



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

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Navigating the IPO Landscape

The Influence of Stock Exchange Regulations on IPO Underpricing in Sweden

Abstract

The study explores the phenomenon of IPO underpricing in the Swedish market, specifically the impact of stock exchange regulations on the first-day abnormal return of IPOs. The paper analyzes data from 2018 to 2022 and compares the first-day abnormal returns of IPOs listed on regulated markets with those listed on unregulated exchanges. Contrary to previous research and the hypothesis, the findings show a positive association between regulated markets and IPO underpricing. However, the results may be influenced by the Covid-19 pandemic as a majority of observations occurred during this period of uncertainty. This implies that investors may have incentives to invest in regulated markets during times of instability, leading to higher returns on IPOs. Thus, a larger sample size with more observations before and after the pandemic is necessary to shed further light on this issue.

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1.0. Introduction

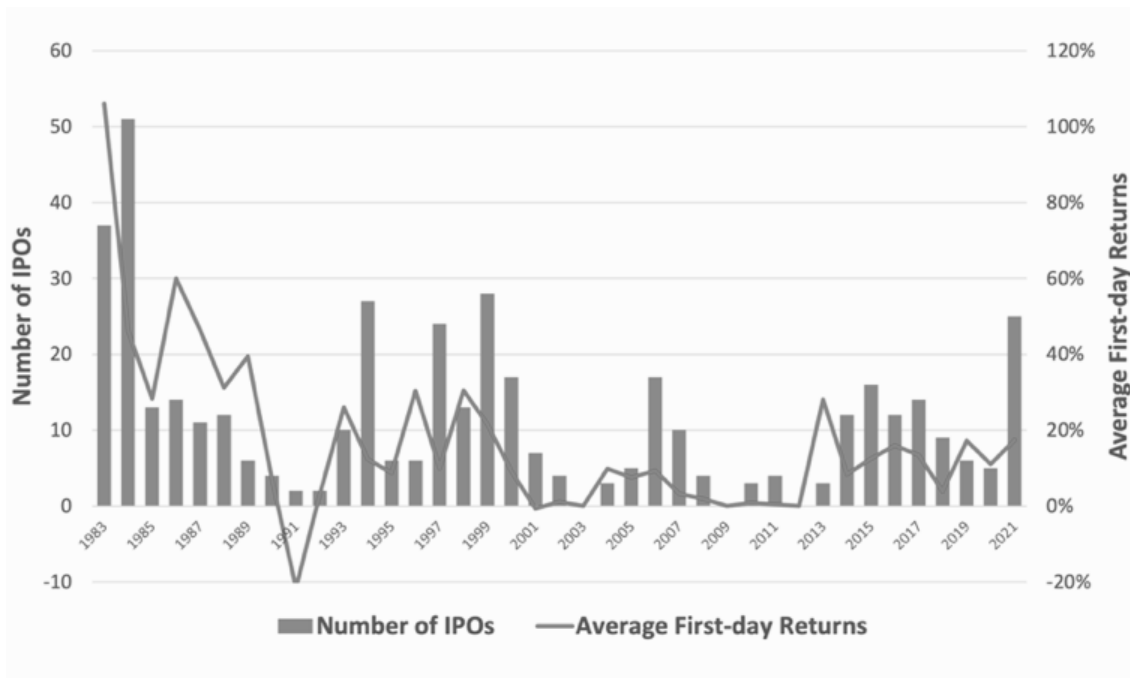
In this introductory chapter, the background of the topic is first presented to the reader, followed by a problem description. The background provides a brief overview of the phenomenon of IPO underpricing and the different possible reasons behind it including different regulations in different stock markets. The problem description and analysis section focus on the specific problem addressed in the thesis, how the regulatory characteristics of the stock exchange on which a company lists itself can affect the IPO underpricing. It also includes a presentation of the study's motivation, research question, and a clear definition of the study's purpose.

1.1. Background Description:

It is commonly known that during the first day of trading stocks experience abnormal returns. This was initially documented in 1970 by Logue (1973) and Ibbotson (1975) and is recognized as Initial Public Offering (IPO) underpricing. It occurs when a company goes public and the stock trades higher on the secondary market than the offer price set by the underwriter.

In the United States, between 1985 and 2022 the average IPO abnormal return was 21% (Ritter, 2023) and it is the same case for Sweden. The graph below shows the average abnormal returns on initial public offerings on Nasdaq OMX Stockholm between 1983 and 2021 and as displayed the average first-day return has consistently been significantly positive.

Graph 1: Evolution of IPO underpricing in Sweden, 1983-2021



Graph 1 shows the IPO underpricing and the number of IPOs in Sweden during the years 1983-2021¹ (IPO Data, 2023).

Even though the phenomenon of IPO abnormal return is well known, the reasons behind it are not as clear and is a debated subject. Possible reasons include market conditions, compensating underwriters, information asymmetry, or different regulations (Rock, 1986). According to Loughran and Ritter (2004), stricter regulations regarding financial reporting and corporate governance for public companies can result in fewer companies going public and therefore increase demand, potentially leading to less underpricing. Further, regulations such as the “quiet period”, which is the time before an IPO when the company is restricted from making public statements, can limit the information available to investors and increase uncertainty.

Regulations can differ between stock exchanges and Sweden has several, including NASDAQ OMX Stockholm, Nordic SME, First North, and Spotlight. The first two are regulated and thus, the listed companies are required to follow IFRS. In 2002, the European Union adopted an IAS directive that made it mandatory for listed companies in the EU to do

¹ 2014-2021 volume numbers exclude First North IPO.

their consolidated financial statements according to IFRS from the year 2005 and forward. As an EU member state, Sweden has been following IFRS since then. The accounting legislation in Sweden includes two important acts, the Annual Accounts Act and the Book-keeping Act, both of which refer to generally accepted accounting principles. The Swedish Account Standards Board or “Bokföringsnämnden” (BFN) is a government body that promotes the development of generally accepted accounting principles and issues general advice and information (IAS PLUS, n.d.). BFN is responsible for the principle-based system K3 which is for larger private companies in their consolidated financial statements. On the other hand, companies listed on an unregulated exchange in Sweden can choose between adopting K3 or voluntarily following IFRS (Skatteverket, 2023).

Certainly, the regulations on stock exchanges affect the underpricing of an IPO. Further, we know that the regulations on the Swedish stock exchanges differ. Thus, it is reasonable to assume that different stock markets experience different abnormal returns during the first day of trading.

1.2. Problem Description:

As mentioned in the background the phenomenon of IPO underpricing has been established over 30 years ago. When it was discovered that the first day a company goes public the stock tends to have abnormal returns. The question is why this is the case, why is it possible to make profits by simply signing up for an IPO? During the last decades, there have been several papers published, and plenty of research has been done in this area such as Ritter (1991). Research has investigated the different causes and reasons for this phenomenon and why it differs between companies.

As mentioned in 1.1 not all firms are listed on the same stock exchange, and in Sweden, there are several stock exchanges with varying characteristics. Each stock exchange applies different regulations and requirements for listed companies, which can significantly differ among them. Therefore, it is reasonable to question whether the regulatory characteristics of the stock exchange on which the company lists itself can affect the abnormal return of the IPO.

The listing requirements and regulations of a stock exchange can have a significant impact on the IPO performance. For instance, some stock exchanges may impose stricter financial reporting standards or demand that companies meet specific corporate governance criteria. Such differences can influence how investors perceive the credibility and quality of the company, which can ultimately affect the demand for its shares and the abnormal return of the IPO (Akyol et al. 2014).

1.3. Aim of the study:

The purpose of the study is to further research on the topic of IPO underpricing and contribute to a bigger understanding of the subject. To do this, we will investigate whether or not the abnormal return of an IPO differs depending on what stock exchange the company is listed on. More specifically if the return on the first day differs between a more regulated market, Nasdaq OMX Stockholm, and Nordic SME, compared with less regulated exchange markets in Sweden.

2.0. Theoretical framework:

This section provides the basic explanations of the economic theory which forms the basis for the following presented research and analyses. This chapter will thus help the reader better understand the subsequent chapters. The included theories are the efficient market hypothesis, information asymmetry, underpricing, signaling theory, and winner's curse. Further, it includes a description of the stock markets in Sweden and the different regulations.

2.1. Efficient Market Hypothesis (EMH)

In the paper *Efficient Capital Markets: a review of theory and empirical work* (1970) Eugene Fama argues with the help of empirical evidence his theory, "Efficient market hypothesis". A theory that claims that no one can outperform the market. Certain market anomalies where major returns are possible will be removed instantly as actors in the market will take advantage of them immediately.

As the market is efficient all assets will be fairly valued. Thus, indicating there is no over- or undervaluation. This price determination is done by using the available information. As the price depends on the available information, the amount/degree of information available will affect what the valuation might be (Fama, 1970).

Fama (1970) further introduces three different stages of information/markets, weak, semi-strong, and strong. The weak market efficiency implies that only past stock prices are used for the price determination, and as the market is efficient you cannot beat the market using this past information. The only way to outperform is to use new information. The semi-strong market efficiency includes both past stock prices and all public information, and therefore the only way to beat the market is to use insider information. The third and last stage is strong market efficiency, which states that insider information is also immediately included in the stock price, which means that there is no way to outperform the market in this stage. It is important to note that Fama (1970) still admits that there will be anomalies where one does beat the market. But this is not something that cannot be done consistently, indicating that the ones that manage have achieved it due to luck.

IPOs tend to have higher abnormal returns in the short-term (Rock, 1986), hence the offering price tends to be lower than the closing price on the first day of trading. Since the market is efficient and fairly prices all assets, it is implied that according to the efficient market hypothesis, if an investor earns abnormal returns from an IPO the offering price is underpriced as the true value is the value set by the market.

2.2. Information Asymmetry

Information asymmetry was introduced by George Akerlof in 1970, in the paper *The market for "Lemons": Quality Uncertainty and the Market Mechanism*. In transactions, there are cases when there is an asymmetry in the information both parts of the transaction have access to, a so-called "Information asymmetry". This situation could be beneficial for the transaction participant who has more information. Akerlof (1970) explains one of the consequences of information asymmetry using cars as an example. The salesperson selling a car is more likely to have more information about the car compared to the potential buyer. Therefore, he has incentives to sell a "bad" car for a higher price as the buyer does not have the information nor capability to determine whether the car is bad or good. Although, as the buyers lack both the information and capability to determine the quality he faces a certain risk, the risk of overpaying for a product in worse condition than anticipated. To compensate for this risk the buyer is not willing to pay the price of a car in good condition, as there is a risk that the car is in fact in bad condition. This will lead to a scenario where the price will become lower to compensate for the risk of buying a bad car, which also results in the car salesperson not being able to sell a good car for its true value.

This information asymmetry is a problem in IPOs, as the potential investors do not have access to all the information there exists a risk in signing up for the IPO. This is further discussed in section 2.3.

2.3. Underpricing

The efficient market hypothesis is opposed by a phenomenon known as underpricing, in which the offer price of an IPO is significantly lower than the closing price on the first day of

trading. The theory of underpricing in IPOs is grounded in the notion of information asymmetry (Ritter, 1984). Companies that are about to go public have access to detailed information about their business, financials, and growth prospects that are not available to the public which creates uncertainty and risk. To mitigate this risk, the financial advisor behind the IPO often intentionally underprices their shares to entice investors to participate in the IPO. The underpricing theory suggests that setting the offer price below the actual market value of the shares will increase demand for the shares and reduce the risk of the IPO being so-called undersubscribed (Beatty & Ritter, 1986).

Another reason for IPO underpricing is the desire of the company and its underwriters to establish a positive reputation with investors. By underpricing the IPO and allowing investors to profit, the company and its underwriters can create a positive reputation around the IPO and generate interest in future offerings. This can also help with attracting institutional investors who are more likely to invest in future offerings if they have experienced positive returns before (Rock, 1986).

Studies have consistently found that investors who can obtain shares at the offer price and sell them during the first day of trading can earn substantial profits due to IPO underpricing. For example, the study by Loughran and Ritter (2004) found that IPOs in the United States between 1990 and 2001 had an average first-day return of 18,8%.

2.4. Signaling Theory

Underpricing can also serve as a signal of the quality of the company and its management. By underpricing the IPO, the company is indicating that it believes its stock is undervalued. This can signal to investors that the company has strong growth prospects and has strong management which can increase demand for the shares and support the price of the stock in the secondary market (Allen & Faulhaber, 1989).

Further, underpricing can also serve to reduce information asymmetry between investors and the company. In a study, Carter and Manaster (1990) found that underpricing can help to reduce information asymmetry between the company and investors, as underpricing serves as

a costly signal of the company's quality. This can increase the confidence of the investors and reduce the expected risk premium of the IPO.

2.5. Winners Curse

Rock's (1986) theory of the Winner's curse is another attempt at explaining IPO underpricing using a model. The model assumes there is information asymmetry between the investors, some investors have more information about the true value of the firm and are thus informed, while the rest are uninformed. These uninformed investors buy shares of every IPO, and the informed investors only buy shares of IPOs they believe are attractive. Although the number of shares is limited, the attractive IPOs are oversubscribed, therefore the uninformed investors will only get a small portion of the attractive IPOs but the whole allocation of the unattractive IPOs. This can also be connected to the auction theory of The Winner's Curse by Thaler (1988), as due to the lack of complete information the uninformed investors end up overpaying for the unattractive IPOs.

Because the uninformed investor gets a small portion of attractive IPOs, and the full supply of unattractive IPOs, they get a return lower than the average underpricing, which can even be negative. If the returns were negative, the uninformed investors would stop signing up for IPOs. Rock (1986) further assumes that the demand from uninformed investors is necessary to avoid the risk of undersubscription, as the demand from informed investors is not sufficient. Because uninformed investors only invest in IPOs when they expect a positive return, underpricing on average is necessary (Engelen & van Essen, 2010).

2.6. Regulated vs Unregulated Markets in Sweden

In Sweden, there are several different stock markets, which can be divided into two main categories. Regulated markets, and unregulated trading platforms, also called Multilateral Trading Facilities (MTF). The main difference between these types of stock markets is that the regulated markets have higher regulatory demands on the companies both during the preparation before the IPO and while the company is listed on the stock exchange (Nasdaq, n.d.).

There are two regulated stock exchanges in Sweden, Nasdaq OMX Stockholm which is the largest one, and the smaller Nordic SME by Nordic Growth Market (NGM). Nasdaq OMX Stockholm is divided into three subcategories, small-cap for companies with a market value below €150 million, large-cap for companies with a market value above €1 billion, and mid-cap for companies in between. The regulated markets in Sweden are overseen by the Swedish Financial Supervisory Authority (“Finansinspektionen”). The companies listed on regulated markets have several obligations, for example, according to the IAS directive enforced by the European Parliament it is demanded that companies listed on a regulated market in a member state must conduct their consolidated accounts using IFRS (Faronline, 2023). These financial reports and other price-sensitive information also must be filed to “Finansinspektionen” which stores the information for at least five years (Finansinspektionen, 2023).

The demands for listing a company on a regulated market are very high, and therefore the costs are also very high. These costs make it hard for smaller companies to go public in a regulated market. Therefore, there are Multilateral Trading Facilitates that are less strict. In Sweden, there are several MTFs, including the Spotlight Stock market, First North and Nordic MTF. Here the company responsible for the MTF can choose which rules the listed companies must follow. Thus, the regulations are usually less strict, and the cost is lower (Nasdaq, 2023). Compared to regulated markets, companies listed on an MTF are not obligated to follow IFRS, instead, this is a voluntary option. However, according to the annual accounts act (“Årsredovisningslag 1995:1554”) and Bokföringsnämnden, if the company chooses not to follow IFRS they will apply K3 for their consolidated accounts (Faronline, 2023).

There are several similarities between IFRS and K3, but there still exist large differences, for example.

- IFRS is a global accounting standard, which is used by over 170 countries around the world. While K3 is a national Generally Accepted Accounting Principle (GAAP), and therefore not used in any country besides Sweden. Thus, if a company has interest from foreign investors the use of IFRS can decrease the information asymmetry.
- IFRS offers a bigger possibility to report the fair value of the company’s assets and liabilities. A fair value gives a more realistic value, which gives better information to its stakeholders.

- IFRS has more disclosure requirements than K3, thus the process of creating the annual report is more time-consuming and costly but gives a more transparent view of the company further reducing the information asymmetry (Faronline, 2023).

The previous research regarding the topic of the regulatory changes' effect on IPO underpricing mainly focuses on the effect of the accounting standards. This is because information asymmetry is one of the major reasons why IPO underpricing exists, and the improvement of the quality of the accounts should in theory improve the information available to the investors (Hong et al., 2014). The accounting principle is the main regulatory difference when comparing the types of stock markets when researching IPO underpricing. This will be further discussed in section 3.1 where previous research on the topic is presented.

3.0. Previous Research

In this chapter, a summary of the most relevant articles and research on the subject is presented. The research includes IPO underpricing in different markets, under different market conditions, and its relation to regulations such as implementing IFRS. This lays the foundation for the hypothesis which is then presented.

3.1. Prior Literature

In recent decades there have been numerous studies on the phenomenon of IPO underpricing and its underlying drivers. The results have been widely debated, but they generally converge in similar variables responsible for underpricing. However, different studies assign varying degrees of importance to different drivers in determining the cause of IPO underpricing. IPO underpricing was initially documented by Logue (1973) and Ibbotson (1975), where it was discovered that investors who purchase new issues at the offering price quickly achieve relatively high returns. Logue (1973) argued about the possibility that underpricing is a consequence of the investment banker's inability or reluctance while Ibbotson (1975) then further discussed the subject and concluded that the average initial performance is positive, indicating underpricing. However, even though they provide insights into this underpricing mystery, they do not answer it.

Ritter (1984) investigates the issue of underpricing and finds a positive correlation between high risk and high abnormal returns, with risk defined as low sales or a recent establishment. The hot market saw an increase in the average initial offering day return which according to Ritter (1984) is the consequence of the "winners curse" phenomenon. Where prices can inflate due to demand for hot issue stocks, resulting in overpayment. Rock (1986) then further discussed this and what the incentives might be since the underpricing of an IPO leaves money on the table for the firm going public, meaning that the company could in theory receive more capital with less underpricing. He argues that this underpricing is also partly an effect of the information asymmetry between issuers and investors, as the issuer has more information about the company and is more likely to know its "true value". Therefore, the issuer has incentives to underprice the offer to attract more investors. This in combination

with the information asymmetry between investors is what Rock (1986) bases his model of Winner's curse on, which is previously discussed in the theoretical framework in section 2.5.

Apart from information asymmetry, there has also been research made on other possible factors contributing to the level of underpricing of IPOs. Beatty and Ritter (1986) continued investigating the underwriter's effect and argue that the underwriter needs to find the so-called underpricing equilibrium. There exists a degree of underpricing that benefits both the issuer and investor, too much underpricing could damage the underwriter's reputation leading to future companies choosing a different underwriter to raise more capital. However, if the underwriter does not underprice the issue enough, they might lose future investors as they won't be compensated for the risk of an IPO. Hence, there exists a point where both parts are satisfied, the underpricing equilibrium.

It is clear that the phenomenon of IPO underpricing exists in various markets. For example, in the US, between 1985-2022 with a sample of 9126 IPOs, the equally weighted average first-day return was 19.0%² (Ritter, 2023). However, when we shift to a long-term horizon, research instead shows abnormal negative returns. Over the long run, the average market-adjusted return of IPOs is -2.87% per year over the three years following the IPO using a sample of 1526 IPOs between 1975-1984. This is according to Ritter (1991) because the IPO is attractive in the short term, as several investors are drawn to the available short-term profits and thus push up the share price, which is done at the expense of the long-term investors.

Loughran and Ritter (2004) explore the changing trends of initial public offering underpricing mainly in the United States. The analysis reveals that the degree of IPO underpricing fluctuated, with one period in the mid-1990s when the abnormal return doubled and then later reverted at the beginning of the 21st century. They give several reasons for this trend including the rise of institutional investors, increased competition among underwriters, and changes in regulatory environment. Changes in the regulatory environment was then further researched by Akyol et al. (2014). They analyze data from 3677 IPOs from 18 European markets between 1998 and 2012 to investigate the impact of regulatory changes on underpricing of IPOs. They discuss regulations such as the Sarbanes-Oxley Act of 2002,

² This sample only includes IPOs with an offer price of at least \$5.00, excluding ADRs, the unit offers, closed-end funds, REITs, natural resource limited partnerships, small best-effort offers, bank and S&Ls, and stocks not listed on Amex, NYSE, and NASDAQ.

which imposes stricter demands on public companies in areas of financial reporting and corporate governance (Wagner & Dittmar, 2006). Akyol et al. (2014) find that this results in a decline in IPO underpricing by improving transparency and increasing information flow. Several of the countries have adopted similar national corporate governance codes, their results show once again that underpricing has been declining over the last few years and has been lower for companies that listed their shares on regulated markets. They thereby suggest that regulations that increase transparency and improve the quality of financial statements, reduce asymmetries that affect IPO valuations. The report emphasizes the effect of market-wide regulations on security prices and notices that such regulations reduce IPO underpricing by making the information gap between informed and uninformed investors smaller.

One of the major changes regarding regulation is how accounting is supposed to be conducted, many regulated markets have implemented International Financial Reporting Standards (IFRS) by International Account Standards Board (IASB). Hong et al. (2014) investigates the effect of mandatory IFRS adoption on IPO underpricing in the global market. It is expected that,

“IFRS adoption increases the quality of reported financial information and thus reduced the information asymmetry among participants in the IPO process.” (Hong et al., 2014, p. 6).

Further, they find that this increase in quality decreases IPO underpricing. Important to note is that the level of the reduction in underpricing depends on how severe the accounting changes are when implementing IFRS (Hong et al., 2014). For example, in China, there was significant mitigation of IPO underpricing after the adoption of convergent-IFRS (Tsai & Huang, 2021). However, in Italy, this reduction of underpricing due to the adoption of IFRS is not found according to Agliata et al. (2018). They argue that the IFRS adoption did not reduce information asymmetry in Italy and discuss that this is probably due to the lack of enforcement. This shows a difference in the effect of IFRS adoption between countries as Hong et al (2014) suggests.

3.2. Hypothesis Development

From the literature review, it is clear that IPO underpricing exists, and several reasons have been found that can either increase or decrease the degree of underpricing. One of these factors is the regulations the company going public faces. The previous research on the topic suggests that an increase in regulation causes less information asymmetry as the requirements for what information must be publicly available increase. As Akyol et al. (2014) concludes, increasing transparency and information available decreases IPO underpricing. In the case of Sweden, we have both regulated and unregulated markets, as stated in the theoretical framework. The differences between these two types of markets (such as IFRS requirement) indicate less information asymmetry in the regulated markets. The question is whether these differences in regulation between the different stock markets have an impact on IPO underpricing in Sweden. Thus, we formulate our alternative hypothesis:

*H₁ = The degree of underpricing on IPOs is less severe
on Swedish regulated markets compared to unregulated*

4.0. Method:

In the following chapter, the reader is first presented with a general description of the method used in this study. We then narrow it down to the specific regression model used to then further explain all the variables used. Finally, a reflection considering the expected standard error is presented.

4.1. The Method in General

The report includes two parts. Firstly, a literature analysis of previous research is done to correctly extract relevant information to find a suitable quantitative model that answers the hypothesis. Here two subjects are mainly investigated.

- IPO underpricing. By deeply reviewing previous papers to find different characteristics of companies that influence the abnormal returns on the offering date. These are then used as control variables in the regression.
- Regulated/Unregulated stock exchanges. As we compare abnormal returns on initial public offerings on different stock exchanges it is important to know the literature regarding the effect of regulation on underpricing.

The main part of the study is the quantitative analysis where data is collected on first-day abnormal returns, stock exchanges, and other control variables such as firm age, firm size, Covid-19 etcetera. Using this data, a linear regression model is used to investigate a possible relationship. The linear prediction is estimated by using an OLS regression model which is run in the statistical software program STATA. The regression is done with the abnormal returns as the outcome variable, with a dummy variable which takes the value 1 if it is on a more regulated market and 0 otherwise, as the interest variable. Further, several control variables are included to avoid extensive OV bias. We assume the OLS assumptions for functional form, homogeneity, full rank, and random sampling hold but we test for heteroscedasticity and multicollinearity in section 4.4 to be certain it does not affect the result in the regression.

4.2. Model Specification

The following model has been chosen for this project after evaluating several control variables used in relevant articles on the subject, also considering available data.

$$1DAYR_{i,t} = \beta_0 + \beta_1 RM_{i,t} + \beta_2 AGE_{i,t} + \beta_3 COV_{i,t} + \beta_4 INT_{i,t} + \beta_5 SS_{i,t} + \beta_6 GP_{i,t} + \varepsilon_{i,t}$$

Where $1DAYR_{i,t}$ is the dependent variable of first-day abnormal return after the IPO which is the proxy for IPO underpricing. β_0 is the intercept and $RM_{i,t}$ is the independent variable in the form of a dummy which takes the number 1 if the IPO is on a regulated market, and 0 otherwise.

Then we have several control variables; $AGE_{i,t}$ is the age in years of the firm going public, $COV_{i,t}$ is a dummy variable that takes the value 1 if the IPO is done during COVID-19 and 0 otherwise, $INT_{i,t}$ is a dummy variable that takes the value 1 if the offer price is an integer and 0 otherwise, $SS_{i,t}$ represents the percentage of shares secured from the IPO and $GP_{i,t}$ shows the gross proceeds in millions of the IPO. Finally, there is an error term which is the difference between the actual value of the dependent variable and the expected value of the dependent variable based on the model. The error term hence represents the unobserved part of the model. For definitions of all variables, see Table 1 below.

Table 1: Definition of Variables

Variable	Variable label	Variable description [Source]
$1DAYR_{i,t}$	Abnormal first day return	First day return computed using offering price and closing price, subtracted with the market return to get the abnormal return ($1DAYR = \frac{CLOSING\ PRICE}{OFFER\ PRICE} - MARKET\ RETURN$). [S&P Capital IQ and several market indexes)
$RM_{i,t}$	Regulated market	Equals 1 if IPO i was listed on a regulated market, and 0 otherwise. [IPO-guiden at Affärsvärlden]
AGE	Age	Age of firm i in years at the IPO date. [S&P Capital IQ]
$COV_{i,t}$	Covid-19	Equals 1 if IPO i was done during the time Covid-19 was a communicable disease in Sweden, and 0 otherwise. [S&P Capital IQ]
$INT_{i,t}$	Integer price	Equals 1 if the offering price of IPO i is an integer, and 0 otherwise [S&P Capital IQ]
$SS_{i,t}$	Shares Secured	Part of offer previously secured. Including all subscription and guarantee commitments. [S&P Capital IQ]
$GP_{i,t}$	Gross Proceeds	Shows the company's gross proceeds from the IPO in million SEK. [S&P Capital IQ]

Table 1 presents information for all variables, and where the data has been collected.

4.3. Variable Descriptions

The initial day's abnormal return is the dependent variable that represents the IPO underpricing when running the regression. It is calculated as the difference between the IPOs first-day return and the return on a corresponding index. In instances where the firms go public on Nasdaq OMX, we used the OMX Stockholm PI index, incorporating all firms on the Nasdaq OMX Stockholm stock exchange. In cases where the firms go public on First North, we applied the First North All-Share SEK index, covering all shares on the First North stock exchange. When firms go public on the Spotlight stock market, we employed the Spotlight index, representing the progress on the Spotlight stock market. For the companies listed on the Nordic SME, we have used the NGM Nordic SME Price Index (NGMSMEPI) which includes all qualified shares listed on the NGM segment Nordic SME. We use the market index return as an approximation for the expected return of the stock on the day of the IPO.

The independent variable is a dummy variable that takes the value 1 if the firm is listed on a regulated exchange including Nasdaq OMX or Nordic SME, and 0 otherwise. The independent variable is derived from the alternative hypothesis to answer if the regulations on the exchange affect the level of underpricing. From the literature review, we know that, according to several articles including Hong et al. (2014), adopting mandatory IFRS decreases information asymmetry and thus the IPO underpricing. However according to Agliata et al. (2018), in Italy, the information asymmetry and IPO underpricing were not affected by implementing IFRS and increasing regulations. Nevertheless, most previous research suggests more regulations should decrease IPO underpricing, so we expect the independent variable to be negative. To obtain a clean result, we control for several variables mainly derived from an article by Teti and Montefusco (2021).

Our first control variable is firm age which is calculated as the difference between the year of the IPO and the foundation year (Teti & Montefusco, 2021). It is considered a proxy for IPO ex-ante uncertainty since younger firms lack experience and are generally smaller. A younger firm is thus more risky which results in the expected relation being negative (Clarkson, 1994).

Teti and Montefusco (2021) used a control variable called financial crisis which controlled for the effect of the financial crisis of 2007. Our sample does not reach back to the financial crisis, so it does not affect our results. However, Covid-19 arose in the middle of the time period from which the sample was collected so a Covid-19 control variable was added. Covid-19 is a dummy variable that takes the value one 1 when the IPO is done while Covid-19 was considered a publicly dangerous disease, in other words from 2nd of February 2020 (Krisinformation, 2020) until 1st of April 2022 (Folkhälsomyndigheten, 2022), and 0 otherwise. According to İlbasmış (2023), an IPO launched during COVID-19 has higher uncertainty and thus larger underpricing, so the relation is expected to be positive.

Integer price is another dummy variable and takes the value 1 when the offer price is an integer and 0 otherwise (Teti & Montefusco, 2021). According to Bradley et al. (2004), an integer price is the result of insufficient negotiations between the firm and the underwriter and indicates uncertainty which increases underpricing. In other words, integer price is a sign of the firm's inability to obtain a higher price for their shares which reflects the uncertainty associated with the value of the shares. This results in increased risk and therefore the coefficient is expected to be positive.

Further, another control variable is Shares Secured which represents the ratio of the IPO that institutional investors have secured during the book-building phase to the total offering. This variable has been found to be important in previous research, for example, a study on the Italian stock market by Teti and Montefusco (2021). They revealed a positive correlation between the level of IPO secured and the level of underpricing, signaling that a higher ratio of previously secured stocks increases the uncertainty. Therefore, we expect the variable to be positive.

The last control variable is Gross Proceeds which is used to represent the size of the firm (Teti & Montefusco, 2021). Similar to firm age, firm size is a measure of the uncertainty of an IPO. Larger firms are generally more stable and therefore, gross proceeds can serve as a meaningful measure of the uncertainty in an IPO. Higher gross proceeds indicate a lower level of uncertainty; thus, the expected relationship is thus expected to be negative (Beatty & Ritter, 1986).

4.4. Standard Errors

When we conduct the regression, it is important to test if the sample has a heteroscedasticity error. A Breusch-Pagan test was performed which examines a null hypothesis that states:

$$H_0: \text{The error variance is constant across the entire sample}$$

The result of the test is as follows:

First day abnormal return	
<i>Chi2 (1)</i>	304.49
<i>Prob > chi2</i>	0.0000

As shown, the p-value of the test is 0 which means that we can reject the null hypothesis at 1% significance. This means that we can assume that the data is affected by heteroscedasticity which can affect the reliability of the regression analysis.

Heteroscedasticity can result in biased coefficient estimations causing variables to appear more or less important than they are (Jaggia & Kelly, 2019). To account for this, we perform our regression with robust standard errors which means that the standard errors assume that the residuals have a constant variance. In section 5.4 we also test for multicollinearity.

5.0. Data

This section begins with an explanation of the data collection process and its complexities. The chapter then describes the data-cleaning process and descriptive statistics. Finally, the reader is presented with some of the implications of the dataset used in the regression.

5.1. Data Collection

To collect our data, we needed a database that offered an IPO screening function, thus we chose S&P Capital IQ due to their extensive information regarding the initial public offering process of various companies. We filtered for companies doing an IPO in Sweden between 2018 and 2022, resulting in 280 observations. Other sources such as Yahoo Finance only show the opening price and closing price, although in the case of IPOs first-day return, the offering price is more relevant. The percentage difference between the offering price (instead of the opening price) and the closing price is the return the investor who signs up for the IPO receives. First-day return is a variable S&P Capital IQ offers and gives the percentage return between the offering price and closing price. Thus, investigating the offering price and the closing price was not necessary. To make sure that this return is based on the correct variables, random observations were tested by comparing the given return with our own calculated first-day return. Furthermore, the return was adjusted to abnormal returns using the market return as an approximation for the expected return. The market return used for each observation is the index return for the specific market each observation was listed on the same date as the IPO. Although some markets were submerged, for example, Nasdaq Small, Nasdaq Medium, and Nasdaq Large are assumed to follow the Nasdaq OMX Stockholm PI.

For the indexes, there was no information on the return for each day on S&P Capital IQ. However, from Yahoo finance for OMXSPI, Investing.com for First North All-Share SEK, and the Spotlight website for the Spotlight index, we received the closing prices for each day. We then were then able to calculate the return by using the following formula:

$$\text{Market return} = \frac{P_n - P_{n-1}}{P_n}$$

Where,

$$P_n = \text{Closing price the day of the IPO}$$
$$P_{n-1} = \text{Closing price the day before the IPO}$$

This data was then added manually into the dataset for each specific IPO date.

The variable of interest, Regulated Market, was not attainable from S&P Capital IQ, as their variable for which stock market the company went public on only gives two different stock markets to all the observations, the stock markets being Nasdaq OMX Stockholm and Nordic Growth Market. Even though the company isn't listed on one of the two stock markets. As the distinction between if the IPO was on a regulated or unregulated market is the focus of this study it was crucial to separate these observations depending on which specific stock market the IPO was offered on. This problem was solved by manually adding every specific stock market to each observation in the data set using IPO-guiden from Affärsvärlden for each observation. Thereafter a dummy variable was created which took the number 1 for IPOs on regulated markets, and 0 otherwise.

5.2. Sample Selection

From S&P Capital IQ we received a sample of 280 IPOs during 2018-2022 in Sweden. However, due to limited data on IPO-guiden which was used for the control variables some of the observations had to be removed. Data were missing on the variable shares secured on 19 of the IPOs leaving us with 261 observations. Thereafter, the variable gross proceeds missed data on an additional 3 observations, leaving us with 258 observations in total. Thus, the observations for which some variables were missing could not be used. Although, when calculating the ratio between the market the companies went listed on, we discovered that it corresponded with the rest of the sample, and we then assume that these variables are missing at random. Table 3 shows the sample selection process.

Table 3: Overview of the Sample Selection Process

Selection Step	IPOs dropped	Remaining IPOs
IPOs collected from Capital IQ		280
Observations without data for Shares Secured	19	261
Observations without data for Gross Proceeds	3	258

Table 3 gives an overview of how the sample selection process.

5.3. Descriptive Statistics

Our dataset contains 258 different observations of initial public offerings in Sweden between the years 2018 and 2022. Table 4 shows the descriptive statistics for the variables used in the regression analysis. As shown, the mean first-day average abnormal return is 9.2% with a standard deviation of 36.5%.

Table 4: Overview of Descriptive Statistics

Variable	Observations	Mean	Standard Deviation	Min	Max
<i>First day abnormal Returns</i>	258	0.092	0.365	-0.710	1.764
<i>Regulated market</i>	258	0.159	0.366	0	1
<i>Age</i>	258	0.609	0.216	0	1.360
<i>Covid</i>	258	16.310	21.358	0	152
<i>Integer</i>	258	0.690	0.463	0	1
<i>Shares secured</i>	258	0.601	0.491	0	1
<i>Gross Proceeds</i>	258	499.934	1751.425	6.080	20000

Table 4 provides descriptive statistics about the variables used in the regression analysis.

Figure 2 gives an overview of the number of observations on each exchange and shows that First North has by far the largest number of initial public offerings standing for 151 observations which correspond to almost 60%. Spotlight has 53 observations, so combined the unregulated markets account for almost 80% of all observations. When it comes to regulated exchanges, Nasdaq OMX experienced 42 IPOs and Nordic SMEs only 12.

Figure 2: Number of Observations based on Exchange.

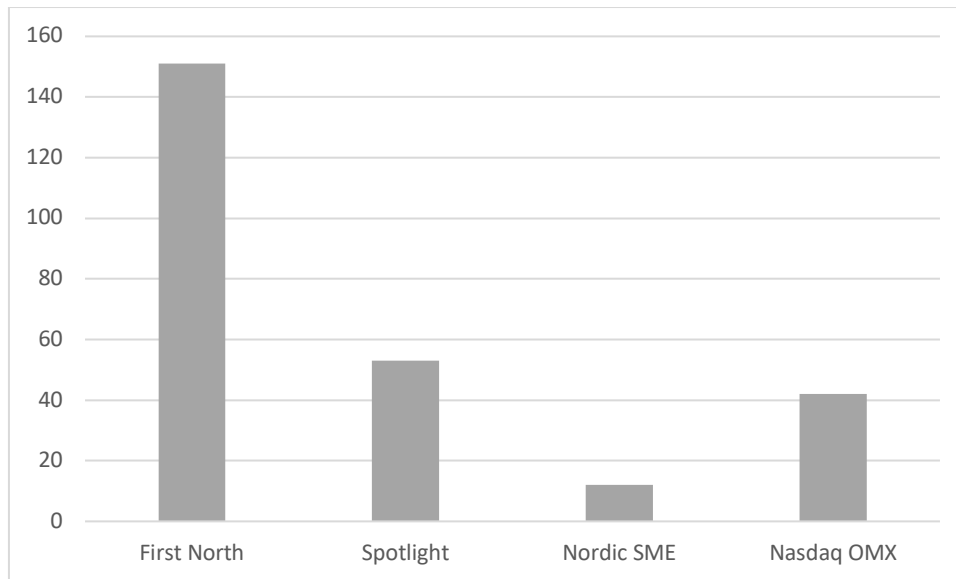


Figure 1 shows the frequency of IPOs on each stock market included in the study.

Figure 3 displays the number of observations per year and as shown 2021 stands out with 129 data points which accounts for approximately 50% of all observations. The rest of the years have a relatively similar number of observations with 37 in 2018, 23 in 2019, 36 in 2020, and 33 in 2022.

Figure 3: Number of Observations based on year.

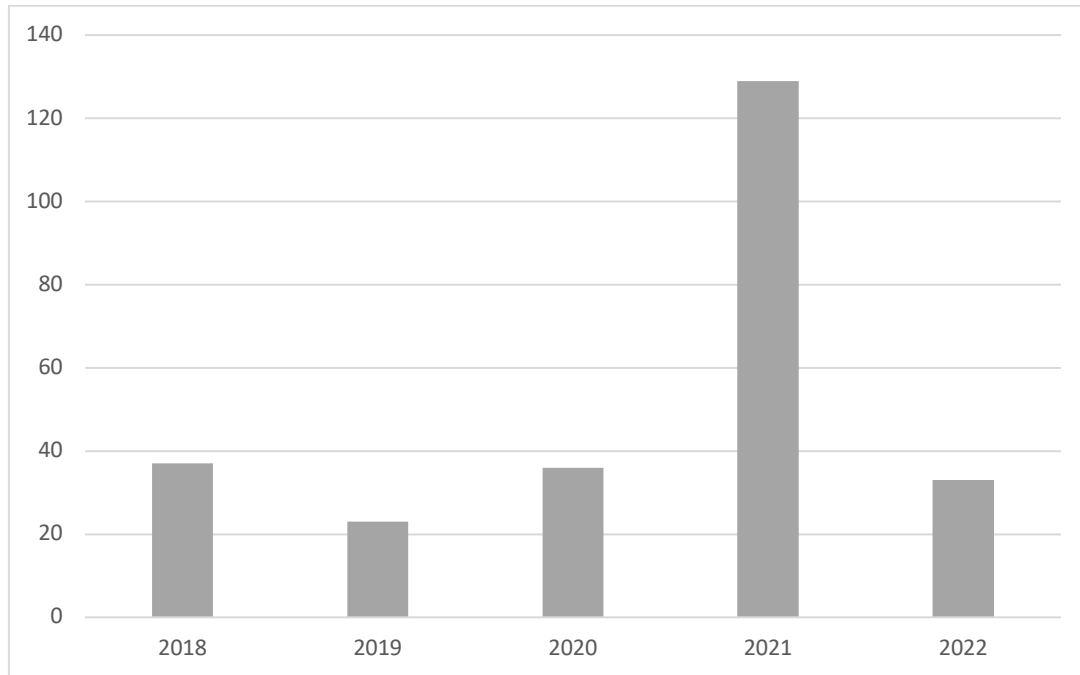


Figure 2 shows the frequency of IPOs every year in the sample.

5.4. Multicollinearity Test

We test for multicollinearity which is done by checking the correlation between the independent variables. This test aims to identify potential issues with the validity of the estimation. If the data is affected by multicollinearity, changes in one variable may lead to corresponding changes in another variable. A correlation coefficient of less than 0.8 suggests a low risk of multicollinearity. The result of the test is presented in Table 2. As shown in the matrix none of the correlation coefficients are above 0.8 which means the data does not suffer from multicollinearity. By avoiding multicollinearity, the regression reduces the difficulty of identifying significant independent variables (Jaggia & Kelly, 2019).

Table 2: Correlation table

	First day abnormal return	Regulated market	Age	Covid	Integer	Shares Secured	Gross Proceeds
First day abnormal return	1						
Regulated market	0.088	1					
Age	-0.010	0.344	1				
Covid	0.096	0.016	0.038	1			
Integer	0.063	0.268	0.261	-0.016	1		
Shares Secured	-0.120	-0.219	-0.158	0.116	-0.190	1	
Gross Proceeds	0.080	0.428	0.294	0.045	0.124	-0.092	1

Table 2 shows the correlation between all variables included in the regression analysis. The figures in bold are statistically significant at the 5% level.

5.5. Problem of Outliers

When collecting large amounts of data from databases, there always exists the problem of data error and outliers. As the sample size in this report is smaller, it was possible to check if the upper and lower 1% in each variable was correct, which was the case. Hence, the only problem regarding the upper and lower 1% is extreme values which could influence the result. It was chosen to include two regressions, one using the data as it is, and one with windsorized values. The reason behind this is discussed further in section 7.1.

5.6. Missing Control Variables

It would be beneficial to include more control variables. According to, Beatty and Welch (1996) profitability such as Return on Assets (ROA) is a proxy for the risk of a firm and can therefore affect the underpricing of the IPO. However, due to missing data regarding the return the year before the IPO, our data set would have decreased too much. It was the same case for the control variable secondary shares which is the number of shares offered to the secondary market by selling shareholders divided by the total number of shares offered. According to Boulton et al. (2009), underpricing decreases when this ratio increases, and it would thereby be a relevant control variable.

Further, the article by Montefusco and Teti (2022) includes a venture-backed control variable since previous studies have shown that underpricing is lower for firms with venture capital firms backing them (Engelen & Essen, 2010). Although, no such data were available with the accessible resources which made it impossible to include.

Finally, Montefusco and Teti (2022) included an industry coefficient as a dummy variable which took the value of 1 for High-tech firms. According to Benveniste et al. (2003), Dewan et al. (2007), and Engelen and Essen (2010) these firms are considered riskier and were therefore subject to more underpricing. Although we found SIC industry codes for all our observations, we could not determine which SIC industries were considered High-tech firms.

6.0. Empirical Results

The reader is first presented with an initial regression including all observations which gives an indication of the result. A section on whether the effect of outliers is followed which results in a final model with the outliers winsorized. First, an overview of the variable data post winsorized is displayed, and then the final regression to clearly show the reader the entire results.

6.1. Initial Model

By regressing our initial model to determine the effect of regulation on the underpricing of IPOs using the outcome variable, interest variable, and control variables previously described in section 4.1, we get the following result, presented in Table 5 below. This gives us an indication of whether conducting an IPO on a regulated market will reduce the initial day abnormal return.

Table 5: Regression of Regulated Market on First-day Abnormal Returns

First day abnormal Returns	Expected Sign	Coefficient	Robust Std. Err.	t	95% Conf. Interval
<i>Regulated market</i>	-	0.093	0.045	2.070	0.004 0.181
<i>Age</i>	-	-0.001	0.001	-1.700	-0.002 0.000
<i>Covid</i>	+	0.062	0.044	1.410	-0.024 0.148
<i>Integer</i>	+	0.056	0.051	1.080	-0.046 0.157
<i>Shares secured</i>	+	0.240	0.095	2.520	0.052 0.427
<i>Gross proceeds</i>	-	0.00001	0.000	1.870	0.000 0.000
<i>Constant</i>		-0.134	0.077	-1.730	-0.287 0.018
Number of observations	258				

Table 5 shows the regression of the regulated market on the First day of abnormal return. * is for 10% significance, ** for 5% and *** for 1%

Table 5 reveals that the Regulated Market dummy variable has a positive coefficient, indicating that during 2018-2022 the first-day return is higher for initial public offerings (IPOs) on Swedish regulated markets compared to Swedish unregulated markets. Thus, the result suggests that the abnormal returns on the first day of the IPO keeping all other things constant tend to be 9.3% points higher than those on an unregulated market in Sweden, at a 5% significance level. Meaning that we can't reject the null hypothesis and claim that the regulation and first-day initial return have a negative relation.

Further, when it comes to the control variables, we recognize that the abnormal returns tend to be higher during the Covid period, for younger companies, when the offer price is an integer and when shares secured are higher. This result goes in line with our expectations, however, for gross proceeds the relationship contradicts our expectations. For the gross proceeds of the IPO, the relationship is positive which means that the larger the IPO is, the more IPO underpricing it experiences.

6.2. Final Model

As some of the variables in the model seems to have extreme values, another regression is done where these values have been windsorized at 1% and 99% as it is standard practice in previous research. The variables are First-day abnormal return, Gross proceeds, and Shares Secured. Table 4 below shows the updated description of the data.

Table 6: Overview of Descriptive Statistics post Winsorizing

Variable	Observations	Mean	Standard Deviation	Min	Max
<i>First day abnormal Returns</i>	258	0.091	0.358	-0.637	1.474
<i>Regulated market</i>	258	0.159	0.366	0	1
<i>Age</i>	258	16.310	21.358	0	152
<i>Covid</i>	258	0.690	0.463	0	1
<i>Integer</i>	258	0.601	0.491	0	1
<i>Shares secured</i>	258	0.608	0.212	0	1
<i>Gross proceeds</i>	258	458.582	1366.218	6.900	11050

Table 6 presents an overview of the descriptive statistics post-winsorizing for the variables used in the final regression.

By comparing the data in Table 6 with the pre windsorized values from Table 4, most of the variables have decreased in mean, except shares secured. Indicating that most of the variables are likely to be subject to more upper-extreme variables. The “First-day abnormal return” decreased from 9.2% to 9.1%, where the maximum value decreased from 176.4% to 147.4%, and the minimum value increased from -71% to -63.7%. Gross proceeds maximum value decreased from 20 000 to 11050, resulting in a decrease in the mean from 499.934 to 458.582. The mean shares guaranteed was the only mean which increased, but not by large amounts, hence it was most likely subject to a rather equal amount of both upper and lower outliers. Using the windsorized values we get the following regression.

Table 7: Regression using Winsorized Variables.

First day abnormal Returns	Expected Sign	Coefficient	Robust Std. Err.	t	95% Conf. Interval
<i>Regulated market</i>	-	0.085	0.044	1.920	-0.002 0.173
<i>Age</i>	-	-0.001	0.001	-1.670	-0.002 0.000
<i>Covid</i>	+	0.060	0.043	1.380	-0.026 0.145
<i>Integer</i>	+	0.058	0.050	1.150	-0.041 0.157
<i>Shares secured</i>	+	0.244	0.097	2.510	0.053 0.434
<i>Gross proceeds</i>	-	0.00002	0.000	2.340	0.000 0.000
<i>Constant</i>		-0.139	0.078	-1.780	-0.292 0.015
Number of observations	258				

Table 7 shows the regression using the windsorized values. * is for 10% significance, ** for 5% and *** for 1%

Consistent with the initial model, the effect of a regulated market is positive, meaning that the first-day return of IPOs tends to be higher in regulated markets compared to unregulated markets. Although, now instead significant at a 10% level.

7.0. Discussion

In the discussion, the reader is firstly presented with a section discussing the results including which model to use and the significance of the different variables. The discussion provides some possible explanations of the result and finally, a section describing the limitations of the study.

7.1. Discussion of Results

When running the regression using windsorized values the result barely changed compared to without the windsorized values, indicating that the result in the first regression is not mainly driven by extreme values in the data set. Even though the t-stat on the last test was lower, the difference is not large. The question of which model is more appropriate to use is difficult. Previous research prefers to use windsorized values, to avoid the problem of both extreme values and outliers due to errors in the data. Because the data set is limited in sample size it was possible to double-check the upper and lower extreme values, and these seem to be correct. Thus, the outliers are not caused by errors in the data, instead, they are simply extreme cases. So, should these extreme values be windsorized or not? These extreme cases are observations that could potentially be explained by both our variable of interest and control variables. To put it in other words, even though these observations might be extreme they could still be vital in finding a relationship as they could have such a high return due to various variables included in the regression. Having said this, we still see the possible bias in including the observations, therefore we saw it as necessary to include both regressions. Which one is most appropriate to use remains a mystery, as we see the extreme cases as potentially necessary to find a relationship, but still acknowledge the fact that including these observations could drive the results. Nevertheless, as the results barely changed, the discussion will be the same regardless of which regression is used, but to follow previous research, the windsorized model is seen as the “Final model”.

The coefficient for the variable of interest, the Regulated market was shown to be positive. A result that contradicts previous research and our alternative hypothesis. One factor which could have a major impact is the Covid-19 pandemic, a majority of the observations in the data set occurred during the pandemic. Periods in time when there is a lot of uncertainty in the world investors tend to be more risk-averse and limit their investments (Guiso et al.,

2018). Thus, one way to interpret the result is the fact that investors might have been more interested in investing in regulated markets with more stable IPOs. If this were to be the case, it is very reasonable that IPOs on more regulated markets had a higher return compared to IPOs on unregulated markets. The reasonability is that higher demand leads to higher market prices (Smith & NetLibrary, 1990). We believe that we are then facing the question of if these abnormal returns are caused by underpricing by the underwriters or an excessive amount of demand.

As the regression shows, the abnormal returns on IPOs are higher in regulated markets compared to unregulated markets. If this is caused by the excessive demand for more secure IPOs, then no conclusion can be drawn regarding the underpricing by the underwriters. As the differences in abnormal returns between markets then do not depend on the choice of valuation by the underwriter, but instead, rather the fact that a large number of investors prefer to invest in safer investments, thus firms on the regulated markets (Gusio et al., 2018). For example, if all the uninformed investors from Rock's (1986) Winner's curse theory only chose to invest in IPOs on regulated markets our result does not answer the question if underpricing differs depending on the stock exchange. It then only shows that higher demand overshoots the first-day return on regulated markets and since the other IPOs would not receive this high demand, the return would be lower. To further investigate if this argument is plausible, one would have to examine the long-run performance of the IPOs included in this sample.

It is attempted to include the effect of Covid-19 in the regression, to try to avoid any OV bias from the variable of interest. Although, it is not clear if this was successfully done, as the sample is limited by the relative observations before and after Covid-19. Therefore, it is possible that the effect of the regulation when the market is in its normal environment is not fully captured. The limitations regarding data collection before and after covid will be further discussed in section 7.2. It can also be argued that some economic uncertainty still exists due to current world conditions, such as the war in Ukraine (World Bank Group, 2022), additionally decreasing the number of observations during times without uncertainty.

Further, all the control variables experienced the expected coefficient sign except gross proceeds which was used as a proxy for the size of the firm. Larger more mature firms tend to be less risky which suggests less underpricing. However, the gross proceeds coefficient was

positive which implies that a higher amount of gross proceeds increases the abnormal return on an IPO. While previous research shows a negative correlation between gross proceeds and first-day return, thus a negative sign on the coefficient (Teti & Montefusco, 2021). One possible reason could be the argument above regarding Covid-19, as a pandemic uncertainty existed in the majority of our sample it is possible that investors mainly want to invest in more stable firms, pushing up the price of larger IPOs on the first trading day.

According to Rock (1986), during tougher economic conditions, discounts are larger, and the number of initial public offerings is few. We believe that it is possible that during these market conditions, mainly larger firms are less prone to perform an IPO due to less urgency of capital. However, for smaller who are having trouble with cash flow, for example, the importance of new capital could be significant to keep the business running and can therefore not wait until more beneficial market conditions. Hence, the companies who still go public on the regulated markets (tend to be larger according to the correlation Table 2) during the pandemic have on average higher risk compared to time periods without uncertainty. As the risk increases, Ritter (1984) shows that the level of underpricing increases, which indicates that the abnormal returns could be higher in the regulated markets, as the types of companies going public could be riskier compared to what is normal.

7.2. Limitations of the Study

The main limitation of the study is the small sample size. The sample size used contains several IPOs in Sweden during the period 2018-2022, with 258 observations after cleaning the sample. 178 of these (69% of the total sample size) were during the pandemic covid-19. Meaning that the sample faces two limitations. The first is the lack of more observations, as the sample size increases the more precise result of the regression will be. Because of this, the conclusions drawn using this sample cannot be assumed to represent the population, the population being all IPOs in Sweden. The second limitation regarding the sample is the fact that a majority of the IPOs occurred during Covid-19. Five years was chosen since we wanted to analyze IPOs before, during, and after Covid-19 to obtain a non-biased result. However, as discovered later, most of the observations were conducted during Covid-19, hence there exists a possibility of bias in our results which is previously discussed in section 7.1.

Further, several of the variables such as shares secured, exchange market, and market return had to be added manually, thus it would be time-consuming to have up to 20 years. Therefore, due to limited data and time, we had to decrease the number of years. However, if we could do the thesis again with more time, we would increase the sample size to 10 years to get more data before Covid-19. If the study would include IPOs from a longer time period, we, most likely would have received a more statistically powerful result, however, it is very hard to know what the result would be. Thus, we reach the conclusion that to further research the differences in IPO underpricing in Sweden between regulated and unregulated markets the sample size would have to be increased due to two reasons. Firstly, to get a more reliable result from a larger sample size. Secondly, to get more observations from IPOs before Covid-19 as it is very likely that the market behaved differently compared to what it would during times when the market was at a normal state.

8.0. Conclusion

The thesis aims to contribute to existing studies regarding the IPO underpricing phenomena by investigating the effect of regulation in Sweden. To do so, the study compares the abnormal returns on the first day of the IPOs on regulated and unregulated stock exchanges. An existing OLS regression model was used to the fullest extent possible, considering limitations such as data collection. The result indicates a positive association between regulated markets and IPO underpricing in Sweden. This relation was consistent whether or not a windsorized model was used, though the significance level varied. When windsorized values were included, the result was significant at 10%, instead of 5%.

As discussed in section 7.1, whether the observed result indicates a difference in underpricing by the underwriter or an excess demand during the Covid-19 pandemic is still unclear. Nevertheless, assuming that the efficient market hypothesis holds, the market correctly values the stocks when traded publicly. The study suggests that regulations have a positive association with first-day abnormal returns on IPOs in Sweden during 2018-2022, contradicting both previous research and the alternative hypothesis. However, given the limited sample size, whether this is due to underpricing or excessive demand during Covid-19 remains unknown. Therefore, additional research is needed to provide more clarity on this issue.

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