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Does skill matter?

A study on the relationship between cornerstone investors and underpricing in the Swedish IPO market

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Abstract: Swedish IPOs backed by cornerstone investors have increased from 10% of all IPOs in 2014 to 90% of all IPOs in January to September of 2020. Although theories regarding IPO underpricing are well developed, the connection to cornerstone investors has not yet been fully covered in financial research. This paper uses a data set including 168 IPOs, of which 118 are cornerstone backed, in the Swedish stock market during the period from 2014 to September 2020, to investigate the relationship between cornerstone investors and IPO underpricing. By performing two-sided t-tests, conclusive evidence is found that both IPOs in general and cornerstone backed IPOs in particular have been underpriced in this period, experiencing an average underpricing of 10.0% and 12.8%, respectively. Furthermore, by performing a multivariate regression analysis, this paper finds conclusive evidence that the share of an offering allocated to cornerstone investors has been significantly positively related to underpricing. Moreover, results from an additional multivariate regression analysis indicate that IPOs backed by at least one skilled cornerstone investor have experienced a stronger relationship to underpricing than that of IPOs backed solely by unskilled cornerstone investors. The results provide further evidence supporting theories explaining underpricing which have been suggested in previous research and derived from interviews with investment banks, mainly the negotiation effect, demand effect, cherry picking effect, and possibly the allocation effect and crowding out effect. Furthermore, the results provide evidence suggesting that the certification effect, derived from informational asymmetry theories, is not as strong as other effects presented in this paper on underpricing in Swedish IPOs during the sample period. The results also provide novel insights regarding the relationship between skilled cornerstone investors and IPO underpricing. This paper's findings warrant further research on IPO underpricing in the context of cornerstone investors.

Keywords: IPO underpricing, cornerstone investors, cornerstone investor skill

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Definitions of key concepts in the paper

- **IPO:** initial public offering.
- **Issuing firm:** the firm issuing shares in an IPO.
- **Underpricing:** the occurrence of abnormal first-day returns of shares in IPOs.
- **Cornerstone investor:** an investor who has committed to acquire a prespecified number of issued shares to the same offer price as other investors in an IPO, and is announced in the IPO prospectus as a cornerstone investor or subscription undertaker.
- **Cornerstone backed IPO:** an IPO in which one or more cornerstone investors are present.
- **Retail investors:** private**,** non-institutional investors.
- **MLR:** multivariate linear regression.
- **OMX:** Nasdaq Stockholm stock exchange.
- **First North:** First North stock exchange.
- **NGM:** Nordic Growth Market stock exchange.
- **Spotlight:** Spotlight stock exchange.

1. Introduction

When a company has reached a certain stage of maturity, the question whether the company should go public often comes up at the board table. There are many reasons for going public, including raising capital for investments or owners wanting to make an exit. In most cases, companies go public through an initial public offering (IPO), where shares of the company are sold to the public. A puzzle that has been troubling researchers in the context of IPOs is the one of IPO underpricing, meaning that issuing firms' shares on average see a strong positive price increase during the first day of trading. If maximising shareholder returns is an important objective when going public, issuing firms should be unwilling to underprice their shares. Several theories have been developed aiming to explain underpricing and many empirical studies have been performed on the subject, but no definitive answer has been reached.

In recent years, the concept of cornerstone investors has emerged in IPOs (McGuinness, 2012), (McNaughton et al., 2015) and (Espenlaub et al., 2016). Simplified, a cornerstone investor is an investor who agrees to buy an often considerable part of the offering at the offer price, and who is mentioned in the IPO prospectus (McNaughton et al., 2015). Since cornerstone investors were first introduced in Sweden in 2014, research on cornerstone investors in Sweden is limited (Dagens Industri, May 11, 2017). This opens up an interesting research area, since cornerstone investors can provide additional insights into factors contributing to underpricing in Swedish IPOs.

Furthermore, the dynamics of cornerstone investors are interesting not only from a research point of view, but also for stakeholders in IPOs. The usage of cornerstone investors has been criticised in Swedish media since it may crowd out retail investors in attractive IPOs (Dagens Industri, January 26, 2015). Finding the true relationship between cornerstone investors and first-day returns is therefore of interest for retail investors. Furthermore, cornerstone investors' relation to underpricing is interesting for issuing firms, since underpricing in effect means that issuing firms leave money on the table. If cornerstone investors can help reduce or increase underpricing, issuing firms may be more or less inclined to attract them in their IPOs.

This study examines the relationship between cornerstone investor allocation and IPO underpricing, as well as the relationship between cornerstone investor skill and IPO underpricing. To do this, a data set is used consisting of 168 IPOs, of which 118 are cornerstone backed, in Sweden from 2014 to September 2020. Recent empirical research regarding

cornerstone investors in general is limited, and studies on cornerstone investor skill is, to our knowledge, non-existent. Drawing from existing literature, empirical research and interviews with investment banks, we define seven effects that cornerstone investors and cornerstone investor skill should have on IPO underpricing, and perform statistical tests in order to test the implications from these theories.

We find that both Swedish IPOs in general and Swedish cornerstone backed IPOs in particular have been underpriced in this period, experiencing an average underpricing of 10.0% and 12.8%, respectively. Furthermore, we find a significant positive relationship between cornerstone investor allocation and IPO underpricing. Our results validate the allocation effect derived from Stoughton and Zechner (1998), the negotiation effect derived from Welch (1992), the cherry picking effect introduced by McGuinness (2002), and the demand and crowding out effects derived from interviews with investment bankers.

Moreover, we find a significant positive relationship between IPO underpricing and cornerstone investor skill, a novel contribution to research on cornerstone investors. The correlation between IPO underpricing and cornerstone investor skill further validates the negotiation effect, the cherry picking effect, and the demand effect. The results also indicate that the allocation effect or crowding out effect on their own cannot fully explain IPO underpricing in the context of cornerstone investors. Rather, the results indicate that other effects presented in this paper must also be valid to fully explain IPO underpricing. However, due to data limitations and robustness limitations, this implication cannot be fully confirmed.

The remainder of the paper is structured as follows. Chapter 2 provides the paper's theoretical framework by giving a review of leading theories and empirical research regarding IPO underpricing and cornerstone investors. Additionally, chapter 2 will then present the effects cornerstone investors may have on IPO underpricing, and will be concluded by presenting the paper's contribution and research questions. Chapter 3 will explain the data collection method and empirical methodology used to answer the paper's research questions. Next, chapter 4 will provide an overview of the data set, including an assessment of the quality of the data. Chapter 5 will present results from the tests, along with results from robustness tests and a discussion regarding the limitations of the results from the main tests. Next, chapter 6 will provide a discussion of the results and connect our findings to theories and previous empirical research. Lastly, chapter 7 will summarise the paper with concluding remarks.

2. Theoretical framework

Since cornerstone investors are a relatively new phenomenon, financial research has not yet reached a consensus on how these investors should be related to IPO underpricing. To capture all aspects of how cornerstone investors may affect underpricing, this chapter will first present studies on IPO underpricing, followed by theories explaining underpricing. Next, cornerstone investors as a concept and their role within IPOs will be described. After that, existing empirical research about cornerstone investors will be presented. After presenting relevant literature and empirical research, as well as the key traits of cornerstone investors, a summary of cornerstone investors' potential relationship with underpricing can be presented. Lastly, the chapter will be concluded by presenting this paper's contribution, research questions and hypotheses.

2.1. Previous studies on IPO underpricing

IPO underpricing was first studied in academia by Reilly and Hatfield (1969), Stoll and Curley (1970), Logue (1973), Reilly (1973), and Ibbotson (1975). Despite differences in how to measure underpricing between the studies, they all found that IPOs are underpriced on average. Reilly (1973) studied relative underpricing compared to industrial averages such as Dow Jones and found that mean underpricing was 9.9% in IPOs during the rising stock market between 1963 and 1965. Ibbotson (1975), on the other hand, measured underpricing as the first month performance and found a 11.4% mean underpricing in IPOs between 1960 and 1969.

The phenomenon has also been studied with a specific focus on the Swedish IPO market. Westerholm (2007) studied underpricing in Sweden between the years 1991 and 2002, where he defined underpricing as the percentage difference between the offer price and the closing price on the first day. With a sample of 88 companies listed on the Stockholm Stock Exchange, he found that Swedish IPOs over the period had an average underpricing of 15.9%.

2.2. Theories explaining IPO underpricing

The existence of underpricing means that issuing firms leave money on the table in IPOs, which has puzzled academia for decades. Thus, several theories explaining underpricing have been developed, which can be divided into four main groups: 1) asymmetric information, 2) institutional reasons, 3) control considerations, and 4) behavioural approaches (Ljungqvist, 2004). Since underpricing is dependent on two variables, offer price and close price, underpricing can increase (decrease) through both lower (higher) offer price and higher (lower)

close price. Academic theories explaining underpricing focus on the former, i.e. assume that the closing price is fixed at the fundamental value of the shares and that the offer price is altered to change the amount of underpricing.

2.2.1. Asymmetric information theories

Three groups are involved in an IPO: the issuing firm, the investors, and the financial advisor/underwriter. Underpricing theories based on asymmetric information stems from the assumption that one of these groups has more information than the others. Asymmetric information theories all imply that more information asymmetry leads to more underpricing, and vice versa.

The most notable theory within this field is the one presented by Rock (1986), Winner's curse, which addresses information asymmetry between different groups of investors. In his theory, he makes the simplifying assumption that there are two types of investors, informed investors and uninformed investors. In IPOs where shares of high quality firms are issued, informed investors will crowd out uninformed investors, whereas when bad quality firms issue shares the informed investors will not participate. The uninformed investors will thus be exposed to a Winner's Curse. On the one hand, they are allocated shares in line with their objective, meaning that they are winners. On the other hand, they are losers because on average they will be allocated more shares in low quality IPOs. In effect, this means that participating in IPOs as an uninformed investor should lead to negative expected returns. This presents a problem for issuing firms since, if uninformed investors realise it is better not to participate, the investor pool will not be large enough to attract sufficient demand for the shares in offerings. Consequently, all IPOs must on average be underpriced in order for IPOs to be an attractive value proposition for uninformed investors, and this is how the Winner's Curse theory explains underpricing.

Another theory along the lines of asymmetric information is the one suggested by Allen and Faulhaber (1989), who claim that high quality firms signal its quality by underpricing their shares. The authors claim that good firms willingly leave money on the table through underpricing because they are confident that, over time, investors will share their belief of the firm being of high quality. Hence, good quality firms will be able to recoup money lost in their IPOs through subsequent share price development and future public offerings. On the other hand, low quality firms may not be able to recoup a potential underpricing in the aftermarket and need to maximise value in their IPOs. Therefore, bad firms cannot mimic good firms by underpricing shares, since it is too much of a risk. Knowing this, good firms can use

underpricing to signal that they in fact are good firms and underpricing could thus be explained as a consequence of good firms signalling their quality to investors.

Megginson and Weiss (1991) provide a theory called the certification hypothesis. By studying venture capital backed IPOs compared to non-venture capital backed IPOs between 1983 to 1987, they show that venture capital backed IPOs experience significantly lower underpricing of 7.1% compared to 11.9% for non-venture capital backed IPOs. Furthermore, they find that venture capitalists keep a large portion of their holdings in the firm after the IPO. Consequently, venture capitalists decrease the asymmetric information between parties by certifying the quality of the issuing firm with its mere presence, which decreases the need for underpricing. The certification hypothesis thus states that the presence of certain investors in an IPO can explain underpricing.

2.2.2. Institutional theories

Institutional theories aim to explain underpricing from the perspective of the institutional landscape for IPOs, e.g. by looking at laws and requirements that need to be followed.

One theory in the institutional context concerns price stabilisations by investment banks, as presented by Ljungqvist (2004). In an IPO, underwriters such as investment banks are hired to ensure that a listing takes place as smoothly as possible. A way to fulfil that undertaking is to provide price stabilisation during a few days or weeks from the IPO date, in order to mitigate drops in after-market prices. Price stabilisation is a regulated process where the underwriter will acquire a predetermined number of shares if the trading share price is below the offer price, in order to stabilise the IPO from heavy price drops in initial trading (EU, 596/2014, 5.4). Hence, price stabilisation leads to fewer cases of overpricing and increases the observed mean first-day return.

A second hypothesis revolves around underpricing being advantageous from a taxation point of view. Rydqvist (1997) studies this phenomenon in the Swedish IPO market. Before the Swedish tax reform in the 1990s, salary income was subject to severely higher tax rates than capital gains, which made employers more willing to pay employees with underpriced shares which were allocated to them preferentially in IPOs. In 1990, however, underpricing-related gains became subject to income tax, which removed this incentive among employers. Consequently, underpricing then fell from an average of 41% in 1980–1989 to 8% in 1990–1994. Tax advantages are thus important to explain underpricing historically. However, it is no longer a primary driver for underpricing in Sweden, as these tax advantages have been removed.

2.2.3. Control theories

Control theories are centred around the idea that underpricing is a way to create more demand for shares, which in turn enables issuers to choose investors strategically.

Brennan and Franks (1997) provided a theory centred around managers' wish to allocate shares strategically in order to protect their self-interest. The theory considers the case where managers of an issuing firm engage in non-value maximising activities. These managers want to avoid allocating large stakes of the company in an IPO, since larger shareholders will most likely lead to increased scrutiny and put an end to their non value-maximising behaviour. To avoid large shareholders and scrutiny altogether, managers can create excess demand through underpricing, which allows them to strategically allocate smaller stakes to more shareholders, which in effect will minimise scrutiny. Consequently, managers' protection of self-interests could explain underpricing.

Stoughton and Zechner (1998) provide an alternative theory within the control perspective. They look at managers' interests as being aligned with investors, i.a. because managers may be part-owners. With this perspective, the implications are opposite of the theory presented by Brennan and Franks (1997). As managers' interest is to maximise shareholder value, they will want to increase scrutiny and monitoring of management. Stoughton and Zechner (1998) suggest that it may be value-maximising to allocate large stakes to investors, since this will in fact increase scrutiny of management. With this in mind, underpricing can be used to create excess demand and thus allocate shares strategically to increase monitoring of management. Thus, issuing firms' wish to strategically choose investors or allocate large stakes of their offerings could explain underpricing.

2.2.4. Behavioural theories

Behavioural theories aim to explain underpricing as an effect of investors' irrational behaviour. These theories stem from the notion that underpricing is too much of an anomaly to be explained by rational explanations in the form of information asymmetry, institutional theories, and control theories.

In the context of behavioural theories, Welch (1992) shows that so-called 'informational cascades' can develop in some IPOs. The basis for understanding informational cascades is that investment decisions should be seen as a sequential process. That is, some investors may evaluate their interest in IPOs solely based on earlier investors' investment decisions and disregard their own beliefs and private information. Later investors will be more

keen on participating as they interpret previous investors' participation as a sign of them having positive information about the quality and success of the IPO. Contrarily, if later investors see low demand for the IPO they will not participate in the IPO. This is what Welch (1992) defines as informational cascades.

What is important to understand regarding informational cascades is how the later investors disregard their own private information about the IPO and follow the lead by the previous investors, regardless of whether the later investors have positive or negative information about the IPO. Early investors can leverage the risk of informational cascades to increase their bargaining power versus the issuing firm. Consequently, early investors can exercise this bargaining power and demand a lower offer price in return for committing to the IPO early and reducing the risk of a negative informational cascade to occur. In this way, the concept of informational cascades can explain underpricing.

2.3. Definition and description of cornerstone investors

To get a full understanding of the potential effect cornerstone investor may have on IPO underpricing, it is important to first get a full understanding of the role that cornerstone investors have in IPOs. Therefore, this subsection will define cornerstone investors, provide a brief history on how they have been used, and explain their role in the IPO process.

2.3.1. Definition

Since cornerstone investors were only recently introduced in IPOs, it is important to clearly define the term. Even though using cornerstone investors has become an established IPO mechanism in Sweden, the terms cornerstone investor and anchor investor are used interchangeably in media and among retail investors, and there is no clear definition for either term.

In this paper, a cornerstone investor is defined as an investor who:

1. has committed to acquire a prespecified amount of shares to the same offer price as other investors.
2. is announced in the prospectus as a cornerstone investor or subscription undertaker.

This definition is in line with how the investment bankers we have conducted interviews with define cornerstone investors. Findings from these interviews will be presented in more detail in section 2.3.3.

2.3.2. History in brief

Cornerstone investors were first used in Sweden in 2014 in the listing of Lifco, a Sweden-based conglomerate operating in the areas of dental, demolition & tools and systems solutions (Dagens Industri, May 11, 2017). Since then, cornerstone backed IPOs have become increasingly more popular. To illustrate, cornerstone investors were present in 10% of IPOs in 2014 and 90% of all IPOs in January to September of 2020.

Internationally, cornerstone investors have been used since 1997 in Hongkong (Espenlaub et al., 2016). In Europe, they were first used in 2011 in the IPO of Glencore, a British and Swiss raw material and mining company that did a dual listing in Hong Kong and London. Cornerstone investors have, similarly to Sweden, become an established element of IPOs in Europe (McNaughton et al., 2015).

2.3.3. Cornerstone investors' role in the IPO process

To gain insight into the Swedish process of choosing cornerstone investors and the relationship between cornerstone investors and issuing firms, we conducted two interviews with representatives from prominent Nordic investment banks. The interviewees were employees at Erik Penser Bank, a Stockholm-based financial advisory firm targeting small cap firms, and Carnegie Investment Bank, a Stockholm-based financial advisory firm targeting medium- and large cap firms. These interviews provided several key insights regarding cornerstone investors.

Firstly, both interviewees stress the point that there are clear differences between cornerstone investors and anchor investors. Cornerstone investors meet with the issuing company early in the IPO process and are disclosed in the official IPO prospectus. They sign a cornerstone agreement and are guaranteed a certain allocation of shares in the offering to the same price as all investors in the IPO. On the contrary, anchor investors are not included in the prospectus and are not guaranteed an allocation. Instead, they register for shares based on the same conditions as retail investors. In this paper, anchor investors are thus not included in the cornerstone investor group, given how cornerstone investors have been defined.

Furthermore, both interviews provided detailed insights into the process of finding potential cornerstone investors. The process is typically led by the assigned financial advisor who has close dialogues with the issuing company to incorporate their preferences regarding who to pick as cornerstone investors. The selection criteria when choosing cornerstone investors include the issuing company's size, existing ownership structure, and in which sector the company operates. As an example, certain types of cornerstone investors usually invest in

specific sectors and a preferred amount of capital in each investment (ticket size) to gain a certain percentage of ownership in the firm from its investment.

The cornerstone investors later have to sign a non-disclosure agreement (NDA) to receive an information material called information memorandum (IM), containing relevant information about the issuing company, e.g. information about product offering, customer groups, market analysis, organisational structure, historical financials and business plan. It is intended to educate the investors and to generate interest in the issuing company. After cornerstone investors have received and studied the IM, the investment bank arranges meetings between the investors and key management of the issuing company. The meetings are called management presentations (MPs) and provide a way for the investors to ask detailed questions to management.

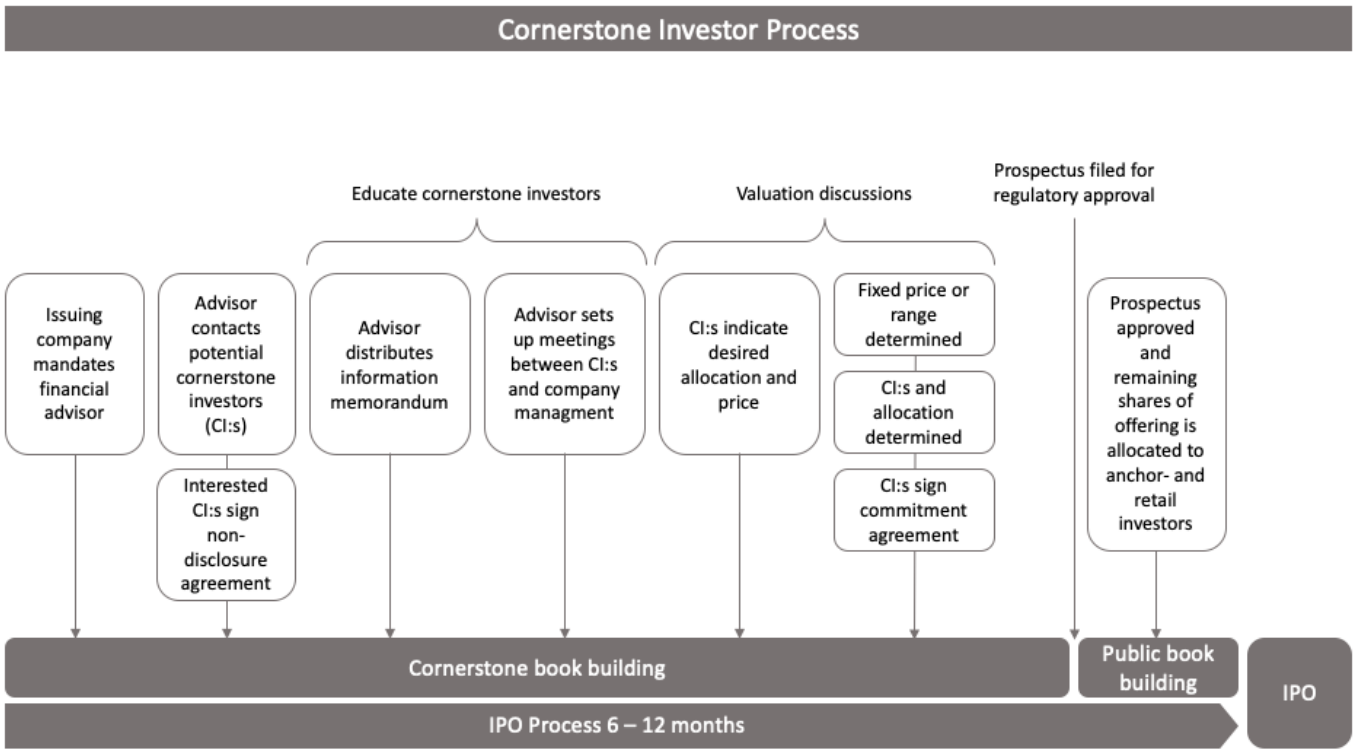
A highly important point to address about this part of the process, which was stressed by the interviewees, is that the information exchange between cornerstone investors and the issuing company is strictly regulated. It is forbidden by law to share information that will not be included in the official prospectus during this part of the process (Insider information law, 1990:1342). In extent, this means that cornerstone investors will have the exact same information as all other investors when they make their decision on whether to become a cornerstone investor or not. To clarify, this means that cornerstone investors cannot be seen as more informed than other investors in an IPO. However, investment bankers mention that cornerstone investors, in the role of professional investors, still have a strong signaling effect to other investors that the issuing firm is of high quality, meaning that cornerstone investor presence still reduces information asymmetry.

If the potential cornerstone investors find the company interesting, they will indicate their desired allocation of shares and a suggested price. Hence, the cornerstone investors can influence the final listing price and their preferred allocation, which means that the process of setting the offer price can be seen as a negotiation between the issuing firm and cornerstone investors. However, it is ultimately the company's decision who they decide to partner with, as this commitment is seen as a long term engagement by both the cornerstone investors and the management.

Once the allocation and the IPO's fixed price or price range is decided, the company and the cornerstone investors undertake a cornerstone agreement, guaranteeing the cornerstone investors a certain allocation at the decided price or price range. Cornerstone investors in Sweden are not subject to a lock-up agreement. Instead, there is an unwritten "gentlemen's agreement" between the cornerstone investor and issuing firm to not sell allocated shares for a

period of three to twelve months. The cornerstone investors are subsequently included in the prospectus which is filed for approval to regulatory authority "Finansinspektionen", after which possible approval of the IPO is provided within ten business days. Once the prospectus is approved, the public book building starts where anchor investors and retail investors are offered to subscribe to the offering, before the issuing firm finally gets listed on the IPO date. A visual representation of the whole process is summarised in figure 2.1 below.

Figure 2.1. Overview of the cornerstone investor process



Overview of the 6-12 month IPO process, with detailed information regarding cornerstone investors' role in the process. Details are based on findings from interviews.

An important point can be derived from the interviews that is not fully covered in literature: Underpricing is not only dependent on the offer price, but also on the closing price of the first day of trading. Consequently, underpricing can increase as an effect of a first-day close price that is higher than the fundamental value of a stock, and not just as an effect of a lower offer price.

2.3.4. Cornerstone investors - benefits

The interviewees lift numerous reasons why issuing firms choose to use cornerstone investors, which can be summarised in two main groups:

- Reduce transaction risk - IPOs are associated with a large risk of the offering not being fully subscribed. Including cornerstone investors is a way to ensure the IPO is successful i.e. that the offering of shares becomes fully subscribed.
- Increase demand for shares - issuing firms want to create strong demand for its shares for two reasons. Firstly, they want to ensure that the IPO is fully subscribed and secondly, they want to create momentum on the first day of trading in the form of positive returns. It is therefore of utmost importance that the cornerstone investors committing to the IPO are perceived by the public as skilled investors.

2.3.5. Cornerstone investors - drawbacks

The interviewees also mention two specific drawbacks with using cornerstone investors. We have named these effects *crowding out effect* and *lower aftermarket liquidity effect*, which are both described below. The former is a concern for retail investors and the latter is a concern for the issuing firm.

- Crowding out effect - As cornerstone investors usually take a larger share of the public offering in high quality IPOs, there is a smaller share of the offering available to anchor investors and retail investors. This aspect of cornerstone investors has received much media attention, since it can be perceived as an unfair gain for institutional investors at the expense of retail investors (Dagens Industri, January 26, 2015). One of the interviewees mention that this criticism has been met with the argument that the benefit of using cornerstone investors from reduced information asymmetry is greater than the negative crowding out effect.
- Lower aftermarket liquidity effect - this problem is only applicable to smaller stock exchanges such as First North, where a large part of an already small offering may be put in the hands of cornerstone investors who do not plan to sell their shares in the near future following an IPO. This can present a problem for an issuing firm, since the number of shares available to the public becomes very limited.

2.4. Previous empirical studies on IPO underpricing and cornerstone investors

Since cornerstone investors are a rather new phenomenon, studies within this field by scholars are few. However, three relevant studies are lifted in this subsection: one study that focuses on the IPO market in Hong Kong, and two studies that focus on the Nordic IPO markets.

McGuinness (2012) studied IPOs in Hong Kong between 2005 and 2009 and, among other topics, researched the new phenomenon of using cornerstone investors and its relationship with underpricing. With a data set consisting of 269 IPOs, of which 79 were cornerstone backed, he found that cornerstone backed IPOs had a mean underpricing of 21% and that cornerstone investors' positive relation with underpricing was significant at the 10% significance level. In his study, cornerstone investors had lock-up agreements of on average nine months and they were on average subscribed to 18% of the offering. McGuinness initially believed cornerstone investors would take a role of certifying the quality of firms, but when he found larger underpricing in cornerstone backed IPOs, he claimed the theory had little support. In explaining reasons for underpricing he lays out theories that cornerstone investors' involvement increases demand for the offering and that underpricing could be a result of crowding out effects. Furthermore, he suggests cornerstone investors might lobby for allocations as the chances of high first-day return are strong, with a caveat however that a lock-up might question the cornerstone investors' incentives for such a procedure.

Furthermore, McGuinness (2012) studied the causality between cornerstone investor allocation and underpricing through a two-stage least squares (2SLS) regression. The aim was to find whether cornerstone investors cause underpricing, or if underpricing itself draws in cornerstone investment. However, he did not find sufficient evidence to rule out any hypothesis.

Borg and Engberg (2016) studied underpricing and aftermarket performance in the context of "hot IPO markets", defined as years with many IPOs, in the Nordic IPO markets during 2005 - 2007 and 2013 - 2016. They also studied cornerstone backed IPOs with a sample of 20 Swedish cornerstone backed IPOs. Their findings suggested that cornerstone backed IPOs were significantly positively correlated with underpricing. They believed that using cornerstone investors acts as an 'insurance' for transaction risk when listing a company, as the issuer can be sure a large part of the offer is secured. The authors argue that underpricing is a compensation for this 'insurance' that cornerstone investors provide to an IPO.

Ahl and Sameni (2017) studied the effect of using cornerstone investors on initial returns to investors. With a data set of 31 cornerstone backed IPOs on Nasdaq in Stockholm, Copenhagen and Helsinki during the 2014-2016 period, their findings concluded that cornerstone backed IPOs yielded a higher underpricing with up to 4.4% higher stock price appreciation in the 20 days following the IPO. Furthermore, they found that cornerstone backed IPOs were on average underpriced by 15%. They believed the positive correlation between cornerstone investors and underpricing is caused by several reasons, including bandwagon effects, i.e. that retail investors follow the cornerstone investors' lead, and crowding-out effects. When interpreting their results, they were uncertain whether the results could be attributed to 1) a discount to the fundamental value of the firm negotiated by the cornerstone investors or 2) if underpricing is a compensation to other institutional and retail investors for receiving lower allocations in cornerstone backed IPOs. They claimed their results needed to be investigated further. Furthermore, they stated that the observed underpricing could be a result of them not controlling for time fixed effects.

2.5. Cornerstone investors' potential relationship with underpricing

Based on previous literature, empirical research and interviews conducted with investment bankers, we have derived seven ways in which cornerstone investors should be related to IPO underpricing. This subsection will provide a summary of these seven effects and their link to literature, empirical research and our interviews. The summary of each effect also includes the expected sign of the relationship with underpricing.

- Allocation effect

  In the context of control theories, Stoughton and Zechner's (1998) theory regarding ownership and control is applicable to cornerstone investors. They argue that underpricing is used as a means to strategically choose investors in an IPO, in order to allocate them large stakes. Since cornerstone investors often invest large stakes in an IPO, it is possible that underpricing is used by issuing firms as a way to attract them, as suggested by Stoughton and Zechner (1998). The allocation effect thus suggests that the presence of cornerstone investors should be correlated with higher underpricing.

- Negotiation effect

  The process of determining the offer price or price range in an IPO is often a negotiation between cornerstone investors and issuers. Underpricing could therefore be a result of cornerstone investors having negotiation power. Support for this effect can be derived from Welch's (1992) theory of 'informational cascades'. His theory assumes that some investors are irrational in that they would disregard private information and follow the lead of earlier investors. Without claiming that other investors, either institutional or retail investors, participating in the Swedish stock market would generally disregard their private information and follow the lead of cornerstone investors, Swedish issuing firms and underwriters may still be aware that such cascades can develop in some IPOs. Hence, the mere possibility of a disadvantageous informational cascade developing, as a result of later investors interpreting low cornerstone investor demand for an IPO as a signal of low quality, could provide cornerstone investors with a better bargaining position vis-à-vis issuers. If cornerstone investors exercise this bargaining power, they can reduce the offer price in offerings through negotiations. Hence, the negotiation effect implies that cornerstone investors should have a positive relation with underpricing.

- Demand effect

  If cornerstone investors create increased demand for an IPO, that demand can lead to more investors buying shares during the first day of trading. In accordance with supply and demand economics, this will lead to a higher close price in the first day of trading. Consequently, cornerstone investors could be associated with more underpricing in the form of a higher first-day close price. Hence, the demand effect implies that cornerstone investors should have a positive relation with underpricing.

- Crowding out effect

  Since cornerstone investors take up a large part of the issuing firms' supply of shares during the public book building process, investors who do not receive shares might turn to the aftermarket and buy shares on the first day of trading. This will lead to a higher close price in accordance with supply and demand economics. Hence, the crowding out effect implies that cornerstone investors should be positively correlated with underpricing.

- Cherry picking effect[1]

  Along the lines of the hypothesis developed by McGuinness (2012), cornerstone investors as skilled investors could be better at picking IPOs that they believe are underpriced, earning them positive first-day returns. The cherry picking effect thus implies a positive relationship between cornerstone investor allocation and underpricing.

- Transaction risk effect

  Using cornerstone investors in IPOs reduces transaction risk since it ensures that at least part of the offering will be subscribed. From interviewing investment banks, this seems to be the main reason for using cornerstone investors in IPOs. This could arguably decrease underpricing, since the alternative approach to ensure that the offering is successful is to increase underpricing. However, in line with findings by Borg and Engberg (2016), issuers could compensate cornerstone investors with underpricing for providing this reduced transaction risk. The transaction risk effect thus has unclear implications regarding the relationship between cornerstone investors and underpricing.

- Certification effect

  Along the lines of Megginson and Weiss (1991), who find that venture capital backed IPOs require less underpricing, retail and other institutional investors should become more informed through the participation of cornerstone investors certifying the good quality of the issuing firm. This in turn reduces information asymmetry and reduces the need for underpricing, and the certification effect thus implies that cornerstone investors should have a negative relationship with underpricing.

[1] Term coined by this paper's authors, describing McGuinness' (2012) theory around cornerstone investors potentially being able to pick underpriced IPOs.

The table below provides an overview of the seven effects discussed in this subsection and how they should affect underpricing, along with their connection to theories, previous research and if they were derived from our interviews with investment bankers[2].

Table 2.1. Summary of different effects cornerstone investors may have on underpricing

Effect	Impact on underpricing	Connection to theory	Connection to previous research	Mentioned in interviews
Allocation effect	+	Control theories	Stoughton and Zechner (1998)	-
Negotiation effect	+	Informational cascades	Welch (1992)	Yes
Demand effect	+	Supply and demand	-	Yes
Crowding out effect	+	Supply and demand	Ahl and Sameni (2017)	Yes
Cherry picking effect	+	None	McGuiness (2002)	Yes
Transaction risk effect	+/-	None	Borg and Engberg (2016)	Yes
Certification effect	-	Information asymmetry	Megginson and Weiss (1991)	Yes

The seven effects derived from literature, empirical research and interviews regarding cornerstone investors' potential effect on IPO underpricing. The expected relationship with underpricing, connection to theory, connection to previous research and whether the effect was mentioned in interviews is presented for each effect.

[2]The effects mentioned in interviews have been reworded to match the equivalent names in theories and empirical research.

2.6. Research gap and contribution

Academic theory and interviews with professionals suggest a number of factors that point to cornerstone investors having a positive or negative relationship with underpricing on the Swedish market. However, previous empirical research has only found a positive relationship between cornerstone investor presence and underpricing, effectively rejecting the information asymmetry hypothesis. We do not want to reject asymmetric theories yet, because of the following two reasons:

1. The small sample of cornerstone backed IPOs that authors of previous studies have used may not be large enough to provide robust results.
2. By studying all Nordic markets and not just the Swedish market, institutional differences between cornerstone investors in Sweden and other Nordic countries may have affected the results of previous studies.

At the time of this paper, a much larger data set than previous studies can be gathered, ranging from 2014 to September 2020 and consisting of 118 cornerstone backed IPOs and 168 IPOs in total in Sweden. The first contribution this paper has to existing literature is thus:

1. By using a much larger data set than previous studies and by only studying Swedish IPOs, we can provide a better and more up-to-date picture of cornerstone investors' relationship with underpricing in Swedish IPOs.

Furthermore, previous research has considered cornerstone investors as a homogenous group. To shed more light on the concept of cornerstone investors, this paper aims to show differences between skilled and unskilled cornerstone investors, in terms of their relationship with underpricing. Therefore, the second contribution of this paper is:

2. By studying the skill of cornerstone investors, we add a factor that has not yet been studied in literature and thus fill a research gap.

Findings from the second contribution will provide more understanding of cornerstone investor mechanisms, and provide further insights into which underpricing theories that seem to be most connected to underpricing of Swedish IPOs in the context of cornerstone investors.

2.7. Research questions and hypotheses development

2.7.1. Research questions

In section 2.5, seven effects were identified to explain how cornerstone investors could affect underpricing. Five of these effects; the allocation effect, negotiation effect, demand effect, crowding out effect, and cherry picking effect all suggest that cornerstone investor presence should have a positive relationship with underpricing. This is also in line with previous empirical research. On the other hand, one of the effects, the certification effect building upon theories regarding asymmetric information, suggests that cornerstone investor allocation should be related to lower underpricing. Additionally, there still remains some doubts regarding the results of previous empirical research. Therefore, to provide a better view of the relationship between cornerstone investor allocation and underpricing in Swedish IPOs, the first research question of the paper is:

1. *Does cornerstone investor allocation have a significant relationship with underpricing in the Swedish market?*

Furthermore, as described in section 2.6, to the best of our knowledge no studies exist where cornerstone investors are not treated as a homogenous group. Therefore, we aim to investigate whether a stronger relationship between cornerstone investor allocation and underpricing exists, when cornerstone investors are differentiated. We will perform this differentiation based on cornerstone investor skill. A skilled cornerstone investor is defined as a cornerstone investor who has demonstrated skill in being part of underpriced IPOs historically and thus have gained a strong first-day return on their previous IPO investments. Thus, the second research question of the paper is:

2. *Do IPOs backed by skilled cornerstone investors have a stronger relationship with underpricing than that of IPOs backed by unskilled cornerstone investors?*

Of the effects described in section 2.5 explaining how cornerstone investor allocations should be related to underpricing, some effects indicate that there should be a stronger effect for skilled investors. On the other hand, other effects indicate that the effect should be equally strong for skilled as for unskilled investors. Therefore, if we are successful in answering research question 2, we will provide additional insight into which underpricing theories that best explain the

relationship between cornerstone investors and underpricing. This will be discussed in-depth after providing results from the tests.

2.7.2. Hypotheses development

To adequately answer the research questions, the following four null hypotheses are defined, which the paper will aim to reject.

- *$H0_1$: IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.*

Since subsequent hypotheses are based on the notion that IPOs are underpriced in general, rejecting $H0_1$ is crucial.

- *$H0_2$: Cornerstone backed IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.*

This hypothesis is developed to ensure that underpricing is present and statistically significant not only for all IPOs, but for cornerstone backed IPOs as well.

- *$H0_3$: Cornerstone investors' allocation does not have a statistically significant relationship with underpricing in the Swedish market during the period 2014 to September 2020.*

If we are successful in rejecting $H0_3$, we will be able to adequately answer our first research question.

- *$H0_4$: IPOs backed by skilled cornerstone investors do not have a stronger relationship with underpricing than that of IPOs backed by unskilled investors in the Swedish market during the period 2016 to September 2020.*

If we are successful in rejecting $H0_4$, we will be able to adequately answer our second research question. The period 2016 to September 2020 is used due to data considerations that will be discussed in the methodology section in chapter 3.

3. Methodology

This chapter will start by briefly presenting the delimitation of the paper, before presenting the data collection method. Next, a description of the statistical tests that are performed to test the four hypotheses will be presented, followed by a description of variables used in the study. Lastly, the robustness tests that are performed will be presented.

3.1. Delimitation

This paper will focus on the Swedish IPO market from the year 2014, when cornerstone investors were first introduced in Sweden, to September 2020, the time when writing this paper commenced. Studying exclusively Swedish IPOs will eliminate potential differences in institutional environments across countries from affecting the results. Only IPOs listed on Nasdaq Stockholm and First North Stockholm will be studied as other exchanges are deemed too small to perform meaningful analysis.

3.2. Data collection

The database SDC Platinum, accessed through *Swedish House of Finance,* was used to get a list of all IPOs in Sweden in the selected time period. From the SDC database, data on each IPO's offer price, primary and secondary shares offered, company name, industry, and issue date was accessed. However, some data needed for the regression was not available in SDC's data set, mainly data on cornerstone investors and close prices for the first day of trading.

Notably, data regarding cornerstone investors on SDC Platinum was non-extensive and not entirely accurate. For some IPOs, cornerstone investors were present in the database, but there were several IPOs without cornerstone investors in the SDC database that were in fact cornerstone backed. To get data on cornerstone investors, we therefore looked at the prospectus for each IPO, and manually retrieved data on who the cornerstone investors were, and the share of each offering that was allocated to cornerstone investors. Several sanity checks and controls were used in order to minimise the effect of human error in this part of the process.

Lastly, data on close prices for the first day of trading for each firm was retrieved from Avanza, which was needed to calculate first-day returns.

Apart from the quantitative data, the interviews conducted with investment bankers were crucial to get a more qualitative understanding of the IPO process and the role of cornerstone investors within it.

3.3. Statistical tests

In order to test our research questions, four null hypotheses are formulated as described in section 2.7. The first two hypotheses are tested with two-sided t-tests, and the last two hypotheses are tested with multivariate linear regressions.

3.3.1. $H0_1$: IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.

To test the first hypothesis, a double sided t-test is performed on the *Underpricing* variable. Rejecting $H0_1$ means that underpricing is present with statistical significance in the data set. Since subsequent hypotheses are based on the notion that IPOs are underpriced in general, running this test is crucial.

3.3.2. $H0_2$: Cornerstone backed IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.

To test the second hypothesis, a double sided t-test is performed on the *Underpricing* variable on all cornerstone backed IPOs. Rejecting $H0_2$ ensures that underpricing is present and statistically significant not only for all IPOs, but for cornerstone backed IPOs as well. $H0_2$ is key to reject in order to test $H0_3$.

3.3.3. $H0_3$: Cornerstone investors' allocation does not have a statistically significant relationship with underpricing in the Swedish market during the period 2014 to September 2020.

Once underpricing in cornerstone backed IPOs is established through rejecting $H0_2$, the specific impact of cornerstone investors can be analysed, controlling for other variables that also might affect the results. Since numerous previous studies have found several factors affecting underpricing, we will do a multivariate linear regression analysis to test $H0_3$. Using a multivariate regression analysis will enable us to include control variables for factors that we know affect underpricing, and consequently isolate the effect of cornerstone investors. This is in line with the methodology of Schenone (2004), who studies the effect of banking relationships on IPO underpricing through, among other methodologies, a multivariate regression analysis. Furthermore, previous studies looking at cornerstone investors in IPOs have found a linear relationship with underpricing, which further warrants a multiple linear regression model (MLR model). The first MLR model, *MLR1,* is run with *Underpricing* as the

dependent variable, *Cornerstone_share* as the main independent variable, and with additional control variables, as shown in equation 3.1[3].

$$MLR1: Underpricing_i = \beta_0 + \beta_1 Cornerstone\_share_i + \gamma_i Control\ variables_i \quad (3.1)$$

This regression will show if there is a significant correlation between underpricing and the share of an offering subscribed by cornerstone investors, thus answering research question 1. Furthermore, by using *Cornerstone_share* as the variable for cornerstone investor allocation and not a dummy variable, more detailed interpretations can be derived from the results, since the coefficient will show how much each percentage point of cornerstone investors' share of an offering is related to underpricing.

3.3.4. H0$_4$: IPOs backed by skilled cornerstone investors do not have a stronger relationship with underpricing than that of IPOs backed by unskilled investors in the Swedish market during the period 2016 to September 2020.

Lastly, an additional multivariate linear regression is run to study the relationship between cornerstone investor skill and underpricing, aiming to reject H0$_4$. For this test, the data used will be a subset of the original data set which eliminates IPOs before 2016. This is because cornerstone backed IPOs were new in Sweden in 2014 and 2015, and cornerstone investors had therefore not been able to demonstrate skill in being part of underpriced issues yet. Next, *MLR1* is run on the subset, to ensure that the significance of cornerstone investors is not lost when removing irrelevant years. After doing this, the multivariate linear regression which answers research question 2 can be run. The two dummy variables *Skilled_CI* and *No_skilled_CI* are constructed to test hypothesis IV. The regression to test hypothesis IV, *MLR2*, is presented in equation 3.2.

$$MLR2: Underpricing_i = \beta_0 + \beta_1 Skilled\_CI_i + \beta_2 No\_skilled\_CI_i + \gamma_i Control\ variables_i \quad (3.2)$$

Definitions of all variables will be presented in the next subchapter.

[3] Control variables are Ln_size, Secondaries, FirstNorth and Year dummies, as presented in chapter 3

3.4. Definition and discussion of variables

3.4.1. Dependent variable

Underpricing

There are several ways to measure underpricing presented in literature, but the most prominent one is to measure the first-day return of an IPO, which was introduced by Beatty and Ritter (1986). More specifically, this is the percentage change in stock price from the IPO's offer price and the close price on the first day of trading, as described in equation 3.3 below.

$$Underpricing_i = \frac{Close\ price_i - Offer\ price_i}{Offer\ price_i} \tag{3.3}$$

A potential drawback with this way of measuring underpricing is that it does not take into account the general behaviour of the stock market on the day of each IPO, since it does not include index movements. However, given the very narrow event window of only one day, this does not robustly affect our results. Beatty and Ritter (1986) found a 0.1% average index daily return, which is small in comparison to the double digit underpricing that previous research has found.

The *Underpricing* variable serves as the dependent variable in our main regressions.

3.4.2. Main independent variables

Three main independent variables are defined for the regressions that are run. Below is a description of these three variables.

Cornerstone_share

The *Cornerstone_share* variable is used as the main independent variable in *MLR1*, which tests the relationship between all cornerstone investors and underpricing. *Cornerstone_share* is defined as the share of total shares offered in an IPO that are allocated to cornerstone investors, as presented in equation.

$$Cornerstone\_share_i = \frac{Shares\ allocated\ to\ cornerstone\ investors_i}{Total\ shares\ offered_i} \tag{3.4}$$

That is, if cornerstone investors are not present in an IPO, the variable takes the value 0, and if 50% of the offering is subscribed by cornerstone investors, the variable takes the value 0.5. Previous studies have used both dummy variables for cornerstone presence and continuous

non-dummy variables, like the one used in this paper. A non-dummy variable is used in this paper since, intuitively, there should be a difference if an IPO is backed to 10% or 80% by cornerstone investors, and this variable can capture that difference.

Skilled_CI

Skilled_CI is the variable that aims to quantify which IPOs that have skilled cornerstone investors.

There are two challenges with creating a variable for cornerstone investor skill. The first challenge concerns what to use as a proxy for investor skill, and the second challenge concerns how to mechanically construct the variable. Previous literature and intuitive reasoning have been the foundation for tackling both these challenges.

Regarding the first challenge of how to measure investor skill, we argue that previous success in being part of underpriced IPOs is the best way to assess a cornerstone investor's skill in managing to be part of new underpriced IPOs. Apart from being an intuitive way to measure skill, this is in line with Chou et al.,'s (2013) measure of VC prestige, which uses prior IPO success as a proxy for prestige for pre-IPO VC owners.

Regarding the second challenge of how to actually construct the variable, previous literature and interviews with investment banks offer limited inspiration. To mirror the first regression in this paper, the *Skilled_CI* variable should ideally reflect the skilled investors' share of total shares offered in a specific IPO. However, some IPOs in the data set do not provide the allocation of shares between cornerstone investors, but rather only provide the total share of offerings that is allocated to cornerstone investors. In other words, the data is not complete enough to construct a variable that takes the share of offerings subscribed by skilled investors without having to remove observations from the data set. Since the test with *Skilled_CI* excludes observations prior to 2016, we are already performing tests on a quite limited data set. Therefore, removing more observations would lead to a too limited data set.

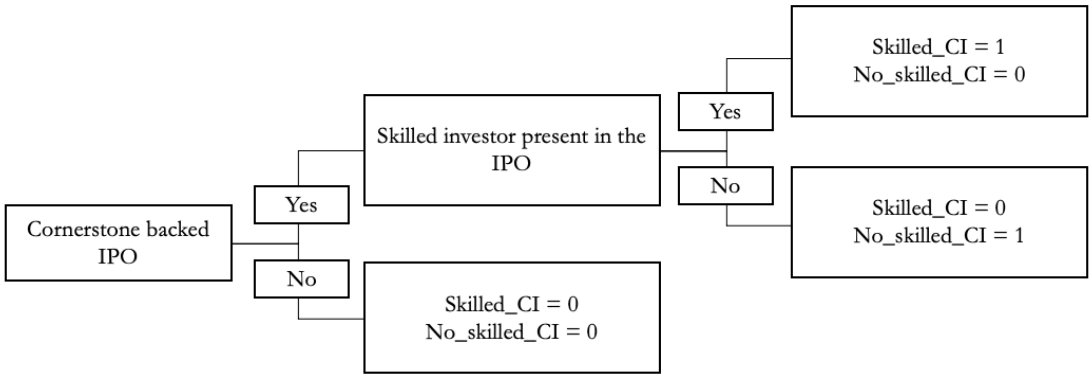
However, the identities of cornerstone investors and the total share allocated to cornerstone investors are disclosed in all IPOs. Therefore, it is still possible to construct a dummy variable that takes on the value 1 for IPOs backed by skilled cornerstone investors, which is how the *Skilled_CI* variable is constructed. For *Skilled_CI*, the underpricing of previous IPOs one year prior to an IPO that each specific cornerstone investor has been present in is calculated. If any of the cornerstone investors in an IPO *i* have on average experienced larger underpricing in its previous IPOs in the one-year period leading up to IPO *i* compared

to the average for all cornerstone backed IPOs in the same period, *Skilled_CI* takes the value 1.

The rationale behind comparing with the prior one-year period of average underpricing is because underpricing has changed over time, and thus the benchmark should follow. Furthermore, the rationale behind only demanding one skilled investor present to get a value of 1 on *Skilled_CI* is that, as we argue, having unskilled investors in an IPO does not affect the more skilled investor in the IPO. Based on our logic, a skilled investor has the same effect on underpricing, regardless of who the other cornerstone investors are. Therefore, only one skilled investor present is needed to be deemed an IPO with skilled cornerstone investors in our tests. Lastly, the rationale behind only including cornerstone backed IPOs in the benchmark is because through this method, we automatically benchmark each cornerstone investor against other cornerstone investors, and not the data sample as a whole. Important to note is that this method only looks at historical IPOs for each observation, meaning that there is no forward-looking bias.

Consequently, a second dummy variable, *No_skilled_CI*, is then constructed which takes on the value 1 for cornerstone backed IPOs that are backed solely by unskilled cornerstone investors. This is to separate IPOs backed solely by unskilled cornerstone investors from non-cornerstone backed IPOs. By doing this, the coefficient on *Skilled_CI* in the regression is easier to interpret, since it can easily be compared to the coefficient of *No_skilled_CI*. Figure 3.1 gives an overview of how values are assigned to the two dummy variables.

Figure 3.1. Process of assigning values to dummy variables Skilled_CI and No_skilled_CI



The process of assigning values to the dummy variables *Skilled_CI* and *No_skilled_CI*, which are constructed in this paper in order to test the second research question regarding cornerstone investor skill and its impact on IPO underpricing.

To clarify, there are thus three groups of IPOs in the data set: cornerstone backed IPOs backed by at least one skilled investor, cornerstone backed IPOs backed only by unskilled investors, and non-cornerstone backed IPOs. Thus, there are three groups and two dummy variables, avoiding the dummy trap.

To illustrate with an example of how the *Skilled_CI* variable is calculated, consider the example of Mag Interactive's IPO. Mag Interactive was issued on December 8, 2017, and is deemed to have at least one skilled investor, and thus has a value of 1 on the *Skilled_CI* variable. The step-by-step process of Mag Interactive having a value of 1 on *Skilled_CI* is the following: First, since it was listed on December 8, 2017, the benchmark becomes average underpricing for cornerstone backed IPOs between December 8, 2016 and December 7, 2017, which was 10.63%. Next, the five cornerstone investors, Didner & Gerge, Handelsbanken Fonder, RAM One, Chalex and Swedbank Robur are analysed individually. In the one-year period before the Mag Interactive IPO, the average underpricing of Didner & Gerge, Handelsbanken Fonder, Chalex and Swedbank Robur had been below the benchmark of 10.63%. However, the average underpricing of IPOs where RAM One had been a cornerstone investor was 14.09%, higher than the benchmark. Since one of these funds, RAM One, had an average underpricing above the benchmark, the Mag Interactive IPO had at least one skilled investor and thus get the value

of 1 on *Skilled_CI*. Had RAM One's average underpricing also been below the benchmark, *Skilled_CI* would have got the value 0, and *No_skilled_CI* would have got the value 1.

3.4.3. Control variables

To control for other factors that are known to affect underpricing and that may skew our results, several control variables are included in the regressions. To determine which control variables to use, previous literature on IPO underpricing has been examined. Since IPO underpricing is a vastly studied subject, there are a lot of studies that find factors that affect underpricing, and these factors have been used as the base point for our control variables. Below is a short description and motivation of all control variables.

Ln_size

Ln_size is the natural logarithm of the size of the offering, as shown in equation 3.5[4].

$$Ln\_size_i = \ln\left(Shares\ offered_i * Offer\ price_i\right) \tag{3.5}$$

Beatty and Ritter (1986) show a negative relationship between firm size and underpricing, which is why this variable is used. Additionally, the interviewee at Carnegie pointed out that larger IPOs, such as the recent IPOs of EQT, on September 24, 2019, and Nordnet, November 25, 2020, do not have the same transaction risk as smaller IPOs, and therefore do not use cornerstone investors. This could have an impact on cornerstone investors' effect on underpricing, since the results are somewhat skewed away from the largest IPOs. Consequently, this provides additional reasons for including a size variable as a control variable in the regression. Offer size has been used as the proxy for firm size since offer size is the market capitalisation at market opening on the first day of trading.

[4] The natural logarithm is used at it is considered best practice for large numbers in regression analysis. For example used by Fama and French (2002).

Secondaries

Secondaries is defined as the ratio of secondary shares to total shares in the offering. Aggarwal et al., (2002) finds that there is a significant negative relationship between secondary shares and the amount of underpricing, which is why this variable is used as a control variable. The ratio of secondary shares to total shares is used since it does not let the size of the offering in terms of the total number of shares issued affect the variable. The variable is calculated as presented in equation 3.6 below.

$$Secondaries_i = \frac{Secondary\ shares\ offered_i}{Total\ shares\ offered_i} \tag{3.6}$$

Year dummies

Year dummies are used since differences between IPO activity and underpricing between years have been observed in previous literature (Engberg and Borg, 2016) and (Ahl and Sameni, 2017). Using year dummies in the model accounts for time fixed effects in our regression. No year dummy is created for 2014, as this year serves as the base case where all year dummies are equal to 0, thus avoiding the dummy trap (Wooldridge, 2015).

FirstNorth

Firms listing on different stock exchanges often possess different characteristics - firms listing on First North are often smaller and more growth oriented, with less information about the company available at the time of the IPO (Nasdaq, 2013). This should have an effect on underpricing, and is therefore used as a control variable. No dummy is created for OMX, as firms listed on OMX serve as the base case when FirstNorth = 0, thus avoiding the dummy trap.

Table 3.1 below presents a summary of the variables discussed in this section.

Table 3.1. Definition of all variables used in the statistical tests

Name	Description	Definition
Underpricing	First-day return	$\frac{Close\ price_i - Offer\ price_i}{Offer\ price_i}$
Cornerstone_share	Share of IPO subscribed by cornerstone investors	$\frac{Cornerstone\ investor\ shares_i}{Total\ shares\ offered_i}$
Skilled_CI	Dummy variable for IPOs backed by skilled cornerstone investors	*Value of 1 if an IPO is backed by at least one skilled cornerstone investor*
No_skilled_CI	Dummy variable for IPOs backed only by unskilled cornerstone investors	*Value of 1 if an IPO is backed only by unskilled cornerstone investors*
Ln_size	Logarithm of offer size	$\ln(Shares\ offered_i * Offer\ price_i)$
Secondaries	Ratio of secondary shares in offering	$\frac{Secondary\ shares\ offered_i}{Total\ shares\ offered_i}$
Year dummies	Dummy variable for each year	$e.g. Year\_2016 = 1\ for\ IPOs\ in\ 2016$
FirstNorth	Dummy variable for First North	$Value\ of\ 1\ for\ IPOs\ listed\ on\ First\ North$

Name, description and calculation for all variables that are used in the statistical tests. Each variable is assigned a value for each observation in the data set. Year dummies include dummy variables for 2015, 2016, 2017, 2018, 2019 and 2020. A year dummy variable is not included for 2014 in order to avoid the dummy trap.

3.5. Robustness tests

Lastly, several robustness tests on *MLR1* and *MLR2* are run in order to secure the validity of the results. Given the approach of using a multivariate linear regression analysis, there are five assumptions that may need to be tested.

1. **Random sampling:** this is not tested in a robustness test, but rather is accounted for in our data collection method, which ensures that the data is collected in a non-biased way. More specifically, since we use the entire population of IPOs in Sweden, and only apply

objective delimitations in the form of years and stock exchanges, this assumption does not need to be tested further.

2. **Linearity in parameters:** as earlier mentioned, previous studies found a linear relationship between cornerstone allocation and underpricing, and is therefore used in this paper. Since this is a key assumption in the MLR model, it is tested by observing residual vs fitted plots and scale-location plots.
3. **No perfect collinearity/test for multicollinearity:** since a number of control variables are used, this is an assumption that may be violated in our model. Therefore, a variance inflation factor (VIF) test is run to check for potential errors of multicollinearity.
4. **Zero conditional mean:** fitted vs residual plots, normal Q-Q plots, scale-location plots and residuals vs leverage plots are observed in order to ensure that errors are normally distributed.
5. **OLS unbiasedness (heteroscedasticity):** given that a large number of observations have the value 0 on the *Cornerstone_share* variable, many observations and consequently many error terms will be present on this particular value on *Cornerstone_share.* Thus, the error terms among those particular observations may be non-random, causing a problem with heteroscedasticity. Therefore, heteroscedasticity is tested with a Breusch-Pagan test.

Apart from the four tests of key assumptions for multivariate regression analysis, Cook's Distance tests are run to ensure that no outliers are present in the analysis. Additionally, both *MLR1* and *MLR2* are run while excluding observations in 2018 and 2020 as robustness tests. The reason for this will be presented in the data overview section in chapter 4. Altogether, 14 robustness tests are thus run (7 tests x 2 models).

4. Data

This chapter will first present an overview of the collected data, including descriptive statistics on the data. Next, it will discuss treatment of extreme variables, before lastly discussing the quality of the data.

4.1. Data overview

The original data set consisted of a sample of all IPOs in Sweden between February 2000 and September 2020. Subsequently, observations were removed in accordance with the delimitations discussed in chapter 2. Since the concept of cornerstone investors was first introduced in Sweden in 2014, all IPOs before 2014 were removed. This was done to get a like-for-like comparison between cornerstone backed and non-cornerstone backed IPOs.

A geographical distinction has been made of only looking at Swedish IPOs in order to eliminate differences in cornerstone investor behaviour between countries from affecting our results. Consequently, non-Swedish IPOs were removed.

Additionally, only IPOs issued on the OMX and First North exchanges have been included, effectively removing IPOs on Spotlight and NGM exchanges.

With the delimitations mentioned above, the data set consists of 168 IPOs. 118 of these are cornerstone backed, with 98 cornerstone backed IPOs post 2015. There are 263 unique investors in our data set, with 205 investors only being part of one IPO and 58 investors being part of two or more IPOs.

Table 4.1 below provides an overview of the data set.

Table 4.1. Descriptive statistics on selected variables

Variable	Obs.	Average	Std. Dev	1st quartile	Median	3rd quartile	Min	Max
Underpricing	168	10%	23%	-1%	7%	20%	-70%	123%
Cornerstone_share	168	32%	26%	0%	35%	50%	0%	86%
Offer_size (SEKm)	168	925.0	1782.0	75.2	387.5	850.3	50.0	14,253.4
Secondaries	168	35%	40%	0%	15%	74%	0%	100%

Number of observations, equally-weighted mean, standard deviation, 1st quartile, median, 3rd quartile, minimum value and maximum value for selected variables in the data set.

The issuing firms are split across 12 different industries, with manufacturing and services being the most prominent industries. Table 4.2 below presents the observations split by industries.

Table 4.2. Sample data split by industry

	Cornerstone backed		Non-cornerstone backed		Total	
IPOs per year	Obs.	Avg. underpricing	Obs.	Avg. underpricing	Obs.	Avg. underpricing
Agriculture	1	-0.6%	0	0.0%	1	-0.6%
Construction	5	12.5%	2	6.6%	7	10.8%
Consumer products	2	-2.3%	0	0.0%	2	-2.3%
Energy	4	9.2%	3	-17.2%	7	-2.1%
Financial services	7	10.5%	4	10.6%	11	10.5%
Healthcare	4	17.3%	1	17.0%	5	17.3%
Logistics	1	13.0%	2	-5.9%	3	0.4%
Manufacturing	42	12.1%	17	4.1%	59	9.8%
Real estate	7	14.9%	11	5.8%	18	9.4%
Retail	7	18.7%	2	36.2%	9	22.6%
Services	35	12.4%	7	-8.0%	42	9.0%
TMT	3	27.0%	1	9.1%	4	22.5%
Total	118	12.8%	50	3.4%	168	10.0%

Number of observations and equally-weighted mean underpricing in the data set. Observations are split by industry across rows, with all observations included in the bottom row. Across columns, observations are split by cornerstone backed and non-cornerstone backed IPOs, with all observations included in the far right columns.

Several key insights regarding the data can be derived from table 4.2. Firstly, companies in the manufacturing and services industries have been very prominent among IPOs in the sample period. Secondly, out of the industries with 10 or more observations, cornerstone backed IPOs have been more underpriced than non-cornerstone backed IPOs in all industries, except for financial services where a 0.1 percentage points higher underpricing for non-cornerstone backed IPOs is observed. Table 4.2 thus shows that, albeit unevenly distributed, characteristics regarding cornerstone vs non-cornerstone backed IPOs are similar across industries with significant amounts of observations. Not including dummy variables for certain industries is therefore warranted.

Tables 4.3 and 4.4 below further show the split of IPOs across stock exchanges and years, respectively.

Table 4.3. Sample data split by exchange

	Cornerstone backed		Non-cornerstone backed		Total	
Exchange	Obs.	Avg. underpricing	Obs.	Avg. underpricing	Obs.	Avg. underpricing
OMX	54	13.1%	24	7.0%	78	11.2%
First North	64	12.5%	26	0.0%	90	8.9%
Total	118	12.8%	50	3.4%	168	10.0%

Number of observations and equally-weighted mean underpricing in the data set. Observations are split by stock exchange across rows, with all observations included in the bottom row. Across columns, observations are split by cornerstone backed and non-cornerstone backed IPOs, with all observations included in the far right columns.

Table 4.3 shows that average underpricing is higher for firms listed on OMX. The table further shows that the spread in terms of underpricing between cornerstone backed and non-cornerstone backed IPOs is larger for IPOs on First North. This implies that the First North dummy variable used in the regressions is warranted.

Table 4.4. Sample data split by year

	Cornerstone backed		Non-cornerstone backed		Total	
Year	Obs.	Avg. underpricing	Obs.	Avg. underpricing	Obs.	Avg. underpricing
2014	1	32.3%	17	8.3%	18	9.6%
2015	19	14.3%	15	2.3%	34	9.0%
2016	30	16.8%	4	-11.2%	34	13.5%
2017	36	10.0%	3	14.2%	39	10.3%
2018	13	-1.9%	5	5.1%	18	0.1%
2019	11	13.4%	5	8.0%	16	11.7%
2020	8	27.6%	1	-70.2%	9	16.7%
Total	118	12.8%	50	3.4%	168	10.0%

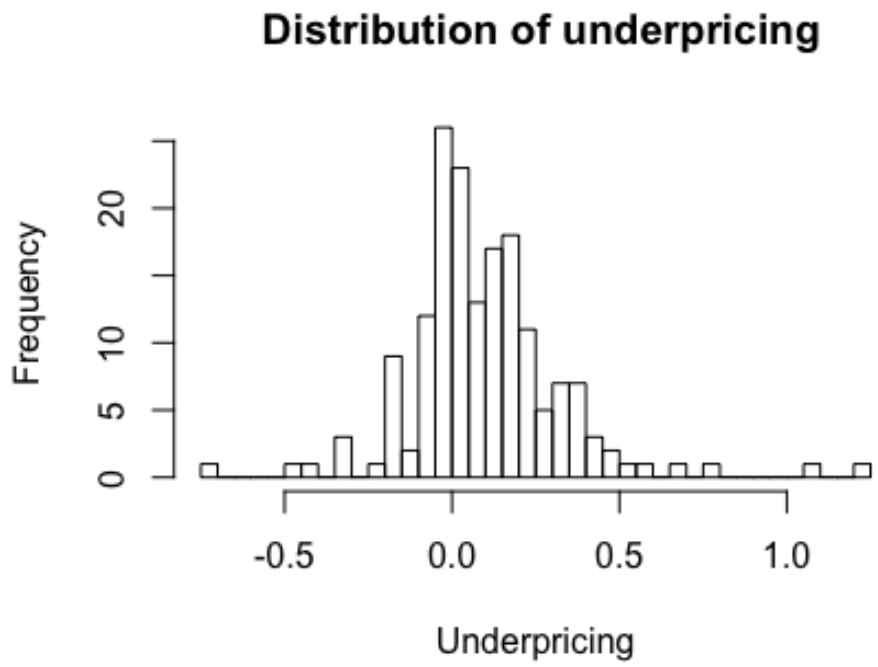
Number of observations and equally-weighted mean underpricing in the data set. Observations are split by year across rows, with all observations included in the bottom row. Across columns, observations are split by cornerstone backed and non-cornerstone backed IPOs, with all observations included in the far right columns.

Table 4.4 shows that the number of non-cornerstone backed IPOs have decreased dramatically over the sample period, where only 1 IPO in 2020, leading up to September, has been non-cornerstone backed, which had a 70% overpricing. Furthermore, table 4.4 shows that underpricing in 2018 was dramatically lower than in other years, which will not be investigated further in this paper, but could be an avenue for further research. The differences in average underpricing across years warrant the year dummy variables that are used in the regressions. Overall, table 4.4 shows that using cornerstone investors is becoming normalised in the Swedish IPO market. Furthermore, given how IPOs are distributed in 2018 and 2020, *MLR1* and *MLR2* will be run excluding these years as robustness tests.

4.2. Treatment of extreme values

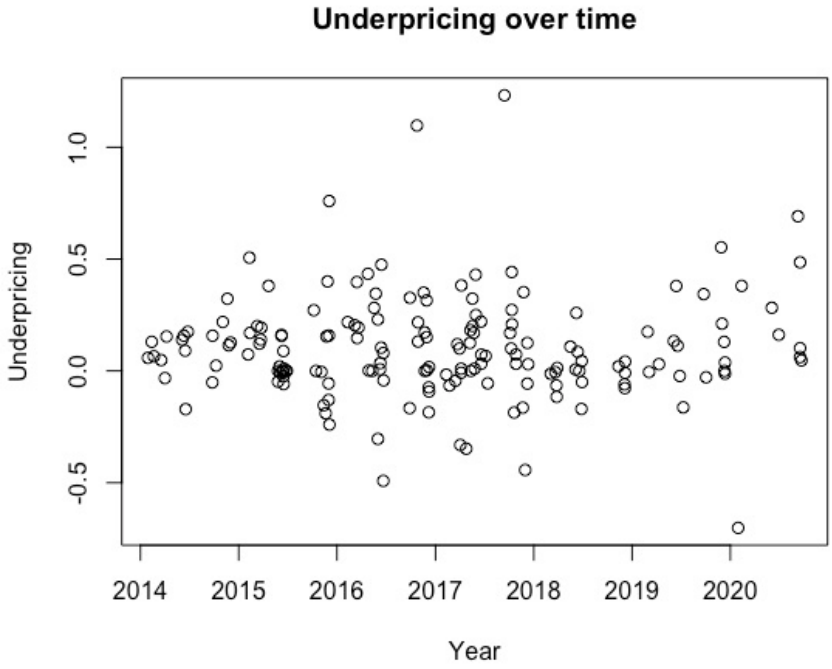
Figures 4.1 and 4.2 below show a graphical representation of underpricing over time in the data set. As is evidenced in the figures, there are no clear extreme outliers in the data with regards to the main dependent variable *Underpricing*. Since the data set is relatively small with 168 observations, the exclusion of extreme variables could have a significant impact on the results, and is therefore not something that should be done without proper motivation. Therefore, no exclusions are made. Instead, a Cook's Distance test is run as a robustness test to ensure that no outliers have a significant impact on the results, as discussed in the methodology section.

Figure 4.1. Histogram showing the distribution of first-day underpricing in the data set



Histogram showing the distribution of underpricing in the data set, with underpricing measured as first-day return for each IPO. The frequency is the number of IPOs for each underpricing range.

Figure 4.2. Scatter plot diagram of underpricing plotted against issue date for all IPOs



All observations in the data set plotted with underpricing on the y axis and date on the x axis. Underpricing is measured as first-day return and date is equal to the issue date for each IPO.

4.3. Quality of data

There are some issues with the data and the data collection method that need to be addressed before moving on to the results section.

Firstly, since no database had sufficiently accurate data on cornerstone involvement in Swedish IPOs, the data had to be gathered manually from IPO prospectuses. Consequently, there is a risk of human error regarding the cornerstone data in particular. To mitigate this risk, all data entries were done twice, independently of each other. The benefit of this data collection method is that the cornerstone data in our data set is much more accurate than the data available at the SDC database.

Secondly, given that IPOs are unique events, no regularities regarding timing occur. In other words, the data set consists of time series data with an uneven distribution of data points over time. With the methodology in this paper, this is not an issue, which is important to note. However, if the data set was to be used for other types of research, this might become an issue.

Lastly, in cases of more than nine cornerstone investors, a cutoff has been made at the eight largest investors in order to save time in the data collection process and to keep the data set less cluttered. The remaining investors have been grouped as *others*, and the sum of their allocations has been the data point. This has no effect on the first part of the analysis, since that part only focuses on total shares allocated to cornerstone investors. It has no effect on the second part of the analysis either, regarding cornerstone investor skill. This is because the smaller cornerstone investors that have been grouped as others are always unique investors, with no other IPO involvements. Consequently, they would not have been regarded as skilled investors if they were included, and would not have impacted the analysis.

5. Empirical results

In this section, the results from all tests are presented, starting with hypothesis 1 and ending with hypothesis 4. The presentation of the results is followed by robustness tests of the models, and lastly the section concludes with discussing the limitations of the results.

5.1. Results

5.1.1. $H0_1$: IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.

The table below shows results from the first test, a two-sided t-test to see if underpricing is present in the data set.

Table 5.1 - Two-sided t-test of the Underpricing variable

Variable	Mean	99% confidence interval		t	p	
Underpricing	10.0%	5.3%	14.6%	5.5977	0.000009%	***

Results from a two-sided t-test on the equally-weighted mean on the *Underpricing* variable.
The equally-weighted mean, 99% confidence interval, t-statistic and p-value are shown.
*** *represents statistical significance on the 0.1% level*

Table 5.1 shows that, in the data set as a whole, the mean underpricing is 10.0% with significance on the 0.1% level. The corresponding 99% confidence interval is 5.3% - 14.6%. The results mean that underpricing exists among IPOs in the data set, and thus suggest that hypothesis $H0_1$ can be rejected on the 0.1% significance level. Furthermore, the results show that Swedish IPOs since 2014 have on average experienced 10.0% underpricing, which is in line with previous studies on the Swedish IPO market.

5.1.2. $H0_2$: Cornerstone backed IPOs in the Swedish market have not been underpriced during the period 2014 to September 2020.

The table below shows results from the second test, a two-sided t-test to see if underpricing is present among cornerstone backed IPOs in the data set.

Table 5.2 - Two-sided t-test of the Underpricing variable in cornerstone backed IPOs

Variable	Mean	99% confidence interval		t	p	
Underpricing	12.8%	7.0%	18.6%	5.7931	0.000006%	***

Results from a two-sided t-test on the equally-weighted mean on the *Underpricing* variable, for only cornerstone backed IPOs. The equally-weighted mean, 99% confidence interval, t-statistic and p-value are shown.
*** *represents statistical significance on the 0.1% level*

Table 5.2 shows that underpricing among cornerstone backed IPOs in the data is 12.8% with significance on the 0.1% level. The corresponding 99% confidence interval is 7.0%-18.6%. The results show that underpricing exists among cornerstone backed IPOs, and thus suggest that $H0_2$ can be rejected on the 0.1% significance level. Furthermore, it is noted that mean underpricing is larger for cornerstone backed IPOs, which is studied further in *MLR1* in the next subsection.

5.1.3. $H0_3$: Cornerstone investors' allocation does not have a statistically significant relationship with underpricing in the Swedish market during the period 2014 to September 2020.

Table 5.3 shows results from the first regression, *MLR1,* which is the third test in the study and aims to study the relationship between cornerstone share allocation and underpricing.

Table 5.3 - Coefficients from MLR1

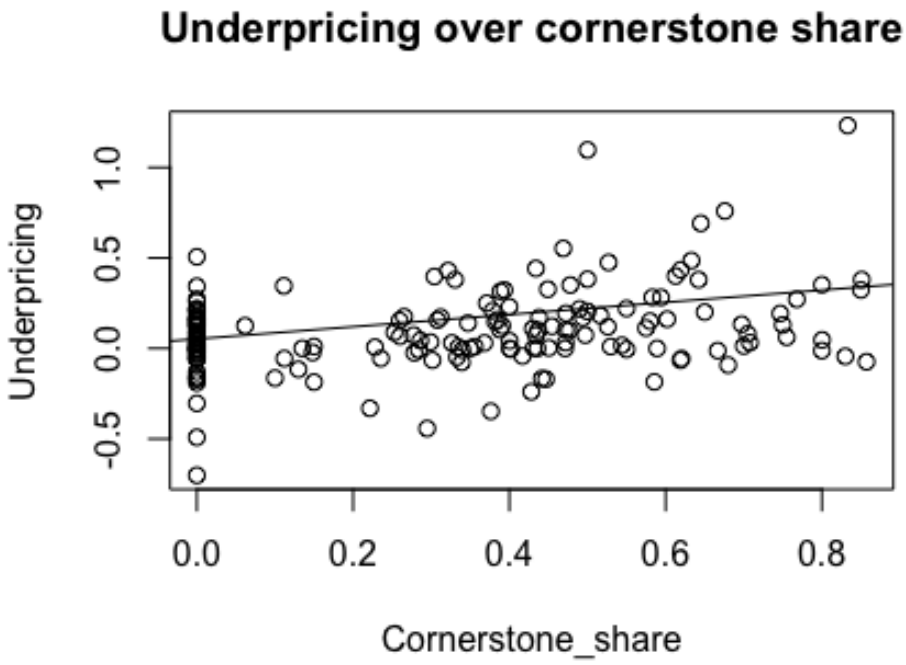
Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.05	0.31	0.167	0.868	
Cornerstone_share	**0.34**	0.08	4.418	0.00002	***
Secondaries	-0.02	0.05	-0.307	0.759	
Ln_size	0.00	0.02	0.169	0.866	
Year_2015	-0.07	0.07	-1.054	0.294	
Year_2016	-0.07	0.07	-1.021	0.309	
Year_2017	-0.11	0.07	-1.520	0.131	
Year_2018	-0.18	0.08	-2.357	0.020	*
Year_2019	-0.08	0.08	-0.957	0.340	
Year_2020	-0.10	0.10	-1.013	0.313	
FirstNorth	-0.04	0.05	-0.769	0.443	
Statistics					
Multiple R-squared	0.142				
Adjusted R-squared	0.087				
F-statistic	2.594				
DF	157				

Coefficients from *MLR1:* Underpricing = Intersect + β*Cornerstone_share + γ*Control variables. *Underpricing* is the dependent variable and *Cornerstone_share* is the main independent variable. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

**** and * represent statistical significance on the 0.1% and 5% level, respectively*

Table 5.3 shows that the cornerstone share of an IPO is positively correlated with underpricing and significant at the 0.1% level, suggesting that $H0_3$ can be rejected. The coefficient is 0.34, which means that, according to the model, the partial effect (ceteris paribus) of an IPO being 100% subscribed by cornerstone investors is correlated with higher underpricing by 34 percentage points (p.p.). More intuitively, an IPO allocating 10% of offered shares to cornerstone investors then has, according to the model, 3.4 p.p. higher underpricing. It is important to note that the results do not imply any causality - the model itself does not provide enough insights to show whether there is a causal effect between *Cornerstone_share* and *Underpricing.* The results will be discussed further in the discussion section.

Figure 5.1. Scatter plot of Underpricing and Cornerstone_share for all IPOs in the data set



All observations in the data set plotted with *Underpricing* on the y axis and *Cornerstone_share* on the x axis. The line is the fitted line from *MLR1:* Underpricing = Intersect + β*Cornerstone_share + γ*Control variables.

Figure 5.1 shows the relationship between *Cornerstone_share* and *Underpricing*, with *MLR1* as a fitted line in the plot. The implications from the coefficient can be visually observed in the graph, increased cornerstone investor subscription is correlated with increased underpricing. Furthermore, it becomes more clear that there is a linear relationship between the variables.

5.1.4. $H0_4$: IPOs backed by skilled cornerstone investors do not have a stronger relationship with underpricing than that of IPOs backed by unskilled investors in the Swedish market during the period 2016 to September 2020.

The table below presents coefficients from performing *MLR1* on the subset used for the last test.

Table 5.4 - Coefficients from running MLR1 on MLR2 subset

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	-0.17	0.43	-0.392	0.696	
Cornerstone_share	**0.35**	0.10	3.475	0.001	***
Secondaries	-0.02	0.07	-0.254	0.800	
Ln_size	0.01	0.02	0.504	0.615	
Year_2017	-0.03	0.06	-0.595	0.553	
Year_2018	-0.11	0.07	-1.564	0.121	
Year_2019	-0.01	0.08	-0.139	0.890	
Year_2020	-0.03	0.10	-0.300	0.765	
FirstNorth	-0.06	0.06	-0.939	0.350	
Statistics					
Multiple R-squared	0.141				
Adjusted R-squared	0.077				
F-statistic	2.196				
DF	107				

Coefficients from *MLR1:* Underpricing = Intersect + β*Cornerstone_share + γ*Control variables, while run on the *MLR2* data subset. *Underpricing* is the dependent variable and Cornerstone_share is the main independent variable. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

**** represents statistical significance on the 0.1% level*

Table 5.4 shows that cornerstone investor presence has a significant correlation with underpricing when only looking at IPOs from 2016 and forward. This is important to establish, since our last test studying the skill of cornerstone investors only studies this time period. As the regression presented in table 5.4 is not part of answering the research question, the coefficients will not be discussed further as it is out of the scope of this paper.

The table below shows results from the fifth and final regression, *MLR2*, aiming to investigate the relationship between IPOs backed by skilled cornerstone investors and underpricing.

Table 5.5 - Coefficients from MLR2

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.03	0.47	0.070	0.944	
Skilled_CI	**0.15**	0.07	2.026	0.045	*
No_skilled_CI	0.08	0.08	1.119	0.266	
Secondaries	-0.02	0.07	-0.227	0.821	
Ln_size	0.00	0.02	0.038	0.970	
Year_2017	-0.03	0.06	-0.428	0.669	
Year_2018	-0.12	0.07	-1.630	0.106	
Year_2019	0.01	0.08	0.091	0.928	
Year_2020	0.04	0.10	0.367	0.715	
FirstNorth	-0.03	0.06	-0.421	0.675	
Statistics					
Multiple R-squared	0.081				
Adjusted R-squared	0.003				
F-statistic	1.040				
DF	106				

Coefficients from *MLR2:* Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables. *Underpricing* is the dependent variable and *Skilled_CI* and *No_skilled_CI* are the main independent variables. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

** represents statistical significance on the 5% level*

Table 5.5 shows that the coefficient on the *Skilled_CI* variable is 0.15 and statistically significant at the 5% level. Furthermore, the coefficient on *No_skilled_CI* is lower at 0.08, and not statistically significant. This suggests that $H0_4$ can be rejected.

The results indicate that there indeed is an effect of cornerstone investor skill in the data set, when cornerstone investor skill is assessed through the method described in section 3.4. More specifically, the results indicate that the correlation between cornerstone investor allocation and underpricing, found in regression 1, pertains specifically to skilled investors. In other words, *MLR2* expands on the findings from the *MLR1*, indicating that the correlation between cornerstone investor allocation and underpricing is not an effect of properties among cornerstone investors as a whole, but rather an effect of certain skilled cornerstone investors. *MLR2* has a very low Adjusted R-Squared of 0.3%, which means that the model does not provide the full picture of factors explaining underpricing. However, the statistical significance

of the coefficient on *Skilled_CI* shows that there is a significant relationship between *Skilled_CI* and *Underpricing.*

5.2. Robustness tests

As described in chapter 3.5, the results from the tests need to be robustness tested in order to fully interpret their implications. Seven tests are run for both *MLR1* and *MLR2*, resulting in a total of 14 tests. For more details, tables and figures from all robustness tests can be found in the appendix.

1. Linearity assumption - Residuals vs fitted and scale-location plots, presented in the appendix in figure A.2, show that *MLR2* makes no violation against this assumption. For *MLR1* however, the scale-location plot presented in the appendix in figure A.1 indicates that the model may violate this assumption, since there is a small curvature in the plot's line. However, this paper only aims to study the relationship between *Cornerstone_share* and *Underpricing*, which clearly has a linear relationship when looking at figure 5.1 and previous studies in the subject. Therefore, our results do not violate the linearity assumption, given that we are only interested in the coefficient of *Cornerstone_share* in particular and not the explanatory value of the model as a whole.
2. VIF tests presented in the appendix in tables A.1 and A.2 show no issue with multicollinearity for either *MLR1* or *MLR2*, since no variable has a VIF value of more than 10 in either of the models.
3. Residuals vs fitted plots in figures A.1 and A.2 show no issue with zero conditional mean assumption in either model, and neither does the scale-location plots. As mentioned, there is a slight curvature in the scale-location line for *MLR1*, but there is no clear upward or downward trend, which means that the zero conditional mean assumption is not violated.
4. Lastly, the Breusch-Pagan tests presented in table A.3 indicates that there is no issue with heteroscedasticity for *MLR2*. However, table A.3 indicates that there might be a problem for *MLR1*, and the regression is thus run with robust standard errors by performing a White Standard test. The White Standard coefficients, presented in table A.4, do not differ much from our *MLR1* original regression and are still statistically significant. Therefore, there is no violation against OLS unbiasedness in the form of heteroscedasticity in either *MLR1* or *MLR2*.

Additionally, the residuals vs leverage plots in figures A.1 and A.2 show that all observations are well below the Cook's Distance line, indicating that there are no issues with outliers in the models.

As presented in the data section, only one IPO in 2020 was non-cornerstone backed, and that IPO had an underpricing of -70%. Additionally, IPOs in 2020 were on average more underpriced than other years. This indicates that our results may be distorted from the year 2020. If the average underpricing in 2020 is due to factors not measured in the model, this can give an upward bias on the coefficient between *Cornerstone_share* and *Underpricing*. Due to these circumstances, robustness tests are run to see if the results are significant when excluding IPOs in 2020 in the analysis. The results from these robustness tests are presented in tables A.5 and A.6, and show that the results from *MLR1* are still robust at a 0.1% level, while the results from *MLR2* are only robust at a 20% level. This means that the strength of the relationship between *Skilled_CI* and *Underpricing* is boosted by the large spread in 2020 due to the -70% underpricing of the non-cornerstone backed IPO. However, the results are still economically significant and statistically significant on a 20% level.

The same robustness test is run for 2018, i.e. *MLR1* and *MLR2* are run on the data set when excluding 2018. This is due to the uncommonly low mean underpricing in 2018. Tables A.7 and A.8 in the appendix show that results from *MLR1* and *MLR2* are still statistically significant when excluding observations in 2018.

In conclusion, the results are deemed robust and can therefore be discussed in chapter 6.

5.3. Limitations

There are limitations to the results that need to be addressed before discussing its implications.

Firstly, even though the sample size of cornerstone backed IPOs is four times the amount of previous studies, there are still only 118 cornerstone backed IPOs in the data set. This could be seen as too small to draw any general conclusions.

Secondly, as earlier mentioned, it is not possible to construct a variable that calculates the share of offerings subscribed by skilled cornerstone investors, since numerous IPOs only report the total allocated share to cornerstone investors. As discussed in our methodology section, this limits us to using a dummy variable for identifying skilled IPOs. This in itself is

not an issue, since implications can still be drawn from the results. However, more implications could be drawn from having a similar variable as we use in our first regression.

Thirdly, another potential limitation also concerns the construction of the *Skilled_CI* variable. Since previous literature offers limited inspiration with regards to the construction of the variable, it has been based on logical intuition. To give a more objective assessment of investor skill, a quantitative approach has been used in this paper, which ensures that our results are not biased. However, perhaps a more qualitative approach to determine investor skill would yield more relevant results. This could be done through interviews with IPO stakeholders in the form of different investor groups, financial advisors, and issuing firms. In other words, surveying interviews could have been used to actually pinpoint which investors are considered skilled in Sweden. Obviously, this would require extensive research and a much larger number of interviews compared to what has been conducted in the writing of this paper.

Lastly, R-squared values are low in both *MLR1* and *MLR2*. *MLR1* has an adjusted R-squared value of 8.7% and *MLR2* has an adjusted R-squared value of 0.3%. These are both low, which means that the models as a whole do not explain the variability in underpricing. However, since we only study the coefficients on the main independent variables, their statistical significance is enough to interpret the results. Furthermore, compared to Westerholm (2007) whose regression has an adjusted R-squared value of 2.5%, *MLR1* in this study has a better R-squared value. The low R-squared values are limitations of the results, but are not sufficiently strong to discard the results. Implications can still be drawn from statistically significant coefficients in the regressions.

6. Discussion

This chapter will first provide a short disclaimer on how not to interpret the results from chapter 5. Next, it will discuss the results and connect them to theories presented in chapter 2. Lastly, suggestions for further research will be discussed.

6.1. Interpretation of results

Before discussing the results, it is important to address how the results can be, and consequently should not be, interpreted.

Firstly, no causality implications can be drawn from the results. The results merely show an occurrence of correlation between *Cornerstone_share* and *Underpricing*, as well as between *Skilled_CI* and *Underpricing.* No conclusions can be drawn whether this is because IPOs with cornerstone investors cause more underpricing, or because cornerstone investors are better at picking IPOs that are underpriced.

Secondly, the models only aim to describe the relationship between specifically cornerstone investor allocation and underpricing. Hence, they should not be used as predictive models to determine underpricing in future issues. Additionally, they should not be interpreted as capturing all factors that affect underpricing, given the low R-squared values.

Thirdly, the results are only applicable to underpricing, and more specifically first-day returns. Consequently, no interpretation can be drawn regarding longer-term share price development from the results. Interpretation regarding the fundamental performance of firms, such as Return on Investment (ROI) or asset turnover, cannot be drawn from the results either.

6.2. Evaluation of results

6.2.1. Underpricing

Results from our first test show that Swedish IPOs have been underpriced by an average of 10.0% in the sample period. This finding is in line with previous research, since previous studies have found that underpricing is somewhere between 9.9% to 15.9%. Furthermore, mean underpricing among cornerstone investors has been even larger in the sample period, averaging to 12.8% among all cornerstone backed IPOs. This is lower than the average underpricing among cornerstone investors of 21.0% that McGuinness (2012) found. The difference in results could be explained by the fact that McGuinness (2012) studied both another market, Hong Kong, and another time period. Our results are also lower than the average underpricing among cornerstone investors of 15% found by Ahl and Sameni (2017). This difference in results could

be explained by a larger sample of cornerstone backed IPOs, and by the fact that Ahl and Sameni (2017) studied all Nordic exchanges, and not just the Swedish IPO market.

6.2.2. Effect of cornerstone investors

In our second test, we find a significant correlation between underpricing and cornerstone investors' share of offerings, with a coefficient of 0.34 on the *Cornerstone_share* variable. This shows that cornerstone backed IPOs are still related to significantly higher underpricing when studying a period leading up to 2020, when cornerstone investors have become a more normalised part of the Swedish IPO landscape. Similarly to the findings of previous research, our findings contrast the certification effect derived from theories around information asymmetry and interviews with investment banks. The results are more in line with the allocation effect derived from Stoughton and Zechner's (1998) control theory, the negotiation effect derived from Welch's (1992) cascade theory, the cherry picking effect introduced by McGuinness (2012), and the demand effect and crowding out effects derived from interviews with investment bankers.

The allocation effect derived from Stoughton and Zechner (1998) suggests that issuing firms use underpricing as a way to create more demand for its IPO, in order to attract more investors who are willing to subscribe to large stakes in the offering. Given that our *Cornerstone_share* variable measures the size of the offering that cornerstone investors take, this theory can be further validated by our results.

The negotiation effect derived from interviews with investment bankers and Welch's (1992) cascade theory suggests that, when cornerstone investors are part of an offering, the offer price becomes subject to a negotiation between the cornerstone investors and the issuing company. Consequently, offer prices in cornerstone backed IPOs might on average be lower than offer prices in non-cornerstone backed IPOs due to these negotiations. This theory is further validated by our results, since larger cornerstone investor allocations are related to higher underpricing.

The cherry picking effect presented by McGuinness (2012), flips the causality of the question, and considers that cornerstone investors might be good at picking IPOs that are underpriced. Since our methodology does not account for causality effects, this theory is validated by our results.

The demand effect and crowding out effect were derived both from interviews with investment bankers and from supply and demand economics regarding the close price of issues. The demand effect suggests that cornerstone investors create increased demand for shares

during the first day of trading, leading to a higher close price and thus higher underpricing. The crowding out effect suggests that the reduced supply in the public book building process from cornerstone investor involvement forces retail investors to buy shares in the aftermarket, increasing the first-day close price. Therefore, the crowding out effect also leads to higher close price on the first day of trading and higher underpricing. Our results are in line with both of these theories.

6.2.3. Effect of skilled cornerstone investors

Results from our last regression indicate that skilled cornerstone investors have a stronger correlation with underpricing than that of unskilled cornerstone investors. This is in line with the aforementioned negotiation effect, cherry picking effect and demand effect. This result contributes to giving a more full picture of cornerstone investors' relation to underpricing, since it shows even stronger evidence supporting these theories.

Furthermore, the results from this regression are not in line with implications from the allocation effect and crowding out effect.

The crowding out effect states that, since cornerstone investors take up a large part of offerings, they decrease the number of shares available to other investors, who then have to turn to the aftermarket to buy shares. For the same amount of shares, this effect should have the same impact regardless of the identity of the cornerstone investor. However, the results from our last regression suggest that skilled investors are related to more underpricing. In other words, the results indicate that the identities of cornerstone investors do matter in terms of the correlation with underpricing. More specifically, IPOs backed by skilled investors have been correlated with higher underpricing in the sample period. Therefore, the results in this section indicate that the crowding out effect alone may not be sufficient to explain the relationship between cornerstone investor allocation and underpricing.

The allocation effect states that underpricing is used as a means to attract investors who are willing to take large stakes in the offering. In effect, this effect suggests that cornerstone investors are attractive for issuing firms due to the ability to take on large stakes. For the same number of shares, this effect should thus have the same impact regardless of the identity of the cornerstone investor. As in the case with the crowding out effect, our results indicate that the allocation effect alone may not be sufficient to explain the relationship between cornerstone investor allocation and underpricing.

However, the results do not provide sufficient evidence to fully reject the crowding out effect or the allocation effect due to three reasons. Firstly, several effects can be present

simultaneously. This means that the allocation effect and the crowding out effect could still be valid, although other effects presented in this paper must also be valid to explain our results when studying skilled investors. Secondly, it is possible that skilled investors often take on large stakes in IPOs. If this is the reason for skilled investors being related to more underpricing, the allocation effect and crowding out effect may still be valid. As discussed in the methodology section, due to data limitations, this could not be controlled for since the distribution of shares in IPOs with several cornerstone investors was not available for some IPOs. Thirdly, the results in this section did not fully clear all robustness tests, with only a 20% statistical significance when excluding IPOs in 2020.

6.3. Suggestions for further research

Our results focus on underpricing, measured as first-day return. An interesting area of further research would be to investigate effects on other measures of firm quality than market value of shares. For example, the same analysis could be drawn about fundamental measures of firm performance, such as Return on Investment (ROI) or asset turnover. This would give a better view of whether cornerstone investors are related to quality firms, and not just firms who experience higher first-day returns.

Furthermore, a large number of reasons for using, and for not using, cornerstone investors in an IPO can be derived from interviews with investment bankers. To get a more nuanced picture of the decision of using cornerstone investors from the issuing firms' perspective, a case study could be conducted. For example, the recent Nordnet IPO on November 25, 2020, which was too recent to be included in our data set, was a high-profile IPO that did not use cornerstone investors. Our interviews with investment banks do suggest that the reason is mainly related to already low transaction risk, but a case study around this specific IPO might be of interest to get a full understanding of the rationale behind not using cornerstone investors.

Lastly, an interesting area of research would be to examine the welfare effects of cornerstone investors. This study shows that cornerstone investors have been related to higher underpricing, which indicates that retail investors could earn high first-day returns by piggybacking cornerstone investors. Furthermore, the study shows that the correlation has been stronger and more significant for skilled investors than for unskilled investors, meaning that certain cornerstone investors have been better to follow than others in the sample period. This raises the question whether IPOs backed by skilled cornerstone investors have a higher degree

of oversubscription, due to other investors already piggybacking on these skilled investors. If the oversubscription effect is larger than the effect from skilled cornerstone investors increasing underpricing, retail investors are worse off from the participation of skilled cornerstone investors. On the other hand, if these IPOs are not more oversubscribed in general, retail investors are better off from the participation of skilled cornerstone investors. Therefore, the welfare effect of skilled cornerstone investors could be both positive and negative, and is therefore a suitable area for further research based on the findings of this paper.

7. Conclusion

This paper set out to shed light on the relationship between cornerstone investors and IPO underpricing. The two research questions answered in the paper were stated as: *Does cornerstone investor allocation have a significant relationship with underpricing in the Swedish market?* and *Do IPOs backed by skilled cornerstone investors have a stronger relationship with underpricing than that of IPOs backed by unskilled cornerstone investors?* To summarise, this paper has provided additional insights to the newly introduced IPO mechanism of cornerstone investors.

Cornerstone investors were introduced quite recently in Sweden, in connection with the 2014 IPO of Lifco. Given the short history of cornerstone investor usage in Sweden, academic research in the field is limited. Furthermore, the latest relevant empirical research on the Swedish market stems back to 2017 and had a broader geographic focus, meaning that the results could have been outdated in 2020 when looking at the Swedish market only. Therefore, the paper has not only provided novel insights regarding skilled cornerstone investors and underpricing, but has also updated findings regarding underpricing and cornerstone investors in general.

Our results indicate that, when treating cornerstone investors as a homogenous group, cornerstone investors' presence has been related to increased underpricing in Swedish IPOs in the sample period. Furthermore, by studying the share of offerings subscribed by cornerstone investors, the paper shows that an increased share of an offering allotted to cornerstone investors has been related to increased underpricing. These results are in line with the allocation effect, negotiation effect, cherry picking effect, demand effect and crowding out effect derived from Stoughton and Zechner (1998), Welch (1992), McGuinness (2002) and interviews conducted with investment bankers. The results further validate results from previous academic research, and show that previous findings are still valid in 2020, when cornerstone investor usage has become more normalised in Swedish IPOs.

The paper also studies a previously uncovered research area regarding the differences in skill among cornerstone investors, and its relation to IPO underpricing. A multivariate linear regression analysis studying underpricing of Swedish IPOs shows that the relationship between cornerstone investors and increased underpricing is more significant for IPOs with at least one skilled cornerstone investor. This further validates the results from the first test and previous literature by providing additional support for the negotiation effect, cherry picking effect and demand effect.

Furthermore, the results when separating skilled cornerstone investors indicate that the allocation effect, derived from Stoughton and Zechner (1998), and the crowding out effect, derived from interviews with investment bankers, are not the only effects that contribute to underpricing among IPOs. Rather, other effects presented in this paper must also be in place to explain why there is a difference in underpricing for IPOs backed by skilled investors compared to IPOs backed by unskilled investors. However, the crowding out effect and allocation effect cannot be disregarded since there may be a correlation between skilled cornerstone investors and larger stakes in IPOs, which is not accounted for in our methodology, and because the results did not clear all robustness tests sufficiently well.

Implications from the results of this paper are of interest for all stakeholders in an IPO. For retail investors, the results show that previous IPO success has historically been a good factor to assess when choosing which cornerstone investor to piggyback, if their goal is to maximise first-day return. For issuing firms, the results imply that they have left more money on the table in cases where they have used skilled investors as cornerstone investors, or that skilled investors have created more momentum on the first day of trading. For underwriters, the results imply that there may be certain cornerstone investors that negotiate offer prices better, or help to create successful IPOs in terms of first-day momentum. Lastly, for cornerstone investors, the results imply that there is a non-random aspect regarding which cornerstone investors that have experienced underpricing, and that it has been possible to consistently be part of successful IPOs.

In conclusion, this paper suggests that the main reasons for underpricing in the context of cornerstone investors are mainly derived from negotiation effects, demand effects, cherry picking effects, and possibly allocation effects and crowding out effects. The results provide further evidence that the certification effect derived from theories around information asymmetry is not as strong as other effects on IPO underpricing in Sweden in the context of cornerstone investors.

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9. Appendix

Table A.1. VIF values of variables in MLR1

Variable	VIF
Cornerstone_share	1.38
Secondaries	1.56
Ln_size	2.26
Year_2015	2.49
Year_2016	2.87
Year_2017	3.11
Year_2018	2.01
Year_2019	1.92
Year_2020	1.87
FirstNorth	1.95
Mean	**2.14**

Results from VIF test on *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables. *Underpricing* is the dependent variable and *Cornerstone_share* is the main independent variable. Other variables are control variables. VIF is the Variance Inflation Factor for each variable in the regression. No variable has a VIF value above 10, meaning that *MLR1* has no issue with multicollinearity.

Table A.2. VIF values of variables in MLR2

Variable	VIF
Skilled_CI	2.41
No_Skilled_CI	2.52
Secondaries	1.56
Ln_size	2.34
Year_2017	1.54
Year_2018	1.34
Year_2019	1.37
Year_2020	1.26
FirstNorth	1.79
Mean	**1.79**

Results from VIF test on *MLR2*: Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables. *Underpricing* is the dependent variable and *Skilled_CI* and *No_skilled_CI* are the main independent variables. Other variables are control variables. VIF is the Variance Inflation Factor for each variable in the regression. No variable has a VIF value above 10, meaning that *MLR2* has no issue with multicollinearity.

Table A.3 Values from BP test of MLR1 and MLR2

	BP	p-value	
MLR1	16.42	0.088	.
MLR2	9.91	0.358	

(.) represents statistical significance on the 10% level

Results from Breusch-Pagan tests on *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables and *MLR2*: Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables. Breusch-Pagan tests test for heteroscedasticity. The p-value on *MLR2* suggests that there is no issue with heteroscedasticity for *MLR2*. The p-value on *MLR1* suggests that there may be an issue with heteroscedasticity for *MLR1*.

Table A.4 - MLR1 coefficients from White Standard regression

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.05	0.28	0.1874	0.852	
Cornerstone_share	**0.34**	0.10	3.3483	0.001	**
Secondaries	-0.02	0.05	-0.3485	0.728	
Ln_size	0.00	0.01	0.1856	0.853	
Year_2015	-0.07	0.04	-1.6397	0.103	
Year_2016	-0.07	0.06	-1.1988	0.232	
Year_2017	-0.11	0.05	-2.026	0.044	*
Year_2018	-0.18	0.05	-3.4879	0.001	***
Year_2019	-0.08	0.06	-1.2427	0.216	
Year_2020	-0.10	0.14	-0.7486	0.455	
FirstNorth	-0.04	0.03	-1.1087	0.269	

****, ** and * represent statistical significance on the 0.1%, 1% and 5% level, respectively*

Coefficients from White Standard regression on *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables. *Underpricing* is the dependent variable and *Cornerstone_share* is the main independent variable. Constant is the intersect. Other variables are control variables.

Table A.5 - Coefficients from MLR1 excluding observations in 2020

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.20	0.31	0.629	0.530	
Cornerstone_share	**0.29**	0.08	3.778	0.0002	***
Secondaries	-0.01	0.05	-0.21	0.834	
Ln_size	0.00	0.02	-0.287	0.775	
Year_2015	-0.06	0.06	-0.904	0.367	
Year_2016	-0.05	0.07	-0.789	0.432	
Year_2017	-0.09	0.07	-1.279	0.203	
Year_2018	-0.17	0.08	-2.244	0.026	*
Year_2019	-0.06	0.08	-0.76	0.448	
FirstNorth	-0.05	0.05	-1.112	0.268	

**** and * represent statistical significance on the 0.1% level and 5% level, respectively*

Statistics	
Adjusted R-Square	0.067
F-statistic	2.270
DF	149

Coefficients from *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables, when excluding observations in 2020. *Underpricing* is the dependent variable and *Cornerstone_share* is the main independent variable. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

Table A.6 - Coefficients from MLR2 excluding observations in 2020

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.39	0.47	0.821	0.414	
Skilled_CI	**0.09**	0.07	1.309	0.194	
No_skilled_CI	0.01	0.07	0.144	0.886	
Secondaries	0.00	0.07	-0.055	0.956	
Ln_size	-0.01	0.02	-0.603	0.548	
Year_2017	-0.02	0.06	-0.292	0.771	
Year_2018	-0.13	0.07	-1.851	0.067	.
Year_2019	0.00	0.08	0.045	0.964	
FirstNorth	-0.06	0.06	-0.900	0.370	

(.) represents statistical significance on the 10% level

Statistics	
Adjusted R-Square	0.001
F-statistic	1.017
DF	98

Coefficients from *MLR2*: Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables, when excluding observations in 2020. *Underpricing* is the dependent variable and *Skilled_CI* and *No_skilled_CI* are the main independent variables. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

Table A.7 - Coefficients from MLR1 excluding observations in 2018

Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.10	0.34	0.308	0.758	
Cornerstone_share	**0.40**	0.09	4.688	0.00001	***
Secondaries	-0.02	0.06	-0.327	0.744	
Ln_size	0.00	0.02	-0.001	0.999	
Year_2015	-0.09	0.07	-1.231	0.221	
Year_2016	-0.10	0.08	-1.339	0.183	
Year_2017	-0.14	0.08	-1.822	0.071	.
Year_2019	-0.10	0.08	-1.182	0.239	
Year_2020	-0.15	0.11	-1.342	0.182	
FirstNorth	-0.03	0.05	-0.612	0.542	

**** and (.) represent statistical significance on the 0.1% level and 10% level, respectively*

Statistics	
Adjusted R-Square	0.091
F-statistic	2.659
DF	140

Coefficients from *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables, when excluding observations from 2018. *Underpricing* is the dependent variable and *Cornerstone_share* is the main independent variable. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

Table A.8 - Coefficients from MLR2 excluding observations in 2018

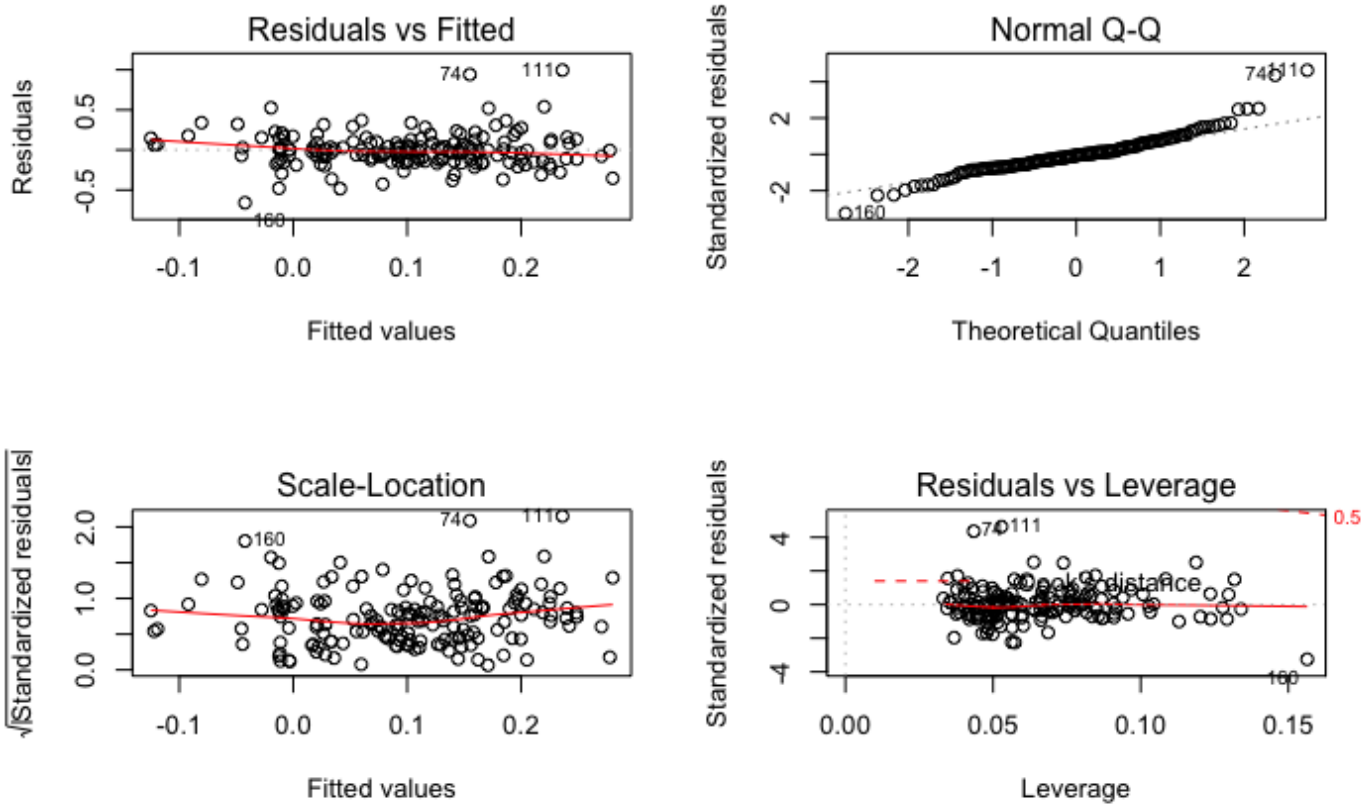
Underpricing	Coef.	Std. Err.	z	P>|z|	
Constant	0.04	0.54	0.083	0.934	
Skilled_CI	**0.23**	0.09	2.541	0.013	*
No_skilled_CI	0.14	0.09	1.593	0.115	
Secondaries	-0.04	0.09	-0.412	0.681	
Ln_size	0.00	0.03	-0.099	0.921	
Year_2017	-0.03	0.07	-0.418	0.677	
Year_2018	0.02	0.09	0.281	0.779	
Year_2019	0.03	0.11	0.291	0.772	
FirstNorth	-0.03	0.07	-0.392	0.696	

** represents statistical significance on the 5% level*

Statistics	
Adjusted R-Square	-0.003
F-statistic	0.970
DF	89

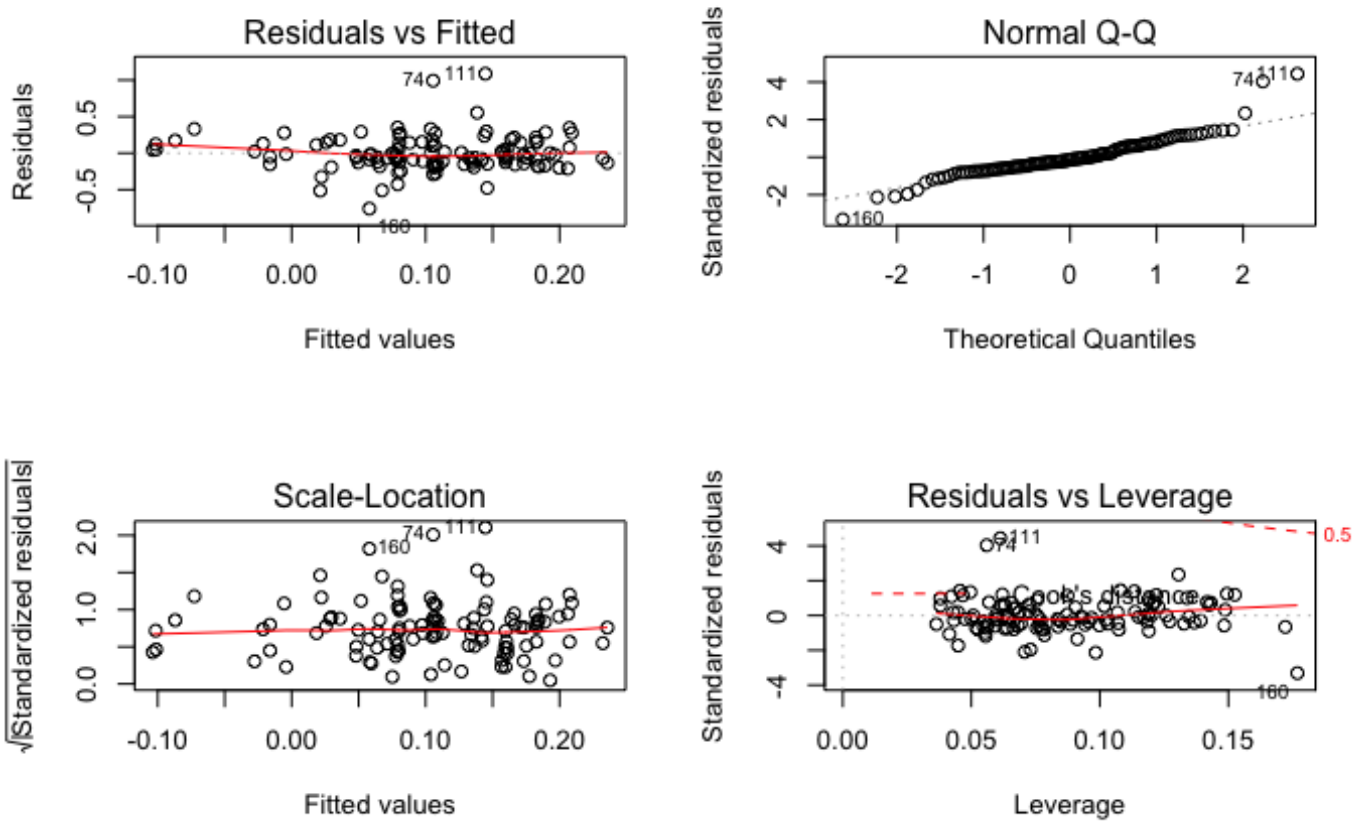
Coefficients from *MLR2*: Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables, when excluding observations in 2018. *Underpricing* is the dependent variable and *Skilled_CI* and *No_skilled_CI* are the main independent variables. Constant is the intersect. Other variables are control variables. Multiple R-squared, adjusted R-squared, F-statistic and DF for the model are shown.

Figure A.1. Residuals vs Fitted, Normal Q-Q, Scale-Location and Residuals vs Leverage plots for MLR1



Robustness plots for *MLR1*: Underpricing = Intersect + β*Cornerstone_share + γ*Control variables. Residuals vs Fitted, Normal Q-Q, Scale-Location and Residuals vs Leverage plot, with Cook's Distance Line included in the Residuals vs Leverage plot. The Scale-Location plot shows that there may be an issue with linearity in *MLR1*. Residuals vs Fitted and Scale-Location plots indicate no issues with the zero conditional mean assumption. The Residuals vs Leverage plot shows that all values are below the Cook's Distance line.

Figure A.2. Residuals vs Fitted, Normal Q-Q, Scale-Location and Residuals vs Leverage plots for MLR2



Robustness plots for *MLR2*: Underpricing = Intersect + β1*Skilled_CI + β2*No_skilled_CI + γ*Control variables. Residuals vs Fitted, Normal Q-Q, Scale-Location and Residuals vs Leverage plot, with Cook's Distance Line included the Residuals vs Leverage plot. The Residual vs Fitted and Scale-Location plots indicate no issues with linearity in *MLR2*. Residuals vs Fitted and Scale-Location plots indicate no issues with the zero conditional mean assumption. The Residuals vs Leverage plot shows that all values are below the Cook's Distance line.