland have highly significant negative coefficient values, Sweden has a significant positive value, and Denmark has a negative but non-significant value.

There are many possible explanations for why the relationship between board size and underpricing is so inconclusive. In the context of information asymmetry theories, the board size might indicate an increased ability to monitor the firm's management and reduce agency costs. On the other hand, an increased number of directors might signal to

6.1.2 Gender diversity

The relationship between the number of female board members and underpricing is negative, indicating that an increase in female board members reduces the degree of underpricing. This result is in line with the theory and null hypothesis presented in the second chapter. The inclusion of female board directors might bring a different set of characteristics to the table, whereas women in general are believed to have inherent qualities that signal a reduction in agency costs, thus reducing the firms short-term underpricing.

This result is particularly interesting due to the Nordic countries status as among those leading the charge as more and more women enter the boardroom. The result from this study gives an indication on the sentiment among external investors towards an increase in female board members.

Looking at the different effects of increased female representation in the four countries provides some further insight into its relationship with underpricing.

6.1.3 Board independence

The result of the regression indicates that an increased proportion of external directors results in increased underpricing. This is not in accordance with the null hypothesis of this thesis and the empirical results from Bertoni et al. (2014). The results do however support the results from Certo et al. (2001a), Howton et al. (2001), and Filatotchev and Bishop (2002) who also found a positive relationship. They theorize that a higher proportion of independent directors' signal higher firm quality compared to a board with a lower proportion of independent directors, thereby increasing the amount of underpricing.

6.1.4 Director ownership

The percentage amount of ownership was calculated for both internal and external directors, with the expected results being that increased share ownership would further align the interests of the board members with the shareholders, thereby reducing the degree of underpricing occurring. Unfortunately, the regression results were not statistically significant for neither the full sample nor the individual countries. One interesting point that was observed when working with the data, was that the degree of share ownership among board members for IPO firms was very low compared to some of the other studies performed on the share ownership.

In the context of this thesis, a low share ownership percentage should not have a great deal to say for its effect on underpricing, as this number does not tell us much about how the wealth transfer that underpricing represents affects the board directors. A higher percentage share ownership does not necessarily entail a higher loss of wealth for a director.

6.1.5 CEO Duality

CEO duality has a slight positive relationship with underpricing. In the context of signalling theory, this is an expected result, as it might signal that the chairman of the board is more aligned with firm management than with investors.

6.1.6 Board committees

Among the three committee-variables, only the audit committee was statistically significant for the full sample regression, albeit only at a 5 % level. The results showed a negative relationship with underpricing, which is in line with the presented hypothesis. One of the reasons why the presence of an audit committee reduces underpricing might be because it is adding an additional board for monitoring both the board of directors and the firm management. The explanation for why the audit committee might have an effect on underpricing while neither the remuneration committee nor the nomination committee might not, can perhaps be found in the perceived nature of the committee. The audit committee might send a signal of responsible governance to investors, thereby requiring less underpricing.

6.1.7 Interlocking

For each increase in the average external board memberships among directors, underpricing increases by 0.1 %. Interlocking being positively related to underpricing might be due to external directorships signaling to investors that the firm is of high quality. In this case, it might also be the opposite, that high quality firms that afford to price themselves below market values also are those firms with many experienced directors.

7. Concluding remarks

Although IPO underpricing has been a much-researched subject, the relationship it has with the characteristics of the board of directors has yet to be exhaustively researched, and this is the first the subject has been researched in the context of the Nordic IPO market.

The goal of the thesis was to research whether certain characteristics of the board of directors had a relationship with short-term underpricing of underpricing in the context of information asymmetry theories, which revolves around the idea that underpricing can be partially explained as a product of uneven information between the players involved, which entails that underpricing can be affected by providing investors with information through so-called signals. The characteristics chosen for this research was the size of the board of directors, the proportion of female directors, the proportion of external directors, the external and internal share ownership, CEO duality, board committees, and the number of outside directorships. On the basis of information asymmetry theories and results from previous research, I developed hypotheses to be empirically tested.

By gathering and analysing data from 326 IPOs across the main exchanges of Norway, Sweden, Denmark, and Finland, I have found evidence that the characteristics of the board of directors do play a role in the degree of short-term underpricing of IPOs, although to a relatively small degree. In line with the established hypothesis, an increased number of directors resulted in less underpricing across the whole sample. However, analysing each individual market, the results were more ambiguous, with two of the markets having negative relationships, one having a positive relationship, and one being insignificant. This ambiguity is theorized to stem from the relationship being non-linear and concave with there being an optimal number of directors that signals the board's ability to both monitor management and communicate properly. Furthermore, an increase in female directors was related to reduced underpricing, perhaps due to it signalling improved monitoring capabilities to external investors, as women bring different characteristics to the corporate board. Board independence was found to have a positive relationship with underpricing, indicating that boards with a higher proportion of external directors have more underpricing than boards with a lower proportion, perhaps due to it signalling higher firm quality.

References

- Arthurs, J. D., Busenitz, L. W., Hoskisson, R. E. & Johnson, R. A. (2009). Signaling and initial public offerings: The use and impact of the lockup period. *Journal of Business Venturing*, 24(4), 360-372. <https://doi.org/10.1016/j.jbusvent.2008.02.004>
- Adams, R. & Ferreira, D. (2009). Women in the Boardroom and their Impact on Governance and Performance. *The Journal of Financial Economics*, 94(2), 291-309. DOI: 10.1016/j.jfineco.2008.10.007
- Aggarwal, R. K., Krigman, L., & Womack, K. L. (2001). Strategic IPO Underpricing, Information Momentum, and Lockup Expiration Selling. *Journal of Financial Economics*, 66(1), 105-137. DOI: 10.2139/ssrn.266956
- Agrawal, A & Knoeber, C. R. (1996). Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders. *Journal of Financial and Quantitative Analysis*, 31(3), 377-397. Link https://EconPapers.repec.org/RePEc:cup:jfinqa:v:31:y:1996:i:03:p:377-397_00
- Angrist, J. & Pischke, J. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. New Jersey: Princeton University Press.
- Allen, F. & Faulhaber, G. R. (1989). Signaling by underpricing in the IPO market. *Journal of Financial Economics*, 23(2), 303-323. DOI: [https://doi.org/10.1016/0304-405X\(89\)90060-3](https://doi.org/10.1016/0304-405X(89)90060-3)
- Mnif, A. (2009) Board of Directors and the Pricing of Initial Public Offerings (IPOs): Does the Existence of a Properly Structured Board Matter? Evidence from France. Retrieved from: https://www.researchgate.net/publication/41540280_BOARD_OF_DIRECTORS_AND_THE_PRICING_OF_INITIAL_PUBLIC_OFFERINGS_IPOS_DOES_THE_EXISTENCE_OF_A_PROPERLY_STRUCTURED_BOARD_MATTER_EVIDENCE_FROM_FRANCE/citations

-
- Arora, N & Singh, B. (2020). Corporate governance and underpricing of small and medium enterprises IPOs in India. *Corporate Governance*, 20(3), 503-525. DOI: 10.1108/CG-08-2019-0259
- Bathula H. (2008). Board characteristics and firm performance: evidence from New Zealand (Doctoral thesis). *Auckland University of Technology*. Auckland. Retrieved from <https://openrepository.aut.ac.nz/handle/10292/376>
- Baysinger, B. D. & Butler, H. N. (1985). Corporate Governance and the Board of Directors: Performance Effects of Changes in Board Composition, *Journal of Law, Economics, & Organization*, 1(1), 101-124. Retrieved from <https://www.jstor.org/stable/764908>
- Bernile, G., Bhagwat, V. & Yonker, S. (2018). Board diversity, firm risk, and corporate policies. *Journal of Financial Economics*, 127(3), 588-612. <https://doi.org/10.1016/j.jfineco.2017.12.009>
- Bertoni, F., Meoli, M. & Vismara, S. (2014). Board Independence, Ownership Structure and the Valuation of IPOs in Continental Europe. *Corporate Governance an International Review*, 22(2), 116-131. DOI: 10.1111/corg.12051
- Bhagat, S. & Bolton, B. (2008). Corporate governance and firm performance. *Journal of Corporate Finance*, 14(3), 257-273. <https://doi.org/10.1016/j.jcorpfin.2008.03.006>
- D. Bilimoria. (2000). Building the Business Case for Women Corporate Directors. In: R. Burke and M. Mattis, Eds., *Women on Corporate Boards of Directors*, Kluwer Academic, Norwell, 2000, pp. 25-40.
- Brennan, M. J. & Franks, J. (1997). Underpricing, Ownership and Control in Initial Public Offerings of Equity Securities in the UK. *Journal of Financial Economics*, 45(3), 391. [https://doi.org/10.1016/S0304-405X\(97\)00022-6](https://doi.org/10.1016/S0304-405X(97)00022-6)
- Brickley, J. A., Coles, J. L. & Terry, R. L. (1994). Outside directors and the adoption of poison pills. *Journal of Financial Economics*, 35(3), 371-390. [https://doi.org/10.1016/0304-405X\(94\)90038-8](https://doi.org/10.1016/0304-405X(94)90038-8)
- Brown, D. A. H., Brown, D. L. & Anastasopoulos, V. (2002). Women on Boards: Not Just the Right Thing... But the “Bright” Thing. *Report (Conference Board of Canada)*.

- Booth, J. & Chua, L. (1996). Ownership dispersion, costly information, and IPO underpricing. *Journal of Financial Economics*, 41(2), 291-310. [https://doi.org/10.1016/0304-405X\(95\)00862-9](https://doi.org/10.1016/0304-405X(95)00862-9)
- Booth, J. R. & Smith, R. L. (1986). Capital raising, underwriting and the certification hypothesis. *Journal of Financial Economics*, 15(1-2), 261-281. [https://doi.org/10.1016/0304-405X\(86\)90057-7](https://doi.org/10.1016/0304-405X(86)90057-7)
- Byrd, J. W. & Hickman, K. A. (1992). Do outside directors monitor managers?: Evidence from tender offer bids. *Journal of Financial Economics*, 32(2), 195-221. [https://doi.org/10.1016/0304-405X\(92\)90018-S](https://doi.org/10.1016/0304-405X(92)90018-S)
- Bøhren, Ø. & Strøm, R. Ø. (2007). Aligned, Informed, and Decisive: Characteristics of Value-Creating Boards. SSRN Electronic Journal. DOI: 10.2139/ssrn.966407
- Carter, D. A., Simkins, B. J. & Simpson, W. G. (2003). Corporate Governance, Board Diversity, and Firm Performance. *Financial Review*, 38(1), 33-35. DOI: 10.1111/1540-6288.00034
- Certo, T., Daily, C. M. & Dalton, D. (2001). Signaling Firm Value Through Board Structure: An Investigation of Initial Public Offerings. *Entrepreneurship Theory and Practice*, 26(2). DOI: 10.1177/104225870102600202
- Chahine, S. & Filatotchev, I. (2008). The Effects of Information Disclosure and Board Independence on IPO Discount. *Journal of Small Business Management*, 46(2), 219-241. DOI: 10.1111/j.1540-627X.2008.00241.x
- Christensen, J., Kent, P. & Stewart, J. (2010). Corporate Governance and Company Performance in Australia. *Australian Accounting Review*, 20(4), 372-386. <https://doi.org/10.1111/j.1835-2561.2010.00108.x>
- Cohen, B. D. & Dean, T. J. (2005). Information asymmetry and investor valuation of IPOs: top management team legitimacy as a capital market signal. *Strategic Management Journal*, 26(7), 683-690. <https://doi.org/10.1002/smj.463>
- Coles, J. L., Naveen, D. D. & Naveen, L. (2008). Boards: Does One Size Fit All?. *Journal of Financial Economics*, 87(2), 329-356. DOI: 10.1016/j.jfineco.2006.08.008

-
- Connelly, J. T. & Limpaphayom, P. (2004). Board Characteristics and Firm Performance: Evidence from the Life Insurance Industry in Thailand. *Chulalongkorn Journal of Economics*, 16(2), 101-124.
- Daily, C.M., Dalton, D.R. and Cannella, A.A. (2003). Corporate Governance: Decades of Dialogue and Data. *Academy of Management Review*, 28(3), 371-382. <https://doi.org/10.2307/30040727>
- Darmadi, S. & Gunwan, R. (2013). Underpricing, Board Structure, and Ownership: An Empirical Examination of Indonesian IPO Firms. *Managerial Finance*, 39(2), 181-200. DOI: 10.2139/ssrn.2034623
- Dechow, P. M., Sloan R. G. & Sweeney, A. P. (1996). Causes and Consequences of Earnings Manipulation: An Analysis of Firms Subject to Enforcement Actions by the SEC. *Contemporary Accounting Research*, 13(1), 1-36. <https://doi.org/10.1111/j.1911-3846.1996.tb00489.x>
- Dehaene, A., de Vuyst, V., & Ooghe, H. (2001). Corporate performance and board structure in Belgian companies. *Long Range Planning: International Journal of Strategic Management*, 34(3), 383–398. [https://doi.org/10.1016/S0024-6301\(01\)00045-0](https://doi.org/10.1016/S0024-6301(01)00045-0)
- Dezsö, C. L. & Ross, D. G. (2012). Does female representation in top management improve firm performance? A panel data investigation. *Strategic Management Journal*, 33(9), 1072-1089. <https://doi.org/10.1002/smj.1955>
- Dolvin, S. D. & Kirby, J. E. (2016). The Impact of Board Structure on IPO Underpricing. *The Journal of Private Equity Spring 2016*, 19(2) 15-21. DOI: <https://doi.org/10.3905/jpe.2016.19.2.015>
- Eckbo, E. B. (Ed.). (2007). Handbook of Corporate Finance, Volume 1. Dartmouth, Tuck School of Business.
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *The Academy of Management Review*, 14(1), 57–74. <https://doi.org/10.2307/258191>
- Emilsen, N. H., Pedersen, K., Sættem, F. (1997). Børsintroduksjoner. *BETA Tidsskrift for Bedriftsøkonomi*, 11(1), 1-13

- Espenlaub, S. & Tonks, I. (1998). Post-IPO Directors' Sales and Reissuing Activity: An Empirical Test of IPO Signalling Models. *Journal of Business Finance & Accounting*, 25(9-10), 1037-1079. <https://doi.org/10.1111/1468-5957.00226>
- Fama, E. F. & Jensen, M. C. (1983). Agency Problems and Residual Claims. *Journal of Law & Economics*, 26(2), 327-349. Retrieved from <https://www.jstor.org/stable/725105>
- Field, L. C. & Karpoff, J. M. (2002). Takeover Defenses of IPO Firms. *Journal of Finance*, 57(5), 1857-1889. Retrieved from <https://www.jstor.org/stable/3094498>
- Field, L. C. & Lowry, M. (2009). Institutional versus Individual Investment in IPOs: The Importance of Firm Fundamentals. *The Journal of Financial and Quantitative Analysis*, 44(3), 489-516. Retrieved from <https://www.jstor.org/stable/40505935>
- Finkle, T. A. (1998). The Relationship Between Boards of Directors and Initial Public Offerings in the Biotechnology Industry. *Entrepreneurship Theory and Practice*, 22(3), 5-29. DOI: 10.1177/104225879802200301
- Fondas, N. & Sasselos, S. (2000). A different voice in the boardroom: How the presence of women directors affects board influence over management, Business and the Contemporary World. *Academy of Management Journal*, 34, 306-330.
- Gao, S., Meng, Q., Chan, J. Y. & Chan, K. C. (2018). Cognitive reference points, institutional investors' bid prices, and IPO pricing: Evidence from IPO auctions in China. *Journal of Financial Markets*, 38, 124-140. <https://doi.org/10.1016/j.finmar.2017.09.002>
- Gompers, P. A., Ishii, J. L. & Metrick, A. (2003). Corporate Governance and Equity Prices. *Quarterly Journal of Economics*, 118(1), 107-155. <http://dx.doi.org/10.2139/ssrn.278920>
- Goyal, V. & Park, C. W. (2002). Board Leadership Structure and CEO turnover. *Journal of Corporate Finance*, 8(1), 46-66. [https://doi.org/10.1016/S0929-1199\(01\)00028-1](https://doi.org/10.1016/S0929-1199(01)00028-1)
- Tanjung, G., Juni, H., Subing, T. & Lestari, W. (2019). Corporate Governance Mechanism, Underwriter Reputation and IPOs Underpricing: Evidence from Indonesia Capital Market. *International Journal of Innovation, Creativity and Change*, 6(5), 45-58.

Retrieved from
https://www.researchgate.net/publication/348936831_Corporate_Governance_Mechanism_Underwriter_Reputation_and_IPOs_Underpricing_Evidence_from_Indonesia_Capital_Market

Hawkins, J. (1997) Why investors push for strong corporate boards. *McKinsey Quarterly*, 3, 144-148. Retrieved from
<https://go.gale.com/ps/anonymous?id=GALE%7CA20341547&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=00475394&p=AONE&sw=w>

Handa, R. & Singh, B. (2015). Women directors and IPO underpricing: Evidence from Indian markets. *Gender in Management: An International Journal*, 30(3), 186–205. DOI: 10.1108/GM-02-2014-0011

Hearn, B. A. (2011). The Impact of Board Governance on Director Compensation in West African IPO Firms. *Research in International Business and Finance*, 28(1), 82-104. DOI: 10.2139/ssrn.1938728

Hendry, K. P. & Kiel, G. C. (2004). The Role of the Board in Firm Strategy: Integrating Agency and Organisational Control Perspectives. *Corporate Governance an International Review*, 12(4), 500-520. DOI: 10.1111/j.1467-8683.2004.00390.x

Helwege, J. & Liang, N. (2004). Initial public offerings in hot and cold markets. *Journal of Financial and Quantitative Analysis*, 39(3), 541-569. DOI: <https://doi.org/10.1017/S0022109000004026>

Hermalin, B. E. & Weibach, M. S. (1998). Endogenously Chosen Boards of Directors and Their Monitoring of the CEO. *The American Economic Review*, 88(1), 96-118. Retrieved from <https://www.jstor.org/stable/116820>

Hidayat, A. W. & Kusumastuti, R. (2015). The Influence of Corporate Governance Structure towards Underpricing. *Bisnis & Birokrasi Journal*, 21(2), 90-96. DOI: 10.20476/jbb.v21i2.4321

Hiner, O. S. (1967). The Size of Company Boards. *Management International Review*, 7(4-5), 69–81. Retrieved from <https://www.jstor.org/stable/40226923>

- Hillman, A.J., Cannella, A.A. & Paetzold, R.L. (2000). The Resource Dependence Role of Corporate Directors: Strategic Adaptation of Board Composition in Response to Environmental Change. *Journal of Management Studies*, 37(2), 235-256. <https://doi.org/10.1111/1467-6486.00179>
- Howton, S. D., Howton, S. W. & Olson, G. T. (2001). Board ownership and IPO returns. *Journal of Economics and Finance*, 25(1), 100–114. <https://doi.org/10.1007/BF02759689>
- Hung, H. (1998). A typology of the theories of the roles of governing boards. *Corporate Governance*, 6(2), 101-111. <https://doi.org/10.1111/1467-8683.00089>
- Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of Financial Economics*, 2(3), 235-272. [https://doi.org/10.1016/0304-405X\(75\)90015-X](https://doi.org/10.1016/0304-405X(75)90015-X)
- Ibbotson, R. G. & Jaffe, J. F. (1975). "Hot Issue" Markets. *The Journal of Finance*, 30(4), 1027-1042. <https://doi.org/10.1111/j.1540-6261.1975.tb01019.x>
- Ingley, C. & Van der Walt, N. T. (2001). The Strategic Board: The Changing Role of Directors in Developing and Maintaining Corporate Capability. *Corporate Governance: An International Review*, 9(3), 174-185. DOI: 10.1111/1467-8683.00245
- Jain, B. A. & Kini, O. (1994). The Post-Issue Operating Performance of IPO Firms. *The Journal of Finance*, 49(5), 1699-1726. <https://doi.org/10.1111/j.1540-6261.1994.tb04778.x>
- Jakobsen, J. B. & Sørensen, O. (2001). Decomposing and Testing Long-term Returns: An Application on Danish IPOs. *European Financial Management*, 7(3), 393-417. <https://doi.org/10.1111/1468-036X.00162>
- Jenkinson, T. & Ljungqvist, A. P. (2001). *Going Public: The Theory and Evidence on How Companies Raise Equity Finance*, Second Edition Oxford: Oxford University Press.
- Jensen, M. C. & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)

-
- Johnson, J. L., Daily, C. M. & Ellstrand, A. E. (1996). Boards of Directors: A Review and Research Agenda. *Journal of Management*, 22(3), 409-438. [https://doi.org/10.1016/S0149-2063\(96\)90031-8](https://doi.org/10.1016/S0149-2063(96)90031-8)
- Johnston, J. & Madura, J. (2009). The Pricing of IPOs Post-Sarbanes-Oxley. *The Financial Review*, 44(2), 291-310. <https://doi.org/10.1111/j.1540-6288.2009.00219.x>
- Joy, L., Carter, N. M., Wagner, H. M. & Narayanan. S. (2007). The Bottom Line: Corporate performance and women's representation on boards. Catalyst. Retrieved from <https://www.catalyst.org/research/the-bottom-line-corporate-performance-and-womens-representation-on-boards/>
- Katz, D. A. & McIntosh, L. A. (2016). Gender Diversity on Boards: The Future Is Almost Here. *The New York Law Journal*. Retrieved from <https://corpgov.law.harvard.edu/2016/03/25/gender-diversity-on-boards-the-future-is-almost-here/>
- Keloharju, M. (1993). The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland. *Journal of Financial Economics*, 34(2), 251-277. [https://doi.org/10.1016/0304-405X\(93\)90020-C](https://doi.org/10.1016/0304-405X(93)90020-C)
- Kemp, S. (2006). In the driver's seat or rubber stamp? The role of the board in providing strategic guidance in Australian boardrooms. *Management Decision*, 44(1), 56-73. DOI: 10.1108/00251740610641463
- Kim, N. (2015). Tests Based on Skewness and Kurtosis for Multivariate Normality. *Communications for Statistical Applications and Methods*, 22(4), 361-375. DOI: 10.5351/CSAM.2015.22.4.361
- Lang, M. H. & Lundholm, R. J. (2000). Voluntary Disclosure and Equity Offerings: Reducing Information Asymmetry or Hying the Stock? *Contemporary Accounting Research* 17(4), 623-662. DOI: 10.1506/9N45-F0JX-AXVW-LBWJ
- Lawless, R. M., Ferris, S. P. & Bacon, B. (1998). The Influence of Legal Liability on Corporate Financial Signaling. *Journal of Corporation Law*, 23(2), 209-243. Retrieved from <https://ssrn.com/abstract=2309638>

- Leeland, H. E. & Pyle, D. H. (1977). Informational Asymmetries, Financial Structure, and Financial Intermediation. *The Journal of Finance*, 32(2), 371-387. <https://doi.org/10.2307/2326770>
- Li, L. & Naughton, T. (2007). Going Public with Good Governance: evidence from China. *Corporate Governance: An International Review*, 15(6), 1190-1202. <https://doi.org/10.1111/j.1467-8683.2007.00640.x>
- Ljungqvist, A. (2004). In Eckbo, E. B. (Ed.), *IPO Underpricing: A Survey. Handbook in Corporate Finance: Empirical Corporate Finance* (375-422). Dartmouth, Tuck School of Business.
- Ljungqvist, A. (2007). In Eckbo, E. B. (Ed.), *IPO Underpricing: A Survey. Handbook in Corporate Finance: Empirical Corporate Finance* (375-422). Dartmouth, Tuck School of Business.
- Ljungqvist, A., Jenkinson, T. & Wilhelm, W. J. (2003). Global Integration in Primary Equity Markets: The Role of U.S. Banks and U.S. Investors. *Review of Financial Studies*, 16(1), 63-99. Retrieved from https://econpapers.repec.org/article/ouprfinst/v_3a16_3ay_3a2003_3ai_3a1_3ap_3a63-99.htm
- Logue, D. (1973) On the Pricing of Unseasoned Equity Issues: 1965-1969. *Journal of Financial and Quantitative Analysis*, 8(1), 91-103. <http://dx.doi.org/10.2307/2329751>
- Loughran, T. & Ritter, J. (2002). Why Has IPO Underpricing Changed over Time?. *Financial Management*, 33(3), 5-37. Retrieved from <https://www.jstor.org/stable/3666262>
- Loughran, T., Ritter, J. & Rydqvist, K. (2021). Initial public offerings: International insights. *Pacific-Basin Finance Journal*, 2, 165-199). Retrieved from <https://site.warrington.ufl.edu/ritter/files/International.pdf>
- Wigglesworth, M. (2021, 09.03). Rise of the retail army: the amateur traders transforming markets. *Financial Times*.

-
- Mary, A. C. (2005). The Relationship Between Chief Executive Officer Duality and Subsequent Corporate Financial Performance. Working Paper, Capella University. Matsa & Miller.
- McBain, M. L. & Krause, D. S. (1989). Going public: The impact of insiders' holdings on the price of initial public offerings. *Journal of Business Venturing*, 4(6) 419-428. [https://doi.org/10.1016/0883-9026\(89\)90011-6](https://doi.org/10.1016/0883-9026(89)90011-6)
- McIntyre, M. L., Murphy, S. A. & Mitchell, P. (2007). The Top Team: Examining Board Composition and Firm Performance. *Corporate Governance International Journal of Business in Society*, 7(5), 547-561. DOI: 10.1108/14720700710827149
- Merendino, A. & Melville, R. (2019). The Board of Directors and Firm Performance: Empirical Evidence from Listed Companies. *Corporate Governance International Journal of Business in Society*, 19(3), 508-551. DOI: 10.1108/CG-06-2018-0211
- Miller, R. E. & Reilly, F. K. (1987). An examination of mispricing, returns, and uncertainty for initial public offerings. *Financial Management*, 16(2), 33-38. <https://doi.org/10.2307/3666001>
- Muth, M. & Donaldson, L. (1998). Stewardship Theory and Board Structure: A Contingency Approach. *Corporate Governance: An International Review*, 6(1), 2-28. <https://doi.org/10.1111/1467-8683.00076>
- Pagano, M., Panetta, F. & Zingales, L. (1998). Why Do Companies Go Public? An Empirical Analysis. *The Journal of Finance*, 53(1), 27-64. <https://doi.org/10.1111/0022-1082.25448>
- Navarro, A. I. & Gallo, A. (2014). The Female CEO in Developing Countries' Firms. <http://dx.doi.org/10.2139/ssrn.2405558>
- Peng, M. W., Buck, T. & Filatotchev, I. (2003). Do outside directors and new managers help improve firm performance? An exploratory study in Russian privatization. *Journal of World Business*, 38(4), 348-360. <https://doi.org/10.1016/j.jwb.2003.08.020>
- Perryman, A. A., Fernando, G. D. & Tripathy, A. (2016). Do gender differences persist? An examination of gender diversity on firm performance, risk, and executive

- compensation. *Journal of Business Research*, 69(2), 579-586. DOI: 10.1016/j.jbusres.2015.05.013
- Post, C. & Byron, K. (2015). Women on Boards and Firm Financial Performance: A Meta-Analysis. *The Academy of Management Journal*, 58(5), 1546-1571. DOI: 10.5465/amj.2013.0319
- Pucheta-Martinez, M. C. & Gallego-Alvarez, I. (2019). An international approach of the relationship between board attributes and the disclosure of corporate social responsibility issues. *Corporate Social Responsibility and Environmental Management*, 26(3), 612-627. DOI: 10.1002/csr.1707
- Rau, P. R., Sandvik, J. & Vermaelen, T. (2021). Are Women Underpriced? Board Gender Diversity and IPO Performance. *INSEAD Working Paper No. 2021/05/FIN*. Retrieved from <https://dx.doi.org/10.2139/ssrn.3783771>
- Reilly, F. K. & Hatfield, K. (1969). Investor Experience with New Stock Issues. *Financial Analyst Journal*, 25(5), 73-80. Retrieved from <https://www.jstor.org/stable/4470582>
- Ritter, J. (1998). Initial Public Offerings. *Contemporary Finance Digest*, 2(1), 5-30. Retrieved from https://www.researchgate.net/publication/284772074_Initial_public_offerings
- Ritter, J. & Welch, I. (2002). A Review of IPO Activity, Pricing, and Allocations. *The Journal of Finance*, 57(4), 1795-1828. DOI: 10.1111/1540-6261.00478
- Roberts, J., McNulty, J. & Stiles, P. (2005). Beyond Agency Conceptions of the Work of the Non-Executive Director: Creating Accountability in the Boardroom. *British Journal of Management*, 16(1), 5-26. <https://doi.org/10.1111/j.1467-8551.2005.00444.x>
- Rock, K. (1986). Why new issues are underpriced. *Journal of Financial Economics*, 15(1-2), 187-212. [https://doi.org/10.1016/0304-405X\(86\)90054-1](https://doi.org/10.1016/0304-405X(86)90054-1)
- Rosenstein, S. & Wyatt, J. G. (1990). Outside directors, board independence, and shareholder wealth. *Journal of Financial Economics*, 26(2), 175-191. [https://doi.org/10.1016/0304-405X\(90\)90002-H](https://doi.org/10.1016/0304-405X(90)90002-H)

-
- Schleifer, A. & Vishny, R. W. (1997). A Survey of Corporate Governance. *The Journal of Finance*, 52(2), 737-783. <https://doi.org/10.1111/j.1540-6261.1997.tb04820.x>
- Schuster, J. A. (2003). IPOs: insights from seven European countries. *Working Paper*, London School of Economics. Retrieved from <https://ideas.repec.org/p/ehl/lserod/24860.html>
- Schwartz-Ziv, M. (2013). Does the Gender of Directors Matter?. *Edmond J. Safra Working Papers*, 8. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2257867
- Setiawan, D., Prabowo, M. A., Trinugroho, I. & Noordin, B. A. A. (2021). Board of Commissioners' Structure, Ownership Retention, and IPO Underpricing: Evidence from Indonesia. *ETIKONOMI*, 20(1), 185-200. DOI: 10.15408/etk.v20i1.19156
- Singh, B. & Gupta, K. (2018). Relationship Between Directors Diversity and IPO Underpricing: Evidence from India. Retrieved from https://www.researchgate.net/publication/323969336_RELATIONSHIP_BETWEEN_DIRECTORS'_DIVERSITY_AND_IPO_UNDERPRICING_EVIDENCE_FROM_INDIA
- Singh, A. K., Maurya, S. & Mohapatra, A. K (2019). IPO Underpricing and Predictive Power of Board Related Corporate Governance Mechanisms: A Study of Indian IPO Market. *Theoretical Economic Letters*, 9(6), 2002-2018. DOI: 10.4236/tel.2019.96127
- Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics*, 87(3), 355-374. <https://doi.org/10.2307/1882010>
- Spencer Stuart. (2021, 07.02). Diversity. Retrieved from <https://www.spencerstuart.com/research-and-insight/nordic-board-index/diversity>
- Teti, E. & Montefusco, I. (2021). Corporate governance and IPO underpricing: evidence from the Italian market. *Journal of Management and Governance*. DOI: 10.1007/s10997-021-09563-z
- Thornton, B., Adams, M. & Hall, G. (2011). Do Underwriters Create

Value In The Determination Of The IPO Final Offering Price?" *Journal of*

Applied Business Research, 25(6), 41-51. <https://doi.org/10.19030/jabr.v25i6.990>

Thorsell, A. & Isaksson, A. (2014). Director Experience and the Performance of IPOs: Evidence from Sweden. *Australasian Accounting Business & Finance Journal* 8(1), 3-24. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2939594

Tinic, S. M. (1988) Anatomy of Initial Public Offerings of Common Stock. *Journal of Finance*, 4(3), 789-822. <https://doi.org/10.1111/j.1540-6261.1988.tb02606.x>

Tricker, R. I. (1984). Corporate Governance. *Strategic Management Journal*, 7(2), 187-188. <https://doi.org/10.1002/smj.4250070208>

Watson, W. E., Kumar, K. & Michaelsen, L. K. (1993). Cultural Diversity's Impact on Interaction Process and Performance: Comparing Homogeneous and Diverse Task Groups. *The Academy of Management Journal*, 36(3), 590-602. <https://doi.org/10.2307/256593>

Wooldridge, J. M. (2016). *Introductory Econometrics: A Modern Approach*, Sixth Edition. Texas: Southwestern University.

Woolley et al. (2010). Evidence for a Collective Intelligence Factor in the Performance of Human Groups. *Science*, 330(6004), 686-688. DOI: 10.1126/science.1193147

Yang, P., Riepe, J., Moser, K., Pull, K. & Terjesen, S. (2019), Women directors, firm performance, and firm risk: A causal perspective. *The Leadership Quarterly*, 30(5).

Yatim, P. (2011). Underpricing and board structures: An investigation of Malaysian initial public offerings (IPOs). *Asian Academy of Management Journal of Accounting and Finance*, 7(1), 73-93. Retrieved from <http://web.usm.my/journal/aamjaf/vol%207-1-2011/7-1-4.pdf>