



EKONOMI- HÖGSKOLAN

Lund University School of Economics
and Management
Institution for Business
Administration
BUSN79 - Degree Project in
Accounting and Finance
Master Thesis - 15 ECTS
Group 1
Word count: 14,988

Cornerstone Allocation and IPO Underpricing: Non-Linear Evidence from the Swedish Market

*- A quantitative study on the impact of cornerstone allocation on first-day returns
and the moderating role of valuation uncertainty*

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Abstract

Seminar date: 2025-06-02

Course: BUSN79 - Degree Project: Accounting and Finance, Graduate level, 15 ECTS

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Keywords: Cornerstone Allocation, IPO, Offer price, Underpricing, Valuation Uncertainty

Purpose: This thesis explores whether cornerstone investor allocation explains variations in IPO underpricing in the Swedish market and whether the relationship is non-linear. It further investigates whether firm-level valuation uncertainty moderates this relationship.

Methodology: A quantitative research design is applied, following a deductive approach with exploratory elements, where Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) frameworks are applied on cross-sectional data. Primary data on cornerstone allocation is manually extracted from prospectuses, and financial data is sourced from Bloomberg.

Theoretical Perspectives: The study draws on information asymmetry and agency theory to explain IPO underpricing generally and employs signaling theory, the bandwagon effect, and the risk composition hypothesis to understand the role of cornerstone investors and valuation uncertainty.

Empirical Foundation: The dataset consists of 429 IPOs listed on Swedish regulated exchanges from 2010 to 2024. Key variables are constructed from prospectus disclosures and firm financials, allowing for a detailed examination of cornerstone allocation and its potential effects on pricing outcomes.

Conclusions: We find that the relationship between cornerstone allocation and IPO underpricing is non-linear, in the form of an inverted U-shape, suggesting that moderate allocations can serve as effective market signals while very high allocations may suppress broader investor interest. No significant moderating effect of valuation uncertainty is observed. These findings support a proposed framework of optimal cornerstone allocation in IPO pricing strategy.

Acknowledgement

We would like to express our heartfelt gratitude to our supervisor, Diem Nguyen, for her insightful guidance and support throughout this study. We also extend our thanks to Peter Jochumzen for his valuable assistance with econometric issues.

Lund, May 26th, 2025

Wictor Bodelind & Erik Sjöberg

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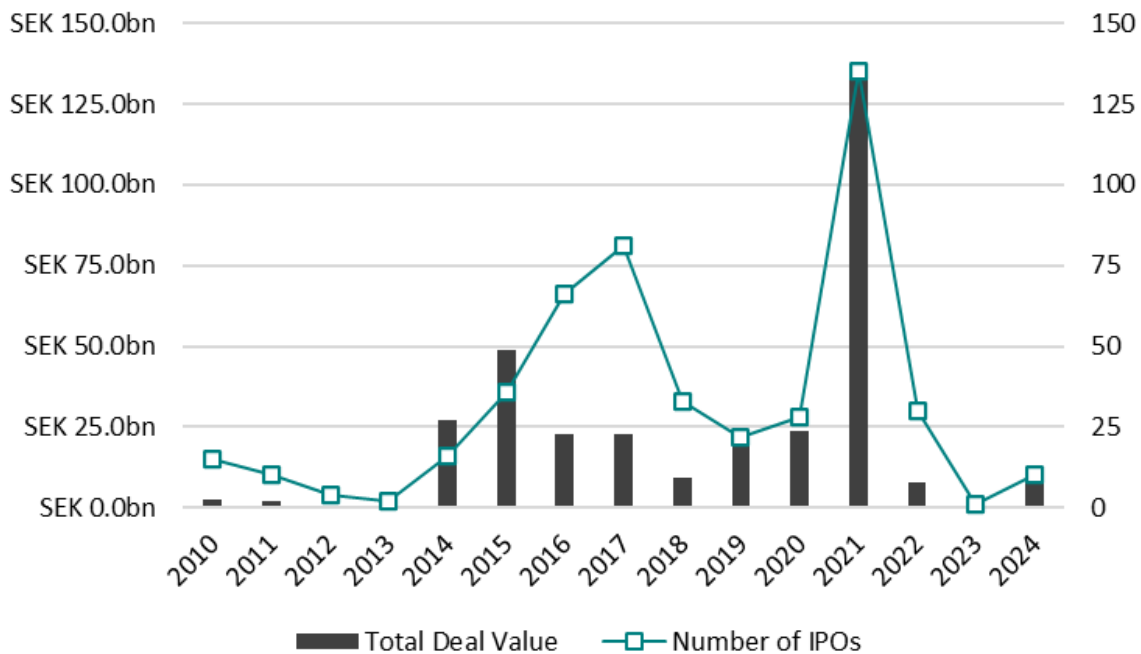
1 Introduction

1.1 Background

An Initial Public Offering (IPO) occurs when a company offers its shares to the public for the first time (Damodaran, 1994). This process allows firms to raise capital for expansion, repay debts, broaden investor base, or enable liquidity for early investors (Nordea, 2025).

Over the past decade, Sweden has established itself as one of the most vibrant IPO markets in Europe. Between 2013 and 2024, Sweden accounted for more IPOs than the combined total of larger economies such as France, Germany, the Netherlands, and Spain (Asgari, 2024). The number of annual IPOs has increased sharply, from just three listings in 2013 to over one hundred in 2021, as shown in *Graph 1* (Bloomberg, 2025), reflecting a strong entrepreneurial ecosystem and favorable market conditions.

Graph 1: Swedish IPOs 2010-2024



This graph shows the aggregate deal value in SEKbn and number of IPOs issued in Sweden between 2010 and 2024.

Despite this rapid growth in IPO activity, one consistent feature of the market has been the underpricing of new issues. Underpricing occurs when the offer price is set below the stock's

closing price on the first day of trading, and it is typically measured as the percentage difference between the two prices. For investors, underpricing represents an opportunity to earn immediate abnormal returns (Ritter and Welch, 2002). For issuers, however, it means money left on the table, making the IPO an even more expensive way to raise funds (Katti & Phani, 2015).

Research on Swedish IPOs reveals that underpricing has been a recurring feature over time. Studies such as Rydqvist (1997) and Abrahamsson and De Ridder (2015) document substantial average first-day returns, ranging from over 40 percent in the 1980s to approximately 14 percent during the 2010s. Ritter's (2004) comparative analysis of global IPO markets shows that Sweden ranked among the European countries with the highest historical underpricing,

One distinctive feature of the Swedish IPO landscape is the widespread use of cornerstone investors. Compared to other European markets, Swedish IPOs more frequently involve cornerstone investors, who commit to buying a predetermined portion of the offering prior to the public launch, thus helping to reduce demand uncertainty and signal quality to other investors (Baker Mckinzie, 2015).

While the exact definition of a cornerstone investor can vary, with some sources limiting the term to institutional actors or only those explicitly named in the prospectus, the core concept remains consistent. Cornerstone investors are well-informed parties who commit to purchasing shares ahead of the broader public offering. In the Swedish IPO context, the general definition refers to investors who agree in advance to subscribe to a significant portion of the offering. Their commitments are disclosed in the prospectus and are typically accompanied by lock-up agreements that restrict them from selling their shares for 90 to 180 days post-listing (Hammarskiöld, 2023). The presence of cornerstone investors is intended to signal firm quality, enhance credibility, and provide order book stability prior to the offering (McGuinness, 2012).

The practice of involving cornerstone investors distinguishes the Swedish market from many others, where reliance on pre-committed investors is less common or where cornerstone roles are often assumed by short-term oriented hedge funds or investment banks, rather than long-term asset managers (Hammarskiöld, 2023). Despite the growing sophistication of the Swedish IPO market, underpricing remains a persistent and costly phenomenon. Understanding the underlying dynamics

of underpricing, particularly the role that cornerstone investors play, remains an important area of interest for firms, investors, and policymakers.

1.2 Problem Discussion

Although the Swedish IPO market has flourished in recent years, academic research specifically addressing the causes and mechanisms of IPO underpricing in Sweden remains relatively limited. While international studies have provided various explanations for IPO underpricing, including information asymmetry (Rock, 1986; Welch, 1989), agency conflicts (Loughran & Ritter, 2004), and market timing (Ritter, 1991), only a handful of studies have examined these dynamics in the Swedish context. Prior research (Rydkvist, 1997; Abrahamsson & De Ridder, 2015) has established that underpricing in Sweden is a persistent phenomenon. However, detailed investigations into specific factors unique to the Swedish market, such as cornerstone investor participation, are scarce.

The institutional structure of Sweden's IPO market presents a distinct setting for examining the underpricing phenomenon. Unlike markets where cornerstone allocations are often dominated by hedge funds or investment banks, Swedish cornerstone investors are typically long-term oriented actors such as pension funds, insurance companies, and asset managers (Abrahamson & De Ridder, 2015). These investors are expected to enhance credibility and stabilize aftermarket performance (Welch, 1989), yet their role in shaping initial pricing dynamics remains less well understood. Prior studies from markets with deep retail participation, such as the United States (Aggarwal et al., 2002), Hong Kong (McGuinness, 2012), and India (Seth et al., 2018), offer mixed conclusions regarding how cornerstone participation affect underpricing. Whether these findings translate to Sweden's more institutionally anchored market structure remains an open question. In this context, the reliance on cornerstone investors to ensure full subscription adds a theoretically relevant contrast to more retail-driven environments.

Moreover, much of the existing literature assumes a linear relationship between cornerstone allocation and IPO underpricing. Yet theoretical perspectives suggest investor responses may vary with participation levels. Signaling theory (Spence, 1973; Welch, 1989) posits that moderate cornerstone involvement can reduce information asymmetry and attract demand, while behavioral theories (Welch, 1989; Shefrin, 2002) suggest that very low or very high allocations may deter

investors, either by signaling weak institutional interest or limiting perceived upside. These dynamics imply a potentially non-linear relationship. In Sweden, the variation in cornerstone allocation is substantial: nearly the entire SEK 0.9bn offering of Humana was allocated to cornerstone investors, while Bravida's SEK 3.2bn IPO had only minimal participation (Bloomberg, 2025). Accordingly, the potential for a non-linear relationship merits closer examination, particularly in the Swedish context.

Additionally, classical theories of IPO underpricing, such as Winner's Curse and signaling models (Spence, 1973; Rock, 1986), often overlook the role of firm-level valuation uncertainty by assuming that insiders have precise knowledge of the firm's fair value and deliberately set prices to signal quality. This perspective implies a clear information advantage for insiders, but disregards the possibility that even insiders may face uncertainty in valuing firms. Empirically, several studies have shown that valuation uncertainty, proxied by R&D intensity, is positively associated with underpricing (Aboody & Lev, 2000; Guo et al., 2006). While cornerstone allocation is theoretically intended to reduce information asymmetries by providing credible signals to the market, this raises the question of how such signals interact with underlying uncertainty about firm valuation in the determination of underpricing.

Understanding these dynamics has important implications for both issuers and investors. For firms, excessive underpricing represents money left on the table (Ritter, 1991). For investors, particularly retail investors, mispricing distorts the fairness and transparency of the allocation process, potentially undermining trust in the equity markets (Jenkinson & Jones, 2009). Given that many cornerstone investors in Sweden are pension funds managing the retirement savings of ordinary citizens, the role they play in shaping IPO outcomes also carries broader societal significance (Hammarskiöld, 2023).

Thus, critical gaps remain in the understanding of how cornerstone investor participation, non-linear relationships, and valuation uncertainty interact to influence underpricing, despite the robust activity in the Swedish IPO market. Addressing these gaps is crucial for advancing academic knowledge, informing regulatory policy, and providing practical insights for issuers, investors, and underwriters operating in Sweden's dynamic IPO environment.

1.3 Purpose and Research Questions

The purpose of this study is to examine the role of cornerstone investor participation in influencing IPO underpricing within the Swedish market context. While the broader determinants of IPO underpricing have been well explored in international literature, less is known about the specific pricing implications of cornerstone investors, particularly long-term institutional actors. Moreover, existing studies often treat the relationship between cornerstone allocation and underpricing as linear and pay limited attention to how firm-specific valuation uncertainty may shape the effectiveness of such signals.

By addressing these limitations, the study aims to contribute to a more nuanced understanding of IPO pricing mechanisms in institutional settings where cornerstone participation is both common and varied. The Swedish IPO market, characterized by strong disclosure regulation and significant variation in cornerstone allocation, offers a particularly relevant setting to explore the following research questions:

RQ₁: Does the level of cornerstone allocation impact IPO underpricing?

RQ₂: Is the relationship between cornerstone allocation and IPO underpricing non-linear?

RQ₃: Does firm-level valuation uncertainty moderate the relationship between cornerstone allocation and IPO underpricing?

1.4 Findings and Contribution

This study enhances the limited literature on IPO underpricing by examining a comprehensive sample of 429 Swedish IPOs from 2010 to 2024, a context that is both underexplored and institutionally distinct. While much of the existing research focuses on larger and more retail-driven markets, this study provides novel insights from a Nordic setting characterized by strong cornerstone investor participation and high disclosure standards.

We add to the literature by finding evidence for a, previously unexplored, non-linear relationship between cornerstone allocation and IPO underpricing. Specifically, the relationship follows an inverted U-shape, suggesting that moderate levels of cornerstone participation enhance underpricing through signaling and bandwagon dynamics, whereas excessive allocations may suppress broader investor demand due to reduced float. Importantly, the study addresses

endogeneity using a 2SLS framework. Thus, we find evidence that this relationship is present despite the likely reverse causality between cornerstone allocation and underpricing.

Additionally, we expand the understanding of how firm-level valuation uncertainty shapes IPO pricing outcomes. We expand prior frameworks looking at the direct effect by specifically analyzing if firm-level valuation uncertainty moderates the effect of cornerstone allocation on IPO underpricing. While theoretical models suggest such an interaction, we find no empirical evidence of a moderating effect in the Swedish setting, indicating that the signaling function of cornerstone investors may be robust to internal valuation ambiguity.

By applying well-established IPO theories such as signaling theory, the winner's curse, and the bandwagon effect to a new institutional environment, this study contributes to the external validity and global relevance of these frameworks. It also introduces a conceptual model of optimal cornerstone allocation that offers novel practical guidance to issuers and underwriters aiming to enhance pricing outcomes.

1.5 Delimitations

This study focuses on IPOs issued on Swedish regulated stock exchanges between 2010 and 2024. The choice of this period is motivated by two factors. First, it captures a full market cycle, including both periods of rapid growth and more subdued IPO activity, providing greater variation in market conditions affecting underpricing. Second, by including recent listings up to 2024, the study ensures that its findings reflect contemporary market structures and the institutionalization of cornerstone investors in Sweden. Additionally, extending the sample further back in time than 2010 would significantly limit the availability of prospectuses for firms that are no longer public, increasing the risk of survivorship bias and potentially skewing the sample.

The sample is further limited to IPOs where historical stock price data and full prospectus documentation are available. Additionally, the study focuses exclusively on first-day underpricing and publicly disclosed cornerstone commitments, without analyzing long-term stock performance or informal investor arrangements. These choices ensure a clearly defined and manageable research scope, although they impose limitations on the generalizability of the results. A more detailed discussion of the sampling strategy and potential biases is provided in section 3.1 *"Sampling."*

2 Literature Review

2.1 The IPO Process

The IPO process is multi-faceted and involves several key stakeholders, each with distinct incentives and responsibilities. These include the issuer, the underwriter(s), retail-, and cornerstone investors (Carbone et al., 2022). Given these differing interests, conflicts may arise throughout the IPO process, which can influence pricing, allocation, and overall transaction dynamics (Ritter & Welch, 2002).

The underwriter plays a pivotal role in guiding the issuer throughout the IPO, advising on regulatory compliance, valuation, market timing, and investor communication (Binay et al., 2009). A crucial function of the underwriter is to ensure the success of the offering through a placing or underwriting agreement, which may obligate the underwriter to purchase any unsold shares, thus assuming part of the financial risk to guarantee full subscription (Espenlaub et al., 2016).

A central component of Swedish IPOs is the book-building process, through which the underwriter and issuer collaboratively set a preliminary price range for the offering. This range is disclosed in the prospectus, a legally mandated document that outlines key information about the company and the offering (Finansinspektionen, 2007). Cornerstone investors are then invited to place non-binding bids indicating the volume and price at which they are willing to purchase shares (Zhang et al., 2022). The underwriter compiles these bids to gauge demand and assess market sentiment, informing the final offer price.

Following the close of the subscription period and regulatory approval of the prospectus, the issuer and underwriter determine the final pricing based on the strength and structure of investor demand. In cases of oversubscription, underwriters propose an allocation plan, often favoring larger or long-term investors. This practice is partly designed to avoid short-term selling pressure, which can arise if small allocations are distributed too broadly and investors quickly offload shares to realize short-term gains. Nonetheless, the final allocation decision rests with the issuer, who has discretion over share distribution, provided listing requirements regarding liquidity and ownership dispersion are met (Finansinspektionen, 2007).

In the Swedish IPO market, cornerstone investors play a significant role in building confidence and ensuring stability in the offering. These investors commit in advance to subscribe to a fixed portion of the offering, which is disclosed in the prospectus and typically agreed upon before the book-building process begins. To further support market stability and signal long-term interest, Swedish cornerstone investors are commonly subject to a lock-up period, usually ranging from 90 to 180 days post-IPO (Hammarskiöld, 2023). During this time, they are contractually restricted from selling their shares. While not mandated by law, this lock-up arrangement is a standard feature in Swedish IPO practice and is publicly disclosed in the prospectus. It serves to reassure the market that key investors will not exit immediately after listing, thereby reducing volatility and supporting price performance in the aftermarket (Finansinspektionen, 2007).

Once the offer price and allocations have been finalized, the IPO is executed and the shares are admitted to trading on the exchange, marking the firm's official entry into the public equity markets (Finansinspektionen, 2007).

2.2 Theoretical Framework

2.2.1 Information Asymmetry

One of the foundational concepts in finance is information asymmetry, which refers to a situation in which different market participants possess unequal access to relevant information. When asymmetric information is present, some actors hold private information that others do not, which can lead to market inefficiencies (Sell & Reese, 2014). Within the context of IPOs, information asymmetry plays a significant role, as the different parties hold varying levels of insight into the fundamental value and risks associated with the offering (Tailard, 2018). The disparity in information among these actors is widely recognized as a primary driver of IPO underpricing.

Information asymmetry serves as a focal point of several theories explaining IPO underpricing, including Rock's Winner's Curse (1986), Ritter's Risk Composition Hypothesis (1984), Spence's Signaling Theory (1973), Welch's Bandwagon Effect Theory (1989), all of which are discussed in 2.4 "*Explanations for IPO Underpricing*".

2.2.2 Agency Theory

Jensen and Meckling's (1976) agency theory explains how conflicts of interest arise when one party (the agent) makes decisions on behalf of another (the principal). In IPOs, this framework helps illustrate how underpricing can result from misaligned incentives between issuers, underwriters, and investors.

Underwriters, tasked with advising issuers on pricing, may deliberately underprice shares to benefit institutional clients, particularly cornerstone investors, with whom they seek to maintain long-term relationships. Loughran and Ritter (2004) argue that this behavior often reduces the capital raised by the issuer. Since issuers rely heavily on underwriters' expertise, they may not fully recognize the extent of this conflict (Filatotchev & Bishop, 2002).

From the managerial perspective, decision-makers might also support underpricing to ensure a successful IPO debut, boost their reputation, and protect their personal financial interests. While these motives may benefit individual agents, they can conflict with the goal of maximizing shareholder value and long-term capital generation (Taranto, 2003).

Agency theory thus provides a complementary explanation to market-based theories, emphasizing how internal dynamics among IPO participants can influence pricing outcomes independently of information asymmetry.

2.3 Empirical Literature

2.3.1 Cornerstone Investor Participation and IPO Underpricing

Aggarwal et al. (2002) lay the foundation for the research frontier, examining the impact of post-pricing institutional allocation in IPOs. Their study consists of 174 U.S. IPOs between 1997 and 1998 and aims to explain how institutional allocations affect IPO underpricing. Employing OLS regressions, they find that institutional allocation has a statistically significant impact on first-day returns. They estimate that a one percentage point increase in institutional allocations is associated with a 0.31 percentage point increase in underpricing. The authors argue that this positive association is partly driven by the superior information institutional investors possess, which enables them to self-select into more underpriced offerings. However, they also acknowledge that the informational advantage may reside with the underwriters. Underwriters possessing private

knowledge of underpricing allocate more shares to institutional investors in highly underpriced offerings to ensure their participation in future deals. While evidence supports both explanations, the authors conclude that the relationship between institutional allocation and underpricing extends beyond what can be explained by book-building alone.

McGuinness (2012) examines the relationship between cornerstone investors and IPO underpricing in Hong Kong during the period 2005 to 2009. Applying multivariate OLS regression on a sample of 269 offerings, he finds a weakly significant association between cornerstone allocations and IPO underpricing, where an increase in cornerstone allocation is associated with a 0.382 percentage point increase in underpricing. Additionally, he finds a statistically significant correlation between underpricing and the mere presence of cornerstone allocations. On average, offerings that include cornerstone investor allocations are expected to exhibit 9.6 percentage point higher underpricing compared to those without cornerstone involvement.

In contrast, a 2018 study by Seth et al. examines the impact of cornerstone investors on IPO underpricing. Sampling 282 Indian IPOs between 2007 and 2013, the study finds that IPOs with cornerstone investors, on average, experience 0.93 percentage point lower underpricing. Furthermore, each percentage of the offering allocated to cornerstone investors is associated with a 0.86 to 0.90 percentage point decrease in underpricing.

2.3.2 The Influence of Firm-Level Valuation Uncertainty on IPO Underpricing

Information asymmetry is widely regarded as a key driver of IPO underpricing (e.g., Loughran & Ritter, 2002), with valuation uncertainty representing a central dimension of that asymmetry. Aboody and Lev (2002) show that, between 1985 and 1997, U.S. firms engaged in R&D experienced significantly greater insider gains than firms without such activity. They attribute this to insiders having superior knowledge of proprietary innovations and R&D outlooks, giving them a valuation advantage over external investors. Supporting this, Chan et al. (2002) and Eberhart et al. (2004) find that high-R&D firms tend to exhibit greater long-term abnormal stock returns, suggesting initial market misvaluation due to information asymmetry.

Guo et al. (2006) further examines the impact of valuation uncertainty in an IPO setting. Sampling 2,696 U.S. IPOs from 1980 to 1995, they find that both increases in the R&D-to-sales ratio and

R&D expenses alone are associated with a increased IPO underpricing¹. Chin et al. (2006) reinforce these findings using a Taiwanese sample of 623 IPOs between 1991 and 2001. They show that a one percentage point increase in R&D-to-sales correlates with a 0.274 percentage point greater underpricing. Moreover, firms with high R&D intensity averaged 15.3% underpricing, compared to 9.0% for low-R&D firms, indicating a clear information-related pricing gap.

While most IPO literature focuses on R&D as a proxy for valuation uncertainty, Choi et al. (2000) argue that such uncertainty extends more broadly across all intangible asset classes. Borghesi and Chang (2019) find that operating in intangibles-heavy industries amplifies exposure to external risk, particularly in periods of global economic policy uncertainty. Wu and Lai (2020) add that firms with high levels of intangible assets (excluding goodwill), whether finite or indefinite in life, are more prone to stock price crashes. Together, these findings suggest that intangible assets, beyond R&D, are a critical, yet underexplored, source of valuation uncertainty in IPO contexts, with meaningful implications for underpricing outcomes.

2.4 Explanations for IPO Underpricing

2.4.1 Winner's Curse

A widely cited explanation for IPO underpricing is Rock's (1986) winner's curse, which highlights asymmetric information between informed and uninformed investors. Informed investors have superior private insights into firm value, while uninformed investors cannot distinguish between overpriced and underpriced issues. As a result, uninformed investors disproportionately receive allocations in overpriced IPOs.

To retain uninformed investors in the market, issuers must compensate them through underpricing. Without their continued participation, informed investors would lose their advantage. Rock's model assumes pro-rata share allocation and no price revisions, assumptions that are less relevant under today's book-building mechanisms where allocations are discretionary and often favor institutional or cornerstone investors (Bienvenue & Wilhelm, 2005).

While foundational, the model's assumptions do not always align with modern IPO practices. Nevertheless, the theory remains influential in explaining how underpricing functions to balance

¹ Due to variable transformations, the coefficients are not directly interpretable in economic terms

investor participation under conditions of information asymmetry. As Loughran (1995) notes, although IPOs are underpriced on average, directly testing the winner's curse remains difficult due to unobservable investor behavior.

2.4.2 Risk Composition Hypothesis

Another explanation for IPO underpricing, often referred to in later literature as the Risk Composition Hypothesis, finds its roots in the foundational work of Ritter (1984). He demonstrated that IPOs associated with higher uncertainty and speculative risk tend to be more heavily underpriced to compensate investors for assuming that additional risk.

The central premise of this hypothesis is that the risk profile of the issuing firm influences the level of underpricing required to attract investor participation. When firms with unproven business models, limited operating histories, or volatile financials approach the public market, they are perceived as higher risk. In such cases, underwriters and issuers may deliberately underprice shares to provide a risk premium that compensates for this uncertainty (Ritter, 1984).

Subsequent research has expanded on this idea by considering the composition of the investor base and broader market conditions. Loughran and Ritter (2004) argue that the degree of underpricing can vary over time depending on macroeconomic factors and investor sentiment, with risk-averse investors demanding greater discounts during periods of heightened uncertainty. Similarly, Ljungqvist (2007) emphasizes the role of investor heterogeneity, suggesting that when the IPO market is dominated by more risk-averse participants, issuers are incentivized to price more conservatively to ensure full subscription. These perspectives frame underpricing as a demand-side response to varying risk preferences across investor groups and market cycles.

2.4.3 Signaling Theory

Signaling theory provides a robust framework for understanding IPO underpricing in the presence of information asymmetry between the issuing firm and potential investors. The theory demonstrates how one party with superior information can credibly convey that information to another through a costly signal (Spence, 1973). In the IPO context, the issuing firm typically possesses better information about its future cash flows, intrinsic value, and operational outlook

compared to external investors (Leland & Pyle, 1977). Due to this information asymmetry, investors may discount the offering unless the firm can credibly signal its quality.

One prominent signal is deliberate underpricing. High-quality firms are more likely to bear the short-term cost of underpricing because they expect to recover the loss through future benefits such as favorable valuations, investor trust, and lower costs of capital in subsequent offerings (Allen & Faulhaber, 1989; Chemmanur & Fulghieri, 1997). In contrast, low-quality firms are unlikely to mimic this strategy, as they cannot afford the associated costs or sustain long-term performance. As such, underpricing becomes a self-selecting mechanism to distinguish credible issuers from opportunistic ones.

Grinblatt and Hwang (1989) expand on this framework by introducing offer price and underwriter quality as further signals. They suggest that the level of underpricing positively correlates with firm quality, and argue that high-quality firms may also signal through choices such as employing reputable investment banks, offering generous dividend policies, or engaging in strong pre-IPO marketing. These multifaceted signals reinforce the firm's credibility and increase investor demand in the absence of complete information.

Empirical studies support this basis, showing that firms using underpricing as a signal often experience better long-term aftermarket performance and smoother access to capital markets (Jegadeesh et al., 1993; Welch, 1989). Nonetheless, signaling through underpricing is costly and may dilute capital raised, meaning it is most viable for firms confident in their ability to deliver future value.

2.4.4 Bandwagon Effect Theory

The bandwagon effect refers to a behavioral tendency where investors mimic the actions of others in the market, rather than relying on their own independent analysis (Welch, 1989). Within the context of IPOs, this phenomenon is particularly relevant. Welch (1989) introduces the idea of informational cascades, where early participation by investors serves as a signal to others, prompting further demand based not on fundamental analysis, but on the assumption that previous investors possess superior information.

In an IPO setting, this behavior can be strategically anticipated and influenced. Underwriters may deliberately underprice offerings to generate strong early interest, which in turn boosts first-day returns. This initial performance acts as a public signal of quality, potentially attracting a broader base of investors who join in not because of their own valuation, but because they perceive the enthusiasm of early participants as a credible indicator of value (Jiang and Léger, 2010). This process helps fuel herd behavior, as successive investors enter the market in response to observable early success.

Shefrin (2002) explains two psychological drivers behind the bandwagon effect in financial markets. First, investors often assume that heavy investment in an IPO signals valuable private information, leading to imitation. Second, social risk sharing reduces personal accountability, as investors feel less burdened by losses if many others share the same experience. This dynamic encourages following the crowd due to regret aversion. The success of underpricing depends on early investor participation, as substantial initial bids can trigger a self-reinforcing bandwagon. Underwriters may intentionally set a low offer price to generate excitement and create this momentum.

2.5 Theoretical Context and Hypothesis Development

Building on the theoretical foundations and prior empirical studies discussed in the literature review, three hypotheses are developed to address the research questions. Each hypothesis draws on established theories in finance and is further supported by empirical evidence on IPO underpricing dynamics.

The first hypothesis is grounded in the winner's curse theory (Rock, 1986), and signaling theory (Welch, 1989). In IPO markets, information asymmetry creates risks for uninformed investors, who face the possibility of being allocated overpriced issues, "winner's curse." The participation of cornerstone investors can mitigate this problem by acting as a quality signal and reassuring less informed investors about the offering's value. From a signaling perspective, the public commitment of cornerstone investors serves as a credible indicator of firm quality, encouraging broader market participation. Empirical evidence from McGuinness (2012) shows that IPOs with cornerstone involvement exhibit higher first-day returns, supporting the proposition that cornerstone investors significantly influence underpricing outcomes.

H₁: There is a positive relationship between the level of cornerstone allocation and IPO underpricing

The second hypothesis considers the possibility of a non-linear relationship between cornerstone investor allocation and IPO underpricing, based on bandwagon effect theory (Welch, 1989; Shefrin, 2002) and signaling theory (Spence, 1973). Although a potentially non-linear relationship has not been explicitly tested, the mixed empirical findings regarding the linear relationship underscore the need for such an investigation. While McGuinness (2012) and Aggarwal et al. (2002) report a positive association between cornerstone or institutional participation and higher underpricing, Seth et al. (2018) find a negative relationship, where greater allocations to cornerstone investors are associated with lower underpricing. Given the contradicting empirical evidence, we expect an inverted U-shaped relationship. At low to moderate levels, increases in cornerstone allocation are expected to correspond with increased underpricing due to signaling and bandwagon effects. However, at higher levels of cornerstone participation, the effect is expected to reverse, as retail investor demand weakens, potentially due to concerns about limited float or diminished upside, consistent with the risk composition hypothesis.

H₂: The relationship between the level of cornerstone allocation and IPO underpricing is non-linear

The third hypothesis builds on the risk composition hypothesis (Ritter, 1984) and winner's curse theory (Rock, 1986), proposing that firm-level valuation uncertainty moderates the relationship between cornerstone investor participation and IPO underpricing. According to these theories, firms characterized by high valuation uncertainty, such as those with high R&D intensity, exhibit greater information asymmetry and perceived risk. Under such conditions, even the signaling value of cornerstone participation may be insufficient to fully alleviate investor concerns, leading to greater underpricing. Empirical support for this view is provided by studies such as Guo et al. (2006) and Chin et al. (2006), which find that firms with higher valuation uncertainty experience significantly larger IPO underpricing. The hypotheses are synthesized in *Table 1* below.

H₃: The effect of cornerstone investor participation on IPO underpricing is weaker for firms with higher valuation uncertainty.

Table 1: Hypotheses

Hypothesis	Explanation	Theoretical support	Empirical Support
H_1	There is a positive relationship between the level of cornerstone allocation and IPO underpricing	Winner's Curse (Rock, 1986); Signaling Theory (Welch, 1989)	McGuinness (2012) Aggarwal et al. (2002)
H_2	The relationship between the level of cornerstone allocation and IPO underpricing is non-linear.	Bandwagon Effect Theory (Welch, 1989; Shefrin, 2002)	Seth et al. (2018)
H_3	The effect of cornerstone investor participation on IPO underpricing is weaker for firms with higher valuation uncertainty	Risk Composition Hypothesis (Ritter, 1984) Winner's Curse (Rock, 1986)	Chin et al. (2006) Guo et al. (2006)

This table summarizes the three hypotheses as well as their theoretical and empirical foundations

3 Methodology

3.1 Sampling

3.1.1 Sample Design

The target population for this study consists of all IPOs issued on Swedish regulated stock exchanges. The sampling strategy aims to maximize the sample size to ensure sufficient statistical power, generalizability, and variation necessary for drawing inferences.

The sample frame covers IPOs issued between 2010 and 2024. The choice of this timeframe is motivated by several factors. First, it captures a full market cycle, including periods of both strong and weak IPO activity, which provides variation in market conditions likely to affect underpricing (e.g., Loughran and Ritter, 2004). Second, it reflects a period when the use of cornerstone investors became increasingly institutionalized in Swedish IPO practice, ensuring that the sample aligns with the specific market mechanisms under study (Asgari, 2024). Moreover, this timeframe is consistent with contemporary empirical research, which often focuses on the post-global financial crisis environment to capture more stable regulatory and financial market conditions (e.g., Seth et al., 2018). Last, going further back in time would likely introduce survivorship bias to the sample as prospectus availability of firms no longer public significantly decreases.

The geographical focus on Sweden is motivated by the need to explore a market context that differs from those examined in most prior IPO research, which has predominantly focused on the United States, India, or China (e.g., Aggarwal et al., 2002; McGuinness, 2012; Seth et al., 2018). Sweden offers a particularly interesting setting due to the strong presence of cornerstone investors with long-term investment horizons, such as pension funds and institutional asset managers. This institutional structure may influence underpricing outcomes differently compared to markets where cornerstone participation is less prevalent or where investors adopt shorter-term strategies. Investigating the Swedish IPO market thus provides an opportunity to examine how cornerstone investors' characteristics impact IPO pricing dynamics.

3.1.2 Sample Construction

The initial dataset, retrieved from Bloomberg (2025), consisted of 489 IPOs conducted on Swedish stock exchanges between 2010 and 2024. From this initial dataset, several observations were excluded from the final sample due to unavailable data.

First, 15 observations were excluded due to missing historical stock price data, which prevented the calculation of the dependent variable underpricing. The lack of stock price data was primarily attributable to the companies either entering bankruptcy or being acquired shortly after the offering.

Second, 30 observations were removed because their prospectuses were unavailable, making it impossible to verify cornerstone investor participation and other offering details. Third, 15 firms were excluded because they were founded and went public within the same calendar year. The reason for excluding these firms is that the measurement of valuation uncertainty, discussed in 3.2.3.2 “*Firm-level Valuation Uncertainty*”, requires financial data from the full fiscal year preceding the offering.

After applying these exclusion criteria, the final sample comprises 429 IPOs as seen in *Table 2*.

Table 2: Sample Construction and Exclusions

Sample Selection Step	No. Firms
Total number of Swedish IPOs issued during 2010-2024	489
(-) IPOs where the historical stock prices were unavailable	(15)
(-) IPOs where the prospectus was unavailable	(30)
(-) IPOs which were made in the same year as the firm was founded	(15)
Final sample	429

This table shows the number of IPOs excluded, and the reasons for their exclusion, from the final sample

3.1.3 Potential Sampling Bias

While the sample construction process aims to maximize coverage and data quality, certain limitations introduce potential sources of sampling bias that may affect the generalizability of the results.

First, the requirement for available stock price data and accessible prospectuses likely creates a skew toward larger, more transparent firms. Companies that lack publicly available data or comprehensive documentation are typically smaller and less mature, suggesting that the final sample may overrepresent more established issuers relative to the full population of Swedish IPOs during the period. This potential bias toward larger and more transparent firms could result in an under- or overestimation of underpricing levels if such firms systematically experience different IPO dynamics compared to smaller or less visible firms.

Second, the exclusion of firms that quickly went bankrupt or were acquired shortly after the IPO introduces a survivorship bias. Because these firms were dropped due to missing stock price data, the sample may omit companies with particularly poor post-IPO performance. As a result, the observed patterns of underpricing outcomes may appear more favorable than they would in a truly representative sample.

Moreover, although manual prospectus review enhances data validity, it also introduces a minor risk of subjective interpretation or classification errors in identifying cornerstone investor participation. Every effort was made to ensure consistency and accuracy during data collection, but this possibility cannot be entirely excluded.

These sources of bias have implications for the generalizability of the findings. While the sample is representative of IPOs that successfully reached the public market and maintained basic disclosure standards, caution should be exercised when extrapolating the results to the entire population of Swedish IPOs, particularly those involving smaller, less transparent, or financially weaker firms.

While random sampling from independent and identically distributed observations is a foundational assumption in statistical inference (Woolridge, 2013), the exclusion of observations due to data availability may mean this assumption is not satisfied in our sample. In particular, the assumption is violated if the probability of exclusion, due to either 1) missing historical price data, 2) unavailable prospectuses, or 3) the firm going public in its first operational year, is a non-random event correlated with underpricing. While this cannot be definitively ruled out, the data loss of ~12% from our initial dataset aligns with sample losses reported in prior IPO underpricing studies (e.g., McGuinness, 2012). As such, we interpret the risk of significant sampling bias as tolerable.

Additionally, a final sample size of 429 IPOs may initially appear modest. However, it exceeds the sample sizes used in many prior empirical studies on IPO underpricing (e.g., Seth et al., 2018; Thorsell & Isaksson, 2014), thereby strengthening the reliability and statistical power of the results.

3.2 Data Collection and Variable Construction

3.2.1 Data Sources

The initial sample was compiled using data retrieved from the Bloomberg Terminal, which provided a comprehensive listing of IPOs in Sweden along with firm-specific financial data for the fiscal year preceding each offering. Bloomberg is widely regarded as a reliable and authoritative data source in financial research and has been extensively used in prior IPO studies (e.g., Aggarwal, 2002).

However, while Bloomberg offers extensive coverage of IPO characteristics, it does not systematically collect detailed information on cornerstone investor participation or lead underwriter(s). As no standardized database currently exists for cornerstone commitments or underwriter roles, each IPO prospectus was manually reviewed to extract information regarding cornerstone allocations, lead underwriters, and other relevant terms. To further enhance data reliability, financial metrics sourced from Bloomberg were cross-validated against the disclosures contained in the IPO prospectuses. This dual collection and verification process ensures a high degree of validity and minimizes the risk of measurement errors.

3.2.2 Dependent Variable

The dependent variable in this study is *Underpricing*, measured as the first-day return, i.e. the percentual change between the closing price on the first trading day relative to the offer price:

$$Underpricing_i = \frac{Closing\ price\ on\ first\ trading\ day_i - Offer\ price_i}{Offer\ price_i}$$

This definition is consistent with the vast majority of literature on IPO underpricing (e.g., McGuinness, 2012; Loughran & Ritter, 2015; Seth et al., 2018). Some studies instead use the first-day abnormal market return to measure *Underpricing* (e.g., Thorsell & Isaksson, 2014). We,

however, argue that this is redundant since first-day returns primarily driven by idiosyncratic factors specific to the firm and offering, rather than broader market movements specifically at the effective date (Loughran & Ritter, 2004).

3.2.3 Main Independent Variables

3.2.3.1 Cornerstone Allocation

The main independent variable of interest in this study is *Cornerstone Allocation*. defined as the percentage of shares pre-subscribed to selected investors prior to the IPO, as disclosed in the public prospectus:

$$\text{Cornerstone Allocation}_i = \frac{\text{Pre - subscribed shares}_i}{\text{Shares offered}_i}$$

This definition of *Cornerstone Allocation* reflects that non-retail investors, by virtue of superior information, can act as credible signals of firm quality. A technically identical definition to that of McGuinness (2012) and a functionally similar one to that of Seth et al. (2019)², facilitating comparability.

3.2.3.2 Firm-level Valuation Uncertainty

This study operationalizes *Valuation Uncertainty* as the ratio of intangible assets, excluding goodwill, to total assets the full fiscal year preceding the IPO:

$$\text{Valuation Uncertainty}_i = \frac{\text{Intangible assets}_i - \text{Goodwill}_i}{\text{Total assets}_i}$$

Common practice in IPO studies is to proxy *Valuation Uncertainty* using the ratio of R&D expenses to either total assets or sales (e.g., Guo et al., 2006; Chin et al., 2006). Our deviation from this approach stems from the fact that R&D expenses are not required to be itemized in Swedish financial statements (KPMG, 2025). Instead, we adopt a broader measure that captures a wider range of intangible activities lacking transparent market valuations, which contribute to *Valuation Uncertainty* beyond R&D alone (Borghesi & Chang, 2019; Wu & Lai, 2020). Goodwill is excluded, as it arises from acquisition-related accounting rather than internally generated assets,

² Seth et al. (2018) measure cornerstone allocation based on mandatory disclosures to Indian financial regulators before the offering

potentially distorting the measure of firm-specific valuation uncertainty at IPO (Gu & Lev, 2008). Last, using balance sheet derived measures for both the numerator and denominator ensures internal consistency and maintains alignment in accounting scope. Hence, this operationalization of *Valuation Uncertainty* is well-suited to capture the intended economic effect, while remaining feasible given the study's scope and available data.

3.2.4 Control Variables

3.2.4.1 *Gross Proceeds*

Aligning with prior studies (e.g., Guo et al., 2006; Seth et al., 2018), this study controls for the variation in *Gross Proceeds*, measured as the product of the shares offered and the offer price:

$$Gross\ Proceeds_i = Shares\ offered_i \cdot Offer\ price_i$$

This variable serves as a proxy for both issuer and issue risk, as firms perceived to be less risky are generally able to raise larger amounts of capital (Guo et al., 2006). However, the book-building process introduces a countervailing perspective: Larger offerings may require larger underpricing to fully subscribe (Bienvenue & Wilhelm, 1990). Consistent with prior literature, the natural logarithm of the variable is applied in the regression models (e.g., McGuinness, 2012; Seth et al., 2018). Given competing theoretical perspectives, we refrain from making an *ex ante* prediction regarding the direction of its effect.

3.2.4.2 *Firm Age*

Consistent with the prior studies on IPO Underpricing, we employ the control *Firm Age* as a proxy for information asymmetry, with younger firms assumed to face greater uncertainty due to limited operating histories (Ritter, 1991; Carter & Manaster, 1990). In contrast, older firms typically offer more transparent information, potentially reducing underpricing (Ljungqvist, 2007). Accordingly, we expect a negative relationship between *Firm Age* and *Underpricing*. Following prior studies (e.g., McGuinness, 2012; Seth et al., 2018), *Firm Age* is measured as the number of years between incorporation and the IPO year, and subsequently log-transformed in regressions.

3.2.4.3 Underwriter Reputation

Aligning with prior studies (e.g., Aggarwal et al., 2002; Chin et al., 2006), we control for *Underwriter Reputation*. We operationalize this as the average market share of the lead underwriter(s) of an IPO across the sample, excluding the IPO itself:

$$Underwriter\ Reputation_i = \frac{1}{k} \sum_{j=1}^k \frac{Gross\ proceeds_j}{\sum_{i=1}^n Gross\ proceeds_i}$$

Where:

k : Number of (co-)lead underwriters for IPO i

j : Index over lead underwriter(s) for IPO i

n : Number of IPOs in the sample

Underwriter Reputation is measured by market share, following Thorsell & Isaksson (2014). Unlike prior studies that rely on deal count, we use total deal value to better capture underwriter prominence in a sample dominated by small-cap IPOs. For instance, using deal count would overstate the reputation of niche firms like Sedermera relative to full-service banks like Carnegie, consistently ranked among the top Nordic underwriters (Lindeberg, 2022). While previous literature often uses binary indicators for underwriter prestige (e.g., Aggarwal et al., 2002; Seth et al., 2018), our continuous measure mitigates overfitting risks in the context of a smaller sample and concentrated underwriter market. Theoretically, reputable underwriters are linked to higher underpricing, as they aim to preserve their standing by avoiding failed offerings (Guo et al., 2006). We therefore expect a positive relationship between *Underwriter Reputation* and *Underpricing*.

3.2.4.4 Market Sentiment

In addition to offering-specific controls, we include *Market Sentiment* to account for the market momentum at the time of IPO. It is measured as the cumulative OMX PI return the 15 trading days prior to the effective date:

$$Market\ Sentiment_t = \frac{OMX\ PI_{t-1}}{OMX\ PI_{t-16}} - 1$$

Where:

OMXPI: Closing price of OMXPI index at date t

t : The effective date of IPO i

Controlling for *Market Sentiment* is common practice in empirical literature in IPO underpricing studies (e.g., McGuinness, 2012; Seth et al., 2018). We adopt the definition from Loughran and Ritter (2015), who find a statistically positive association between the cumulative 15 prior trading days return of a market-wide index and *Underpricing*. The economic rationale is that overall market momentum has a spillover effect on the return of new issues. Subsequently, we expect *Market Sentiment* to have a positive effect on *Underpricing*. Last, OMX PI is chosen as the appropriate index for computing the variable as it comprises all stocks listed on the Stockholm exchange (Avanza, 2025), efficiently capturing overall market momentum representative of our sample.

3.2.4.5 Year Fixed Effects

In addition to short-term market conditions, we employ *Year Fixed Effects* as a control for broader macroeconomic and temporal influences on IPO pricing, consistent with Guo et al. (2006) and Seth et al. (2018). We use *Year Fixed Effects*, instead of otherwise employed subjective classifications or arbitrary quantitative criterion to determine “hot” or “cold” IPO markets (e.g., McGuinness, 2012; Thorsell & Isaksson, 2014), to not introduce subjectivity into the methodology.

Table 3: List of Variables

Variable (Abbreviation)	Definition	Expected sign
Dependent variable:		
<i>Underpricing</i>	<i>The first-day return of an IPO</i>	n.a.
Main independent variables:		
<i>Cornerstone allocation</i>	<i>The percentage of the shares offered pre-subscribed before the IPO</i>	+/- ³
<i>Valuation uncertainty</i>	<i>The ratio of intangible assets, excluding goodwill, to total assets the full fiscal year before the IPO</i>	n.a. ⁴
Control variables:		
<i>Gross proceeds</i>	<i>The nominal value of the capital raised in the IPO before fees and expenses</i>	+/-
<i>Firm age</i>	<i>The difference in years between the effective date of the IPO and the firm registration date</i>	-
<i>Underwriter reputation</i>	<i>The average sample market share of the IPO's lead underwriter(s), in terms of gross proceeds</i>	+
<i>Market sentiment</i>	<i>The 15-trading-days cumulative return of the OMX PI index, prior to the effective date</i>	+
<i>Year fixed effects</i>	<i>Dummy variables for each year included in the sample, except for the base year</i>	n.a.

This table lists all variables used in the study, their definitions, and our ex ante predictions of their effects on underpricing

3.2.5 Dealing with Outliers

To deal with the noisy nature of IPO markets, we winsorize all continuous variables with cutoffs at the 2nd and 98th percentile. This threshold follows Thorsell & Isaksson (2015), who examine IPO underpricing in the Swedish market, thereby enhancing methodological comparability with studies focused on the same geographical setting. We opt for winsorization, as opposed to other approaches such as outright exclusion (e.g., Guo et al., 2006), to preserve the sample size and reduce the risk of selection bias. All variables are winsorized before any log-transformations.

³ In linear specifications, we expect *Cornerstone Allocation* to have a positive effect on underpricing and in non-linear specifications we anticipate an inverted U-shaped relationship, i.e. a positive effect of the linear term and a negative effect of the quadratic term

⁴ As *Valuation Uncertainty* only appears as part of an interaction term with *Cornerstone Allocation* we make no ex ante prediction of its direct effect, but expect a negative effect of the interaction term

Underwriter Reputation, however, is excluded from winsorization as it would remove three observations that had no underwriter, yielding a value of zero. Since these observations reflect meaningful variation rather than noise, they are retained in their original form to avoid distorting the analysis.

3.3 OLS Framework

We begin our empirical analysis with OLS estimations to establish a baseline and assess the potential endogeneity of key regressors. This initial step allows for a comparison between OLS and 2SLS estimates, facilitating tests for endogeneity and evaluating the validity and strength of our instruments. Such an approach aligns with standard econometric practices and provides a comprehensive understanding of the underlying relationships in our model (Woolridge, 2013).

3.3.1 OLS Model Specifications

3.3.1.1 Model 1A: Linear Specification

The baseline specification aims to test the linear association between *Cornerstone Allocation* and *Underpricing*:

$$\text{Underpricing}_i = \beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \boldsymbol{\varepsilon}_i$$

Where:

\mathbf{X}'_i denotes the $k \cdot 1$ vector of control variables for observation i

$\boldsymbol{\gamma}$ denotes the $k \cdot 1$ vector of coefficients for the control variables

k is the number of control variables

3.3.1.2 Model 2A: Non-Linear Specification

The second specification expands on *Model 1A* by introducing the square of *Cornerstone Allocation*, $\text{Cornerstone Allocation}^2$. This aims to test for a non-linear association between *Cornerstone Allocation* and *Underpricing*:

$$\text{Underpricing}_i = \beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Cornerstone Allocation}_i^2 + \mathbf{X}'_i \boldsymbol{\gamma} + \boldsymbol{\varepsilon}_i$$

As such, the marginal effect of *Cornerstone Allocation* on *Underpricing* becomes dependent on the level of *Cornerstone Allocation*:

$$\frac{\partial \text{Underpricing}}{\partial \text{Cornerstone Allocation}} = \beta_1 + 2\beta_2 \text{Cornerstone Allocation}$$

3.3.1.3 Model 3A: Moderation of Valuation Uncertainty in Linear Specification

To test the moderating effect of *Valuation Uncertainty* on the relationship between *Cornerstone Allocation* and *Underpricing*, we introduce the interaction term *Moderator*, which is the product of *Cornerstone Allocation* and *Valuation Uncertainty*:

$$\text{Underpricing}_i = \beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Moderator}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$$

Valuation Uncertainty is intentionally excluded as a standalone regressor, as the analysis focuses solely on its moderating role rather than a direct effect⁵. This approach also promotes model simplicity and mitigates overfitting risk given the limited sample size.

Accordingly, β_2 captures the moderating effect of *Valuation Uncertainty*, and the marginal effect of *Cornerstone Allocation* on *Underpricing* becomes dependent on the level of *Valuation Uncertainty*:

$$\frac{\partial \text{Underpricing}}{\partial \text{Cornerstone Allocation}} = \beta_1 + \beta_2 \text{Valuation Uncertainty}$$

3.3.1.4 Model 4A: Moderation of Valuation Uncertainty in Non-Linear Specification

Additionally, the moderating effect of *Valuation Uncertainty* on the relationship between *Cornerstone Allocation* and *Underpricing* is tested in the non-linear specification as well;

$$\text{Underpricing}_i = \beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Cornerstone Allocation}_i^2 + \beta_3 \text{Moderator}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$$

We deliberately exclude a higher-order interaction term, which would allow *Valuation Uncertainty* to influence the curvature of the *Cornerstone Allocation* - *Underpricing* relationship. Theoretically, our framework supports that *Valuation Uncertainty* may weaken the marginal effect of *Cornerstone Allocation* due to increased information asymmetry (Ritter, 1984; Rock 1986). However, it does not provide a basis for assuming that the moderating effect itself is moderated by *Cornerstone Allocation*, as implied by the inclusion of a higher-order interaction term. Including such a term would therefore imply a second-order moderation dynamic not supported by our theoretical framework. Additionally, incorporating an additional endogenous regressor would increase model complexity, elevate the risk of overfitting, and reduce the efficiency of instrumentation in the 2SLS framework, particularly given the modest sample size.

⁵ *Valuation Uncertainty* was initially included as a standalone regressor, but was later excluded due to consistently insignificant coefficients across all model specifications

In this specification, the marginal effect of *Cornerstone Allocation* on *Underpricing* becomes dependent on both the level of *Cornerstone Allocation* and *Valuation Uncertainty*:

$$\frac{\partial \text{Underpricing}}{\partial \text{Cornerstone Allocation}} = \beta_1 + 2\beta_2 \text{Cornerstone Allocation} + \beta_3 \text{Valuation Uncertainty}$$

Table 4: Overview of Model Specifications

Model Specification	Purpose
1A $\beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$	Test the linear relationship between <i>Cornerstone Allocation</i> and <i>Underpricing</i>
2A $\beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Cornerstone Allocation}_i^2 + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$	Test the non-linear relationship between <i>Cornerstone Allocation</i> and <i>Underpricing</i>
3A $\beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Moderator}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$	Test the moderating effect of <i>Valuation Uncertainty</i> on the relationship between <i>Cornerstone Allocation</i> and <i>Underpricing</i>
4A $\beta_0 + \beta_1 \text{Cornerstone Allocation}_i + \beta_2 \text{Cornerstone Allocation}_i^2 + \beta_3 \text{Moderator}_i + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$	

This table summarizes the OLS model specifications and their purpose.

3.4 Addressing Endogeneity

In the noisy setting of IPOs, endogeneity is most likely present. To combat this and derive causal relationships to test our hypotheses a 2SLS framework is employed, where the main explanatory variables will be instrumented to isolate the exogenous variations of the variables (Woolridge, 2013).

3.4.1 Instrument Selection

Our instrumentation is guided by both the 1) relevance condition and 2) exclusion criterion. That means that Z is a valid instrument for the endogenous regressor X if is 1) correlated with the endogenous regressor, conditioned on controls, and 2) uncorrelated with the error term and

correctly excluded from the structural equation (Wooldridge, 2013). While the relevance condition is tested statistically, using methods outlined in 3.5 “Regression Diagnostics”, the exclusion restriction is justified by theory and economic rationale.

3.4.2.1 Cornerstone Allocation Instrumentation

The main endogeneity concern relating to *Cornerstone Allocation* is that informed investors with superior information may be able to identify underpriced IPOs and therefore self-select into those offerings (Rock, 1986). Consequently, it is likely that expected underpricing influences the level of cornerstone participation, raising concerns about reverse causality. This notion is reinforced by McGuinness (2012), who applies a 2SLS framework (without detailing the instrument structure), reporting inconclusive results implying the potential for a bidirectional relationship. Additionally, Aggarwal et al. (2002) suggest that institutional investors possess private information, allowing them to avoid participating in “lemons,” i.e., IPOs with minimal underpricing.

We instrument *Cornerstone Allocation* using the average *Cornerstone Allocation* of each IPOs lead underwriter(s) sample average *Cornerstone Allocation*, excluding the focal IPO:

$$Z_{\text{Cornerstone Allocation}_i} = \frac{1}{|U_i|} \sum_{u \in U_i} \left(\frac{1}{|I_u|} \sum_{j \in I_u} \text{Cornerstone Allocation}_j \right)$$

Where:

U_i is the set of lead underwriter(s) for IPO i

I_u is the set of IPOs underwritten by underwriter $u \in U_i$, excluding IPO i

j denotes the index over IPOs in I_u

Theoretically, we argue that this instrument satisfies the relevance criterion as underwriters are likely to exhibit consistent placement strategies regarding the proportion of shares allocated to cornerstone investors, a pattern supported by Aggarwal et al. (2002). In terms of exogeneity, the allocation practices of underwriters should not directly impact a specific IPOs underpricing, other than through the proportion of shares allocated to cornerstone investors. By excluding the IPO in question from the underwriter-specific average, we further mitigate mechanical correlation, thereby supporting the assumption of plausible exogeneity. One potential concern, however, is that the average *Cornerstone Allocation* of a lead underwriter’s past IPOs may still be correlated with underpricing, since more reputable underwriters might attract higher cornerstone participation

through their broader investor networks. However, as our regression models control for *Underwriter Reputation*, we argue that the instrument isolates the exogenous variation in *Cornerstone Allocation* arising from underwriter-level placement practices, supporting its validity in a 2SLS framework.

In the non-linear specifications, we follow standard practice in non-linear IV estimation by using the square of the original instrument as the excluded instrument for the exogenous quadratic term, i.e. $Z_Cornerstone Allocation^2$ is the instrument for $Cornerstone Allocation^2$.

3.4.2.2 Firm-Level Valuation Uncertainty

Valuation Uncertainty is likely endogenous in relation to *Underpricing* for several reasons. First, firms may adjust balance sheet composition strategically during IPO preparation based on the anticipated level of *Underpricing* (Teoh et al., 1998) potentially implying reverse causality. Second, consistent with prior studies (e.g., McGuinness, 2012), this study does not control for firm-specific financials. As a result, intangible-asset intensity may be correlated with the error term through omitted financial characteristics. Third, when used in an interaction term, *Valuation Uncertainty* may introduce endogeneity through joint strategic behavior if *Cornerstone Allocation* and *Valuation Uncertainty* are simultaneously determined.

We instrument *Valuation Uncertainty* using the industry average *Valuation Uncertainty* of all publicly traded Swedish firms in the year of the IPO, excluding the firm going public:

$$Z_{Valuation Uncertainty_i} = \frac{1}{|I_s|} \sum_{j \in I_s} Valuation Uncertainty_j$$

Where:

I_s is the set of all publicly traded Swedish firms in the same industry and IPO year as firm i , excluding firm i

j is the index over firms in industry I_s

We argue for the relevance of the instrument on a basis of industry norms, as asset intangibility often reflects sector-specific business models, R&D intensity, and reporting practices. The industry average of *Valuation Uncertainty* is constructed using other firms in the same sector and year, excluding the IPO firm itself. Therefore, it captures industry-level variation in asset-intangibility, which is plausibly exogenous to the specific pricing of the IPO. Since the instrument

is external to the firm and does not directly influence the offer price, it is unlikely to affect *Underpricing* except through the firm's own *Valuation Uncertainty*.

Since *Valuation Uncertainty* only features as part of an interaction term in all specifications where its included, we follow common econometric practice and instrument the interaction term using both the product of each component's instrument along with the individual instruments themselves. As such, the set of excluded instruments for *Valuation Uncertainty* contains *Z_Valuation Uncertainty*, *Z_Cornerstone Allocation*, and their product, *Z_Moderator*.

3.4.3 2SLS Model specifications

3.4.3.1 Structural Equation

To estimate the causal effect of *Cornerstone Allocation* on *Underpricing*, and assess the potentially moderating role of *Valuation Uncertainty*, the following general structural equation is specified:

$$Underpricing_i = \alpha + \widehat{\mathbf{E}}'_i \boldsymbol{\beta} + \mathbf{X}'_i \boldsymbol{\gamma} + \varepsilon_i$$

Where:

$\widehat{\mathbf{E}}'_i$ is the $k \cdot 1$ vector of predicted endogenous variables included in each model

$\boldsymbol{\beta}$ is the $k \cdot 1$ vector of IV estimators for the endogenous regressors included in each model

k is the number of endogenous regressors included in each model

As opposed to OLS, IV estimator coefficients do not represent the marginal effect of the regressor on the dependent variable in a general sense, but rather identify the local average treatment effect. Consequently, while the computation of partial derivatives described in section 3.3.1 "*OLS Model Specifications*" remains formally applicable to each model's 2SLS counterpart, the interpretation shifts: The estimated effects represent the causal effect of the endogenous regressor on the dependent variable for the subpopulation whose values are influenced by the instrument(s), i.e. compliers.

3.4.3.2 First-Stage Regressions

To estimate each model's vector of predicted endogenous variables, $\widehat{\mathbf{E}}'_i$, there are k first-stage regressions, one for each endogenous regressor:

$$E_{ij} = \mathbf{Z}'_i \boldsymbol{\pi}_j + X'_i \boldsymbol{\nu}_j + \nu_{ij}$$

Where:

E_{ij} is the scalar value of endogenous regressor j for observation i

\mathbf{Z}'_i denotes the $1 \cdot m$ vector of excluded instruments for observation i

$\boldsymbol{\pi}_j$ is the $m \cdot 1$ coefficient vector for instruments predicting regressor j

$\boldsymbol{\nu}_{ij}$ is the scalar first-stage residual for regression j and observation i

m is the number of excluded instruments

All first-stage regressions include the same set of control variables as those specified in the corresponding structural equations and OLS specifications. This ensures consistency across model specifications and allows the identification strategy to isolate variation attributable to the instruments alone. In models with multiple endogenous regressors, each first-stage regression includes the full set of excluded instruments used in the corresponding structural equation, regardless of whether a specific instrument directly targets a given endogenous regressor. This aligns with conventional 2SLS estimation, where instruments serve to explain joint exogenous variation across all endogenous regressors (Woolridge, 2013). The composite 2SLS framework is summarized in *Table 5* below.

Table 5: Overview of 2SLS Framework

Model	Endogenous regressor(s)	Instrument(s)	Note
1B	▪ <i>Cornerstone Allocation</i>	▪ <i>Z_Cornerstone Allocation</i>	Linear specification
2B	▪ <i>Cornerstone Allocation</i> ▪ <i>Cornerstone Allocation</i> ²	▪ <i>Z_Cornerstone Allocation</i> ▪ <i>Z_Cornerstone Allocation</i> ²	Non-linear specification
3B	▪ <i>Cornerstone Allocation</i> ▪ <i>Moderator</i>	▪ <i>Z_Cornerstone Allocation</i> ▪ <i>Z_Valuation Uncertainty</i> ▪ <i>Z_Moderator</i>	Linear specification with moderator
4B	▪ <i>Cornerstone Allocation</i> ▪ <i>Cornerstone Allocation</i> ² ▪ <i>Moderator</i>	▪ <i>Z_Cornerstone Allocation</i> ▪ <i>Z_Cornerstone Allocation</i> ² ▪ <i>Z_Valuation Uncertainty</i> ▪ <i>Z_Moderator</i>	Non-linear specification with moderator

This table outlines the sets of endogenous regressors and excluded instruments used in each structural equation. Each 2SLS specification corresponds to its OLS counterpart, with models labeled using the suffix “A” instead of “B”.

3.5 Regression Diagnostics

To ensure the robustness of our results and support our causal claims, we conduct a series of diagnostics. Given the likely presence of endogeneity for both *Cornerstone Allocation* and *Valuation Uncertainty*, main inference is drawn from the 2SLS estimations. To formally assess if endogeneity is present, we conduct a Hausman test for endogeneity (Woolridge, 2013) to confirm that 2SLS is the preferred estimator. The null hypothesis is rejected at the 5% level, aligning with conventional econometric thresholds.

Additionally, instrument strength is critical for 2SLS validity. In *Model 1B*, which includes one endogenous regressor and one excluded instrument, we apply the conventional rule-of-thumb where an F-statistic in the first-stage regression below 10 indicates a weak instrument (Staiger & Stock, 1997). For models with multiple endogenous regressors, *Model 2B* and *3B*, we use the Cragg-Donald Wald F-statistic and compare it against Stock and Yogo (2002) critical values to assess size distortion. While no exact cutoff exists in the multi-endogenous setting, the general benchmark is that distortions of at most 10% indicate strong instruments. Notably, the widely cited

$F > 10$ rule-of-thumb for models with a single endogenous regressor corresponds to a much higher distortion threshold, often exceeding 25% depending on the number of instruments employed.

Model 4B includes three endogenous regressors and four excluded instruments. The lack of sufficient overidentifying restrictions means that neither formal size distortion nor bias-based critical values exist. Thus, we assess its strength by analogy to *Model 3B*, while recognizing its tighter identification margin and reduced reliability.

To complement these formal tests, we present auxiliary first-stage regressions for each endogenous regressor using its respective instruments and control variables. These serve as informal diagnostics, with attention to statistical significance, economic magnitude, and adjusted R^2 . Importantly, these are not the regressions used in the 2SLS estimation⁶ but support assessment of instrument relevance.

Last, for overidentified models, we apply the Hansen J-test to assess whether instruments are valid, i.e. uncorrelated with the error term and correctly excluded (Woolridge, 2013). At the 5% level, the null hypothesis is rejected, indicating that one or more instruments are not valid.

⁶ For model 1B, with only one endogenous regressor, the auxiliary regression is in fact the one used in the 2SLS estimation

4 Results

4.1 Descriptive Statistics

Table 6: Sample Distribution Table

Panel A: Industry distribution	N	N (%)	Cum (%)	UP (mean)	CA (mean)	VU (mean)
Communications	27	6.29	6.29	.099	.445	0.257
Consumer Discretionary	56	13.05	19.35	.089	.421	0.135
Consumer Staples	9	2.10	21.45	.107	.468	0.069
Financials	30	6.99	28.44	.115	.404	0.067
Health Care	113	26.34	54.78	.034	.498	0.305
Industrials	60	13.99	68.76	.061	.443	0.183
Materials	19	4.43	73.19	.084	.441	0.243
Real Estate	24	5.59	78.79	.127	.386	0.001
Technology	76	17.72	96.50	.041	.501	0.320
Utilities	15	3.50	100.00	.03	.511	0.261
Panel B: Year distribution						
2010	6	1.40	1.40	.038	.113	0.289
2011	9	2.10	3.50	.224	.186	0.236
2012	3	0.70	4.20	-.14	.307	0.534
2014	15	3.50	7.69	.09	.278	0.112
2015	34	7.93	15.62	.125	.328	0.160
2016	58	13.52	29.14	.098	.398	0.304
2017	69	16.08	45.22	.069	.47	0.216
2018	29	6.76	51.98	-.036	.445	0.280
2019	21	4.90	56.88	.148	.575	0.198
2020	26	6.06	62.94	.008	.497	0.177
2021	126	29.37	92.31	.071	.541	0.214
2022	27	6.29	98.60	-.049	.589	0.225
2024	6	1.40	100.00	.028	.355	0.065

This table presents the distribution of the final sample. Panel A shows the distribution across industries and Panel B by IPO years. Industries are classified according to the BICS Level 1 sector taxonomy. For each category, the table reports the number of IPOs (N), their proportion of the full sample (N %), and cumulative percentage (Cum %). It also provides the mean values of the study's key variables where UP = Underpricing, CA = Cornerstone Allocation, and VU = Valuation Uncertainty. All variables are defined in Section 3.2 "Data Collection and Variable Construction".

As shown in Table 6, the dataset consists of 429 IPOs issued between 2010 and 2024, with a slight concentration towards the end of the period. Notably only 4.2% of the IPOs occurred between 2010 and 2012. Additionally, 2021 stands out as an outlier year where 126 IPOs, accounting for 29.4% of the sample, were issued. In terms of industry distribution, the dataset is balanced. However, Health Care stands out as it accounts for 26.3% or 113 of the observed IPOs.

When it comes to industry variation, the industry-average *Underpricing* ranges between 3.0% and 12.7%, compared to the aggregate sample mean of 6.5%. *Utilities* and *Real Estate* account for the sectors with the least and most underpriced IPOs respectively. *Cornerstone Allocation* presents a balanced industry distribution with industry averages ranging between 38.6% and 51.1%,

compared to the sample mean of 46.2%. *Valuation Uncertainty*, however, differs significantly between industries, ranging from 0.1% in *Real Estate* to 30.5% in *Health Care*. This variation, however, is expected since *Valuation Uncertainty* is influenced by industry standards.

When it comes to temporal variation, *Underpricing* differs significantly between years. All years record positive averages for *Underpricing*, except for 2012, 2018, and 2022. The most notable year is 2011 where the average *Underpricing* was 22.4%. However, this is likely skewed due to only 2.1% of the sample IPOs occurring in that year. *Cornerstone Allocation*'s year-average seems to follow a positive trend, growing almost every year from 11.3% in 2010 to 58.9% in 2022, before declining to 35.5% in 2024. This shows the growing prevalence of cornerstone participation in Swedish IPOs. *Valuation Uncertainty*, as expected, differs significantly between years as the industry representation varies temporally.

Table 7: Summary Statistics

	Mean	SD	Min	Median	Max	N
Dependent variable:						
Underpricing	.065	.297	-0.592	.029	1.008	429
Main research variables:						
Cornerstone Allocation	.462	.272	0.000	.5	.92	429
Valuation Uncertainty	.222	.263	0.000	.102	.897	429
Control variables:						
Gross Proceeds	623.804	1266.282	8.580	60	6236.74	429
Firm Age	19.406	24.642	1.000	11	120	429
Underwriter Reputation	.053	.083	0.000	.003	.263	429
Market Sentiment	.006	.035	-0.080	.006	.073	429

This table presents summary statistics for all variables used in the analysis. The dependent variable is Underpricing, which measures the initial return on IPOs. The main research variables are Cornerstone Allocation, representing the proportion of shares allocated to cornerstone investors, and Valuation Uncertainty, reflecting market valuation variability. Control variables include Gross Proceeds, Firm Age, Underwriter Reputation, and Market Sentiment. The table shows the mean, standard deviation, minimum, median, maximum, and sample size (N) for each variable, providing an overview of the data distribution and variation.

As demonstrated in Table 7, the average IPO in the sample experience a first-day return of 6.5% with a standard deviation of 29.7%, showcasing significant variation. This is below that of McGuinness (2012) and Seth et al. (2018) whos' samples both record mean underpricing of ~21%. The median of 2.9%, below the mean highlights the presence of a few IPOs with exceptionally large first-day returns. IPOs in the sample allocate between 0.0% and 92.0% of the offering to cornerstone investors, with the mean cornerstone allocation being 46.2%. With a standard deviation of 27.2%, the dataset captures significant variation in *Cornerstone Allocation* covering almost the entirety of the variable's scale. *Valuation Uncertainty* also shows significant variation,

ranging between 0.0% and 89.7%, with a mean of 22.2%. The standard deviation is 26.3% and the median is 10.2%, implying a right-skewed distribution. This is not unexpected given that *Valuation Uncertainty* partially is a factor of the firm’s industry.

When it comes to the control variables, *Gross Proceeds* stands out with a mean of SEK 623.8m and a standard deviation of SEK 1.3bn. The median *Gross Proceeds* are SEK 60m, showcasing that the sample is dominated by smaller IPOs with a few extremely large ones. The average *Underwriter Reputation* is 5.3%, with a range between 0% (no underwriter) and 26.3%. The median and standard deviation is 0.3% and 8.3% respectively, showcasing the presence of a few underwriters with significant sample market share, yet a much lower deal count. Last, the sample average firm going public is 24.6 years old and has had a 15 prior trading day market run-up of 0.6%.

4.2 Univariate Analysis

Table 8: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Underpricing	1.000						
(2) Cornerstone Allocation	0.068	1.000					
(3) Valuation Uncertainty	-0.059	0.096**	1.000				
(4) Gross Proceeds	0.117**	-0.132***	-0.212***	1.000			
(5) Firm Age	0.062	-0.093*	-0.236***	0.389***	1.000		
(6) Underwriter Reputation	0.164***	-0.115**	-0.261***	0.435***	0.309***	1.000	
(7) Market Sentiment	0.149***	-0.035	-0.002	-0.013	-0.037	0.042	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

This table presents a correlation matrix showing each variable’s correlation with all other variables. All variables are defined in Section 3.2 “Data Collection and Variable Construction”.

Table 8 presents the correlation matrix for the variables in the study. The correlation between *Cornerstone Allocation* and *Underpricing* is 0.068 and statistically insignificant, offering no preliminary support for *Hypothesis 1* in a univariate setting. However, the absence of significance may be due to omitted variable bias or a non-linear relationship, in line with *Hypothesis 2*. Notably, *Cornerstone Allocation* is significantly correlated with both *Gross Proceeds* and *Underwriter Reputation*, two controls that are themselves significantly associated with *Underpricing*, suggesting that meaningful relationships may emerge once controls are introduced.

Valuation Uncertainty exhibits a weak, negative, and insignificant correlation with *Underpricing* of -0.059, which is somewhat surprising given theoretical expectations. However, it shows strong

negative correlations with both *Gross Proceeds* and *Underwriter Reputation*, potentially indicating that more uncertain firms issue smaller IPOs and work with less prominent underwriters, factors that could mediate the underpricing outcome. The significant positive correlation between *Valuation Uncertainty* and *Cornerstone Allocation* of 0.096 supports the plausibility of an interaction effect, as suggested in *Hypothesis 3*.

Among control variables, *Gross Proceeds*, *Underwriter Reputation*, and *Market Sentiment* are all positively and significantly correlated with *Underpricing*, aligning with theoretical expectations. *Firm Age*, is surprisingly positively correlated with *Underpricing*, however, not statistically significant. This may be confounded by its strong correlation with *Gross Proceeds* of 0.389, as older firms tend to conduct larger IPOs.

The highest correlation coefficient in absolute terms is 0.435, observed between *Underwriter Reputation* and *Gross Proceeds*. This is expected as larger offerings often engage more reputable underwriters, or vice versa, given fee incentives. Importantly, no pairwise correlation exceeds conventional multicollinearity thresholds, indicating that multivariate regression results are unlikely to suffer from multicollinearity issues. Last, we note that these univariate results serve only as descriptive insight and do not account for confounding factors. Inference is therefore reserved for the multivariate regressions.

4.3 Regression results

4.3.1 OLS Regressions

Table 9: OLS Regression Results

Model:	1A	2A	3A	4A
Dependent variable:	Underpricing	Underpricing	Underpricing	Underpricing
Cornerstone Allocation	0.143** (0.059)	0.294* (0.175)	0.181*** (0.065)	0.316* (0.176)
Cornerstone Allocation ²		-0.185 (0.202)		-0.167 (0.201)
Moderator			-0.133 (0.107)	-0.128 (0.107)
log Firm Age	-0.026* (0.015)	-0.026* (0.015)	-0.028* (0.015)	-0.027* (0.015)
Underwriter Reputation	0.309* (0.186)	0.266 (0.188)	0.304* (0.184)	0.266 (0.185)
Market Sentiment	1.240*** (0.393)	1.251*** (0.393)	1.246*** (0.390)	1.256*** (0.391)
log Gross Proceeds	0.025** (0.010)	0.025** (0.010)	0.022** (0.010)	0.023** (0.010)
_cons	-0.046 (0.053)	-0.057 (0.052)	-0.033 (0.054)	-0.043 (0.053)
Observations	429	429	429	429
R-squared	0.103	0.105	0.107	0.108
Adj R ²	0.066	0.066	0.068	0.067
Standard errors	Robust	Robust	Robust	Robust
Method	OLS	OLS	OLS	OLS
Year controls	Yes	Yes	Yes	Yes

Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

This table shows the results of the OLS regressions, where Underpricing is the dependent variable in all models. The variables Firm Age and Gross Proceeds are in natural logarithmic form. All variables are defined in Section 3.2 "Data Collection and Variable Construction".

Table 9 shows the initial OLS regressions. Model 1A estimates the linear relationship between *Cornerstone Allocation* and *Underpricing*. The results indicate that a one percentage point increase in *Cornerstone Allocation* is strongly significantly associated with a 0.143 percentage point increase in *Underpricing*. Among the control variables, *Firm Age* exhibits a weakly significant negative association with *Underpricing*, although the effect size is economically negligible. *Gross Proceeds* is positively and statistically significantly associated with *Underpricing*, but likewise of economically insignificant magnitude. *Underwriter Reputation* shows a weakly significant

positive association with *Underpricing*, where a one percentage point increase in *Underwriter Reputation* corresponds to a 0.309 percentage point increase in *Underpricing*. *Market Sentiment* emerges as strongly significant, with a one percentage point increase being associated with a 1.240 percentage point increase in *Underpricing*. Overall, *Model 1A* explains 6.6% of the variation in *Underpricing*, adjusted for the number of regressors.

Model 2A introduces a non-linear specification by including a squared term for *Cornerstone Allocation*. In this model, the marginal effect of *Cornerstone Allocation* on *Underpricing* is given by: $0.294 - 0.370 \cdot \text{Cornerstone Allocation}$. While the coefficient of the linear term nearly doubles in magnitude compared to *Model 1A*, its significance weakens to the 10% level. The quadratic term, however, is statistically insignificant, providing limited support for non-linearity in this specification. The control variables largely behave as in *Model 1A* in terms of sign, direction, significance, and magnitude, with the exception of *Underwriter Reputation*, which loses statistical significance. Additionally, *Model 2A* retains the same explanatory power as *Model 1A*, with an adjusted R^2 of 6.6%.

Model 3A and *4A* introduce the term *Moderator*, the interaction term between *Cornerstone Allocation* and *Valuation Uncertainty*, to examine a potential moderating effect. In both the linear and non-linear specifications *Moderator's* coefficient is negative but statistically insignificant, providing no evidence of a moderating effect of *Valuation Uncertainty* on the relationship between *Cornerstone Allocation* and *Underpricing*. The inclusion of the interaction term does not materially affect the sign, significance, or magnitude of the control variables and retains a similar explanatory power compared to previous specifications.

4.3.2 2SLS Regressions

Table 10: Auxiliary First-stage Regression Results

Model:	A	B	C
Dependent variable:	Cornerstone Allocation	Cornerstone Allocation ²	Moderator
Z_Cornerstone Allocation	0.957*** (0.104)		-0.084 (0.099)
Z_Cornerstone Allocation ²		0.932*** (0.116)	
Z_Valuation Uncertainty			-0.365 (0.284)
Z_Moderator			1.823*** (0.664)
log Firm Age	0.002 (0.013)	0.004 (0.011)	-0.008 (0.008)
Underwriter Reputation	-0.007 (0.186)	-0.148 (0.176)	-0.011 (0.121)
Market Sentiment	-0.286 (0.334)	-0.210 (0.282)	-0.087 (0.240)
log Gross Proceeds	0.007 (0.010)	0.007 (0.008)	-0.012** (0.006)
_cons	-0.335*** (0.085)	-0.174*** (0.044)	0.076 (0.054)
Observations	429	429	429
R-squared	0.269	0.249	0.202
Adj R ²	0.239	0.218	0.165
Instrument(s) F-Statistic	84.41	64.79	17.84
Standard errors	Robust	Robust	Robust
Method	OLS	OLS	OLS
Year controls	Yes	Yes	Yes

Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

This table presents the results of auxiliary first-stage regressions for a 2SLS estimation. The table includes three models: A, B, and C, where Cornerstone Allocation, Cornerstone Allocation², and Moderator are the respective dependent variables. Moderator is the interaction term between Valuation Uncertainty and Cornerstone Allocation. The respective instruments are prefixed by “Z_”. Z_Cornerstone Allocation is the average Cornerstone Allocation of the lead underwriter(s) sample average Cornerstone Allocation excluding the IPO itself. Z_Cornerstone Allocation² is the square of that instrument. Z_Valuation Uncertainty is the year-industry average Valuation Uncertainty of all firms listed on a Swedish regulated exchange, excluding the firm itself. Z_Moderator is the product of Z_Valuation Uncertainty and Z_Cornerstone Allocation. In the auxiliary regressions only the instruments specifically targeting the dependent variable are included.

Table 10 presents the results from the auxiliary first-stage regressions. Model A instruments Cornerstone Allocation using the lead underwriter(s)’ average Cornerstone Allocation across other IPOs, excluding the IPO itself. The instrument is strongly significantly associated with the endogenous regressor, with a marginal effect of 0.957. None of the control variables are statistically significant, and the model explains 23.9% of the variation in Cornerstone Allocation. Importantly, the partial F-statistic for the instrument is 84.41, substantially exceeding the conventional threshold of 10 indicating that the instrument is both relevant and strong.

Model B instruments *Cornerstone Allocation*² using the squared instrument from *Model A*. The instrument is strongly significantly associated with the endogenous regressor, with a marginal effect of 0.932. As in *Model A*, no control variables are significant, and the model exhibits an adjusted R² of 0.218. While this instrument does not appear in a 2SLS regression with only one endogenous regressor, its partial F-statistic of 64.79 indicates strong relevance.

Model C instruments *Moderator* using the interaction of the instruments for *Cornerstone Allocation* and *Valuation Uncertainty*, along with the individual instruments themselves. The interactive instrument is strongly statistically significant, with a marginal effect of 1.823, while the individual instruments are statistically insignificant with negative signs. *Gross Proceeds* is statistically significant, but with an economically insignificant magnitude. The adjusted R² and partial F-statistic for this auxiliary first-stage regression is 0.165 and 17.84 respectively. Although *Moderator* does not feature alone as an endogenous regressor in any final specification, this suggests acceptable instrument strength.

Table 11: 2SLS Regression Results

Model:	1B	2B	3B	4B
Dependent variable:	Underpricing	Underpricing	Underpricing	Underpricing
Cornerstone Allocation	-0.254* (0.151)	1.261* (0.665)	-0.206 (0.197)	1.266* (0.656)
Cornerstone Allocation ²		-1.787** (0.901)		-1.657** (0.843)
Moderator			-0.177 (0.388)	-0.374 (0.425)
log Firm Age	-0.027* (0.015)	-0.023 (0.015)	-0.029* (0.015)	-0.028* (0.015)
Underwriter Reputation	0.228 (0.188)	-0.174 (0.283)	0.221 (0.187)	-0.156 (0.278)
Market Sentiment	1.113*** (0.414)	1.243*** (0.436)	1.120*** (0.411)	1.253*** (0.435)
log Gross Proceeds	0.023** (0.011)	0.026** (0.011)	0.020 (0.012)	0.020 (0.013)
_cons	0.013 (0.067)	-0.103 (0.067)	0.031 (0.074)	-0.058 (0.069)
Observations	429	429	429	429
R-squared
Adj R ²
Standard errors	Robust	Robust	Robust	Robust
Method	2SLS	2SLS	2SLS	2SLS
Year controls	Yes	Yes	Yes	Yes

Robust standard errors are in parentheses
*** $p < .01$, ** $p < .05$, * $p < .1$

This table shows the results of the 2SLS regressions, where Underpricing is the dependent variable in all models. Cornerstone Allocation, Cornerstone Allocation², and Moderator are instrumented across all specifications they appear in. Their respective instruments are explained in 3.4.1 “Instrument Selection” and the full set of excluded instruments for each model is detailed in Table 5 “Overview of 2SLS Framework”. All other variables are defined in Section 3.2 “Data Collection and Variable Construction”. The variables Firm Age and Gross Proceeds are in natural logarithmic form.

Table 11 shows the 2SLS regression results. Model 1B estimates the causal effect of *Cornerstone Allocation* on *Underpricing*, using only exogenous variation isolated through the instrument. For IPOs whose *Cornerstone Allocation* is influenced by underwriter placement practices, a one percentage point increase in *Cornerstone allocation* is causally associated with a 0.254 percentage point decrease in *Underpricing*, significant at the 10% level. Compared to the OLS results in Model 1A, the direction of the effect reverses and significance weakens, suggesting that OLS may suffer from endogeneity bias. The control variables behave similarly in terms of direction, significance,

and magnitude as they do in the comparable *Model 1A*, except that *Underwriter Reputation* loses statistical significance in the 2SLS specification.

Model 2B estimates the causal non-linear relationship between *Cornerstone Allocation* and *Underpricing*, using the exogenous variation isolated through several instruments. The linear term records a coefficient of 1.261, statistically significant at the 10% level, while the quadratic term's coefficient is -1.787, statistically significant at the 5% level. Together, they imply a local causal marginal effect of *Cornerstone Allocation* on *Underpricing* for compliers of $1.261 - 3.574 \cdot \text{Cornerstone Allocation}$. For a complying firm with the sample median *Cornerstone Allocation*, a one percentage point increase is causally associated with a 0.526 percentage point decrease in *Underpricing*. This suggests an inverted U-shape relationship where increases in *Cornerstone Allocation* initially increase *Underpricing* before reaching a threshold of 0.353 where the local causal marginal effect for complier turns negative. Since the inflection point lies below the sample median *Cornerstone Allocation*, the average marginal effect is negative. Compared to the OLS results in *Model 2A*, the linear term is equally significant, with an over four times larger magnitude, while the quadratic term becomes statistically significant with a magnitude approximately ten times greater. The behavior of the control variables is largely consistent, except for *Firm Age* which loses statistical significance and *Underwriter Reputation* which changes direction under 2SLS.

Moderator is statistically insignificant in both the linear *Model 3B* and the quadratic *Model 4B*, with coefficients of -0.177 and 0.374, respectively. These findings are consistent with the OLS results, despite having isolated the exogenous variation in *Moderator* through instrumentation. Notably, in *Model 3B*, *Cornerstone Allocation* loses statistical significance, whereas in *Model 4B* the direction, significance, and magnitude of *Cornerstone Allocation*'s linear and quadratic term are consistent with *Model 2B*. The behavior of the control variables in *Model 3B* and *Model 4B* is consistent with their counterparts, *Model 1B* and *Model 2B*, where *Moderator* is not included.

4.3.3 Diagnostic Tests

Model 1B demonstrates strong support for drawing causal inference on the *Cornerstone Allocation* – *Underpricing* relationship from the 2SLS regression. The instrument is highly relevant and records a partial F-statistic of 84.41, well above the conventional threshold of 10. Rejection of the

Hausman test for endogeneity null hypothesis at the 1% level (Appendix, Table 12) confirms that 2SLS is the correct estimator.

Model 2B also satisfies the key conditions for drawing inference from 2SLS. Both excluded instruments show strong relevance in the auxiliary first-stage regressions with large and significant coefficients. The Cragg-Donald Wald F-statistic of 16.57 meets the threshold for allowing a maximum of 10% size distortion, indicating strong instrumentation. Additionally, the Hausman test for endogeneity is rejected at the 1% level (Appendix, Table 12), reinforcing the validity of 2SLS as the appropriate estimator.

For *Model 3B* and *4B*, which examine the moderating role of *Valuation Uncertainty* on the relationship between *Cornerstone Allocation* and *Underpricing*, instrument strength is more limited. While all partial F-statistics from auxiliary regressions exceed 10, the Cragg-Donald Wald F-statistic is 7.45, implying up to 20% size distortion. For the similar yet more complex *Model 4B* where no formal critical values are available, size distortion is likely at least as high and possibly greater than in *Model 3B*, limiting inference. However, the Hansen J-test fails to reject instrument validity in both models. The Hausman test is also rejected at the 1% and 5% level for *Model 3B* and *4B* respectively, supporting the use of 2SLS (Appendix, Table 12). Nonetheless, results from these specifications are interpreted with greater caution due to weaker instrumentation.

5 Analysis

5.1 Cornerstone Allocation and Underpricing: A Pricing Mechanism

Our first hypothesis builds on canonical models in IPO literature, notably Signaling Theory (Spence, 1973; Welch, 1989) and the Winner's Curse framework (Rock, 1986), which predict a positive association between cornerstone allocation and first-day returns. In line with this, our OLS regression results indicate a statistically significant positive effect of cornerstone allocation on IPO underpricing, at the 5% level in linear specifications and 10% level in non-linear specifications. This seemingly supports prior findings (McGuinness, 2012; Aggarwal et al., 2002) that interpret cornerstone participation as a public signal of firm quality.

However, under the more reliable 2SLS estimations, the evidence becomes less supportive. The linear 2SLS model reveals a negative relationship, while the non-linear specification suggests an inverted U-shaped pattern. The linear term is associated with lower underpricing in linear specification, whereas the direction changes in non-linear specifications. Additionally, significance of the linear term is not below the 10% level in any specification. Taken together, these results do not provide sufficient evidence to support that *Cornerstone Allocation* has a causal linear positive effect on *Underpricing*.

These results indicate a more complex relationship where OLS estimate likely captures a selection effect: Cornerstone investors self-select into IPOs expected to be underpriced, thereby inflating the correlation. The 2SLS estimates provides more credible evidence that cornerstone investors act both as pricing anchors and signals depending on the level of cornerstone participation.

This reinterpretation aligns well with agency theory (Jensen & Meckling, 1976; Loughran & Ritter, 2004), which highlights conflicting incentives among IPO actors. Underwriters, in particular, may deliberately underprice to favor institutional clients and maintain long-term relationships. The finding that cornerstone participation may reduce underpricing aligns with Loughran & Ritter's (2004) agency-based explanation, where underwriters have incentives to set prices below intrinsic value to favor institutional clients. In this context, cornerstone investors in the Swedish market often participate in early pricing negotiations. Their longer-term investment mandates may enable them to serve as counterbalances to underwriter-driven pricing behavior. Their involvement can

introduce greater pricing discipline, mitigating the underwriter's ability to cater exclusively to favored clients.

Filatotchev & Bishop (2002) argue that issuers may be unaware of the degree to which underpricing reflects underwriter–investor collusion rather than true market demand. In this context, cornerstone investors could act not merely as passive signalers but as active negotiators who influence offer pricing to secure long-term value. Their involvement may thus curb underwriter-driven underpricing by introducing more disciplined, conservative pricing expectations into the book-building process.

Aggarwal et al. (2002) further support this perspective. They find that underwriters tend to allocate more shares to institutional investors in deals with high expected underpricing, either to reward favored clients or to ensure deal success. These allocations are not necessarily reflective of firm quality, but of internal deal structuring dynamics. In this light, our 2SLS findings suggest that in Sweden's IPO market, cornerstone investors could serve as price anchors, moderating potential pricing manipulation from underwriters and reducing the extent of underpricing.

Additionally, our results can be interpreted through the lens of investor risk aversion, particularly in institutional settings. Ljungqvist (2007) emphasizes that underpricing can act as a compensation mechanism for risk-averse investors, especially in uncertain or speculative offerings. Cornerstone investors in Sweden, typically long-term, risk-averse institutions such as pension funds, may demand more conservative pricing as a condition for participation. Their presence could thus reflect higher internal pricing discipline and a preference for moderate rather than speculative first-day returns. This behavior would naturally lead to lower underpricing levels, consistent with our 2SLS results where cornerstone allocation decrease underpricing at higher levels.

Taken together, these findings challenge the notion of cornerstone investors as simple quality signalers. Additionally, they emerge as active participants in price discovery, which may exert downward pressure on underpricing through their influence on both issuer strategy and underwriter negotiations. In Sweden's relatively institutionalized and transparent IPO market, this dynamic is likely amplified by the reputation and bargaining power of cornerstone participants.

5.2 The Inverted U-Shape: Bandwagon Dynamics and Overcommitment

The second hypothesis states that the relationship between cornerstone allocation and underpricing is non-linear, based on Bandwagon Effect Theory (Welch, 1989; Shefrin, 2002). Specifically, we expect a pattern where modest cornerstone commitments generate momentum and investor confidence, while excessive participation reduces available float and perceived upside, thereby discouraging secondary market interest.

The initial OLS regressions provide no support for this hypothesis, as the quadratic term is statistically insignificant in both specifications. However, the drop in the linear term's significance from the 1% level to the 10% level upon including the quadratic term suggests the possibility of a more complex relationship. When endogeneity is addressed in the 2SLS regressions the evidence becomes more compelling as the quadratic term is statistically significant at the 5% level in both specifications, supported by strong diagnostics. Based on this, we find strong support for the presence of a causal non-linear relationship between Cornerstone Allocation and Underpricing, which takes the form of an inverted U-Shape. While the model implies a specific turning point, no precise inference is made regarding its location due to the linear term only being weakly significant.

This showcase that cornerstone participation initially increases underpricing, up until a certain threshold where the marginal effect becomes negative. This finding advances the literature by formally identifying a threshold effect in investor signaling. Cornerstone allocations below this threshold appear to stimulate demand by conveying insider confidence and reducing perceived adverse selection. Above this point, however, signals may be interpreted as signs of issuer dependency or lack of retail interest, triggering caution among secondary market participants.

These results refine signaling and bandwagon models by showing that the signaling power of cornerstone investors exhibits diminishing returns. The relationship is not linear, but rather saturates and eventually reverses as higher levels of pre-commitment begin to crowd out speculative demand. This interpretation adds theoretical nuance to the empirical literature (e.g. Seth et al. (2018)), which has often assumed monotonic effects. This is consistent with Grinblatt and Hwang (1989), who propose that beyond a certain point, signaling mechanisms such as

ownership or pricing may lose informational value, particularly when the market begins to question the motives behind excessive insider involvement.

Welch (1989) also highlights that information cascades are fragile. If investors perceive early signals, such as high cornerstone participation, as overly engineered or indicative of weak natural demand, they may not follow the momentum. Instead, the cascade may break, and investors may interpret the signal as a warning rather than an endorsement, thereby halting demand rather than amplifying it.

Shefrin (2002) further emphasizes regret aversion as a key behavioral factor in financial markets. When cornerstone investors dominate the allocation book, remaining investors may perceive limited upside potential and fear making a wrong decision alone. This psychological cost can deter participation and contribute to the declining segment of the curve beyond the estimated threshold.

In the Swedish market, where cornerstone allocations are transparent and retail investor participation is relatively high, this dynamic may be particularly relevant. Excessive pre-commitment can be perceived as reducing liquidity and trading opportunities, making the offering less attractive to speculative or momentum-driven investors. As a result, what initially functions as a strong positive signal may, beyond a certain point, become a constraint on demand and pricing performance.

5.3 Valuation Uncertainty: Absent Moderation in a Transparent Market?

The third hypothesis explored whether firm-level valuation uncertainty moderates the relationship between cornerstone allocation and IPO underpricing. The underlying logic is drawn from the Risk Composition Hypothesis (Ritter, 1984) and the Winner's Curse Theory (Rock, 1986). Both predict that IPOs with greater information asymmetries should exhibit larger underpricing to compensate investors for the increased risk. A vast body of literature adds to this by providing evidence for valuation uncertainty, measured as R&D intensity, being a driver of information asymmetry (e.g. Abody & Lev, 2002; Eberhart et al., 2004). We operationalized uncertainty via the commonly used proxy of intangible assets, excluding goodwill, to total assets (Gu & Lev, 2011). We anticipated that cornerstone allocation would impact underpricing less when valuation uncertainty is high, aligning with results of adjacent studies (Chin et al., 2006; Guo et al., 2006).

Contrary to this expectation and the previous literature, our results yield no significant interaction effect between valuation uncertainty and cornerstone allocation. These findings remain consistent across both OLS and 2SLS estimations, despite the latter allowing for at least up to 20% size distortion. Hence, the relationship between cornerstone allocation and underpricing appears to be invariant to the degree of firm-level valuation uncertainty, at least as captured by intangible asset intensity. The suboptimal diagnostic results may, however, suggest that the absence of a significant relationship is not necessarily due to a lack of economic effect, but rather a consequence of insufficient instrumentation of the interaction term.

This null result, opposing both theoretically and empirically based predictions, warrants a closer examination. One interpretation is rooted in selection behavior, where cornerstone investors may deliberately avoid IPOs characterized by elevated valuation uncertainty. In doing so, they endogenously limit their exposure to high-risk offerings, effectively reducing the range of observable uncertainty in the subset of IPOs with meaningful cornerstone allocation. In the presence of such a selection mechanism, the absence of a moderating effect is not necessarily indicative of insignificance but could suggest a preemptive risk filtration outside of our model.

A second explanation is that valuation uncertainty may already be mechanically absorbed into other offering characteristics that are explicitly accounted for in our regressions. In particular, we observe in the univariate analysis that firms with higher valuation uncertainty tend to be younger, employ less reputable underwriters, and issue smaller offerings. Each of these features are, by themselves, associated with information asymmetry and by extension impact underpricing (e.g. Ritter, 1991; Loughran & Ritter, 2004). If valuation uncertainty manifests through the more tangible proxies, firm age, underwriter reputation, and gross proceeds, its incremental explanatory power in moderating the cornerstone allocation – underpricing relationship may be limited. Accordingly, the informational content of valuation uncertainty may already be priced in elsewhere.

Third, the univariate correlation between valuation uncertainty and cornerstone allocation suggests a potential substitution in signaling channels. To the extent that cornerstone investors are more likely to engage with firms exhibiting higher informational risk, the level of their commitment may already reflect perceived uncertainty. From this perspective cornerstone allocation is not an

exogenous signal to be moderated by uncertainty, but a positive response mechanism to it. If so, the moderating role of valuation uncertainty would be theoretically redundant as its influence is already embedded in the level of cornerstone allocation. In this framework, cornerstone allocation would serve as a stronger signal to investors as it encapsulates a broader spectrum of information asymmetries rather than only valuation uncertainty. This framework aligns with the findings of Welch (1989), who highlight that early investor behavior, especially by institutional actors, serve as a determinant for subsequent demand in environments of ambiguity.

Finally, the broader institutional and regulatory context in Sweden may dampen the impact of firm specific uncertainty altogether. The country's IPO regulations feature strong investor protections, uniform prospectus requirements and high standards of disclosure (Finansinspektionen, 2007). In such a setting, even intangible-asset-intensive firms must adhere to extensive transparency obligations. This effectively levels the informational playing field across issuers, as argued by Jenkinson & Jones (2009). The setting of homogenous disclosure quality and cornerstone investors base exhibited in the Swedish IPO market could explain why cornerstone signals do not meaningfully interact with underlying uncertainty. By responding to a uniformly informed investor base the marginal value of additional signals beyond cornerstone allocation is lower.

In summary, the absence of a moderating effect does not undermine the relevance of valuation uncertainty as a theoretical foundation. Instead, it invites consideration of how, and through which channels, uncertainty is incorporated into IPO pricing. Our findings suggest that in Sweden's highly institutionalized IPO market context, the effects of uncertainty are diffused across multiple observable dimensions and likely preempted by selection behaviors and regulatory standards.

6 Discussion and Conclusion

Beyond the focal hypotheses, our results yield several broader implications. The robust impact of market sentiment on underpricing reaffirms the role of macro-level investor psychology in IPO pricing (Loughran & Ritter, 2015). Even in structured offerings, exogenous optimism exerts upward pressure on valuations, suggesting that timing considerations remain paramount for issuers.

Additionally, the weak and inconsistent effects of firm age and underwriter reputation align with the findings of Thorsell and Isaksson (2014), suggesting a shift in signaling hierarchies. In institutionalized IPO markets such as Sweden, cornerstone participation may now eclipse traditional proxies of firm quality. This institutional evolution reflects a broader shift in IPO market mechanics, where strategic investor engagement is central to price discovery.

Moreover, our identification of cornerstone investors as signalers, rather than mere price stabilizers, represents a novel contribution. In contrast to conventional assumptions, where cornerstone participation merely influences underpricing through their role in book-building (Aggarwal et al., 2002), their participation is found to have a causal effect even when accounting for the reverse causality and self-selection of superiorly informed investors. We argue that the causal effect is a result of the information and quality signaled by the level of cornerstone participation, which we find to have a non-linear effect on first-day returns.

Considering our findings of the non-linear relationship between cornerstone allocation and underpricing, we propose a novel framework of optimal signaling in IPOs. In this framework, cornerstone participants exert influence through two distinctive channels, pricing and signaling, expanding on regular pricing-based explanations (Aggarwal et al., 2002). As a pricing mechanism, increased cornerstone investors put downwards pressure on offer prices via their bargaining power, effectively increasing underpricing. As a signaling mechanism, however, cornerstone investors' superior information leads their participation to serve as an effective signal of the quality of the firm and the offering. Specifically, this signaling effect takes the form of an inverted U-shape, as opposed to the monotonic signaling effect proposed by McGuinness (2012). Low levels of cornerstone participation signal a lack of institutional demand, while excessively high levels trigger concerns of crowding out upside potential for external investors, both dampening post-

pricing demand. At moderate levels, enough firm- and offer quality is signaled, yet the cornerstone demand is not too dominant to discourage external investor demand. This framework departs from linear signaling models by highlighting the trade-off between IPO firm's information credibility and perceived market accessibility, suggesting that issuers may optimize first-day returns by carefully calibrating the level of cornerstone participation.

Moreover, the null results pertaining to the moderating effect of firm-level valuation uncertainty on the cornerstone allocation - underpricing relationship builds upon the findings of Guo et al (2006) and Chin et al (2006). While these findings find a direct effect of valuation uncertainty on underpricing, we test its moderating effect on other underpricing determinants but fail to identify a meaningful interaction. Additionally, these findings shed more light on the importance of the institutional context of IPO underpricing. We argue that in the highly institutionalized Swedish market, where cornerstone investors are fairly homogenous with long-term investment horizons, traditional indicators of firm- and offer quality are instead absorbed into the more uniform metric of cornerstone allocation. Given the high standardization of IPO regulations and homogeneity of cornerstone investors in Sweden, traditional proxies for information asymmetry, such as firm age, gross proceeds, and valuation uncertainty yield less information revelation as it is assumed to have been priced in to the level of cornerstone participation. This interpretation aligns with findings by Thorsell and Isaksson (2014), who, as in this study, fail to detect significant statistical effects for conventional proxies for information asymmetry in the Swedish IPO context.

The findings of this study contribute to the existing literature on IPO underpricing and proposes several avenues for further disentangling the phenomenon. Firstly, the insight of an inverted U-shape relationship between cornerstone participation and underpricing begs the question of how this variable should be operationalized to best capture the true economic effect. While this study treats it as a continuous variable, it would be interesting to see if the results are impacted by instead categorizing offerings in different brackets of cornerstone participation. From a theoretical perspective of signaling, it makes sense to operationalize it this way as external investors are unlikely to distinguish the signal value between marginally different levels but instead employ cutoff points. Secondly, it would be interesting to see how our results hold in other markets different to the highly institutionalized Swedish market. Alternatively, what factors of the regulatory environment facilitate cornerstone allocation as an effective signaling mechanism.

Lastly, categorizing different types of cornerstone investors would deepen the understanding of the nuanced mechanisms through which cornerstone allocation impacts underpricing.

While this study offers new insights into the IPO underpricing phenomenon, several limitations should be acknowledged. First, our operationalization of valuation uncertainty, while supported by prior literature raises concerns regarding precision. This metric may capture broader balance sheet effects beyond valuation uncertainty alone. More specific proxies, such as R&D expenses relative to total assets or sales, would likely better isolate valuation uncertainty and improve comparability with earlier studies (Chin et al., 2006; Guo et al., 2006). However, the absence of mandated R&D itemization in Swedish financial statements, along with time constraints, rendered such measures infeasible in the current study. Furthermore, treating valuation uncertainty as an absolute measure may be overly simplistic. Given that asset intangibility varies systematically by sector, our proxy may inadvertently serve as a proxy for industry affiliation rather than firm-specific valuation uncertainty.

Second, even assuming the proxy for valuation uncertainty is valid, the instrumentation strategy for the interaction term may be suboptimal. Following conventional practice, we employed the product of each component's instrument along with their linear terms. Yet there may exist one or more exogenous instruments which better explain the variation in the interaction term. However, given the lack of time and clear economic guidance, the search for such an instrument was the scope of this study.

Third, the modeling of non-linearity in the relationship between cornerstone allocation and underpricing is restricted to a quadratic specification. While this is a standard and interpretable choice supported by robust diagnostics, it may oversimplify the underlying economic dynamics. Our evidence supports a non-linear effect in the form of an inverted U-shape, but the precise shape should not be overinterpreted without testing alternative non-linear functional forms. In addition, our use of cornerstone allocation as a continuous variable may obscure important signaling thresholds. As discussed earlier, signaling theory suggests investors may interpret cornerstone involvement in categorical bands rather than along a continuous scale. Accordingly, employing alternative statistical methods, such as quantile regressions, semiparametric models, or rank-transformed specifications, could offer a more nuanced understanding and enhance the robustness

of the findings. Together, these limitations do not diminish the central contributions of the study but underscore the need for continued methodological refinement in future research.

In conclusion, this study finds that cornerstone allocation in Swedish IPOs influences underpricing through a non-linear, inverted U-shaped relationship. This finding is supported by 2SLS estimations based on strong instrumentation, indicating a causal effect even in the presence of reverse causality. Contrary to expectations, we do not find support for valuation uncertainty moderating this relationship. These findings offer valuable insights for issuers, investors, and underwriters involved in IPOs. Furthermore, the study contributes to the IPO underpricing literature by extending the analysis beyond the conventional linear framework and broadening the understanding of the role of regulatory environments in shaping IPO outcomes. Despite inherent limitations, such as the narrow geographical scope, the evidence contributes to the IPO underpricing research. Future research could expand this analysis to other markets or explore additional moderating factors.

Appendix

Use of AI

In the preparation of this thesis, the AI-based tool ChatGPT was the only generative AI tool utilized. ChatGPT was employed throughout the thesis writing process to provide feedback on spelling, wording, and structure. It was also used to seek practical guidance regarding how to work with certain features of Stata. All topic selection, theoretical and methodological choices, analysis, interpretations, and conclusions have been carried out independently by the authors without assistance from AI tools. No AI-generated content has been used for writing original text, conducting analysis, or forming conclusions. ChatGPT was used solely for supportive purposes in line with the permitted use outlined in the guidelines for the Accounting and Finance Master Thesis course.

Table 12: 2SLS Regression Diagnostics

Model:	1B	2B	3B	4B
Hausman test for endogeneity Chi_sq	8.32	10.26	9.61	10.74
p-value	0.004	0.006	0.008	0.013
Cragg-Donald Wald F-statistic	n.a.	16.57	7.45	n.a.
Max size distortion allowed	n.a.	10.0%	20.0%	n.a.
Hansen J-statistic	n.a.	n.a.	0.61	0.22
P-value	n.a.	n.a.	0.434	0.643

This table reports the test-statistic for the Hausman test for endogeneity, Cragg-Donald Wald F-statistic, and Hansen J-statistic, as well as the corresponding p-values/max size distortion allowed, for the 2SLS specifications. Max size distortion allowed is derived from the Stock and Yogo (2002) critical values. The Cragg-Donald Wald F-statistic is not applicable for model 1B and 4B as they utilize the first-stage partial F-statistic and lack formal critical values respectively. The Hansen J-statistic is not applicable for model 1B and 2B as they are not overidentified.

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