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Opening the Black Box

An Analysis of how Underwriter Reputation,Venture Capital, and Offering Size influences Underwriting fees in Initial Public Offerings

By
Axel Jidorf
Mårten Liljeblad
Sebastian Hjorth
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Supervisor: Zahida Sarwary

Abstract

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Authors	Hjorth Sebastian, Jidorf Axel and Liljeblad Mårten
Supervisor	Sarwary, Zahida
Keywords	Initial Public Offering, Underwriting fee, IPO Gross Proceeds, Bookrunner, Nasdaq First North, Underwriter reputation, Venture capital, Offering size
Purpose	The purpose of this study is to examine how underwriter reputation, VC-backing and offering size affected the fees paid to underwriters on Nasdaq First North during the time period 01-01-2021 to 31-12-2021. In doing so, the study aims to contribute to a more comprehensive theoretical understanding of the entire cost image associated with going public.
Methodology	The authors decided to use a quantitative method and a deductive approach to conduct this study.
Theoretical perspectives	The study is conducted on the basis of previous research regarding underwriting fees, underwriter reputation, venture capital backing, offering size, and initial public offerings. This is combined with the agency, information asymmetry, certification hypothesis and hot market theories.
Empirical foundation	The empirical data consists of information derived from a sample size of 33 initial public offerings. Information was gathered through a web based self-completion questionnaire.
Conclusions	The results show that underwriter reputation has a positive significant correlation with and the offering size has a significant negative correlation to the fee paid to underwriters. Venture-capital backing was concluded not to have a significant effect on this fee. Our model was able to explain 49% of the variation in the underwriting fee.

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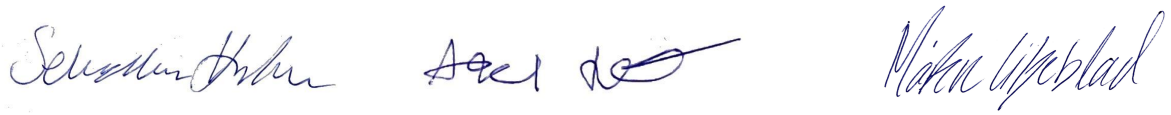

Sebastian Hjorth **Axel Jidorf** **Mårten Liljeblad**

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List of Definitions

Bookrunner:	Financial specialists hired by the issuing firm to conduct a valuation, set the offer price, lead the IPO process and provide the prospectus (synonym to underwriter).
Cornerstone investor:	Class of investors who commit to invest a fixed amount of capital, or for a fixed number of shares prior to the IPO.
Guarantor:	An entity guaranteeing that a specific amount of shares will be sold in the issue.
Guarantor commitment:	A form of guarantee in which external investors commit to purchase a certain fraction of the issue shares if the IPO is undersubscribed.
Initial public offering (“IPO”):	The process of offering shares of a private company to the public in a new stock issuance.
Issuing company (or issuer):	Defined as the company offering shares to the public in a new stock issuance.
IPO proceeds:	The gross proceeds raised from the IPO.
Reverse merger:	When a private company becomes public by acquiring a publicly listed company
Special purpose acquisition vehicle (“SPAC”):	Publicly traded shell company created for the purpose of acquiring or merging with an existing company
Underpricing:	The practice of listing IPOs at a price below its real value in the stock market.
Underwriter:	Synonym to bookrunner.
Underwriter fee:	The fee paid by the issuing firm to the underwriter as compensation for their services.
Venture capital:	Form of private equity and a type of financing that investors provide to start-up companies and small businesses.

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1. Introduction

1.1 Background

In recent years, an increasing number of companies have decided to go public. According to Guzman, Immordino, Proudian, Rubinstein and Vetterli (2022), the global IPO market experienced a record year in 2020 with 2,340 new issues raising $428.9 billion. The following year this record was broken again, as global IPO activity rose with 73% relative to 2020, excluding special purpose acquisition companies, or SPACs (Guzman, et al. 2022). Sweden's stock markets also broke new records during 2021, as the number of unique investors on the market rose to 2.7 million, which was an increase of 11% from the previous year (Euroclear, 2022). In addition, the market value of the Swedish market has more than doubled in value since 2016, reaching an all-time high valuation of 12.3 Trillion SEK by the end of 2021 (Euroclear, 2022). To add, a total of 141 billion SEK (See Appendix 1) was raised via initial public offerings during 2021 constituting an all time record. On Nasdaq's European markets, namely in Sweden, Denmark, Finland, Iceland and Balticum, a total of 174 IPOs and 6 SPAC IPOs took place during 2021 (Dagens Industri, 2022). Of these, 64% were introduced on Nasdaq's Swedish markets, which is believed to be the result of the small cap focus in Stockholm (Dagens Industri, 2022).

The rise of Special Purpose Acquisition Vehicles, or SPACs, characterised by lower costs, arguably indicate the importance of cost minimization to companies (Geiss, 2022; Klausner, Ohlrogge & Ruan, 2022; Bazerman & Patel, 2021). Approximately half of the IPO volume in the U.S. during 2020 constituted of SPAC IPOs (Geiss, 2022). Bazerman and Patel (2021) suggest that SPACs are advantageous to IPOs by enabling a faster process and providing higher valuations as well as are associated with lower fees, less dilution, fewer regulatory demands and more certainty and transparency.

Although having been argued by some to be a better way of going public than traditional IPOs, Klausner, Ohlrogge and Ruan (2022), found that SPACs are generally associated with higher costs than previously recognized. Their research suggests that investors experience a steep post-merger loss whereas the sponsors, i.e, underwriters, profit significantly. By drawing a parallel to the boom and fall of reversed mergers a decade ago, Naumovska (2021)

argues that SPACs are only experiencing a temporary upsurge. The argument put forward is the significant speed of the growth of SPACs together with negative media sentiment and regulatory concern. Additionally, she argues that it has not been uncommon for target firms in SPAC deals to have little to show in terms of business plan or revenue, which could lead to shareholder lawsuits. A statement that is aligned with Bazerman and Patel (2021), who argues that not all SPACs find high performing targets and will thus not always generate profits for investors.

According to industry professionals, the need for SPACs is larger in the U.S. compared to Sweden, as the process of going public in the U.S. is more costly and complicated (Almgren, 2021). Thus, given that the SPAC trend might only be temporary in Sweden, the widespread criticism of its usage, and its limited viability in a Swedish context, investigating the costs associated with the traditional method of going public is arguably more valuable. In addition, given current literature's focus on US markets, and the differences indicated by industry professionals (Almgren, 2021), there is a need to examine the Swedish market in order to assess the applicability of current theories on IPO costs.

Swedish companies can choose to go public on main markets or multilateral trading facilities (MTFs), often called junior stock markets. The two main markets are Nasdaq OMX Stockholm (referred to as "Nasdaq") and Nordic Growth Market Main Regulated (referred to as "Main Regulated"), and the three MTFs are First North Growth Market (referred to as "First North"), Spotlight Growth Market (referred to as "Spotlight") and Nordic Growth Market SME (referred to as "Nordic SME") (Lindahl, 2020). To be listed on these exchanges, issuing firms must fulfil some criteria, which are primarily set by the stock exchange's own regulatory framework (Lindahl, 2020). General criteria to be listed on any of these exchanges relates to free float (25% on main markets, and 10% on MTFs), ownership dispersal (i.e., minimum number of qualified owners to be satisfied) but also to be able to exhibit profit-earning capacity (Lindahl, 2020). However, the listing process with regards to going public on MTFs is associated with relatively less strict criteria to be fulfilled (Lindahl, 2020).

Due to the relative ease of going public on MTFs in comparison to main markets, it can be observed that a clear majority of new issues in Sweden has historically taken place on MTFs (Appendix 2). Out of these listings, it can be concluded that First North has been the most popular Swedish MTF (Appendix 3). When conducting research on junior stock markets,

Granier, Revest and Sapio (2019), discovered that First North attracted nearly as many new issuers as the largest and most attractive junior market at the time of the study, the Alternative Investment Market (AIM). Because of the less-regulated nature and the simpler listing process of junior stock markets (Granier, Revest and Sapio, 2019), it is primarily smaller companies that choose to go public on First North. Junior stock markets can be viewed as screening devices for promising companies that might qualify to main markets later on (Granier, Revest & Sapio, 2019). To go public is associated with considerable direct costs and Pagano, Panetta and Zingales (1998) argue that these expenses weigh relatively heavier on smaller companies as they do not increase proportionally with firm size. Therefore, the authors of this paper believe it is of importance and relevance to explore the direct costs of going public on First North in Sweden. As a consequence, the study investigates whether these differ from what have been concluded in previous literature based on larger IPOs on main markets in the U.S.

Direct costs constitute a significant portion of the costs associated with an IPO. Ritter (1987) found that the direct costs of an IPO amount to $250,000 plus 7% of the gross proceeds. This is significantly higher than the direct costs associated with SEOs (Smith, 1977). Out of the direct costs, the largest one is the underwriting fee (Ritter, 1987). The underwriting fee is unavoidable, as a certified financial advisor is a requirement to get listed, even on Nasdaq First North (Lindahl, 2020). The issuing company is thus in a dependency relationship with the underwriter, which puts them in a power disadvantage since the underwriter sets the underwriting fee (Binay, Gatchev & Pirinsky, 2007). It is therefore crucial for companies, and small ones in particular, to understand how they can affect the underwriting fee in order to succeed with a cost minimization strategy.

1.2 Problematisation

With increasingly high IPO activity on growth markets such as seen on First North, it can be inferred that smaller companies go public to larger extent than before. To acquire knowledge on how to cost-effectively go public is particularly important for smaller companies as they have limited amounts of capital to be spent on the process of going public. Additionally, cost minimisation strategies are arguably of relevance to small companies as going public on a junior market might in the future result in that they can qualify to main markets, seeing as junior markets function as screening devices for promising companies (Granier, Revest &

Sapio, 2019). It is therefore of interest to investigate factors that the companies actually can influence in order to make cost-minimising decisions. Historically, IPOs have been researched quite extensively. However, existing literature has been centred around underpricing of IPOs. This is supported by Ritter and Welch (2002) who state that particularly underpricing, patterns in issuing activity, and long-run underperformance have constituted the focal points in the recent literature. Paired with the fact that the majority of existing research has also been focused on regulated markets concerning primarily larger offerings than seen on First North (Koda & Yamada, 2018). There is therefore an apparent gap in literature for a study focused on the direct costs of IPOs and on smaller MTFs such as First North. To address this gap, the findings from existing literature on the underwriting fee, the largest cost of going public (Ritter, 1987), can be used to make predictions as to what factors tend to influence the underwriting fee.

One of the most researched factors is that of underwriter reputation. Based on research carried out by Dunbar (2000) and Corwin and Schultz (2005), it can be concluded that underwriters find it important to build a strong reputation in order to secure being hired for IPOs seeing as the IPO underwriter market is highly competitive. Not only does a strong reputation potentially lead to higher revenues as a result of more underwriting business (Dunbar, 2000), but it is also found that issuers tend to be willing, or in some instances even pressured, to hire a prestigious underwriter who are better positioned to ask for greater compensation relative to less prestigious underwriters (Alavi, Pham & Pham, 2008). Given that the companies listed on First North are smaller than on the main market, it is therefore of particular interest to see how the willingness to hire reputed underwriters with a more strained budget affects the underwriting fee.

Another factor previously investigated in literature is the presence of a venture capitalist in the issuing firm. Out of the 311 IPOs that were conducted in the US during 2021, 50% of the firms were VC-backed (Ritter, 2022). Since VC-backing was widespread in the US, we wanted to investigate whether the same applied on First North. Previous literature points to the monitoring role, the reputational stake, and the decrease of informational asymmetry between actors to explain why VC-backed firms pay lower underwriting fees than non-backed firms.

Lastly, a third factor highlighted in the literature and trending, in the U.S., all the way back to the beginning of the 20th century is the size of the offering. It implies that the larger the amount of proceeds raised the lower the underwriting costs as a fraction of proceeds will be, and firms will therefore experience economies of scale (Dimovski & Brooks, 2007). Since the offering size is set by the issuing firm together with the underwriter, it is of particular interest to determine its impact on the underwriting fee.

Since this thesis focuses on IPOs on a junior market in Sweden with smaller issues than seen on the main markets in the U.S., the authors believe there is a need to investigate whether the conclusions of previous research hold true in the particular context outlined in this thesis. This paper thus aims to contribute by existing literature through providing insights into the possible correlation between the underwriting fee with underwriter reputation, VC-involvement and size of offering on Nasdaq First North, and by doing so provide a framework for how companies going public on First North can decrease the largest direct cost of going public; the underwriting fees.

1.3 Research Aim and Objectives

The overarching aim of this report is to investigate common factors that influence the direct issue costs, especially those associated with fees paid to underwriters for smaller IPOs on MTFs. The thesis thus aims to outline the direct costs of going public for the sample size analysed, and investigate which factors that are the most significant. The data will be further analysed to determine whether the hypotheseses derived from the literature on the topic of informational asymmetry, reputational capital and economies of scale are of statistical significance, and subsequently discuss its implications on the direct costs when going public.

To achieve this aim, the objectives of this report can be outlined in three main stages: (1) formulation of a tentative theoretical framework for the factors that influences the fees paid by an issuing firm, (2) collecting applicable data from IPOs conducted on First North, and (3) matching the constructs of the tentative theoretical framework against the patterns in the empirical data, outlining where they coincide and where they differ, and from this concretize the implications of our results.

1.4 Research Purpose

The paper could provide insights regarding what factors affect the direct costs associated with going public. In doing so, the authors aim to assist small companies wanting to go public with a greater understanding of how several influenceable factors affect the direct costs associated with an IPO, thus in turn, potentially enabling them to make more well-informed decisions and minimise the direct costs associated with the IPO process. By examining the direct costs associated with going public, the gap in literature for such a study in a Swedish context is thus contributed to, providing a more comprehensive theoretical understanding of the entire cost image associated with going public on Nasdaq First North. The purpose of the study is therefore to examine how underwriter reputation, VC-backing and offering size affect the fees paid to underwriters on Nasdaq First North. In order to fulfil the aim, objectives and purpose of this study, the research question that this thesis addresses is:

How does underwriter reputation, venture capital involvement, and the size of the offering affect underwriting fees associated with initial public offerings on Nasdaq First North?

1.5 Thesis Outline

The thesis is structured into five sections. Following the introduction laid out in Chapter 1, Chapter 2 presents a literature review and theoretical framework. This chapter will dissect the associated costs with going public and define the underwriter fee. Here the agency principal theory will also be introduced and presented together with information asymmetry, the certification hypothesis and hot market theory. Thereafter, a conceptualization of the factors driving the underwriting costs will be defined and hypotheses will be formulated. In Chapter 3, the research approach and design, as well as the method for collecting data and for analysing the data will be described. In Chapter 4, the results from the survey will be analysed and the hypothesis will be statistically tested. Furthermore, in Chapter 5, the results will be analysed and discussed based on what has been found in previous research as well as by using the theoretical framework outlined in the literature review. Finally, in Chapter 6, the authors will conclude the analysis and discuss the theoretical and practical implications of this study. Here, limitations of the study and suggestions for future research will be presented as well.

2. Theoretical Framework & Literature Review

2.1 The Costs of Going Public

To be listed on a stock exchange presents several benefits to the priorly privately held company. Benefits such as new sources of funding, flexibility, greater access to capital, improved opportunities for additional funding, mergers, acquisitions and an enhanced public image (Tirole, 2006). These benefits can help the company secure new investors and talent as well as improve relationships with creditors and trading partners (Tirole, 2006; Aghamolla & Thakor, 2022). However, both the actual process of going public and to operate as a publicly listed company are associated with various expenses (Kaserer & Schiereck, 2007).

Kaserer and Schiereck (2007) argue that two different types of costs are incurred for the firm deciding to go public: the costs associated with being a listed company and the costs directly associated with the process of going public. The former largely relates to commitments of having to supply information to regulators and investors, which in addition to being a time-consuming and costly process also presents the risk of disclosing strategic information (Tirole, 2006). Further, these costs can also be separated into direct and indirect components.

According to Kaserer and Schiereck (2007), the most prominent indirect costs component is related to the impact of the equity valuation. Underpricing has been the focal point of many research articles on the topic of IPOs (Ritter & Welch, 2002), and is defined as the difference between the offer price and the closing price of a stock's first day of trading (Ibbotson, 1975). First-day returns are costly to issuers as it “results in a greater dilution of the original owner’s claims” (Dunbar, 2000, p. 7). However, as can be concluded from the findings of e.g. Ritter (1984) and Ibbotson (1975), IPOs are on average underpriced.

The direct costs incurred when going public have not been researched to the same degree as underpricing. Fees paid to underwriters and other sponsors constitute major items belonging to the direct costs (Kaserer & Schiereck, 2007). Moreover, besides the fees paid to the underwriter, other direct costs common to going public specifically on First North involve

fees paid to legal advisers, auditors, liquidity providers, investor relations advisors, Central Securities Depository, i.e. Euroclear Sweden, the Swedish Financial Supervisory Authority, advertising costs as well as compliance costs (Nasdaq, 2017). However, as previously stated, underwriter fees usually constitute the largest direct cost of going public (Ritter, 1987).

2.1.1 Underwriting Fee

Brooks (2016) describes the general role of underwriters considering IPOs on U.S. stock exchanges. He suggests that the process of going public is unfamiliar to most companies and that they therefore seek out to hire an underwriter, usually in the form of an investment bank. The investment bank helps guide the issuer through the selling process. This often includes assignments such as helping the firm set the IPO price, providing a prospectus, and advertising the sale of shares issued. Moreover, in order for the investment bank to confirm that the information published during the process is correct, they are required to conduct extensive due diligence. The consequences of failing with this due diligence can put the investment bank and the issuing company at risk for litigation following the listing (Brooks, 2016). The services provided by the investment bank come at a cost as they usually demand large compensation for undertaking the role as an underwriter (Brooks, 2016).

According to Brooks (2016), there are two types of underwriting compensation related to whether the best efforts arrangement or the firm commitment arrangement is used. The compensation used in the best efforts arrangement is based on the number of shares sold. Here, the underwriter commits to sell as many shares as possible in good faith, however, without guaranteeing that a specific amount will be sold. Alternatively, within the firm commitment arrangement the underwriter commits to purchasing all the unsold shares in case the IPO would be undersubscribed. In the firm commitment arrangement the underwriter is compensated based on the difference between the purchase price and the public offering price (Brooks, 2016). When comparing the two, it was found that IPOs using firm commitment arrangements were more expensive for the issuing company (Brooks, 2016).

In 2007, Finansinspektionen described the listing process and the general usage of underwriters in Sweden (D'Agostino, Hellgren, & Fröderberg, 2007). They state that the norm is to hire an underwriter, commonly referred to as bookrunner, to lead the IPO process. Bookrunners have an advising role and help issuing firms handle the administration of the transaction but are also involved in several other parts of the transaction. Examples of such

activities are examining the issuer through due diligence, producing analysis material, preparing a prospectus, marketing the offer through its distribution network, handling application forms and payment, giving proposals for allocation as well as ensuring that regulatory requirements are satisfied (D'Agostino, Hellgren, & Fröderberg, 2007).

D'Agostino, Hellgren & Fröderberg (2007) also discusses the notion of underpricing and the need for some issuers to let external parties guarantee their issue. Usually, the issuer completes the transaction without any problems. An IPO runs a greater chance of being fully subscribed when the capital market is favourable, and the issuer exhibits profitable and solid operations (D'Agostino, Hellgren & Fröderberg, 2007). However, the reverse situation may occur, which places higher demand on the issuer to sell the investment in a convincing manner. One way is to ensure a high safety margin, i.e. set a significantly lower price than what prevails in the market. In recent years, it has also become more common for the issuer to want to ensure that the issue is fully or partially subscribed. To assure oneself of this some form of guarantor for the offer is used (D'Agostino, Hellgren & Fröderberg, 2007; Tirole, 2006). This can for example be done by so-called guarantor commitments in which external guarantors commit to purchasing a certain fraction of the IPO shares if the issue is undersubscribed. These investors are usually high net worth individuals, i.e, private investors and are usually paid compensation based on the corresponding percentage of the issue that was guaranteed (D'Agostino, Hellgren & Fröderberg, 2007; Tirole, 2006).

How different bookrunners coordinate and handle these issue guarantees may differ seeing as some bookrunners will choose to be part of guaranteeing the issue themselves (D'Agostino, Hellgren & Fröderberg, 2007). In other words, it is not always the case that bookrunners are involved in guaranteeing Swedish IPOs. This is in line with the role of the underwriter in a U.S. context described by Brooks (2016). Conclusively, however, the use of so-called guarantor commitments appears to be a Swedish phenomen.

2.1.2 Cornerstone Investors

Another, relatively new, way of limiting risks associated with going public is by using so-called cornerstone investors. The number of cornerstone IPOs are increasing in Europe with issuing firms drawing inspiration from Asian equity market practices. They do so in order to avoid risks associated with the process of going public, as cornerstone investors help

guarantee that a proportion of shares will be sold (Tan & Ong, 2013). Tan and Ong (2013) describe cornerstone investors as a class of investors who commit to invest a fixed amount of capital, or for a fixed number of shares before the actual IPO takes place. McNaughton and Cole (2015) state that issuing firms may choose to use cornerstone investors as a means of increasing the chances of the IPO being fully subscribed as it limits the number of shares that need to be sold.

2.2 Theoretical Framework

The next subsection introduces the theories in which the study will be based on, namely the agency theory, information asymmetry, the certification hypothesis and hot market. These theories have been used in similar research trying to explain factors influencing the fee paid to underwriters.

2.2.1 Agency Theory

Principal agent problems are based on the agency theory introduced by Ross and Mitnick in 1973 (Mitnick, 2019). The problems arise in a relationship where one party (the agent) is acting on the behalf of another party (the principal). In such a relationship the agent is a representative for the principal and responsible for actions that are of value for the principal or somehow affect the principal's interests. The agent is consequently supposed to act in a way that is beneficial for the principal (Mitnick, 1975). However, an agent often has interests of its own. Consequently, if the interests of the principal and agent are not aligned there is cause for problems to arise.

A common principal-agent problem in the context of an IPO is that between the underwriter (the agent) and the issuer (the principal). The relationship between the underwriter and the issuer is a tertiary relationship meaning that the underwriter acts on the behalf of the issuer but with necessary involvement of third parties as well. The underwriter is in this circumstance performing an act that the issuer cannot do itself, which in this case can be described as an advisor with expert knowledge exceeding the capabilities of the issuer (Mitnick, 1975). Moreover, Jenksinson and Ljungqvist (2001), argue that the interests between the issuer and the investors can be contradictious. They explain that the issuer wants to raise as much capital as possible, whereas the investors want to buy shares at a bargain

price. Here, the underwriter has an intermediary role working to serve both the interests of the issuing firm as well as the interests of the investors (Jenkinson & Ljungqvist, 2001).

2.2.2 Information Asymmetry

Information asymmetry refers to the imbalance that arises whilst two parties with a disproportion of knowledge capital are negotiating. The side that possesses the superior knowledge or information will enjoy a competitive advantage. The higher the information asymmetry between the issuing firm and the underwriter the greater the opportunity for the underwriter to exploit their advantage. An underwriter can consequently favour their interest, but that is often at the expense of the issuing firm whose interests are negatively correlated with the underwriter, thus creating an increased agency cost (Baron, 1982; Jensen & Meckling, 1976). Agency costs also exist between venture capitalists and the issuing firm. In his Grandstanding theory, Gompers (1995) argues that venture capitalists polish their reputation by bringing companies to market at a rapid pace which they accomplish by setting the stock price at a low level resulting in that the share price significantly increases on the first day of trading. He also finds evidence that venture capitalists target early-stage firms that are not having as much experience or industries with a significant uncertainty which makes it easier for venture capitalists to extract influence by their expert industry knowledge (Gompers, 1995).

2.2.3 Certification Hypothesis

Coined by Booth and Smith (1986), the certification hypothesis is one of the instrumental theories in IPO literature. Drawing on the assumption of asymmetric information between shareholders of the issuing company and outsiders who are prospective subscribers of the issue, the theory states that reputable underwriters can credibly certify issuer quality to less informed investors since they put their reputations at stake when acting as certifiers (Booth & Smith 1986). Booth & Smith's (1986) theory thus relies on the use of reputational capital to ensure product quality.

The mechanism works because reputable underwriters set stricter evaluation standards to become insiders of the firms they certify, thus incurring higher costs (Chemmanur & Fulghieri, 1994). Furthermore, to hire a prestigious underwriter sends out a signal indicating that the quality of the underwriter chosen reveals private information about the issuer, hence,

lowering information asymmetry (Carter & Manaster, 1990). Conclusively, the theory hypothesises that underwriter compensation as a percent of issue proceeds will be a decreasing function of issue size, giving rise to economies of scale in underwriting (Booth & Smith, 1986).

Megginson and Weiss (1991) argue that the certification hypothesis is applicable on VC-backing as well. This will be discussed further under chapter 2.3 Formulation of hypotheses.

2.2.4 Hot Market

Ibbotson and Ritter (1995) proposes that companies tend to capitalise on the opportunity to raise money in hot markets, as the investors assume that a hot market entails a positive autocorrelation in the first day return of the IPO. In addition, they contend that because of the irrational nature of investors, if previous IPOs have risen in value, the purchase of expensive IPO shares amongst investors is intensified. Autocorrelation is thus created, resulting in a hot issue market (Loughran & Ritter, 1995).

According to Rock (1986), two types of investors exist on the stock market, well-informed and uninformed investors. Informed investors are professional and institutional investors that can value IPOs correctly. Uninformed investors cannot differentiate between underpriced and overpriced IPOs and therefore participate in the IPO regardless of its pricing. Rock (1986) goes on to emphasise that the presence of uninformed investors in IPOs is more significant during hot IPO markets.

2.3 Formulation of Hypotheses

There are many factors that can influence the underwriting fees a firm has to pay when going public. Based on previous research, the thesis will focus on three of the most recurrent factors: the perceived reputation of the underwriter (Corwin & Schultz, 2005; Dunbar, 2000; Carter & Manaster, 1990; Menyah & Paudyal, 2002; Chen & Ritter, 2000; Chen & Wang, 2016; Alavi, Pham & Pham, 2008; Fang, 2005), whether the issuing firm is backed by a venture capitalist (Barry, Muscarella, Peavy III, & Vetsuypens, 1990; Megginson & Weiss, 1991; Bartling & Park, 2007; Francis & Hasan, 2001) and the size of the offering (Altinkilic & Hansen, 2000; Dimovski & Brooks, 2007; Hansen & Torregrosa, 1992; Calomiris,

Himmelberg & Wachtel, 2000; Calomiris & Pornrojnangkool, 2009). Hypotheses will be formulated based on the literature presented in the following section.

2.3.1 Underwriter Reputation

Underwriters are provided with significant compensation from corporate finance activities such as the issuance of securities. There is particularly heavy competition amongst underwriters to procure new underwriting activities in the market for IPOs (Dunbar, 2000; Corwin & Schultz, 2005). Reasons put forward by Dunbar (2000) include the generally higher underwriting fees as a percentage of proceeds for IPOs relative to those obtained in seasoned equity offerings (SEOs) or in debt offerings. Additionally, he suggests that the investment bank hired as underwriter in an IPO is usually offered additional assignments related to subsequent offerings (Dunbar, 2000).

In the literature exploring a firm's choice of underwriter a recurrent theme is that of the underwriter's reputation. Corwin and Schultz (2005) determined that underwriters are more likely to be hired as underwriters if they have a reputation of offering good financial analyst coverage. Additionally, Dunbar (2000) put forward that an issuer generally considers factors such as the perceived quality of an underwriter, pricing and performance of previous offerings advised by the bank as well as research capabilities when determining the choice of underwriter.

Several researchers have found evidence of a positive relationship between the fee paid to the underwriter and its perceived status and quality (Carter & Manaster, 1990; Menyah & Paudyal, 2002; Chen & Wang, 2016). Menyah and Paudyal (2002), found a link between underwriter reputation and issue costs. According to their research, the quality of the sponsor, i.e. underwriter, affects the issue costs faced by the firm going public. Similarly, when researching IPOs of Chinese state-owned enterprises (SOEs) and non-state-owned enterprises (NSOEs), Chen and Wang (2016) found that the reputation of underwriters may result in reputational premiums. They discovered that whilst the underwriters' reputation did not seemingly affect underwriting fees in IPOs of SOEs, reputation of the underwriter was found to be positively correlated to fees considering IPOs of NSOEs.

That prestigious underwriters receive higher compensation can be explained by the notion that established and prestigious banks are positioned to demand higher fees as compensation for the rental of their reputation, whereas less reputed underwriters tend to lower their fees in order to attract more projects (Dunbar, 2000). Correspondingly, Chen and Ritter (2000) argue that because of how important analyst coverage is, issuers are often led to hire an underwriter, at least partly, based on attributes other than the fee paid. They suggest that underwriter reputation results in a hierarchy in which issuers choose to hire so-called "bulge-bracket" underwriters over less prestigious underwriters regardless if this is associated with paying a higher fee.

The findings of Alavi, Pham and Pham (2008) may further explain this connection between reputation and direct issue fees. They suggest that highly reputed underwriters' strong marketing- and bargaining power may put them in a situation in which they are able to demand higher fees compared to less established underwriters. This reasoning is based on the idea that prestigious underwriters may be better positioned to attract large new shareholders and that they might be able to pressure issuers to increase the size of their offering. They argue that, especially in cases where the issuing firm aims to raise a large amount of money in relation to its pre-money value, they may find themselves rather coerced to hire prestigious, and thus more expensive, underwriters.

Moreover, although investigating the relation between underwriters' reputation and the price and quality of underwriting of bonds, Fang's (2005) findings further constitutes evidence of the importance of reputation. According to Fang's research, a "[investment] bank's underwriting decisions reflect reputation concerns, and are thus informative of issue quality" (Fang, 2005, p. 2731). Furthermore, she states that economic rents are earned on reputation and that underwriters therefore are incentivized to maintain a good reputation. Similarly, Carter and Manaster (1990) found that prestigious underwriters aspire to maintain their reputational capital and will therefore avoid high risk issuers. This is in line with Beatty and Ritter (1986), who similarly discuss the notion that underwriters have reputational capital at stake.

As outlined above, previous literature on the topic of underwriters' perceived quality indicate that prestigious underwriters are able to demand higher fees relative to less prestigious

underwriters without being replaced by the issuing firm. Hence, the following hypothesis was formulated and researched:

> **Hypothesis 1**: The issuing firm will pay higher underwriting fees for a prestigious underwriter than for a non prestigious underwriter when going public on First North.

2.3.2 Venture Capital-Backed IPOs

One of the most influential works on the topic of venture capital's role in the process of going public is by Barry, Muscarella, Peavy III, and Vetsuypens (1990). They describe how venture capitalists take on monitoring roles and the implications on the price of the IPO. Through their study of 433 VC-backed IPOs, they identify that venture capitalists tend to make economically significant positions in their companies, as the aggregate holdings of venture capitalists amounted to 34% of the outstanding shares. They also point to the fact that a venture capitalist's expertise and experience in monitoring their investments can send valuable signals to potential investors. Furthermore, they found that VC-backed IPOs tend to use higher quality underwriters when going public as opposed to non-VC backed IPOs, and that this is consistent with the notion that higher quality underwriters are generally more willing to accept offers that have been extensively monitored.

Megginson and Weiss (1991) compared VC backed and non-VC backed firms through industry and offer size during 1983 and 1987. Not only did they find that VC-backed firms tend to go public earlier than non-backed firms, but also that on average, VC backed firms have lower underwriting spreads than non-VC backed firms. They argue that the backing of a VC can serve as a credible third party certification and outlines three criteria that are fulfilled by a VC. First, building on the certification hypothesis, VC fulfils the requirement of reputational capital at stake as a certifying agent, incentivizing them to value the issue accurately. Secondly, they fulfil the requirement of having a reputational capital that is greater than the largest possible one-time wealth transfer or side payment that could be received by certifying falsely. Lastly, it must come at a significant cost for the issuing firm to acquire the services of (lease the reputational capital of) the certifying agent, and the cost must be positively correlated with the scope and importance of the information asymmetry

concerning intrinsic firm value (Megginson & Weiss, 1991). These findings have since been validated by Francis and Hasan (2001).

Furthermore, Megginson and Weiss (1991) argue that VC-backed firms face less search costs for underwriters since the venture capitalist has likely been involved with other IPOs in the past. They therefore already have established connections with underwriters, auditors and institutional shareholders, and that consequently, parties can infer information about the IPO through their previous experiences with the venture capitalist. Provided that the venture capitalist wants to use their connections in a future IPO, the venture capitalist thus has their reputational capital at stake, and is therefore incentivised to release all information about the IPO honestly (Megginson & Weiss, 1991). Followingly, they predict that VC-backed firms should opt for higher quality underwriters and auditors since it helps maintain their reputation and lowers the due diligence costs. Conclusively, they contend that venture capitalists are able to lower the direct costs of going public by reducing the information asymmetry between the issuing firms and financial specialists such as underwriters, auditors and institutional investors (Megginson & Weiss, 1991). Francis and Hassan (2001) reached the same conclusions.

In a more recent study, Bartling and Park's (2007) findings support the claims of Megginson and Weiss (1991). Through their examination, they found that IPOs where the VC-backed firms are well informed are characterised by lower spreads, but face larger underpricing than less informed non VC-backed IPOs. The authors attribute the lower spread to Megginsons and Weiss' (1991) explanation that venture capitalists are experienced, repeat players with a lot of bargaining power, but point to the fact that this alone can not explain how higher underpricing can occur jointly with lower spread. Furthermore, by constructing a model based on a signalling game, they find that VC backed firms set pooling (concealing) spreads that hide their signal, but at these spreads banks set separating (revealing) prices. Conversely, non-VC backed firms cannot convey information through the spread, and thus choose spreads that induce banks to set high, risky pooling prices in equilibrium (Bartling & Park, 2007).

With previous literature clearly suggesting that VC-backed firms pay lower underwriting fees than non-backed firms, the following hypothesis was formulated and researched:

Hypothesis 2: Venture-backed firms going public on First North will pay lower underwriting fees compared to non-backed firms.

2.3.3 Size of the Offering

Another factor that is frequently mentioned in the literature regarding direct costs of raising capital is the influence that the size of the equity proceeds to be raised has. Dimovski and Brooks (2007) investigate factors that have an influence on direct costs of property trust IPOs through an analysis of IPOs in Australia between 1994 and 2004. Through conducting a regression analysis, they find support for economies of scale in the underwriting cost of the IPO equity raising process. The underwriting cost increases by 0.77% for every 1% increase of proceeds raised, showing that underwriting costs as a percentage of the IPO proceeds are diminishing as the offering size increases.

The evidence of higher underwriting costs of the proceeds raised for smaller issues trace back to the U.S. in the beginning of the 20th century (Calomiris and Raff, 1995 as cited in Calomiris and Tsoutsoura, 2016). The results of the study mentioned above by Dimovski and Brooks (2007) are supported by previous studies. Hansen and Torregrosa (1992), Ritter (1987), Calomiris, Himmelberg and Wachtel (2000), Altinkilic and Hansen (2000) and Calomiris and Pornrojnangkool (2009) all look at underwriting fees and how the size of the offering affects that cost. They all arrive at is that firms of smaller issuings pay a higher fraction of underwriting fees as a percentage of capital raised.

Altinkilic and Hansen (2000) imply that larger firms, which tend to raise larger amounts of capital, obtain lower monitoring, certification, and marketing costs compared to smaller firms, which tends to raise smaller offerings. This suggests that underwriter fees as a fraction of proceeds would appear to be decreasing as offering size increases. However, they suggest that it might not be the issue size that affects the underwriting fee. Instead, they argue that the issuer's quality and in-house expertise might be the more significant factor. They argue for this by saying that smaller firms are considered to have less expertise in-house and often seek less financial capital (in comparison to a bigger company) when going public (Altinkilic and Hansen 2000). But this is not always the case since the size of the offering is not always positively correlated with firm size. If it were to be true it is argued that smaller firms are

considered to be riskier and require greater marketing costs in underwriting which obviously results in higher total underwriting costs (Calomiris & Tsoutsoura, 2016).

With this in mind, the following hypothesis was formulated and researched:

> **Hypothesis 3:** The underwriting fee will decrease as the size of the offering increases.

2.4 Chapter summary

This chapter started by outlining the different costs associated with going public. Here, a detailed definition of the underwriter fee in a Swedish context was also presented. In addition, the notion of different forms of guarantees were discussed. Following this, a theoretical framework discussing the agency problem, information asymmetry concerning IPOs, the certification hypothesis and the notion of hot market were laid out. Lastly, some hypotheses regarding factors that have been found to affect the underwriting fee were formulated based on recent literature on the topic. These factors were the reputation of the underwriter, also referred to as bookrunner, whether the issuing firm was backed by a venture capital firm or not at the time of the IPO, and the size of the offering.

3. Methodology

3.1 Research Design

This thesis employs a deductive approach. According to Bryman, Bell and Harley (2019), deductive research studies deduce one or multiple hypotheses based on available research of a particular domain and on theoretical considerations relative to that domain. They argue that these hypotheses must then be subject to empirical scrutiny. In other words, theories and prior literature will guide the research in this thesis. To answer the research question and statistically test the hypotheses, a quantitative cross-sectional design is utilised. Cross-sectional design is a research design which implies that data is collected at a single point in time in connection with multiple variables on more than one case (Bryman, Bell & Harley, 2019). The data is then "examined to detect patterns of association" (Bryman, Bell & Harley, 2019, p. 59).

In this study, a self-completion survey was carried out seeking to collect data from the 96 companies that conducted an IPO on First North during 2021 regarding the following variables: underwriter reputation, venture capital involvement, and offering size. Since these variables are difficult or even impossible to manipulate, a cross-sectional research design is more suitable than, e.g., an experimental research design. Cross-sectional research is conducted in order to study connections between several variables but does not indicate anything about the cause behind these correlations (Bryman, Bell & Harley, 2019). Therefore, as a means of trying to explain and analyse the empirical findings presented in Chapter 4, the thesis will adopt a theoretical framework based on the agency theory, information asymmetry, certification hypothesis and hot market.

Prior to administering the self-completion questionnaire, a pilot study was conducted. According to Bryman, Bell and Harley (2019), it is always desirable to conduct a pilot study, if possible, especially concerning research based on a self-completion questionnaire since an interviewer will not be present to clarify and explain the questions. A pilot survey was sent out to three companies that went public on First North. These answers contributed to the construction of the survey by giving the authors valuable feedback on how to best formulate certain questions to ensure clarity and avoid misinterpretation. Bryman, Bell and Harley

(2019) suggest that pilot studies do not only ensure that the survey questions work well, but they also give an indication of how well the research instrument as a whole operates.

Moreover, hypothesis-testing studies based on self-completion surveys have advantages and disadvantages (Bryman, Bell & Harley, 2019). Whereas this format enables the authors to design tailored measures, some drawbacks include low level of control, possibility of low response rates, limited time frame to send out the survey, difficulty to establish casualty and difficulty to formulate measurement (Bryman, Bell & Harley, 2019). However, the difficulties of establishing causality and formulating measurement were minimised by using primarily numeric allocation questions by asking respondents to enter numeric values, such as SEK and percentages.

3.1.1 Questionnaire Design

The thesis uses an open-ended response questionnaire, with some exceptions for simple closed-ended yes/no questions (See Table 1 for the questions used in the web survey). Since the majority of the survey questions deal with numeric values (i.e., revenue, proceeds, underwriter fee, etc.), open-ended questions seemed more appropriate as it allows for more exact responses as opposed to giving the participants alternatives to choose from. An advantage with closed-ended questions is that respondents cannot easily misinterpret questions as they are provided with some alternatives (Bryman, Bell & Harley, 2019). However, since a pilot study was sent out and the terminology used in the survey questions was clearly defined, example answers were presented and respondents were instructed in what metric to answer (SEK, %, etc.), the risk for misinterpretation was believed to be minimal.

Before the respondents were asked to provide their answers to the survey questions, some general information about the purpose of the thesis was displayed and anonymity was clearly ensured. The questions in the web survey can be categorised into three segments: questions associated with the dependent variable, questions concerning the independent variables presented in the literature review, and questions related to control variables.

First the participants were asked to provide some general information about which industry they operate in, their size, measured by most recently reported full year revenue, and in what

year the company was founded. Following this, the respondents were asked some general questions about their IPO process, namely the total amount of capital raised in the IPO and the total direct costs paid in connection with the IPO.

Subsequently, some questions regarding the underwriter, referred to as bookrunner, were asked. The respondents were requested to indicate who they hired as bookrunner (open) and how much they paid for its services (open: in SEK). These questions will help base the dependent variable and the independent variable related to underwriter reputation.

Since not all IPOs are guaranteed, it was believed to be appropriate to break up the underwriting fee into two segments, one where the bookrunner guaranteed the issue, and the other where the bookrunner did not guarantee the issue. In other words, discern if the firm commitment arrangement or best efforts arrangement was used. The respondents were therefore asked to answer whether the IPO was guaranteed (alternative: “yes” or “no”). If the respondents indicated that the IPO was guaranteed, they were asked to specify the fraction of the issue that was guaranteed (open: in %) as well as the paid compensation to guarantors as a fraction of the guaranteed capital (open: in %). Additionally, respondents who answered “yes” to if the IPO was guaranteed were asked to indicate by what type of investor. By asking this question, the authors were provided with information about if the bookrunners also acted as guarantors (i.e, firm commitment arrangement) and whether companies choose to use other types of guarantors.

Finally, the respondents were asked to indicate how large the ownership stake of a venture capital firm was at the time of the IPO (open: in %), if a venture capitalist did not own any stake in the firm they were asked to indicate that by answering 0% to the question. The respondents were also told to answer whether other types of institutional investors had backed the company in the time leading up to the IPO and accordingly by who (open).

Table 1. Web Survey Questions and Connection to Variables

This table shows the questions asked in the web survey and how they relate to the variables the study aims to explore

Relevance	Web Survey Questions
Control Variable: Industry	1. *What industry does your company operate in?*
Control Variable: Firm size	2. *What were the company's revenues for the fiscal year 2020? (in SEK)*
Control Variable: Firm age	3. *In what year was the company founded?*
Independent Variable: Hypothesis 3	4. *What was the total value of the shares issued in the IPO, in SEK? (defined as IPO price multiplied by the number of IPO shares sold)*
Dependent Variable	5. *What were the total direct costs associated with the IPO, in SEK? (defined as the fees paid to underwriters, certified advisors, liquidity providers, legal advisers, auditors, investor relations advisors, Central Securities Depository [Euroclear Sweden], the Swedish Financial Supervisory Authority, advertising costs, compliance costs, as well as costs related to guaranteeing the issue)*
Independent Variable: Hypothesis 1	6. *What were the name/s of those who acted as bookrunner/s in the IPO? (defined as financial specialist guiding the issuer through the selling process by helping to determine the final offering price, producing a prospectus, ensuring that regulatory requirements are satisfied, and marketing the offering through its distribution network)*
Dependent Variable	7. *What were the fees paid to bookrunners in SEK?*
Dependent variable	8. *Was the IPO guaranteed? (were any actors involved in guaranteeing that a specific number of shares would be sold at the initial price and purchase agreed amount of shortage of shares if required)*
Dependent Variable	9. *If the issue was guaranteed, what percentage of the proceeds was guaranteed?*

Dependent Variable	*10. If the issue was guaranteed, what was the compensation to guarantors as a percentage of the capital guaranteed?*
Independent Variable: Hypothesis 1	*11. If the issue was guaranteed, indicate who guaranteed the issue. (please be specific; was it mainly the bookrunner/s, or were external guarantors used? Also indicate here if cornerstone investors were used]*
Independent Variable: Hypothesis 2	*12. Was the company backed by a venture capital firm at the time of the IPO? (please indicate 0% if no venture capitalist were involved at the time of the IPO)*
Control Variable: Other institutional backing	*13. Was the company backed by any other institutional investor (such as funds, investment companies, private equity firms, etc) at the time of the IPO? If yes, please indicate what type of investor.*

3.2 Variables

3.2.1 Dependent variable

This study's dependent variable is the underwriting fee firms face when going public. As previously explained, what constitutes the underwriting fee when a company goes public is not always as straightforward as indicated in the literature on IPOs (Kaserer & Schiereck, 2007; Tirole, 2006). Companies that choose to go public through IPO always hire a bookrunner but the bookrunner does not always help guarantee the offering (Brooks, 2016). Since the compensation differs between best efforts arrangements and firm commitment arrangements, the authors made sure to differentiate between eventual respondents that had used different methods, thus allowing for comparisons and a more accurate analysis.

Moreover, in order to make the underwriter fee comparable across IPOs of varying sizes, the underwriter fee will be presented and measured as a fraction of IPO proceeds, i.e., the gross proceeds raised in the IPO. This is a common metric to compare underwriting fees and was for example used in research carried out by Chen, Fok and Wang (2006) when comparing underwriter fees across different markets and national contexts. Thus, the definitions of the dependent variable that will be used on the analysis is:

$$Underwriter\ fee\ =\ \frac{fee\ paid\ to\ underwriter}{IPO\ proceeds}$$

Where:

$$IPO\ proceeds\ =\ Size\ of\ the\ offering\ =\ IPO\ price\ \times\ number\ of\ IPO\ shares$$

3.2.2 Independent variables

As the study aims to research how a company can minimise underwriting fees when going public, the independent variables are factors that are believed to influence the underwriting fee. These factors were the basis of the hypotheses put forward in the literature and theoretical review and will be statistically tested in Chapter 4.

3.2.2.1 Underwriter Reputation (Rep)

The first independent variable this study will examine is the reputation of the underwriter i.e., the reputation of the bookrunner. Based on prior IPO research, a hypothesis was formulated declaring that firms that hire highly reputed underwriters will face larger underwriting costs. Several researchers have developed proxies for underwriter reputation (Hansen, 2001; Carter, Dark & Singh, 1998; Booth & Chua, 1996). When examining the relationship between long-run performance of IPOs and the various proxies for underwriter reputation, Carter, Dark and Singh (1998), discuss three different proxies developed by Carter and Manaster (CM), Johnson and Miller (JM) and Megginson and Weiss (MW). They imply that the CM proxy is based on underwriters' relative placements in stock offering announcements. The JM proxy is merely an extension of the CM proxy classifying underwriters into four groups. Lastly, the MW proxy ranks underwriters based on their relative market share of total IPO proceeds (Carter, Dark & Singh, 1998). Due to the limited time frame and scope of the project, the MW measure will be the most appropriate since it is the least time consuming (Carter, Dark & Singh, 1998). In accordance with Megginson and Weiss (1991) bookrunners will be considered prestigious if they obtain a relative market share above 10%. Prestigious underwriters will be indicated with 1.00 and non-prestigious underwriters with 0.00. In instances when multiple underwriters, i.e. bookrunners, were hired, the study will focus on the highest ranked of these. The thesis will measure underwriter reputation in accordance with the proxy developed by Megginson and Weiss (1991):

$$Underwriter\ reputation\ (Rep)\ =\ \frac{amount\ of\ capital\ brought\ to\ market\ by\ underwriter}{total\ amount\ of\ capital\ brought\ to\ market}$$

3.2.2.2 Venture Capital Dummy (VC)

Secondly, based on previous research, the authors hypothesised that venture capital backed firms will face lower underwriting fees when going public. It was found by Megginson and Weiss (1991) that venture capitalists certify the offer for both underwriters and investors hence lowering the two most important fees when performing an IPO, underpricing and underwriter fees. The venture capital dummy is an indicator variable that equals 1.00 when an issuing firm had VC-backing and 0.00 otherwise. This proxy is in line with a similar Megginson and Weiss (1991) and Brau and Fawcett (2006).

3.2.2.3 Offering Size (Size)

Lastly, the authors argue that the size of the offering is negatively related to the dependent variable i.e., larger IPO offerings will accompany smaller underwriting costs as a fraction of IPO proceeds. This hypothesis is based on previous research and accounted for in section 2.3.3. The size of the offering variable will be presented in SEK and is measured in absolute terms as follows:

$$Offering\ size\ (Size)\ =\ number\ of\ IPO\ shares\ issued\ \times\ price\ per\ IPO\ share$$

3.2.3 Control variables

To account for additional factors that may influence the dependent variable, the authors decided to include four independent variables for control purposes in the model. These were (1) industry, (2) firm age, (3) firm size and (4) presence of institutional investors other than venture capital. The control variables are based on similar IPO-related studies carried out by Brau and Fawcett (2006), Brav and Gompers (2003), Bradley and Jordan (2002) and Megginson and Weiss (1991).

3.2.3.1 Industry dummy (Ind)

The first control variable relates to which industry the issuer is operating in and has been used as a control variable in similar research conducted by Bradley and Jordan (2002) and Brau and Fawcett (2006). Industry will be controlled for by dividing the sample companies into either high-tech industries or low-tech industries. The categorization of industries is in line with Chahine, Filatotchev and Wright (2007) and Lee and Wahal (2004), classifying data/IT and pharmaceuticals as high technology industries. High-tech industries will be indicated with 1.00 and low-tech industries will be indicated with 0.00.

3.2.3.2 Firm age (Age)

The second control variable is related to the issuing firm's age, specified as the number of years in which the company has been operating. Firm age was used as a control variable in the study carried out by Brau and Fawcett (2006) as well as Megginson and Weiss (1991). Similarly to these studies, firm age will be defined as the number of years the company has existed by subtracting the founding year from the year in which the firm went public. Megginson and Weiss (1991) found that older firms had lower information asymmetry resulting in lower underwriter compensation which points to the fact that firm age is a relevant variable when studying IPOs.

3.2.3.3 Firm Size (Rev)

Further, firm size, based upon revenues prior to the issue, was also used as a control variable both in the survey carried out by Brau and Fawcett (2006) and by Brav and Gompers (2003). Since all companies investigated performed their IPO in 2021, this figure is based on revenue for the full year 2020.

3.2.3.4 Institutional backing dummy (IB)

Seeing as prior research has found evidence that venture capital involvement has an effect on underwriting fees, since other active institutional investors could serve the same purpose, it would be unlikely if their involvement yielded a different result. Hence, the authors decided to expand the question of institutional-backing through a control variable asking respondents whether the issuing company was backed by other forms of institutions such as private equity, investment companies, etc. This variable will be equal to 1.00 when one or more institutional investors (such as private equity firms) backs the issuing firm and 0.00 otherwise. This proxy is in line with how previous studies have used the similar variable for venture capitalist backing (Brau & Fawcett, 2006).

3.3 Sampling

Since this thesis focuses on studying underwriting costs to explore whether some of the evidential factors that influence underwriting costs for larger IPOs on main markets similarly influences the underwriting costs for smaller IPOs on MTFs in a Swedish context, the thesis will collect data on companies that went public via IPO on Nasdaq First North. The authors found that it is relevant to focus on First North seeing as it is the most popular MTF in

Sweden (See Appendix 3). Similarly, the authors believe it is of relevance to study IPOs rather than e.g., SPACs or reversed mergers because a clear majority of companies going public on First North chooses to do so through IPO (Nyemmissioner database). A total of 594 First North IPOs have been recorded on the Nyemmissioner database. After eliminating IPOs that were not conducted within the time frame, reverse mergers, SPACs, direct listings and list changes, the remaining sample consisted of 96 IPOs. The final sample was randomly derived after having conducted an exclusion process (See Table 2) and having defined the population, i.e, First North IPOs 2021. In other words, the study adopted a simple random sampling method which according to Bryman, Bell and Harley (2019), provides equal probability of inclusion for each unit in the population and can be used to apply findings derived from a sample to the larger population with a known margin of error.

In order to gather the quantitative data for the analysis, a survey targeting companies that went public on First North during 2021 was conducted. Limiting the sample frame to IPOs conducted 2021 provides the study with a subgroup that faced similar market conditions. To add, by focusing on issues on First North, the sample group is believed to consist of generally similar sized companies, this will however be controlled for. With this particular sample group, the risk of having a high degree of variability in the results is minimised and enables the authors to study the group in great depth. Potential variability will be controlled for by using variables such as industry, size, and age.

Despite the fact the sampling frame used in this study only includes First North issues during one year, the authors believe this sample population to be the most appropriate given the limited time frame and resources available for this study. A survey that would cover other junior markets in other countries with a longer time frame was not possible for the authors. Even though the findings of this study should not be generalised beyond the sampling frame (i.e., IPOs on First North), the authors believe that the formulated hypotheses are founded on enough theoretical ground to have wider applicability than the population from which the sample was selected. This is especially true for the other Swedish MTFs.

The final sample of IPOs used in this study amounts to 33 as can be seen in Table 2. Compared to preceding studies of IPOs this might be considered very low but as the final sample represents more than a third (34,375%) of the total population chosen for this study, the authors believe to have a strong sample.

Table 2. Exclusion Process in the Data Sample

This table shows the exclusion process when reaching the final sample used in the study

Data sample and exclusions	**Number of observations**
Nyemmisioner.se data (First North)	594
Non-2021	-472
Non-IPO	-26
Original data sample	96
Missing data / no response	63
Final Sample	**33**

3.4 Data Collection Method

To collect a large amount of data in a relatively fast and economical way, the thesis used a web survey that followed a self-completion format with open questions distributed through a selective approach to make sure that only data from IPOs were collected. Therefore, "non-IPO listings" that showed up on the Nyemmisioner.se database, such as list changes and reversed mergers, were removed. Additionally, to minimise the further risk of receiving unusable surveys, questions were made mandatory to answer.

The questionnaire was constructed and distributed online via Google Forms, which was believed to provide a user-friendly and easy-to-answer format for the respondents. This format also provided for relatively rapid distribution and collection of responses since most of the companies included in the data collection operate from offices located in Stockholm and some even from offices abroad. According to Bryman, Bell and Harley (2019), advantages with conducting a web survey include fast collection as responses can be downloaded directly into a database. However, due to the use of open-ended questions to collect non-numerical data for some of the questions, a small degree of decoding was still required.

According to Fan and Yan (2010), a major concern with using web surveys to collect data is the risk of low response rates. They suggest that factors such as who is sponsoring the survey, what the topic is, and the time it takes to complete the survey is closely related to the achieved response rate. Surveys that are sponsored by academic agencies generally obtain a higher response rate than surveys sponsored by commercial agencies (Fan & Yan, 2010). They also imply that survey topics that are of interest to the ones answering it tend to have a higher response rate. Additionally, the survey length, measured by number of questions, number of pages, and answering time, tends to have a negative linear relation to the response rate (Fan & Yan, 2010). Nevertheless, the fact that the thesis survey is sponsored by an academic institution, that the topic is arguably of interest to the participants (especially to CEOs engaged in other companies planning to go public in the future), and that the estimated time of completion is relatively low could still result in a high response rate.

The web survey was sent out by e-mail to the whole sample group. In this email, the purpose of the study was explained and the one receiving the email could choose between a survey written in English and a survey written in Swedish. The e-mail addresses varied based on what was displayed on the companies' web pages. In some cases, contact details to CEOs or CFOs were found and then utilised. In other cases, e-mail addresses to investor relation contact persons were used. On the web pages that lacked IR contacts, "info" contacts had to be utilised to distribute the survey. Subsequently to sending out the questionnaire by email, the authors called the companies with listed phone numbers in order to increase the chances of getting responses. Moreover, since the data requested by the survey was believed to be easily accessible for anyone working at the company and were not based on opinions, the quality of the responses would not differ based on company representatives answering the survey.

3.5 Data Analysis

In order to investigate how underwriter reputation, vc-backing and the size of the offering affects the underwriting fee, the study employs a multiple regression to evaluate the hypotheses.

3.5.1 Regression

$$UF = \beta Rep + \beta VC + \beta Size + \beta Ind + \beta Age + \beta Rev + \beta IB + \varepsilon$$

3.5.2 Significance level

Based on the results of the regressions, the null hypothesis is either rejected or validated depending on the p-value. In statistics, a p-value of 1%, 5% or 10% is normally applied when performing hypothesis tests. The lower the p-value the higher is the significance. For this study, the authors chose a p-value of 5 % for rejecting the null hypothesis.

3.5.3 Ordinary least squares

Being one of the most common methods (Brooks, 2019, p. 151), the ordinary least squares method (OLS) will be used to fit the multiple regression model. This method fits the data to the best suitable line through minimising the sum of squared deviations of the residuals. The choice of the OLS model is also anchored in its use in existing research on the relationship between IPO costs and underwriter reputation, VC-backing, and offering size (Corwin & Schultz, 2005; Megginson &Weiss, 1990; Dimovski & Brooks, 2007).

Brooks (2019, p. 107) presents five assumptions that need to be satisfied in order for the analysis to be reliable and valid.

Assumption 1: The errors have zero mean

If a constant is included in the equation, the assumption will never be violated (Brooks, 2019, p.148). Since the regression contains a constant, no further tests are needed.

Assumption 2: The variance of the error terms are constant

This is also known as the assumption of homoscedasticity. If the errors lack a constant variance they are referred to as heteroscedastic. To detect the level of heteroscedasticity, a White test was conducted as per the suggestion of Brooks (2019, p. 187). If heteroscedasticity was to be found, logarithmic transformations of certain variables could be used to rescale the data and mitigate some of the effects of heteroscedasticity.

Assumption 3: The errors are uncorrelated with one another

This assumption states that the covariance between the error terms over time is zero, meaning that they are uncorrelated with each other. In the event that a correlation would exist, they would be referred to as serially correlated.

Assumption 4: There is no relationship between the error and the corresponding dependent variable

Brooks (2019, p.106) states that this assumption can be disregarded if assumption 1 holds true.

Assumption 5: The error term is normally distributed

The variables used in the regression have to be normally distributed in order to execute hypothesis testing (Brooks, 2019, p. 209). This allows for exclusion of outliers that would otherwise skew the data. To test for normality, a Jarque-Bera test will be conducted.

In the case that all the assumptions are validated, the regression determined by the OLS will be referred to as Best Linear Estimator, aso referred to as BLUE. Brooks (2019, p. 107) argues that the OLS estimator thus has desirable properties that are consistent, unbiased and efficient, and that the conclusions drawn from the data can be regarded as valid.

3.6 Model Validation

3.6.1 White's Test

White's test is conducted in order to review the level of heteroscedasticity. For the test, a 5% critical value of significance is used, and if the p-value should exceed 0.05, the null hypothesis of homoscedasticity is rejected as recommended by Brooks (2019, p. 129). In the event that the test should reject the null hypothesis, Brooks (2019, p. 190) recommends logarithmic transformations to rescale the data for extreme observations. If logarithmic transformations would be unable to correct the issue, measures for robustness can be employed. Should this happen, heteroskedastic-consistent standard error estimates should be appropriated.

3.6.2 Jarque-Bera Test

The Jarque-Bera test examines whether the residuals of observations are normally distributed. An outcome of the test that would reflect a normal distribution would not be skewed and has a coefficient of kurtosis of 3 (Brooks, 2019).

3.6.3 Multicollinearity

Multicollinearity occurs when two or more explanatory variables are highly correlated (Brooks, 2019, p.213). To determine whether the selected variables are subject to multicollinearity, a correlation matrix is produced where variables with correlations exceeding 0.8 are excluded. Additionally, a Variance Inflation Factor (VIF) is applied to the regression, which approximates the extent to which variables are correlated. VIF values equal to or exceeding 5 are to be of concern (Brooks, 2019, p. 215)

3.6.4 Ramsey's Reset Test

Ramsey's reset test is conducted in order to assess whether a linear regression is the most suitable way of describing the relationship between the dependent and independent variables. Using an auxiliary regression, the method is able to capture a variety of nonlinear relationships between the dependent and independent variables. If the p-value of the test exceeds 0.05, the null hypothesis of the regression being linear cannot be rejected (Brooks, 2019).

3.7 Reliability and Replication

According to Bryman, Bell and Harley (2019), reliability, replication and validity are three of the most important criteria for evaluating business research. They imply that the notion of "reliability refers to the consistency of a measure of a concept" (Bryman, Bell & Harley, 2019, p. 172). In other words, reliability is concerned with the consistency and conformity of the measures used to investigate a phenomenon. Bryman, Bell and Harley (2019) argue that replication is closely connected to reliability and relates to how well a study can be replicated to show the same results. Several steps were taken to ensure the reliability and replicability of this study. The data collection procedure as well as the sample exclusion process was thoroughly explained and presented. Thus, by following these steps, a similar sample would be ensured in future research. Additionally, due to precautions taken when constructing the survey, such as conducting a pilot study, the potential for misinterpretation was believed to be minimal. Therefore, the data derived from the questionnaire should hold if replicated. Moreover, the authors gave thorough descriptions on how the different variables were measured. For example, a detailed outline was given relating to how underwriters were ranked and how high-tech industries were classified. Lastly, the authors provided a detailed

explanation of the procedure for how the analysis was conducted. Based on this, the data was considered reliable and replicable.

3.8 Validity

According to Bryman, Bell and Harley (2019) the most prominent criterion of research is validity and is concerned with the integrity of the conclusions. One of the main types of validity is measurement validity, sometimes called construct validity, and relates to whether a measure successfully reflects the intended concept (Bryman, Bell & Harley, 2019). The study used established measurements that have been developed and tested by several prominent researchers to measure the variables. However, seeing as not all IPOs are guaranteed by underwriters and as other types of guarantees can be seen in Sweden, the measure for the dependent variable was altered to better fit the model and enable for more accurate comparison of the fee paid to the bookrunner. Moreover, Bryman, Bell and Harley (2019) argue for the importance of establishing face validity when developing a new measure. They imply that face validity can be established by letting experts or experienced people within the field assess whether a measure appears to ascertain the concept of interest. Since the survey was reviewed by experienced individuals in the field through conducting a pilot study, the use of relevant and appropriate measures were ensured and face validity was obtained.

Validity can be described from both an internal and external perspective. Internal validity relates to the issue of casualty, i.e, how confident one can be that the independent variable causes variation in the dependent variable and that not something else is influencing the dependent variable (Bryman, Bell & Harley, 2019). The hypotheses were developed and the variables were selected based on the findings of multiple studies carried out by prominent researchers. Additionally, several tests were performed to confirm the quality of the regressions. Internal validity was also accounted for by including some control variables used in other studies of IPOs conducted by Brau and Fawcett (2006), Brav and Gompers (2003), Bradley and Jordan (2002) and Megginson and Weiss (1991). It could still be the case that other variables not included in the study might significantly influence the dependent variable, however, the risk of this is at least believed to be limited by including the chosen control variables.

External validity deals with whether the results can be generalised beyond the adopted context (Bryman, Bell & Harley, 2019). This puts emphasis on the importance of the

selection of units analysed (Bryman, Bell & Harley, 2019). Bryman, Bell and Harley (2019), suggest that external validity is strong when the sample has been randomly selected. Although the defined population was highly specified, the sample group derived from the population was collected randomly. In this regard, one could argue that the risk for sample error was therefore limited. However, as the sample size is relatively small in absolute terms, the risk for error is therefore larger than it would be in larger samples. Additionally, the specified population, and hence the specified sample group, could limit the possibility to generalise the findings to other contexts such as IPOs on other Swedish MTFs, and especially to other countries and larger stock markets.

3.9 Chapter Summary

In the methodology chapter, the overall research design and approach of the thesis was stated. Here, it was concluded that the study will employ a deductive research approach based on data collected through a self-completion web questionnaire with a cross-sectional research design. Following this, the design of the questionnaire was presented and discussed. This followed by outlining the variables used in the study and consequently describing how they are measured. The dependent variable is the underwriter fee, and the three main independent variables are underwriter reputation, VC-backing, and offering size. Additionally, some independent control variables were presented and discussed. The sample population of the study was defined as companies going public on First North through an IPO during 2021. Subsequently, the method for collecting data and how the data will be analysed was described. Lastly, the reliability and validity of the study was reviewed. In the following chapter the results will be presented.

4. Results

4.1 Pre-Analysis

4.1.1 Data Screening

From the questionnaire, 33 responses were collected, which accounted for approximately 35% of the specified population (the survey was sent out to 96 companies), i.e, First North IPOs during 2021. The survey was online for 12 days between 06-05-2022 and 17-05-2022. When assessing the collected data, it could be concluded that underwriters were not themselves involved in guaranteeing any of the IPOs in the sample, i.e, only best efforts arrangements were used (Table 4). Since this study has defined underwriter fee as the fee paid by the issuing firm to underwriters, no further analysis was made on the fee that one respondent paid to an external party for guaranteeing the issue, as they did not serve as the bookrunner for the IPO.

4.1.2 Preparation of Data

Prior to running the main analysis, some data concerning the underwriter reputation variable had to be interpreted and prepared. As previously described, the study uses the Megginson-Weiss proxy to rank bookrunners on First North during 2021, i.e., the bookrunners were ranked according to their relative market share measured in terms of amount of capital brought to the market by the specific bookrunner relative to the total amount of capital brought to market. In the survey, respondents were asked to indicate the name of the underwriter hired to advise the IPO. This data was ranked by constructing a league table in Bloomberg (See Appendix 4) focusing on IPOs conducted on First North within the time frame of 2021. Based on the league table, it can be concluded that a total of 34 bookrunners were hired to advise IPOs on First North during 2021. The mean MW rank for these 96 IPOs was 3.03% and the median rank was 0.75%. Within this selected time frame and exchange, Carnegie and ABG Sundal Collier stood out, as they accounted for 44.85% of the IPO market share.

4.2 Descriptive Statistics

Table 3 showcases the distribution of the 33 sample firms and includes mean, median and standard deviation values for the dependent variable as well as for the independent variables and control variables. In the table, minimum and maximum values as well as values for the first and third quartile are also displayed. To counteract skewness in the data and make a non linear-relationship multiplicative relationship into a linear additive relationship, logarithmic transformations were conducted (See Appendix 7 and 8) as per (Brooks, 2019, p. 14). These transformations significantly improved the regression model which will be discussed further in section 4.3.

As presented in Table 3, the dependent variable UF, i.e., underwriter fee, centres around 6% with a relatively high variation indicated by a standard deviation of approximately 3%. Major outliers on both sides were found as the minimum fee was only 0.53% of total proceeds whereas the maximum fee as a percentage of proceeds was 12.05%, hence, indicating a range of approximately 11.5%. UF is not skewed as it had a skewness value of approximately -0.19. However, with a negative kurtosis value of approximately -0.6, the variable can be said to be platykurtic, indicating that it is not normally distributed but rather has a flatter peak and thinner tails.

The independent variable Rep-dummy is positively skewed, and has a mean and median value of 0.18 and 0.00, respectively. This indicates that most of the IPOs used bookrunners with a relative market share below 10%, hence, classified as non-prestigious (0.00 in Table 3). This can also be seen by the mean (5.59%) and median (0.93%) Megginson-Weiss ranks of the underwriters used in the sample IPOs (Appendix 5). Approximately half of the market for bookrunners on First North is dominated by Carnegie and ABG Sundal Collier whereas the remaining half is jointly accounted for by many smaller investment banks and corporate advisory firms (See Appendix 4 for bookrunner league table). As Carnegie and ABG Sundal Collier stood for much of the proceeds but not necessarily much of the volume of IPOs (ABG Sundal Collier would not be ranked second in terms of number of IPOs), it was not surprising that most of the issuing firms in the sample were discovered to have hired non-prestigious bookrunners.

As can be observed in Table 3, the VC dummy variable was found to be positively skewed with a mean of 0.12, a median of 0.00 and skewness value of approximately 2.4. The number of VC-backed companies were small relative to the total sample size, with only approximately 12% of the companies being backed by a venture capital firm before going public (See Appendix 6). The same applies to the number of companies that were backed by other institutional investors, such as private equity firms, investment companies, and funds, even though this figure is larger than the number of VC-backed companies. The institutional backing dummy variable was positively skewed and it can be concluded that approximately 25% of the sample companies were backed by private equity, investment companies, and or funds prior to going public (See Appendix 6).

Furthermore, it can be observed that the offering size variable was positively skewed and varied greatly with a standard deviation of SEK 368 million to the mean of 216 million SEK reporting major outliers. The variable was found to have a large range of around 1.9 billion SEK. An absolute majority of 56% of the companies raised below 100 million SEK whereas only around 9% of the companies raised more than 500 million SEK. The great variance can largely be explained by a single subject raising an abnormal amount equal to almost 2 billion SEK. Due to the extreme outliers, the offering size variable was logarithmically transformed.

Firm age was found to be positively skewed with some extreme outliers. The average and median firm was found to be around 16 and 9 years, respectively. However, extreme outliers such as a 51 year old company were included in the sample, pushing up the mean age. Due to this, the variable age was logarithmically transformed. Moreover, the industry dummy variable centred around 0.6 and was found to be negatively skewed as the majority of the companies in the sample group belong to high technology industries.

Lastly, similarly to offer size, it can be deferred that firm size, measured as revenue, yielded results in which the majority of firms were found to be relatively small. The variable is positively skewed with a median revenue of only 30 million SEK. Additionally, the standard deviation of 468 million to the mean of 208 million indicates some major outliers. This was the case on both sides of the spectrum seeing as some companies did not report any revenue whereas some companies reported revenues in the billions. Due to the outliers, this variable was logarithmically transformed to better fit the model.

Table 3. Descriptive Statistics

This table provides a summary of the statistics for all variables used in the study. The summary statistics includes 33 IPO observations from January 1 2021 to December 31 2021. All the data containing IPOs was obtained through a web based questionnaire since relevant information was not publicly available.

n=33	Mean	Std Dev	Min	Median	Max	Skewness	Kurtosis
Dependent Variable							
UF	6.14%	2.89%	0.53%	6.51%	12.05%	-0.194	-0.601
Independent Variables							
Rep-dummy	0.182	0.392	0.000	0.000	1.000	1.729	1.051
VC-dummy	0.121	0.331	0.000	0.000	1.000	2.433	4.170
Size (in millions)	213	373	16	68	1 920	3.542	14.289
LogSize	18.302	1.271	16.591	18.032	21.376	0.615	-0.477
Control Variables							
Ind-dummy	0.606	0.499	0.000	1.000	1.000	-0.455	-1.913
Age (in years)	13	9	2	9	51	2.723	9.009
LogAge	2.340	0.595	0.693	2.197	3.932	0.227	1.948
Rev (in millions)	208	468	0	30	2 000	3.049	9.173
LogRev	15.689	5.495	0.000	17.217	21.416	-2.161	4.385
IB-dummy	0.242	0.435	0.000	0.000	1.000	1.260	-0.443

Table 4 showcases the fraction of the IPOs that were guaranteed. As can be observed, six IPOs were guaranteed and bookrunners were found to not have been involved as a guarantor in any of the IPOs in the data set. It can be concluded from the table that nearly no issuers paid a direct compensation to guarantors. Only one company indicated that they paid a compensation of 6% of the guaranteed capital to guarantors. Looking at the fraction of the proceeds that were guaranteed for the two IPOs that used cornerstone investors, it can be concluded that 76.5% of the issue was on average guaranteed. Approximately 43% of the issue was on average guaranteed for the four IPOs using external guarantors via a so-called guarantor commitment.

Table 4. Distribution of IPOs that were Guaranteed

This table showcases the distribution of forms of guarantees observed of the sample of 33 IPOs. Fraction of guaranteed proceeds is measured as the percentage of IPO gross proceeds that were guaranteed. Compensation is measured as compensation to guarantors as a percentage of the capital guaranteed. Median is indicated in square brackets.

	Mean fraction of guaranteed proceeds	Mean compensation
Cornerstone investor (n=2)	76.50 [76.50%]	0.00% [0.00%]
Guarantor commitment (n=4)	42.85% [42.85%]	1.50% [0.00%]
Firm commitment (n=0)*	- [-]	- [-]

* No IPOs were observed to have used a firm commitment arrangement since it could be derived from the data set that no underwriters acted as guarantors in the sample IPOs.

Of the final sample consisting of 33 IPOs six used prestigious underwriters and 27 used non-prestigious underwriters. Table 5 shows the descriptive statistics for these two subgroups. The data indicate that companies that hired non-prestigious underwriters paid a larger fee as a fraction of proceeds than companies that used prestigious underwriters. Companies conducting “prestigious IPOs” paid a mean underwriter fee of 4.6% of the proceeds whereas companies conducting “non-prestigious IPOs" paid a mean fee of approximately 6.5% of the proceeds. Moreover, the size of the prestigious IPOs were considerably higher than the offering size of the non-prestigious IPOs. It can also be concluded that the average firm hiring a reputable bookrunner was older and reported a

noticeably higher revenue for 2020. Finally, it can be observed that the companies using prestigious bookrunners were backed by VC and other institutional investors to a larger degree than companies using non-prestigious bookrunners.

Table 5. Descriptive Statistics for IPOs using Prestigious and Non-prestigious Underwriters

This table provides a summary of the descriptive statistics concerning two subgroups: IPOs where prestigious underwriters were hired and IPOs where non-prestigious underwriters were hired.

	Prestigious underwriters (n=6)			Non-prestigious underwriters (n=27)		
	Mean	Median	Std dev	Mean	Median	Std dev
UF	4.60%	5.52%	2.46%	6.49%	7.00%	2.90%
VC-dummy	0.333	0.000	0.516	0.074	0.000	0.267
Size (in millions)	756	511	640	92	48	96
Log Size	20.164	20.052	0.816	17.889	17.676	0.939
Ind-dummy	0.333	0.000	0.516	0.667	1.000	0.480
Age (in years)	23	16	17	10	9	5
Log Age	2.904	2.728	0.720	2.214	2.197	0.496
Rev (in millions)	721	267	901	94	15	197
Log Rev	18.708	19.215	3.051	15.018	16.524	5.727
IB-dummy	0.500	0.500	0.548	0.185	0.000	0.396

Table 6 provides an overview of the descriptive statistics between two subgroups: VC-backed IPOs and IPOs that were not backed by VC. It can be concluded that the mean and median underwriter fee as a fraction of proceeds for VC-backed companies were 5.26% and 5.08% respectively, and that the mean and median underwriter fee for non-VC backed companies amounted to 6.27% and 6.54% respectively. This indicates larger fees as a fraction of proceeds for IPOs in which VC firms were not involved. It can also be concluded from the table that VC backed firms were on average older, raised more capital in the IPO, and were larger.

Table 6. Descriptive Statistics for VC-backed and Non-VC-backed IPOs

This table provides a summary of the descriptive statistics concerning two subgroups: IPOs that were backed by venture capital and IPOs that were not backed by venture capital

	Backed by VC (n=4)			Not backed by VC (n=29)		
	Mean	Median	Std dev	Mean	Median	Std dev
UF	5.26%	5.08%	3.18%	6.27%	6.54%	2.88%
VC-dummy	0.500	0.500	0.577	0.138	0.000	0.351
Size (in millions)	629	284	886	155	56	216
Log Size	19.164	19.031	1.890	18.184	17.841	1.159
Ind-dummy	0.750	1.000	0.500	0.586	1.000	0.501
Age (in years)	20	12	20	11	9	7
Log Age	2.693	2.525	0.896	2.291	2.197	0.546
Rev (in millions)	551	232	806	161	24	401
Log Rev	18.730	18.781	2.287	15.269	16.989	5.696
IB-dummy	0.250	0.000	0.500	0.241	0.000	0.435

4.3 Diagnostic tests

The tests were first conducted on the untransformed raw data. Thereafter the tests were conducted on the transformed regressions, where size, age, and revenue had been logarithmically transformed.

4.3.1 White's test

The White's test on the original data gives a p-value (chi-square) of 0.83 and a p-value (f-statistic) of 0.87 (See Appendix 9.1.1). Since the p-values exceed the 0.05 significance level, the null hypothesis of homoscedasticity is accepted. This holds true after the data is logarithmically transformed as well with p-values of 0.18 (chi-square) and 0.19 (f-statistic).

4.3.2 Jarque-Bera test

The Jarque-Bera test shows that the data is normally distributed, both before and after the transformation as the p-values of 0.64 and 0.81 exceed the critical value of 0.05 (See

Appendix 9.2.1 and 9.2.2). The null-hypothesis of normal distribution is therefore accepted. After the transformation, skewness improves from -0.39 to 0.012, but this comes at the cost of kurtosis which worsens from 3.19 to 2.44.

4.3.3 Multicollinearity

To investigate whether multicollinearity was present in the data, a correlation matrix was constructed of the transformed data. As can be seen in table 7, none of the independent or the control variables had a correlation above 0,8. The highest correlation was found between Rep_dummy and LogSize which was 0,701. In addition, VIF tests were conducted on the original and transformed data as seen in Appendix 9.3.1 and 9.3.2. Having initially exceeded 5, logarithmic transformations were applied to the size variable which decreased its value to 2,387. Multicollineraity was therefore corrected in the final regression.

Table 7. Correlation Matrix

This table includes a correlation matrix for all variables used in the study. A correlation of +1.00 indicates a perfect positive linear correlation, and a correlation of -1.00, a perfect negative correlation.

Variables	**UF**	**Rep_ Dummy**	**VC_ Dummy**	**LogSize**	**Ind_ Dummy**	**LogAge**	**LogRev**	**IB_ Dummy**
UF	1,000							
Rep_Dummy	−0,255	1,000						
VC_Dummy	−0,115	0,306	1,000					
LogSize	−0,662	0,701	0,256	1,000				
Ind_Dummy	0,246	−0,263	0,109	−0,119	1,000			
LogAge	−0,244	0,454	0,224	0,357	−0,243	1,000		
LogRev	−0,471	0,263	0,209	0,423	−0,322	0,375	1,000	
IB_Dummy	−0,042	0,283	0,007	0,263	0,167	0,507	−0,030	1,000

4.3.4 Ramsey RESET Test

To evaluate whether a linear regression was the best fit model for the regression, a Ramsey RESET test was conducted on both the untransformed data and the transformed data. As can be seen in Appendix 9.4.1 and 9.4.2, the raw data's p-value of 0.024 fell under the critical value of 0.05 which would thus mean that a linear-regression model would be unsuitable. However, after the logarithmic transformation the p-value increased to 0.77 which clearly exceeds 0.05. While the initial data would reject the null-hypothesis, the transformed data accepts the null-hypothesis of a linear regression being the best approximation of the model.

4.4 Regression

An OLS regression was conducted in order to find whether the variation in the dependent variable UF, could be explained by variation in the independent variables of underwriter reputation, vc-backing and offering size. In addition, the control variables of industry, firm age, firm revenue and institutional backing were tested against the underwriting fee.

Table 5 shows that reputation has a positive correlation with the underwriting fee and is statistically significant at the 5% significance level. Size is found to have the opposite effect on the fees paid to underwriters as there is a negative correlation and is statistically significant at a 1% significance level. VC-backing, industry, firm age, firm revenue and institutional backing were not significant as their p-values exceed the 5% significance level, meaning that they did not have an impact on the underwriting fee in this study. Furthermore, since the p-value (F-statistic) falls under the 5% significance level, the null-hypothesis is rejected. The model thus fits better than a model without independent variables. Furthermore, the R^2 value amounted to 49,2%, meaning that the regression model can explain 49,2% of the variation of underwriting fees on First North during 2021. The regression constructed by the transformed data is substantially stronger than the original regression, which had no statistically significant variables, a p-value (F-statistic) exceeding the 5% significance level and an adjusted R^2 of 18.4% (See Appendix 10).

Table 8: OLS Regression

*This table displays the p-values and the coefficients for the regression, the independent and control variables. *** means that the result is valid at a 1% significance level, ** means that the result is valid at 5% level, * means that the result is valid at 10% significance level.*

Independent variable	P-Value	Coefficient
Regression	0.000672***	-
Rep_Dummy	0.020**	0.037
VC_Dummy	0.928	-0.001
LogSize	0.000***	-0.021
IND	0.196	0.012
LogAge	0.675	-0.004
LogRev	0.484	-0.001
IB	0.715	0.004
Constant	**0**	**0.449**
N	**33**	**-**
Adjusted R-Squared	**0.494**	**-**

4.5 Summary of Findings

Based on a pre-analysis, the data from the 33 respondents was categorised into dummy variables, and a preliminary regression was run. To counteract skewness and create a linear relationship, logarithmic transformations were made to three variables. The logarithmically transformed regression model then satisfied the five assumptions of the OLS model and was statistically significant. Underwriter reputation and size were found to be significant independent variables whereas VC-backing and the control variables were found to be insignificant in the study.

5. Analysis and Discussion of Results

5.1 Analysis of Descriptive statistics

As seen in Table 4, no underwriters acted as guarantors for the IPOs. From this it can be inferred that all of the issuing firms opted for a best efforts arrangement instead of a firm-commitment approach. One possible reason for this could be the increase in investor demand for IPO shares on the market. The Swedish stock market has seen a significant increase in the number of unique owners of stock since 2019 (Euroclear, 2022), and Rock (1986) highlights how the presence of uninformed investors in IPOs is more significant during hot IPO markets. Thus, given the increase of uninformed investors and the hotness of the IPO market on First North, price sensitivity of the IPOs likely decreased as uninformed investors were unable to differentiate between underpriced and fairly priced IPOs. The direct implication of this is that the risk of not achieving full subscription through the IPO is reduced. This could potentially explain why all the firms in the sample opted for a best effort arrangement rather than paying the underwriter an additional fee (Brooks, 2016) for a firm-commitment arrangement. D'Agostino, Hellgren and Fröderberg's (2007) findings support this argument too. They found that IPOs have a better chance of being fully subscribed when the capital market is favourable, which certainly was the case during 2021, as the Swedish stock market was valued at an all-time high of 12.3 Trillion SEK by the end of 2021 (Euroclear, 2022).

It could also be observed from the descriptive statistics that a clear majority of the observed firms hired non-prestigious underwriters (See Table 5). When conducting tests on the Megginson-Weiss underwriter prestige proxy on a sample of 2 292 U.S. IPOs between 1979 and 1991, Carter, Dark and Singh (1998) found a mean MW rank of 5.31%. Similarly, Megginson and Weiss (1991) reported mean MW ranks for venture capital backed and non-venture capital backed IPOs equivalent to 4.4% and 3.0%, respectively. Hence indicating similar results to the mean rank of 5.59% found in this study (See Appendix 5). A mean MW rank below 10% indicates that IPOs on average use non-prestigious underwriters. Therefore, the lower fraction of prestigious underwriters found in the sample (See Table 5) is in line with the findings of other researchers. To add, since Carter, Dark and Singh (1998) and Megginson and Weiss (1991) used samples consisting of IPOs on multiple and larger U.S. stock exchanges, it could be inferred that the fraction of IPOs using prestigious underwriters on

First North are similar to that of larger U.S. markets. In other words, it is more common for issuers to hire non-prestigious underwriters, both on First North but also on several U.S. main markets.

5.2 Influence of Underwriter Reputation

The regression (Table 8) showcases that there is a statistically verified positive relationship at a 5% significance level between underwriting fees and underwriter reputation. In other words, underwriting fees are larger in issues in which prestigious underwriters were hired. This result is in line with previous research such as Dunbar (2000), Chen and Wang (2016) and Alavi, Pham and Pham (2008). Alavi, Pham and Pham (2008) found evidence that underwriters receive higher fees as a consequence of their relatively stronger bargaining power to increase offering size as well as their ability to attract larger shareholders. Seeing as the largest IPOs in terms of offering size were those in which prestigious underwriters were involved, this possibility should not be rejected. However, it is difficult to assess the underwriters' relative bargaining power and ability to attract large shareholders from the study's results.

Nevertheless, offering size is connected to the fees paid to prestigious underwriters. The correlation matrix (Table 7) indicated a correlation value between underwriter reputation and offering size equivalent to approximately 0.7, thus exhibiting a strong and positive relationship between the two variables.

An explanation for the positive correlation between offering size and underwriter reputation could be related to the different motives of prestigious and non-prestigious underwriters. Dunbar (2000) and Corwin and Schultz (2005) argued that the underwriting market is characterised by heavy competition and that underwriters that have a reputation of offering good analyst coverage are better positioned to get hired despite demanding higher compensation. As an "[investment] bank's underwriting decisions reflect reputation concerns" (Fang, 2005, p. 2731), reputable underwriters might dismiss smaller and riskier issuers in order to maintain their reputational capital. This is also likely the case as prestigious underwriters are arguably financially motivated to focus on larger IPOs as they will receive greater compensation from these projects. Conversely, according to Dunbar (2000), less reputable underwriters will try to improve their status by offering lower fees and

consequently increase the volume of IPOs they advise (Dunbar, 2000). Hence, another explanation could be that due to their more strained budget, smaller firms are simply not able to resist the financially attractive deals offered by the aspiring underwriters lacking a proven track record.

A highly reputed underwriter according to the MW proxy has a relatively great market share which means that they have a lot of experience within the industry (Carter, Dark & Singh, 1998). They can therefore be considered as knowledgeable which gives them a competitive advantage against an issuing firm. This competitive advantage is created through information asymmetry which in turn will create an increasing agency cost (Meckling, 1976). The higher underwriter fee that comes with the more reputed underwriter can therefore be seen as an increased agency cost that arises through an increased information asymmetry between the underwriter and the issuing firm.

5.3 Influence of VC-backing

This study also set out to assess the impact of venture capital involvement on the underwriting fee. As could be concluded in Table 6, VC-backed companies paid a lower mean and median underwriter fee as a percentage of proceeds compared to companies that were not backed by venture capital. This is in line with the findings of Megginson and Weiss (1991) who similarly found that the amount of compensation to underwriters was less for VC-backed firms than for firms that were not backed by VC. A possible explanation could be rooted in the certification hypothesis. Megginson and Weiss (1991) discovered that the presence of venture capitalists reduces the underwriter's compensation as the underwriter's cost of due diligence decreases. Put differently, venture capital involvement reduces information asymmetry and, consequently, the underwriter fee.

In Table 6 it could also be concluded that a clear majority of the sample firms neither hired a prestigious underwriter nor were backed by venture capital firms. Among the firms that hired prestigious underwriters, only 33% were backed by venture capital. In addition, the correlation between VC-backing and underwriter was weak at only 0,306. This is not in line with Barry, Muscarella, Peavy III and Vetsuypens (1990) who found that VC-backed IPOs generally use prestigious underwriters and that higher quality underwriters tend to accept offers that have been monitored by venture capital firms. Similarly, Megginson and Weiss

(1991) argued that venture capital backed issuers should attract prestigious underwriters as the presence of VC could protect reputational capital and reduce costs associated with due diligence. However, when looking at other backing as well, it can be concluded that 66% of the IPOs that used prestigious underwriters were either backed by VC, PE, funds, and or investment companies.

However, the validity of the inferences made from the data should be questioned. Contrary to the hypothesis, and while VC-backed firms paid a lower mean and median underwriter fee, Table 8 shows that the variation in the underwriting fee cannot be explained by the variation in VC dummy variable, since it has a p-value of 0.928. It is therefore unlikely that these companies paid a lower underwriting fee due to their VC-backing. VC-backing's insignificance can likely be the result of VC-backing being less common than anticipated, as there were only 4 VC-backed companies in our sample. This is a stark contrast to the amount of VC-backing found on the US-markets by Ritter (2022), where the amount of VC-backed firms accounted for 50% of the sample. The number of observations thus becomes too small in order to make conclusions that are of statistical significance, which could also help explain why the result deviates from prior research with more data points

5.4 Influence of Offering Size

When looking at the result of this study it is evident that offering size has a significant effect on direct underwriting costs. The regression confirms hypothesis three by demonstrating a negative coefficient and a p-value of 1%, showing that economies of scale exist with regards to offering size. This result is in line with findings from previous studies such as Dimovski and Brooks (2007), Hansen and Torregrosa (1992), Ritter (1987), Calomiris, Himmelberg and Wachtel (2000), Altinkilic and Hansen (2000), Booth and Smith (1986), and Calomiris and Pornrojnangkool (2009).

As previously mentioned, the results indicate that the firms with the largest offerings size most often used more reputed underwriters for their issues. The correlation of the two variables Rep_Dummy and LogSize as can be seen in Table 7 is 0.701 and indicates a strong positive relationship. More prestigious underwriters thus tend to choose larger offerings. IPOs that are less risky are often the result of more shared information between the underwriter, the issuing firm and potential investors. Information symmetry counters the problems in a principal agency relationship and conjointly reduces the underwriting costs

(Baron, 1982; Jensen & Meckling, 1976). It is found by Booth and Smith (1986) that underwriter compensation is positively related to the ratio of unique and systematic risk and since it is established that underwriter compensation is negatively related to the percentage of issue proceeds it is understood that asymmetric information serves as a proxy for risk and consequently also higher underwriting costs.

Another potential explanation could be related to firm size. Altinkilic and Hansen (2000) imply that larger firms tend to raise larger offerings compared to small firms. As larger firms have lower monitoring, certification, and marketing costs relative to smaller firms, and because smaller firms have less in-house expertise thus adding to higher information asymmetry, spreads will appear to be decreasing as offering size increases (Altinkilic & Hansen, 2000). However, seeing as the correlation value between offering size and firm size was weak (See Table 7), and since firm size did not have a significant relationship with underwriting fee, this explanation cannot be justified by our results.

5.5 Analysis of Control Variables

Given that the p-value of the regression is significant at a 1% level, the control variables impact on the underwriting fee on First North during 2021 can thus be neglected as the p-value of all control variables exceeded the 5% level as seen in Table 8. It can thus be said that factors that have been found to have an impact on the underwriting fee in other markets, did not have a statistically reliable effect on First North during 2021.

5.6 Consequences of the hypotheses

After having presented the theoretical frame, three hypotheses were tested by the empirical data collected from the survey. All the variables were then tested through an OLS regression. After size, age, and revenue had been logarithmically transformed, the regression satisfied all the conditions to be considered as BLUE and was statistically significant to the 1%. The three hypotheses and the study's outcome are explained below:

- H1: The issuing firm will pay higher underwriting fees for a prestigious underwriter than for a non prestigious underwriter when going public on First North - **Supported**
- H2: Venture-backed firms going public on First North will pay lower underwriting fees compared to non-backed firms - **Rejected**

- H3: The underwriting fee will decrease as the size of the offering increases - **Supported**

As H1 and H3 were significant, they found empirical support in the study. Underwriter reputation and size of offering can thus be said to affect the underwriting fee, reputation with a positive correlation and offering size with a negative correlation.

Despite the strong indication from current literature, H2 was found to be statistically insignificant in our model. This was likely the result of the limited sample, as only four companies out of 33 were found to be VC-backed. The sample also deviates from previous literature with the lack of correlation between underwriter reputation and VC-backing,

6. Conclusion

6.1 Conclusion

The purpose of this paper was to examine how underwriter reputation, VC-backing and offering size affect the fees paid to underwriters on Nasdaq First North. This was accomplished by answering the research question: *How does underwriter reputation, venture capital involvement, and the size of the offering affect underwriting fees associated with initial public offerings on Nasdaq First North?*

The results of the study show that underwriter reputation and offering size has a significant impact on the underwriter fee, whilst VC-backing was found to have no statistically significant effect in our sample. Neither did any of our control variables have a significant impact on the underwriting fee.

It was found that the variation in the underwriting fee could be explained to 49% by the regression. Underwriter reputation is positively correlated with the underwriting fee, meaning that underwriters with a high reputation get higher compensation. Offering size is negatively correlated with the underwriting fee, meaning that as the size of offering increases, the underwriting fee decreases. While the model cannot explain the entire picture, it accounts for half the variation which can still give indications of measures that companies can take to minimise the underwriting fees, and thus gain access to equity financing in a cheaper way.

Companies seeking an affordable way to go public should therefore not feel pressured to seek VC-backing before going public. Our findings suggest that the same applies to PE-backing or other institutional backing. Furthermore, since there was no statistically significant relationship between firm age and the underwriting fee, there are no cost-related drawbacks with regards to the underwriting fee of going public early in the company's lifetime. Nor do our findings produce any evidence to suggest that the firm would get a cost advantage based on their size. Additionally, the underwriting fee is not dependent on whether the company is classified as high-tech or not, indicating that there is no industrial discrimination with regards to underwriting fees.

6.2 Contributions

6.2.1 Empirical contributions

This study contributes to the existing literature of underwriter fees by providing insights to the effect that underwriter reputation, VC-backing and issuing size have on the direct costs associated with going public. Much of the existing literature on IPOs have been focused on underpricing and this study brings another perspective. Previous studies on a similar topic are from 1980-2000 so this paper helps update and shine new well needed light to the topic as well. By focusing on Sweden and First North the study also complements previous researchers who mainly have been focused on larger American IPOs on main markets. The authors believe that this study will help to create a better understanding of how several influenceable factors affect the direct costs associated with an IPO.

6.2.2 Practical contributions

The thesis' primary practical contribution is an added understanding how underwriter reputation, vc-backing and offering size affects the underwriting fee on First North. This understanding can be of use for firms wanting to go public on First North who would have limited bargaining power compared to their underwriter given the information asymmetry and dependency relationship. It is therefore crucial for firms, especially smaller ones, to understand how they can affect the underwriter fee and succeed with a cost minimization strategy. Smaller companies wanting to go public on First North will thus be able to make more well-informed decisions on how to minimise the direct costs associated with the IPO process, allowing for easier access to equity financing and potentially decreasing the profitability of the underwriting business.

6.3 Limitations of the study

One of the main concerns of the study is the limited sample achieved as only 33 out of 96 companies responded to the survey, which represents 34% of the population. There is thus a possibility of sampling error as the findings may not be representative of the population with certainty. Achieving a greater sample would thus minimise the possibility of this error (Brooks 2019). However, it should be noted that the sample was still large enough in order to create a significant regression and find significant independent variables.

The data collection method in the form of a survey where the respondents are either the CEO or the CFO of the listed companies is also a limitation. Due to their crammed schedules, many did not reply or responded that they could only fill out the survey after the deadline would pass. The authors accounted for this by making the survey as short as possible in order to decrease the threshold of completing the survey, but at the cost of including more variables. While more variables would have prolonged the survey and required more time for the respondents to complete, the added data could have given a more complete image about the factors that have a significant impact on the underwriting fee.

Using Megginson and Weiss' (1991) proxy for underwriter reputation has clear drawbacks when used on First North. Since merely two underwriters were classified as prestigious, this affects the result, as several actors who are classified as non-prestigious under the current proxy could potentially be regarded as prestigious given their current positioning and reputation. Applying the proxy which was created for the large US market, thus creates inaccuracies when applied on a significantly smaller market such as First North. In the event that investment banks or corporate advisory firms that would be considered prestigious on other stock exchanges were not ranked as prestigious in the data set, the ability to draw broader conclusions on reputation's effect on the underwriting fee outside First North is limited. A way of counteracting would be to increase the amount of markets and consequently more underwriters, however this would disregard national differences in ranking which in itself poses new accuracy problems.

Another limitation of the study is the transferability of the results across markets. In our sample, we found no instances where the IPO was guaranteed by the underwriter which likely has a significant impact on the fee paid to the underwriter. The results of the study are thus limited to the coordinator and advisory role that the underwriter takes during the IPO process. While this might be common practice on First North, it can look different on other markets and other offerings that are guaranteed, thus hindering the results from being applicable in other settings.

6.4 Suggestions for future research

Seeing as the variation in our independent variables could only explain the variation in the underwriting fee by 49,4%, further investigation and analysis is required to see what other factors besides underwriter reputation and issue size. Further control variables could thus be added, such as IPO-peer effects as suggested by Aghamolla and Thakor (2022), firm transparency (Ang & Brau, 2002), firm-bank relationship (Shenone, 2004), quality of accounting information (Lee & Masulis, 2009), and firm risk (Booth & Smith, 1986). Another suggestion is expanding the population size and investigating what has influenced the underwriting fees on First North since its founding in 2005, alternatively adding the other MTFs to the population as well. The larger population size would likely result in a larger sample if a method similar to the one applied in this study was chosen, thus generating more data points, allowing for stronger statistical conclusions.

On a final note, a topic that could be researched is the correlation between the underwriting fee and post-IPO-performance to determine whether the cost-minimising strategies come at the cost of performance. Related to this is an investigation into whether reduced underwriting fees would generate larger underpricing. In other words, if it would be found that reduced underwriter fees disproportionately increase the costs of underpricing, the propositions made from this study would not be an effective tool to reduce the overall costs of going public. Seeing as the authors were limited by the time scope of this thesis, this was not investigated. Instead, it is suggested that future research with more resources explores this potential correlation. Only then can our results be implemented by firms as a means of minimising their costs of going public.

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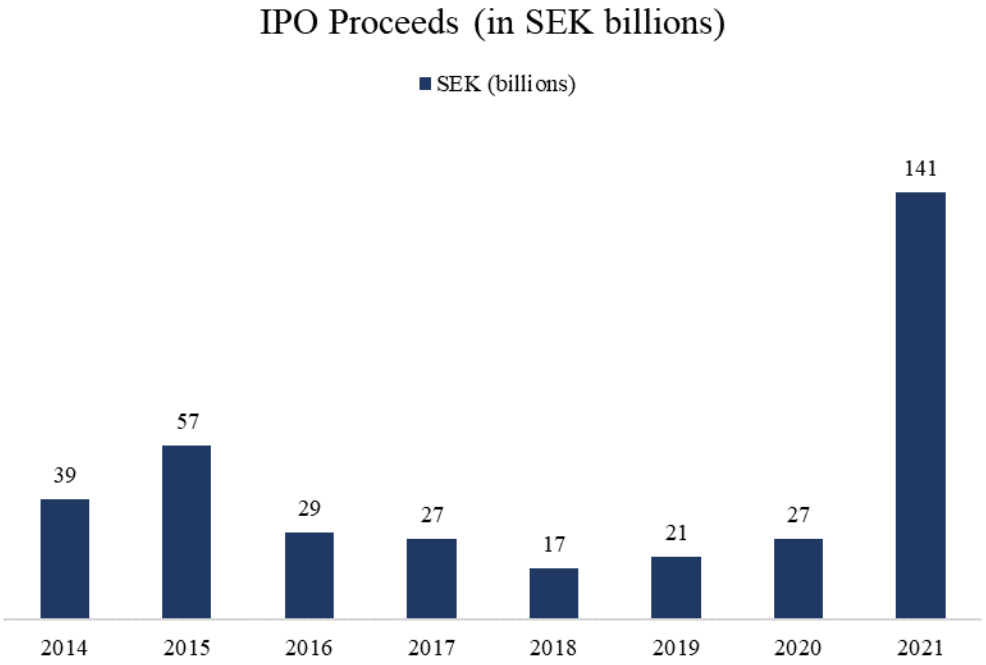
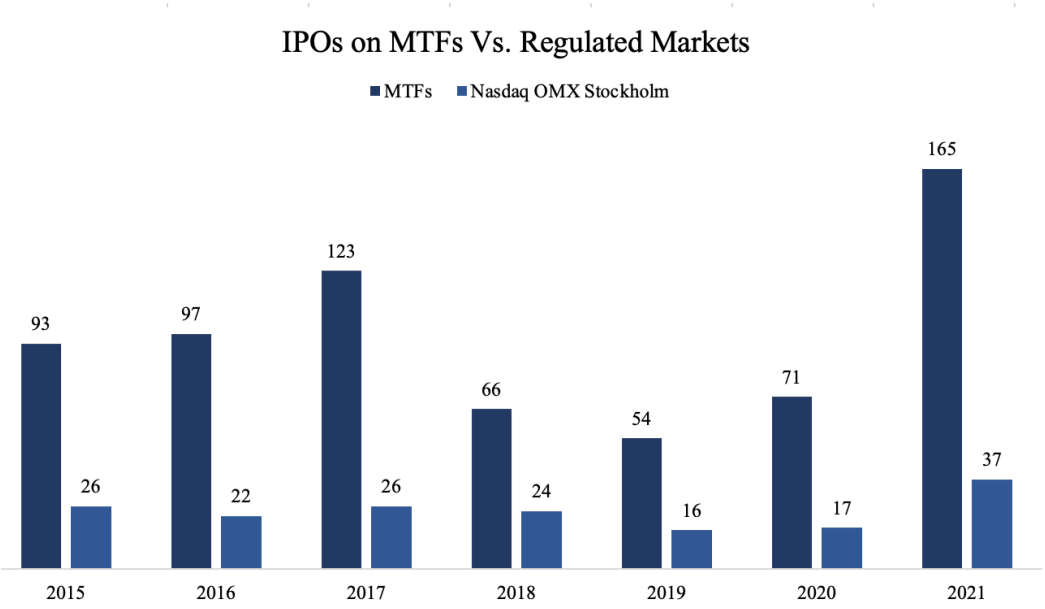
Appendices

Appendix 1 - Total IPO Proceeds on Swedish Stock Exchanges



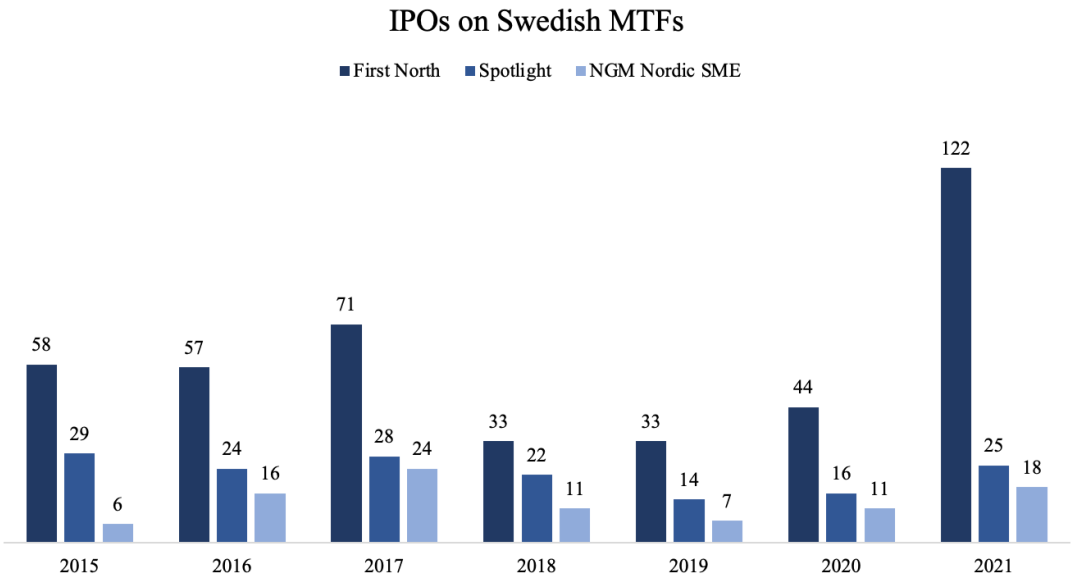
Source: Bloomberg

Appendix 2 - Number and Distribution of IPOs on Swedish Main Market and MTFs



Source: Nyemmissioner.se

Appendix 3 - Number and Distribution of IPOs on Swedish MTFs



Source: Nyemmissioner.se

Appendix 4 - Top 30 ranked bookrunners on First North during 2021

Rank	Adviser	Market Share (%)	Credit (SEK)	Deal Count
1	Carnegie	24.79%	7.85B	13
2	ABG Sundal Collier Asa	20.06%	6.35B	8
3	Nordea	7.68%	2.43B	4
4	DNB ASA	7.33%	2.32B	5
5	Pareto Securities	7.13%	2.26B	7
6	Barclays	6.62%	2.10B	2
7	SEB	5.47%	1.73B	5
8	Citi	4.41%	1.39B	1
9	Avanza AB	3.95%	1.25B	6
10	Svenska Handelsbanken	1.41%	445.33M	1
11	Joh Berenberg Gossler & Co KG	1.21%	382.11M	1
12	Mangold AB	0.95%	301.61M	7
13	Eminova Fondkommission AB	0.93%	294.79M	10
14	Bryan Garnier & Company Ltd	0.87%	274.71M	1
15	Partner Fondkommission AB	0.83%	261.29M	3
16	Naventus Corporate Finance AB	0.77%	245.00M	1
17	Danske Bank	0.75%	235.85M	1
18	Redeye AB	0.71%	225.00M	5
19	Swedbank	0.63%	200.00M	1
20	G&W Kapitalforvaltning AB	0.61%	194.12M	4
21	SpareBank 1 SMN	0.48%	151.90M	1
22	Sedermera Fondkommission AB	0.41%	129.08M	5
23	Vastra Hamnen Fondkommission AB	0.34%	109.00M	1
24	Augment Partners AB	0.34%	107.46M	2
25	Stockholm Corporate Finance	0.28%	90.00M	1
26	FNCA Sweden AB	0.24%	76.79M	1
27	Translution Capital AS	0.16%	50.00M	1
28	Corpura Fondkommission AB	0.15%	47.40M	2
29	Skills Corporate Finance AB	0.14%	45.84M	3
30	Erik Penser Bankaktiebolag	0.14%	45.00M	2

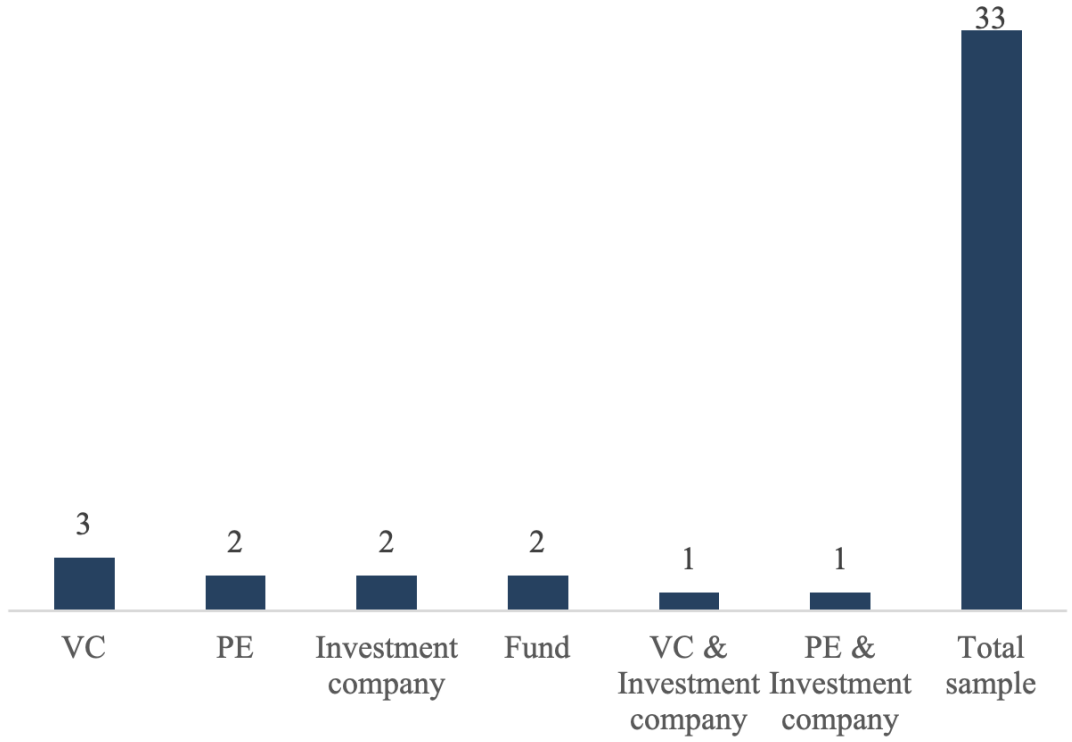
Source: Bloomberg

Appendix 5 - Megginson-Weiss Rank

This table provides a summary of the mean and median Megginson-Weiss rank for the sample IPOs

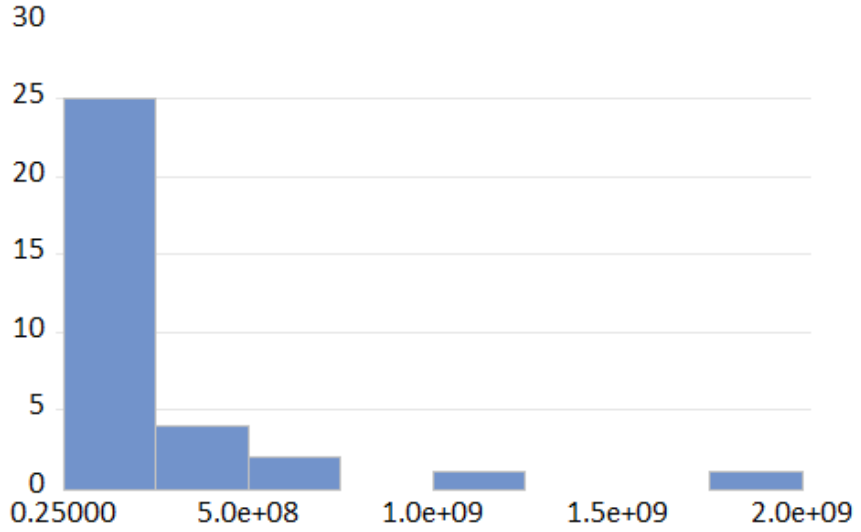
	Mean	Median
MW Rank	5.59%	0.93%

Appendix 6 - Distribution of VC- and other institutional backing



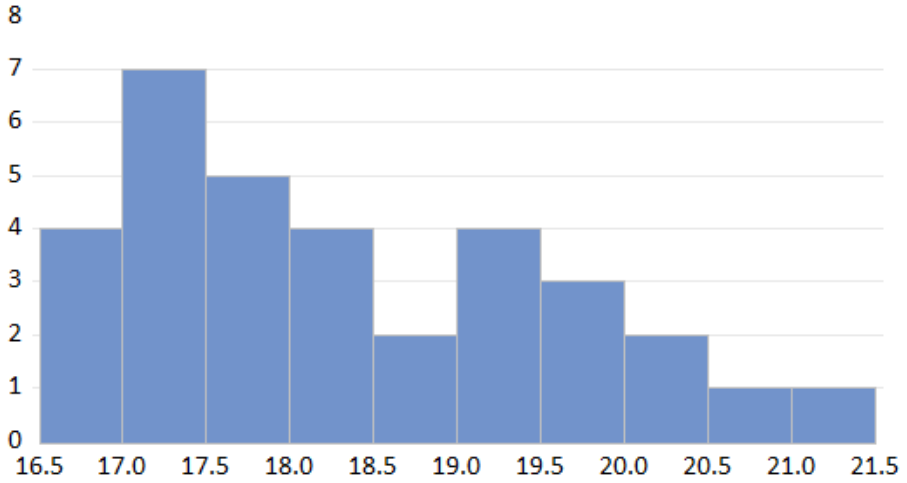
Appendix 7 - Logarithmic transformations of independent variables

7.1.1 - Size



Series: SIZE	
Sample 1 33	
Observations 33	
Mean	2.13e+08
Median	67800000
Maximum	1.92e+09
Minimum	16053223
Std. Dev.	3.73e+08
Skewness	3.379327
Kurtosis	15.03774
Jarque-Bera	262.0564
Probability	0.000000

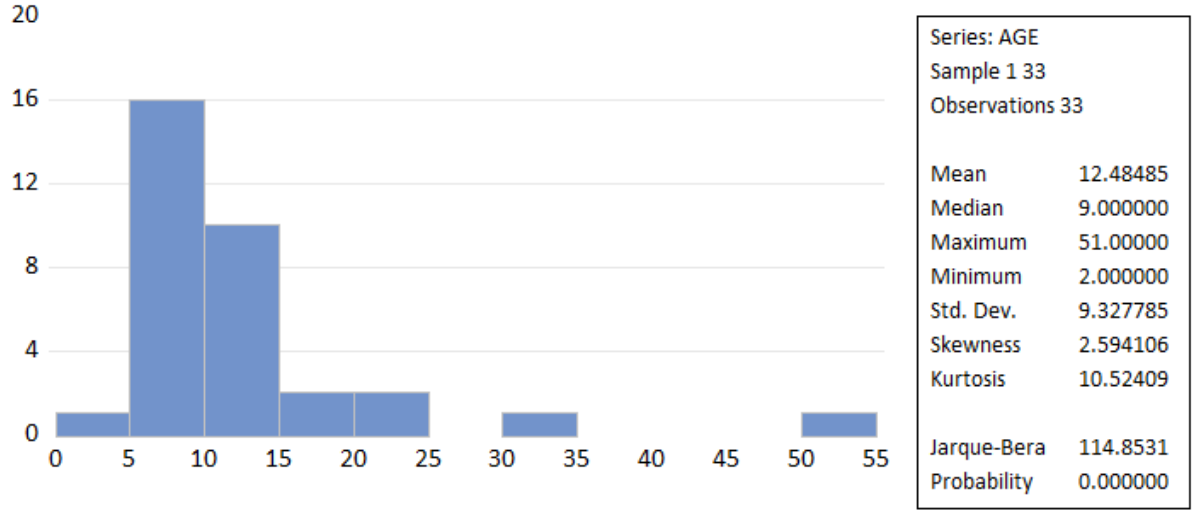
7.1.2 - Logarithmically transformed Size



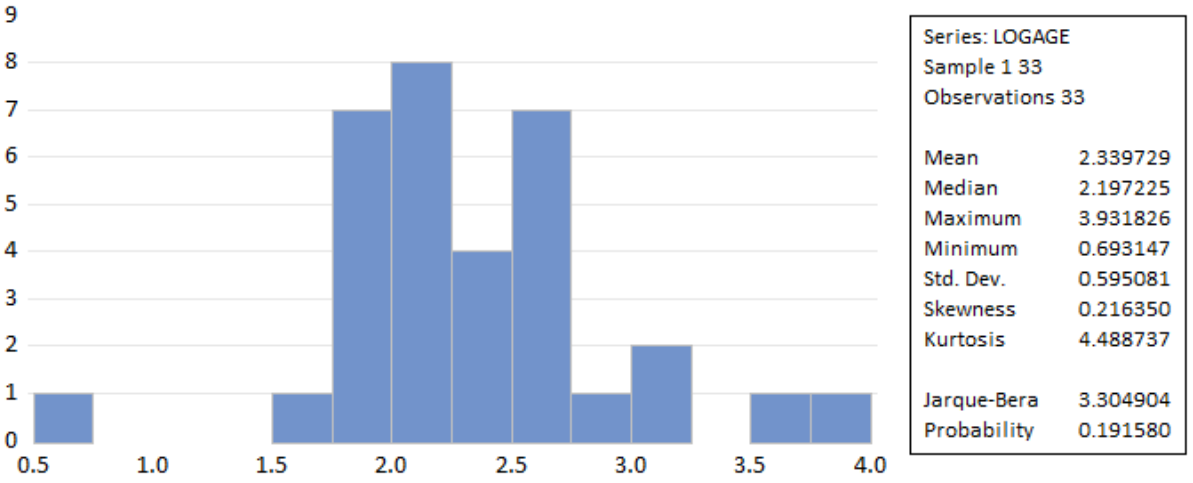
Series: LOGSIZE	
Sample 1 33	
Observations 33	
Mean	18.30239
Median	18.03207
Maximum	21.37559
Minimum	16.59142
Std. Dev.	1.270757
Skewness	0.586766
Kurtosis	2.415376
Jarque-Bera	2.363571
Probability	0.306731

Appendix 8 - Logarithmic transformations of control variables

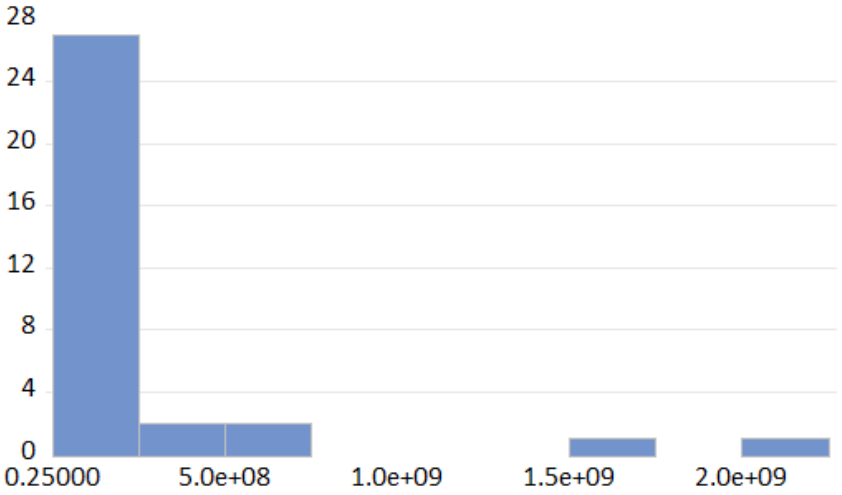
8.1.1 - Age



8.1.2- Logarithmically transformed Age

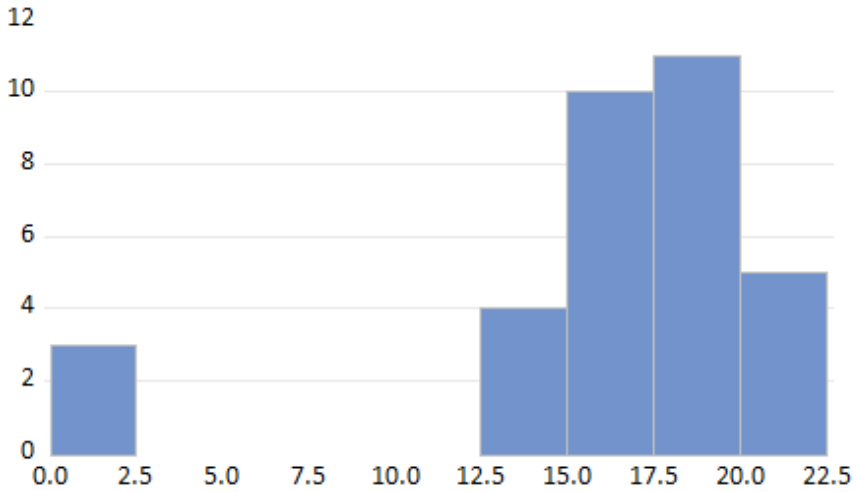


8.2.1 - Revenue



Series: REV	
Sample 1 33	
Observations 33	
Mean	2.08e+08
Median	30000000
Maximum	2.00e+09
Minimum	1.000000
Std. Dev.	4.68e+08
Skewness	2.908622
Kurtosis	10.66416
Jarque-Bera	127.2970
Probability	0.000000

8.2.2 - Logarithmically transformed Revenue



Series: LOGREV	
Sample 1 33	
Observations 33	
Mean	15.68861
Median	17.21671
Maximum	21.41641
Minimum	0.000000
Std. Dev.	5.494695
Skewness	-2.061400
Kurtosis	6.571455
Jarque-Bera	40.91006
Probability	0.000000

Appendix 9 - Model validation test results

9.1.1- White's test before transformation

Heteroskedasticity Test: White
Null hypothesis: Homoskedasticity

F-statistic	0.429691	Prob. F(7,25)	0.8743
Obs*R-squared	3.543955	Prob. Chi-Square(7)	0.8305
Scaled explained SS	2.229789	Prob. Chi-Square(7)	0.9460

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/19/22 Time: 21:58
Sample: 1 33
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000442	0.000280	1.576162	0.1276
REP_DUMMY^2	-0.000246	0.000547	-0.449908	0.6567
VC_DUMMY^2	-0.000149	0.000609	-0.243998	0.8092
SIZE^2	-1.15E-23	4.72E-22	-0.024387	0.9807
IND^2	0.000314	0.000370	0.850277	0.4032
AGE^2	-1.14E-07	4.83E-07	-0.235724	0.8156
REV^2	9.51E-24	3.18E-22	0.029897	0.9764
IB^2	-0.000115	0.000448	-0.257635	0.7988

R-squared	0.107393	Mean dependent var	0.000515
Adjusted R-squared	-0.142537	S.D. dependent var	0.000774
S.E. of regression	0.000828	Akaike info criterion	-11.14888
Sum squared resid	1.71E-05	Schwarz criterion	-10.78609
Log likelihood	191.9566	Hannan-Quinn criter.	-11.02682
F-statistic	0.429691	Durbin-Watson stat	2.048156
Prob(F-statistic)	0.874281		

9.1.2 - White's test after transformation

Heteroskedasticity Test: White
Null hypothesis: Homoskedasticity

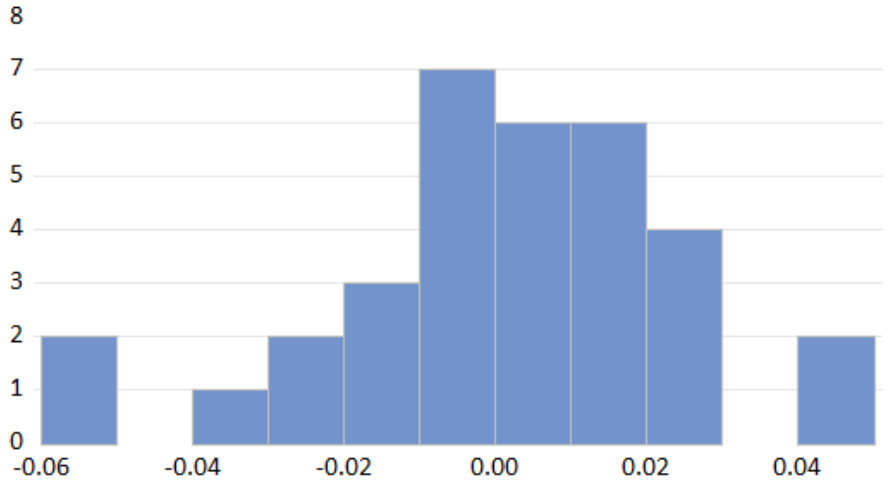
F-statistic	1.582568	Prob. F(7,25)	0.1866
Obs*R-squared	10.13286	Prob. Chi-Square(7)	0.1812
Scaled explained SS	4.212991	Prob. Chi-Square(7)	0.7549

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/19/22 Time: 22:01
Sample: 1 33
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000747	0.000682	-1.095868	0.2836
REP_DUMMY^2	-0.000428	0.000271	-1.579609	0.1268
VC_DUMMY^2	-0.000104	0.000225	-0.461093	0.6487
LOGSIZE^2	4.33E-06	2.23E-06	1.940551	0.0637
IND^2	7.39E-05	0.000161	0.458904	0.6503
LOGAGE^2	-2.86E-05	3.47E-05	-0.826223	0.4165
LOGREV^2	-7.85E-07	7.76E-07	-1.011890	0.3213
IB^2	0.000148	0.000207	0.716102	0.4806

R-squared	0.307056	Mean dependent var	0.000319
Adjusted R-squared	0.113032	S.D. dependent var	0.000390
S.E. of regression	0.000367	Akaike info criterion	-12.77313
Sum squared resid	3.37E-06	Schwarz criterion	-12.41034
Log likelihood	218.7567	Hannan-Quinn criter.	-12.65106
F-statistic	1.582568	Durbin-Watson stat	1.800423
Prob(F-statistic)	0.186647		

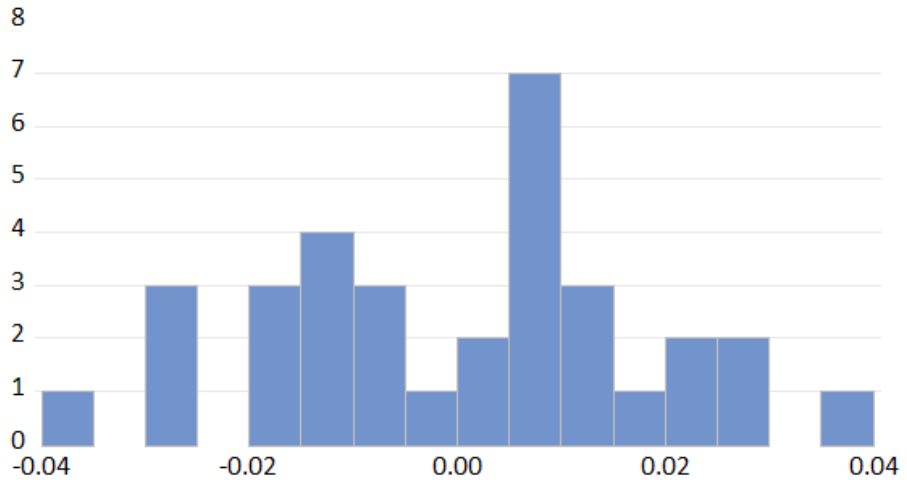
9.2.1- Jarque-bera test before transformation



Series: Residuals
Sample 1 33
Observations 33

Mean	9.03e-13
Median	0.001106
Maximum	0.045785
Minimum	-0.055009
Std. Dev.	0.023043
Skewness	-0.392276
Kurtosis	3.192569
Jarque-Bera	0.897332
Probability	0.638479

9.2.2 - Jarque-bera test after transformation



9.3.1 - VIF before transformation

Variance Inflation Factors
Date: 05/19/22 Time: 22:05
Sample: 1 33
Included observations: 33

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
REP_DUMMY	0.000424	3.744773	3.063905
VC_DUMMY	0.000292	1.718211	1.509943
SIZE	1.06E-21	9.261220	6.935395
IND	0.000152	4.468923	1.760485
AGE	5.97E-07	6.963507	2.445521
REV	4.51E-22	5.595092	4.647096
IB	0.000207	2.434363	1.844214
C	0.000140	6.820136	NA

9.3.2 - VIF after transformation

Variance Inflation Factors
Date: 05/19/22 Time: 22:04
Sample: 1 33
Included observations: 33

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
REP_DUMMY	0.000215	3.068857	2.510883
VC_DUMMY	0.000153	1.453586	1.277393
LOGSIZE	1.95E-05	513.1206	2.387479
IND	7.91E-05	3.753680	1.478723
LOGAGE	7.59E-05	34.59043	2.041696
LOGREV	6.95E-07	15.00467	1.595038
IB	0.000122	2.318549	1.756476
C	0.006022	471.7801	NA

9.4.1- Ramsey RESET test before transformation

Ramsey RESET Test
Equation: UNTRANSFORMEDREGRESSION
Omitted Variables: Squares of fitted values
Specification: GROSS_SPREAD REP_DUMMY VC_DUMMY SIZE IND AGE REV IB C

	Value	df	Probability
t-statistic	2.777119	24	0.0105
F-statistic	7.712392	(1, 24)	0.0105
Likelihood ratio	9.195571	1	0.0024

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.004132	1	0.004132
Restricted SSR	0.016992	25	0.000680
Unrestricted SSR	0.012859	24	0.000536

LR test summary:

	Value
Restricted LogL	78.10539
Unrestricted LogL	82.70318

9.4.2 - Ramsey RESET test after transformation

Ramsey RESET Test
Equation: TRANSFORMEDREGRESSION
Omitted Variables: Squares of fitted values
Specification: GROSS_SPREAD REP_DUMMY VC_DUMMY LOGSIZE IND LOGAGE LOGREV IB C

	Value	df	Probability
t-statistic	0.238837	24	0.8133
F-statistic	0.057043	(1, 24)	0.8133
Likelihood ratio	0.078341	1	0.7796

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	2.50E-05	1	2.50E-05
Restricted SSR	0.010531	25	0.000421
Unrestricted SSR	0.010506	24	0.000438

LR test summary:

	Value
Restricted LogL	85.99880
Unrestricted LogL	86.03797

Appendix 10 - Regression before transformation

Dependent Variable: UF
Method: Least Squares
Date: 05/23/22 Time: 17:37
Sample: 1 33
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REP_DUMMY	0.022962	0.020596	1.114853	0.2755
VC_DUMMY	0.005631	0.017087	0.329529	0.7445
SIZE	-4.50E-11	3.25E-11	-1.382385	0.1791
IND	0.014481	0.012324	1.175044	0.2510
AGE	-0.000120	0.000773	-0.154790	0.8782
REV	-9.93E-12	2.12E-11	-0.467510	0.6442
IB	-0.002673	0.014381	-0.185850	0.8541
C	0.061579	0.011852	5.195738	0.0000

R-squared	0.362524	Mean dependent var	0.061438
Adjusted R-squared	0.184031	S.D. dependent var	0.028861
S.E. of regression	0.026070	Akaike info criterion	-4.248812
Sum squared resid	0.016992	Schwarz criterion	-3.886022
Log likelihood	78.10539	Hannan-Quinn criter.	-4.126744
F-statistic	2.031026	Durbin-Watson stat	2.086123
Prob(F-statistic)	0.090853		

Appendix 11: Regression after transformation

Dependent Variable: UF
Method: Least Squares
Date: 05/23/22 Time: 17:30
Sample: 1 33
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REP_DUMMY	0.036604	0.014678	2.493719	0.0196
VC_DUMMY	-0.001134	0.012373	-0.091620	0.9277
LOGSIZE	-0.020976	0.004412	-4.754689	0.0001
IND	0.011817	0.008892	1.329047	0.1958
LOGAGE	-0.003700	0.008712	-0.424720	0.6747
LOGREV	-0.000592	0.000834	-0.710309	0.4841
IB	0.004085	0.011049	0.369725	0.7147
C	0.448629	0.077603	5.781049	0.0000

R-squared	0.604904	Mean dependent var	0.061438
Adjusted R-squared	0.494278	S.D. dependent var	0.028861
S.E. of regression	0.020524	Akaike info criterion	-4.727200
Sum squared resid	0.010531	Schwarz criterion	-4.364410
Log likelihood	85.99880	Hannan-Quinn criter.	-4.605132
F-statistic	5.467973	Durbin-Watson stat	2.143119
Prob(F-statistic)	0.000672		