DISCOUNTS, COMMITMENTS, AND THE ATTRACTIVITY OF RIGHTS OFFERINGS

A SWEDISH EXAMPLE

Victor Asp

Alexander Josefsson

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Discounts, Commitments, and the Attractivity of Rights Offerings: A Swedish Example

Abstract:

We examine the effect of discounts, subscription commitments, and underwriting commitments on the ex-post subscription rate of rights offerings, based on a sample of 164 manually collected rights issues from Swedish stock exchanges in the period ranging from January 1, 2020, to December 31, 2021. Our analysis draws on utility and signaling theory, and our findings determine a statistically significant positive effect of the subscription price discount to the theoretical ex-rights price on the ex-post subscription rate variable which we hold as a proxy for rights offering attractivity. We are unable to observe a statistically significant relationship between aggregate commitment coverage and the ex-post subscription rate of an offering, and thus find no evidence for positive signaling effects of such offerings. We conclude that rights offering commitments, despite their lack of signaling value, are efficient instruments for guaranteeing proceeds, and that financial managers thereby need not focus solely on the proven effects of discounts to certify the value of rights issues.

Keywords:

Seasoned Equity Offering, Rights Issue, Discount, Commitment, Subscription

Authors:

Victor Asp (24648)
Alexander Josefsson (24647)

Tutor:

Olga Obizhaeva, Assistant Professor, Swedish House of Finance

Examiner:

Adrien d'Avernas, Assistant Professor, Swedish House of Finance

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Stockholm School of Economics

I. Introduction

A rights offering is a form of seasoned equity offering (henceforth "**SEO**") whereby publicly traded companies issue and sell new equity as a means of raising capital. This study contributes to the existing pool of research on SEOs by examining how the ex-post subscription rate in rights issues is affected by the discount of the subscription price to the theoretical ex-rights price (henceforth "**TERP**") and by the aggregate coverage of subscription commitments and warranty commitments. Firms may issue equity with expansive purposes such as to initialize commercialization or to fund new investments, or they may raise money to cover cash shortages and assure survival. We argue that financial managers, regardless of the purpose of the offering, are incentivized to make the firm's offering sufficiently attractive to make the issue successful, i.e., raise capital. By using the ex-post subscription rate as a proxy for offering attractivity, we can assess to what extent, if any, the signaling values of commitments and the value of discounts affect the attractivity of rights offerings on Nordic capital markets.

The question of how to make an offering attractive has seldom been as relevant as it currently is. In a recent chronicle published in the Swedish business magazine Affärsvärlden, Benson (2022) reported that 400 out of the approximately 1,000 Swedish exchange-traded companies have exhibited negative operating profits consistently over the last three years. 231 out of these companies were forecasted to run out of cash within twelve months, and at least 200 are expected to require a rights issue within two years. At the end of the first quarter of 2022, Swedish North Point Securities (2022) reported that only 17 percent of rights issues on OM in the finished quarter were either fully or overly subscribed. Our research is of interest not only to the more than 200 Swedish companies with expected near-time cash calls, but also to financial managers of similar offerings in the larger Nordic markets, researchers in the field, and investor collective at large.

With theory based on perfect capital market theory, we formulate and test the hypothesis that high discounts to the TERP have a positive effect on the ex-post subscription rate of rights offerings. Moreover, using the developments of signaling theory from Balachandran, Faff, and Theobald (2008), we test the hypothesis that using subscription and warranty commitments on their own, as well as in conjunction with a low discount, can signal that the firm is of higher quality and subsequently yield a higher subscription rate on the offering.

We base our study on a sample of manually collected data from 164 rights offerings on two main Nordic stock exchanges, Nasdaq Nordic (formerly "Optionsmäklarna", henceforth "**OM**") and Nordic Growth Market (henceforth "**NGM**"), over the period ranging from January 1, 2020, to December 31, 2021. The sample is analyzed with a hierarchical linear regression model containing aggregate subscription as the dependent variable, the discount to the TERP and aggregate commitments as predictors, and issuer market capitalization and issue volume as control variables. The model finds that the discount variable has a negative regression coefficient (β) of 1.803 with a 1-sided p-value of

0.031, implying that a higher discount to the TERP has a significant positive impact on the ex-post subscription rate at a 5 percent confidence level. The aggregate commitment variable on the other hand exhibits a 1-sided p-value of 0.749, and any significant effect of commitment coverage on subscription outcome can thus not be confirmed.

A Mann-Whitney U-test is performed to assess whether a defined group of transactions with high commitment coverage and a low discount yields a higher average subscription outcome than a defined group of transactions with low commitment coverage and a high discount. The 1-tailed p-value of 0.114 indicates that there is no significant difference in outcome between the two groups at a 5 or 10 percent confidence level. As the group with low commitment coverage and a high discount was assigned a higher mean rank, the test concludes that offerings with high commitment coverage and a low discount are more likely to yield lower subscription outcomes than offerings with low commitment coverage and a high discount, if a significance level of 15 percent is accepted.

Although there are limitations to consider, meaning that the conclusions should be interpreted restrictively, the results of the study should make logical financial managers question the use of ex-ante commitments as a tool for certifying the quality of an offering. Assuming an objective of maximizing the subscription rate of the rights offering, paying for warranty commitments should not be considered a substitute for issuing the shares at a discount to TERP. Instead, we conclude that warranty commitments should be used to guarantee proceeds and not to signal to the market that the offering is of higher quality or more attractive. Our study makes no attempt at general validity, and our findings need thus not be applied to other forms of SEOs, or on rights issues that take place outside the Nordic capital markets.

II. Related literature

The study draws on the theories developed and formulated by Balachandran et al. (2008). They investigate the role of ex-ante commitments on announcement stock price reaction and takeup (subscription rate) on a sample of 636 rights issues in Australia between the years 1995 and 2005. The authors find evidence that ex-ante commitments can signal the quality identity of the firm and subsequently affect the announcement price reaction and takeup. Based on their sample, the highest quality firms present rights issues characterized by high ex-ante commitment coverage and a low discount, and thus experience the least unfavorable stock price reaction upon announcement. The hypotheses evaluated by Balachandran et al. are ultimately based on the signaling models of Henkel and Schwartz (1986) and Booth and Smith (1986) which were originally developed to study the difference in reaction between underwritten offerings and rights offerings in the United States. Our thesis uses largely the same theoretical framework and retains some but not all the hypotheses from Balachandran et al. While the general sentiment is the same, the manually collected Swedish market dataset enables a few additional hypotheses to be made and tested. We examine the correlation between discounts and ex-ante commitments. Simultaneously, our dataset and the Swedish

market conventions limit us from making several hypotheses that are enabled by the Australian market data or irrelevant to the Swedish market. We are unable to reliably obtain readily available price reaction data and therefore our thesis does not contain hypotheses related to price reaction mechanisms. Unlike the study by Balachandran et al., the sole dependent variable examined in our thesis is thus the ex-post subscription rate. We argue that this is a more direct measure of offering attractivity than price reaction analysis, as the price reactions incorporate a surprise component and may reflect changes in the wider market sentiment as well as other information related to the company, but not the offering per se. For instance, a negative price reaction upon rights offering announcement may be the result of a lower inferred firm quality due to the sudden communicated need for cash injection. The negative price movement does not necessarily correspond to the attractiveness of the offering, and so we resort to studying the subscription outcome instead.

As for independent variables, rights issue renounceability is evaluated in the study by Balachandran et al. (2008), but not considered in our thesis as non-renounceable rights are not permitted in Sweden (Holderness and Pontiff, 2016). All rights issues in Sweden are renounceable rights issues which means that subscription rights can be sold and exercised by both existing owners and external investors. Apart from the contribution of the manually obtained Swedish market dataset, our thesis contributes to the research by specifically examining the relationship between ex-ante commitments and the subsequent subscription rate outcome. This has not been identified in the existing literature, and furthermore, no specific subset analysis of different Discount : Commitment combination implications on the subscription outcome has been found in the pool of literature. Supplementing the theory on ex-ante commitments, the perfect market theory highlighted by Mateus, Farinha, and Soares (2016) makes the important prediction that participating investors should be price insensitive. Considering this to be the case and incorporating the presence of external investors who can benefit through high discounts from passive right holders gives rise to the hypothesis of the relationship between the discount to TERP and the subscription rate. By collecting subscription data with and without the use of subscription rights separately, and by accounting for the existence of the passive and external investors, we can differentiate our thesis and test for the impact of subscription price discounts on the subscription rate in the Swedish and Nordic capital markets.

III. Theory and hypothesis

First, we introduce the mechanics of the conventional rights issue method in Sweden. The rights offering builds on the idea that existing shareholders have prioritized claims over outside shareholders to subscribe to equity offerings. As such, the method is built up of a system where the existing shareholders receive a number of subscription rights with primary entitlement to new equity in the SEO that corresponds to their pro-rata share of the firm's equity. These subscription rights give the owner a prioritized right to purchase a certain number of new shares in the company. If all existing shareholders subscribe to their pro-rata

share of the offer, the previously existing ownership structure remains. However, it is rarely the case that every existing investor is able or willing to contribute the additional capital. The rights can, during a predefined period, be sold on the open market if the shareholder does not want to exercise their rights. Through trade of the rights, both existing and new investors can take part in the offering. If there are any unexercised rights at the end of the subscription period, shares not subscribed to by the holders of the rights are allocated to other investors, who have expressed interest in an additional subscription, regardless of whether such investors are previous owners or external investors. If this aggregate interest exceeds the remaining number of unexercised rights, not all investors will be allocated part of the offering. If, on the other hand, there are no such additional expressions, or they are insufficient to cover the entire issue, the remainder or part of the remainder can be covered by one or more warranty commitments, if such agreements exist. These are made by investors, usually institutions, and work similarly to insurance or put options. If the interest in the issue is insufficient to reach full subscription, the party that has agreed to a warranty commitment will purchase the additional shares to secure the wanted capital infusion for the emitting firm. Again, similar to insurance or put options, the warranty commitment issuer will charge a premium for this service. Finally, if there are no such warranty commitments, the issue will not reach full subscription.

The success of a rights offering can in part be measured by its subscription rate, or in other words, what percentage of the offering is being subscribed to by the market. Rights offering failures through insufficient subscription are costly to companies since there are large unrecoverable direct costs associated with the issuance process. These include clerical fees, legal fees, marketing costs, etc. Additionally, the need for capital may be time-sensitive, meaning that a second issue attempt is not a viable option. An offering failure may thus have impactful indirect costs such as foregoing value-creating investments or failing to honor debts. To shield against costly failures, firms usually make rights offerings at a considerable discount compared to the current share price and even to the TERP that would be expected after dilution. Discounting is especially important if the rights issuer expects the share price to decline during the subscription period. The discount purchase price of the share gives the subscription rights an initial intrinsic value since it enables the right-holder to buy stock at a price lower than what initially prevails in the open market. The function of the discount is to make the exercise of the rights more likely and thus increase the likelihood that the equity is raised. Theoretically, all rights with a positive intrinsic value should and will be exercised. In reality, they are not always exercised. Furthermore, the offering may be insufficiently discounted and the rights therefore may not carry any intrinsic value. In a perfect market scenario highlighted by Mateus et al. (2016), so long as the price of the new shares is lower than the price of the shares at announcement, the pricing of the offering should be irrelevant. Theoretically, the value of the discount is offset by the value of the right and as long as the right can be sold, the wealth of the existing shareholders should be unaffected. The exception to this would be the passive shareholders who neither sell their rights nor subscribe to them. The cost to them is the value of the right. This means that to active investors, the pricing

should not matter. To outside investors, this represents an opportunity if they can be allotted any unexercised rights, and more heavily discounted offerings hence attract more interest from outside investors. This leads us to hypothesize that a higher discount in the subscription price of a rights offering will imply a higher ex-post subscription rate. A high discount to the theoretical ex-rights price means that it is costlier to be a passive investor and not exercise your rights, and is also prone to generate more interest from external investors. Our first hypothesis is thus as follows:

H_1: An offering with a higher discount to the TERP will exhibit a higher aggregate subscription rate than an offering with a lower discount to the TERP.

Looking further at the role of ex-ante commitments, the hypothesis formulations in the paper by Balachandran et al. (2008) are founded on a quality signaling perspective which we are utilizing, albeit with some modifications to suit the dataset of the Swedish market. To better understand the hypothesis formulations of this paper, one can look at the research of Heinkel and Schwartz (1986) and Booth and Smith (1986). As highlighted in these papers, there is a fundamental information asymmetry between the firm and outside investors when raising seasoned equity. The firm and its insiders are assumed to be more informed regarding the future cash flows and value of the firm and its projects. To insiders, there is partly an incentive to effect a wealth transfer from outside investors and there is thus, ceteris paribus, a higher proportion of over-valued firms seeking new equity issuance than their natural proportion of the firm population. Announcements of the intent to raise new equity by a firm provide investors with information in the form of a signal. In this case, the signal is that there is a higher than proportional probability that the firm is overvalued, and the market response is thus often an instant price decline in accordance with the degree of overvaluation perceived by the market. The decision to issue equity under these circumstances warrants that the investment opportunities of the firm are sufficiently valuable to overcome this loss and further, that they are transitory and cannot be postponed at a low cost.

When contemplating the effects of ex-ante commitments in a rights issue environment, we are basing our hypothesis on the modified Heinkel and Schwartz (1986) model used by Balachandran et al. (2008). A basis for this theory is that firms can signal their quality by the choice of underwriting and ex-ante subscription commitments. The argument that follows is that high-quality or undervalued firms are willing to bear the costs of investigation to an underwriter and will thus elect to issue fully underwritten rights issues. Reversely, low-quality firms are, based on a signal cost/benefit perspective, unwilling to bear the costs of investigation to fully underwrite the issue. Furthermore, low-quality firms are likely to lack confidence in raising the necessary financing through completely uninsured rights issues due to poor subscription rates. They must therefore partially underwrite the rights issue to secure financing. When electing to study the relationship between the ex-ante commitments and attractivity of the offering, it is important to make the distinction between what Balachandran et al. (2008) refer to as underwritten offerings which correspond to the Swedish equivalent of warranty commitments, and the subscription commitments which are made by existing

investors with subscription rights without any compensation. Since our dataset contains subscription commitments to a large extent, the hypothesis must be restated. We hypothesize that there will be a positive relationship between the degree of commitments and the attractivity of the offering since subscription and warranty commitments are assumingly made by investors who are more informed than the common investor collective, and that their informed actions are thus interpreted as a sign of strength. Our second hypothesis is thus as follows:

H_2: An offering with a higher aggregate ex-ante commitment coverage will exhibit a higher aggregate subscription rate than an offering with a lower ex-ante commitment coverage.

When looking at specific combinations of discounts and insurance levels, Balachandran et al. (2008) found that the most attractive offerings in terms of announcement price reaction have a high degree of ex-ante commitments and a low discount. Assuming these observations hold true for the Swedish dataset, subscription rates for offerings with Low Discount : High Commitment combinations should be higher than offers that have High Discount : Low Commitment combinations. Our third hypothesis is thus as follows:

H_3: Offerings that have a combination of a high degree of aggregate commitments and a low discount are more attractive than offerings that have a low degree of commitments and a high discount.

Moreover, when contemplating the implications of Balachandran et al. (2008) in their claim that firm quality is negatively correlated with discount, it also stands to reason that there exists a negative correlation between the offering discount to TERP and the degree to which it has been covered by ex-ante commitments. Given the claim that high-quality firms generally have a lower discount to the TERP (Balachandran et al., 2008), such firms are is also ceteris paribus more attractive for issuers of subscription and warranty commitments. It therefore stands to reason that high-quality firms are likely to be covered by commitments to higher extents since actors who commit to their rights offerings have more to gain from the discount in the event of insufficient subscription. A similar reverse logic can also be applied to low-quality firms. If an offering is not covered by commitments to a high degree, the firm has to offer the equity at a larger discount in order to receive the necessary funding. Additionally, both discounted offers and warranty commitments are to an extent costly ways for a financial manager to increase the likelihood that the rights offering reaches full subscription. Given a finite budget restriction, financial managers are possibly faced with a trade-off of either discounting an offering or raising commitments to guarantee full subscription. Our fourth hypothesis is thus as follows:

H_4: There is a negative correlation between the degree to which the offering has been covered by commitments and the offering discount relative to TERP.

An important consideration to this hypothesis is that although it is reasonable to assume that high-quality firms should, ceteris paribus, have greater commitment coverages, highly discounted offerings that stem from low-quality firms could also be perceived as safer and cheaper for external actors to make commitments on. This effect is difficult to estimate in relation to the reasoning put forth in the works of Balachandran et al. (2008). In the case that the positive effect is significant or even larger than the negative effect suggested, the correlation may be close to zero, or even positive.

IV. Research design

Equipped with our research question and the hypotheses outlined above, we move on to describe our research process below, starting with the data collection (*Section IV.i.*), then defining our key variables (*Section IV.ii.*), and lastly describing our test methods (*Sections IV.iii–v.*).

IV.i. Data and sample

We use a sample of 164 rights issues offered by publicly traded companies in Sweden on two main Nordic stock exchanges, OM and NGM, over the period ranging from January 1, 2020, to December 31, 2021.

Several considerations underlie our choice of sample:

1. **Geography**: According to Holderness and Pontiff (2016), the financial markets' appetites for rights offerings vary substantially across countries. While they rarely occur in the United States, Israel, and Canada, rights issues are more common in Italy, Sweden, Singapore, and the United Kingdom. To control for the geographical variance in rights offering appetite, our study centers on the Swedish equity markets, where rights issues constitute 85 percent of the value raised through SEOs (Cronqvist and Nilsson, 2005, in Holderness and Pontiff, 2016).
2. **Time period**: We perceive the market's sentiment and investment strategies as timely matters which are subject to change. Hence, to maintain the relevance of our research, we focus on a recent sample period of two years, ranging from January 1, 2020, to December 31, 2021. This sample period is suitable not only because it is recent in time, but also because it captures periods of growth as well as downturn in the Swedish economy's gross domestic product, as illustrated in Figure 1. In accordance with Tomić, Šimurina, and Jovanov's (2020) conclusion that there is a causal relationship between economic sentiment indicators and gross domestic product, we induce that our sample may capture periods of both positive and negative market sentiment, possibly making our results more generalizable and less dependent on the state of the economy.

3. **Sample size**: In general, a greater sample size, i.e., a longer sample period, would strengthen the confidence in any results our study is to produce. However, due to the time constraints that we face, and due to the fact that our method requires time-consuming manual data collection, we settle for a sample period of two years.
4. **Characteristics**: The extracted sample must be homogenized on the basis of transaction characteristics, to lessen the risk of having other variables affect the results. We decide to focus on rights issues in their simplest form, i.e., pure stock offerings, as such offerings are observed to be the most common ones on the Swedish markets.

Figure 1: GDP growth rates in Sweden, 2020–2021

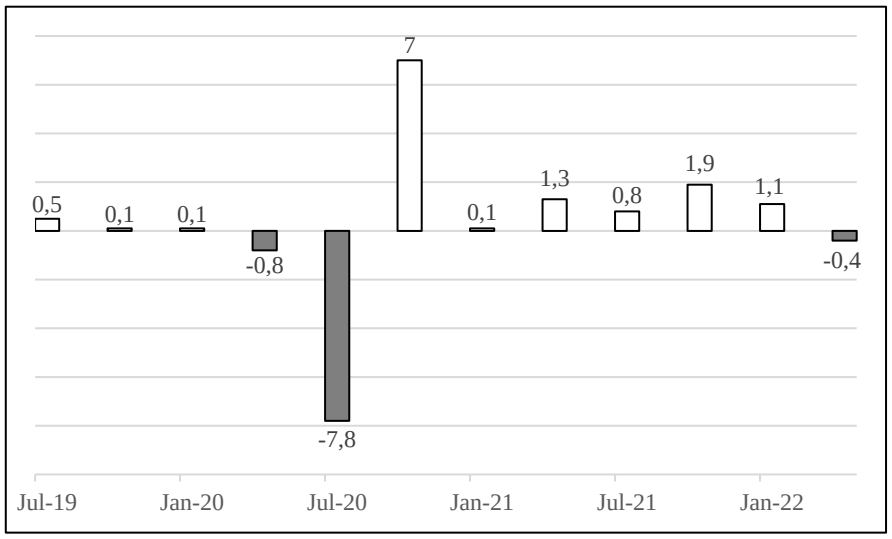

Figure 1: Quarter-wise GDP growth rates in Sweden between July 2019 and April 2022. The figure presents GDP growth percentages on a 3-month basis. Adapted from TRADING ECONOMICS (2022).

We use the Capital IQ database hosted by S&P Global Market Intelligence to extract all public transactions that meet the following screening criteria: i) they are public follow-on equity offerings; ii) the transactions were announced on a date within the two-year period ranging from January 1, 2020, to December 31, 2021; iii) they are specified as a rights offering; and iv) the transactions occurred on an exchange within Sweden. A total of 222 samples are extracted, each with supplementary data variables such as ex-ante issuer market capitalization (one day before announcement), gross offering amount, offered price per share, maximum number of shares offered, and issuer financials such as the latest annual revenue, EBITDA, and net income of the issuer at announcement.

As the data offered by the Capital IQ database alone does not suffice for our desired research method, we manually collect additional information regarding the discount, commitments, and subscriptions for every transaction in our sample. For this data collection process, an array of different sources is used. Rights issues in Sweden are subject to national

as well as transnational regulations. The EU Prospectus Regulation 2017/1129 requires that a prospectus with specific information requirements is established and made public in advance of a rights offering's subscription period. Although Sweden's law (2019:414) of complementary prescriptions to the EU Prospectus Regulation withdraws the prospectus obligations for companies who issue stock volumes to the public of less than EUR 2.5 million per twelve months (first paragraph, second chapter), OL and NGM still require such companies to establish and publish memorandums with similar information requirements as the prospectuses. The prospectuses and memorandums are generally made available on the websites of each respective issuer as well as on the website(s) of the designated bookrunner(s) and sometimes on the Swedish Financial Supervisory Authority's website. As such, the prospectuses or memorandums of each rights offering constitute a suitable and accessible resource in the manual gathering of sample information for this study.

Prior to the publication of the prospectus or memorandum, it is common practice for a company listed on the Swedish stock market to announce their rights offering in a press release (henceforth "**PR**") to the public market, in accordance with the EU Market Abuse Regulation. The same regulation also requires the issuer to publish information on the outcome of each rights offering after the offering completion, including investor subscription data and issue volume data. We utilize Modular Finance AB's news database, mfn.se, to gain access to the press releases published by the rights issuers identified in the dataset extracted from Capital IQ. From these press releases, we gather data on stock offering price, stock issue ratio (i.e., how many new stocks are issued per existing stock), subscription commitments, underwriting commitments, post-offering subscription rates subscribed with the use of subscription rights, and post-offering subscription rates subscribed without the use subscription rights. For the transactions whose issue volume has not been extracted from Capital IQ, the PRs are used to add this information. In the event the press releases do not suffice for our manual data collection, we turn to the prospectuses or memorandums released in connection with the transactions as previously described. Furthermore, we use Avanza Bank AB's stock exchange platform, Avanza, to obtain the adjusted close price of each issuer prior to the announcement of their rights offering to compute the discounts of the offering prices. For the issuers whose market capitalization has not been provided by Capital IQ, Avanza's data is used. All variables are defined in the next subsection, *IV.ii. Key variables and assumptions*.

Of the 222 transaction samples extracted from the Capital IQ database, 193 transactions remain after we have analyzed each transaction and omitted any observations which either turned out to be (i) directed issues, (ii) duplicates of other rights issues in our extracted sample, (iii) renounced issues (canceled), or (iv) issues by companies whose ex-ante stock prices are not observable if the company was not exchange-listed at the time of transaction announcement. Of the remaining 193 observations, 29 of the transactions are unit offerings (issuing bundles of stock and warrants) which we omit in accordance with the sample considerations presented earlier. Thus, our final sample consists of 164 rights offerings on OM and NGM from February 1, 2020, to December 31, 2021.

IV.ii. Key variables and assumptions

The key variables along with their definitions, and source and computation, are summarized in Table 1.

In accordance with the theoretical section and the hypotheses outlined therein, we identify three variables from Table 1 as variables of particular interest, namely AgSub, DiscTERP, and AgCom.

IV.ii.i. Dependent variable (AgSub)

We use the aggregate subscription variable (AgSub) as the dependent variable. This variable is suitable because it is arguably the purest measure of rights issue attractivity. While Balachandran et al. (2008) include the issuer's stock price reaction following the rights issue announcement as a measure of market reaction and a proxy for stock offering attractivity, this measure hardly isolates the attractivity component of the market's perception of the offering. We believe that stock price reactions reflect a surprise component and an often-negative sentiment derived from the realization that the company is in sudden need of cash. The aggregate subscription, on the other hand, reflects the actual volume that the market wishes to purchase in an offering given the fundamental characteristics of the rights issue, i.e., the attractivity of the offering. We do, however, recognize that aggregate subscription is not entirely unrelated to the stock price reaction, as the latter is sure to affect the potential gains of investing perceived by the investor.

We identify the aggregate subscription rate (AgSub) as the total cash volume subscribed to with and without the exercise of subscription rights divided by the maximum issue volume (Volume) according to the offering's transaction structure. We thus present the AgSub outcome as a percentage of Volume. Naturally, the lower limit of this variable is 0 since subscriptions cannot be negative. The upper limit, however, is per our definition infinite – while the subscription rate with subscription rights (RightSub) can only amount to 100 percent of Volume, there is no upper demarcation for the subscription rate without subscription rights (NoRightSub). As such, our measure of AgSub reflects the attractivity of an offering, i.e., to what extent the market is willing to participate in the offering, rather than the gross proceeds a company is able to raise through its offering (Proceeds) which would have an upper limit of 100 percent.

IV.ii.ii. Independent variables (DiscTERP & AgCom)

It is a common perception that investors are more willing to participate in an offering if they perceive that the price to which they are offered to subscribe for is lower than the actual value of the security they are buying (which would be akin to an arbitrage trade). In our context, it suggests a relation between the attractivity of an offering (AgSub) and the discount of the offering's price to real value. In the Swedish financial industry, it is common practice to use the volume-weighted average price (henceforth "**VWAP**") of a stock during a specific

Table 1: Definitions of key variables

Key variable	Definition	Source and Computation
Close	Stock's latest closing price per share before announcement of the offering (SEK)	*(Avanza)*
Price	Offered subscription price per share (SEK)	*(PR)*
Old	Existing number of shares in the company	*(PR/Memorandum/Prospectus)*
New	Maximum number of shares issued in the offering	*(PR/Memorandum/Prospectus)*
DiscClose	Subscription price's discount to closing price (% of Close)	*= Price / Close – 1*
DiscTERP	Subscription price's discount to the Theoretical Ex-Rights Price (% of Close)	*= Price / ((Close * Old + Price * New) / (Old + New)) – 1*
SubCom	Offering's subscription commitment coverage (% of Volume)	*(PR/Memorandum/Prospectus)*
WarCom	Offering's warranty commitment coverage (% of Volume)	*(PR/Memorandum/Prospectus)*
AgCom	Aggregate degree of commitments (% of Volume)	*= SubCom + WarCom*
RightSub	Subscription outcome with subscription rights (% of Volume)	*(PR)*
NoRightSub	Subscription outcome without subscription rights (% of Volume)	*(PR)*
AgSub	Aggregate subscriptions (% of Volume)	*= RightSub + NoRightSub*
WarEx	Subscription through exercise of warranty commitments	*(PR)*
Proceeds	Gross proceeds (% of Volume)	*= max(AgCom; AgSub)*
Volume	Offering's maximum gross inflow of cash to the issuer (SEK million)	*(Capital IQ)*
MarketCap	Issuer's market capitalization, one day before announcement (SEK million)	*(Capital IQ)*

Table 1: Summary of the variables extracted and collected from the sample, along with definition, and source and computation. The first fourteen variables (1–14) were collected manually. The last two variables (15–16) were obtained through the sample extraction from the Capital IQ database, and as such, the data of said variables have not been revised by the authors.

short-term period (commonly 10 days) to indicate the true value of said stock according to the market. This method has the benefit of lowering the impact of temporary fluctuations in the stock price. We use the latest closing price of the issuer's stock (Close) as a proxy for the actual value of the stock because it is more easily accessible and computable than the VWAP, and because it requires fewer considerations regarding the horizon of the VWAP. Since the closing prices retrieved from Avanza are split-adjusted, we readjust the prices for any stocks that have undertaken one or multiple splits or reverse splits after the transaction date. We compute two measures of rights offering discounts, the first one being a straightforward discount of the offering price (Price) to the (Close), i.e., DiscClose. Our second discount measure is the discount of Price to the TERP, which is defined as the ex-post theoretical value of each stock in the event of full subscription. This measure incorporates the effect of dilution that occurs as a consequence of the offering, and we therefore believe that the discount to TERP (DiscTERP) serves as a better measure of the true offering discount compared to DiscClose. We reiterate that the DiscTERP assumes full subscription and full dilution of the offering. If the offering is not fully subscribed, the DiscTERP underestimates the true discount of the rights issue. Our DiscTERP parameter has a lower limit of -100 percent (signifying a 100 percent discount), and no upper limit. Positive values on the DiscTERP parameter imply a premium of the offering price compared to the assumed true value of the stock (Close). A lower value on the DiscTERP variable corresponds to a higher discount, and a higher value corresponds to a lower discount.

The computation of the commitment coverage is subject to fewer considerations than the former independent variable. We look at the aggregate subscription rate (AgSub) as a measure of the degree of security in an offering. Regardless of whether the issuer is in a cash call or simply presents the offering to fund an expansion or investment, the maximum issue volume is often set to ensure the capital the company needs, and seldom much more. Most investors are probably not willing to invest in an issue if they perceive that the company will not raise the capital needed for survival or expansion. The aggregate commitment rate sets a lower bound of the final subscription rate and can thus be used to assure the investor that the company will in fact raise capital up to a certain threshold. We define AgSub as the sum of the subscription commitment rate (SubCom), i.e., binding ex-ante commitments by specific investors to subscribe to the offering using subscription rights they possess or will possess, and the warranty commitment rate (WarCom), i.e., binding ex-ante commitments by specific investors to subscribe to the offering to the extent that the aggregate subscription reaches a certain level (e.g., 80 percent). Subscription commitments usually cover less than half of the Volume, and Warranty commitments only cover the residual remaining up until a predefined level. The bounds of the AgSub variable thus range from 0 percent to 100 percent. Although there is a standard form for warranty and subscription commitments as we have described them so far, they are in their essence merely dispositive contracts and may thus come in different alterations. An alternative form of subscription commitment is a declaration of intent (henceforth "**DOI**") to subscribe with subscription rights. Although the DOI is not legally binding, our sample indicates that it occurs as a substitute for true

commitments. We believe that the observed DOIs bear the same signaling effects as true commitments, and we reason that any actors who announce DOIs are incentivized to fulfill their intents since a failure of doing so would yield a bad reputation for the actor in the dense financial market of Sweden. Therefore, we count the DOIs to the SubCom variable in the few cases they occur. As for the warranty commitments, we make no difference in our data collection between different variations of such commitments, whether regular, bottom, top, or top-down warranties. Although these different forms have different implications for the guarantor, we conduct this study from the perspective of the issuer and the investors to whom these different warranty types all present similar signaling effects and implications.

IV.ii.i. Control variables (Volume & MarketCap)

To isolate the effects of the DiscTERP and AgCom variables on the AgSub outcome, we include another set of control variables that could affect the subscription outcome in our regressions. While many different circumstances could affect the outcome, such as industry, market sentiment, rights offering frequencies, etc., we resort to variables that are readily available. In the extraction from the Capital IQ database, we retrieve data on the issuer's one-year total revenue, EBITDA, and net income, as per the announcement of the offering. We also retrieve the Volume and MarketCap variables, the latter of which does arguably incorporate the former three variables.

We use the Volume and MarketCap variables as control variables. A higher market capitalization should arguably signal a more valuable business and thus potentially a higher stock offering attractivity. However, a higher MarketCap could also imply a higher burn rate and larger investment volumes, and thus a potential positive correlation with the Volume variable. The volume of the offering, in turn, could likely have a negative effect on the aggregate subscription outcome, since it should be potentially more difficult to attract sufficient subscription for offerings that call for more money. Any effects of the Volume and MarketCap variables are controlled for in the following regression.

IV.iii. Multiple regression

We use a multiple regression model and the least squares method to examine the impact of the discount and commitment coverage on the average subscription rate and attempt to draw conclusions about H_1 and H_2. We use the AgSub variable as the dependent variable, and DiscTERP and AgCom as the predictors. To control for Volume and MarketCap, a hierarchical linear regression is performed with MarketCap and Volume as independent variables in the first block, and with DiscTERP and AgCom added in the second block.

In the hierarchical linear regression model, the following regressions are executed:

$$AgSub_i = \beta_0 + \beta_1 \times MarketCap_i + \beta_2 \times Volume_i \quad (1)$$

$$AgSub_i = \beta_0 + \beta_1 \times MarketCap_i + \beta_2 \times Volume_i + \beta_3 \times AgCom_i + \beta_4 \times DiscTERP_i \quad (2)$$

where $ß_0$ represents the model's intercept, $ß_1$ represents the regression coefficient of the issuer's market capitalization, $ß_2$ represents the regression coefficient of the issue volume, $ß_3$ represents the regression coefficient of the offering price's discount to the TERP (i.e., the impact on AgSub of incrementing DiscTERP), $ß_4$ represents the regression coefficient of the aggregate commitment coverage (i.e., the impact on AgSub of incrementing AgCom), and $ε_i$ captures the residual errors of the regression.

The **hierarchical linear regression model** is a special form of the population multiple regression model. It is suitable because attempts to infer the nature of any relationship between a dependent variable and a set of independent variables, while controlling for the effect attributable to a set of other variables, based on a sample from the population (Newbold et al., 2013, 479). Our study uses the hierarchical linear regression model in two blocks on the form corresponding to equations (1) and (2) above, and relies on the following five standard assumptions (Newbold et al., 2013, 482):

1. **Randomness**: The independent variable data are fixed numbers or realizations of random variables that are independent of their error terms.
2. **Linearity**: The expected value of the random dependent variable is a linear function of the independent variables.
3. **Normality and homoscedasticity**: The error terms are normally distributed random variables with a mean of 0 and a uniform variance.
4. **No multicollinearity**: The random error terms are uncorrelated with each other.
5. **Independent inputs**: There is no direct linear relationship between the independent variables.

We argue that our sample satisfies the randomness assumption based on the unbiased collection of all stock rights issues on the OM and NGM between January 1, 2020, and December 31, 2021. We also argue and rely on the possibility that the incremental effects of AgCom and DiscTERP on AgSub could indeed be linear. The normality assumption can be justified by applying the Central Limit Theorem (henceforth "**CLT**") if the sample is random, independent, and sufficiently large (usually, the threshold is 30 observations). The remaining assumptions of homoscedasticity, no multicollinearity, and the use of independent inputs, will be assessed with robustness tests (*Section IV.iii.*).

There is a distinction between offering attractivity, as measured by the aggregate subscription rate, and between offering success, as measured by the gross proceeds the firm succeeds in raising through the offering. For the sake of interest and discussion, we repeat the method outlined above and perform a hierarchical linear regression with Proceeds as the dependent variable, to see how the independent variables affect offering success. In the second hierarchical linear regression model, the following regressions are executed:

$$Proceeds_i = \beta_0 + \beta_1 \times MarketCap_i + \beta_2 \times Volume_i$$

$$Proceeds_i = \beta_0 + \beta_1 \times MarketCap_i + \beta_2 \times Volume_i + \beta_3 \times AgCom_i + \beta_4 \times DiscTERP_i$$

where $ß_0$ represents the model's intercept, $ß_1$ represents the regression coefficient of the issuer's market capitalization, $ß_2$ represents the regression coefficient of the issue volume, $ß_3$ represents the regression coefficient of the offering price's discount to the TERP (i.e., the impact on Proceeds of incrementing DiscTerp), $ß_4$ represents the regression coefficient of the aggregate commitment coverage (i.e., the impact on Proceeds of incrementing AgCom), and $ε_i$ captures the residual errors of the regression.

IV.iv. Mean comparison

We divide our sample into groups and use a mean comparison test to examine whether offerings with high commitment coverage and low discounts yield higher ex-post subscription than offerings with low commitment coverage and high discounts, to draw conclusions about H_3.

We define the thresholds for high and low commitments and discounts respectively based on the sample descriptive characteristics (*Section V.i.*). Any offerings with a DiscTERP equal to or lower than -30.29 percent (25^{th} percentile) are characterized as offerings with a High Discount and any offerings with a DiscTERP equal to or higher than -16.94 percent (75^{th} percentile) are characterized as offerings with a Low Discount. We identify any offering with an AgCom equal to 100,00 percent as an offering with High Commitment, and any offering with an AgCom of less than 100,00 percent as an offering with Low Commitment.

The High Discount and Low Discount segments each consist of 41 transactions. The High Commitment segment hosts 84 transactions and the Low Commitment segment contains 79 transactions. Any transactions which belong to both the Low Discount and High Commitment segments are added to the Low Discount : High Commitment group. Any transactions which belong to both the High Discount and Low Commitment segments are added to the High Discount : Low Commitment group. The Low Discount : High Commitment group consists of 25 transactions, and the High Discount : Low Commitment group amounts to 18 transactions.

A **Student's t-test** is executed to compare the mean subscription rates that result from the two distinguished groups. The Student's t-distribution is preferential because it allows us to test for the difference between two normal population means with independent samples, where the populations' variances are unknown and the sample sizes do not exceed 100 (Newbold et al., 2013, 393). The Student's t-distribution takes on the following assumptions (Newbold et al., 2013, 394):

1. **Randomness**: The samples are independent and random.
2. **Equal variances**: The observations are drawn from populations with equal variances.
3. **Normality**: The observations are drawn from normally distributed populations.

In accordance with prior reasoning regarding the hierarchical linear regression model (*Section IV.iii.*), we make the case that our sample transactions are indeed randomly selected and independent of each other. Normal distribution in the underlying variable is a necessary Student's t-test assumption only for small sample sizes (usually, the threshold is 50 observations). Unlike with the hierarchical linear regression model which enabled the CLT to justify normal distribution in the *sample*, the CLT cannot be used to approximate normal distribution in the *population* and justify the Student's t-distribution. Hence, if the equal population variance assumption or normality assumption is proven to be violated in the robustness tests (*Section IV.v.*), a non-parametric Mann-Whitney U-test is used to supplement the mean comparison test.

The **Mann-Whitney U-test** tests the null hypothesis that the central locations of two different populations are the same, based on an ascending ranking of the samples' observations. It relies on the normal distribution assumption, which is approximated for large sample sizes (usually, the threshold is 10 observations per sample) (Newbold et al., 2013, 629).

IV.v. Robustness tests

Several tests are performed to assess whether the underlying assumptions of the regression and mean comparison tests are satisfied. For the hierarchical linear regression model, the normality assumption is assessed with a **Kolmogorov-Smirnov test** and a **Shapiro-Wilk test** respectively, both with the null hypothesis that the sample is normally distributed. We define Res as the unstandardized residual from the hierarchical linear AgSub regression, and Pred as the unstandardized predicted value from the hierarchical linear AgSub regression. ResSquare is then defined as the Res variable squared, and PredSquare as the Pred variable squared. The homoscedasticity assumption is then assessed with a **Breusch-Pagan test** by performing a regression with ResSquare as the dependent variable and Volume, MarketCap, DiscTERP, and AgCom as the independent variables. If no regression coefficients are significantly different from 0, the homoscedasticity assumption cannot be rejected. **White's test** may be used to supplement the Breusch-Pagan analysis if the Breusch-Pagan assumption of normally distributed error terms is rejected in a second set of Kolmogorov-Smirnov and Shapiro-Wilk tests. White's test performs a regression with ResSquare as the dependent variable, and Pred and PredSquare as the independent variables. It tests the same assumption as the Breusch-Pagan test by examining the regression coefficients. The multicollinearity assumption is assessed with a **Variance Inflation Factor** (henceforth "**VIF**") **test**. Lastly, the assumption of independent inputs is assessed with the **Pearson correlation coefficient** on all variables of interest. While we examine the correlation coefficient and test against the

null hypothesis of no correlation, and specifically when we examine the coefficient between AgCom and DiscTERP, we are also able to infer conclusions about H_4.

Another set of robustness tests is conducted for the mean comparison test to conclude whether the Student's t-test or the Mann-Whitney U-test is preferential. The Student's t-distribution assumption of equal group variances is assessed with **Levene's test**. The assumption of normally distributed populations is assessed with the aforementioned **Kolmogorov-Smirnov test** and a **Shapiro-Wilk test** respectively.

V. Results

In this section, we begin by describing the characteristics of our data sample (*Section V.i.*). We then move on to regress our dataset (*Section V.ii.*) and perform mean comparison tests (*Section V.iii.*) to infer conclusions about our hypothesis and answer our research question. Additionally, we perform and include a set of robustness tests to see if the assumptions which underlie our tests hold.

V.i. Descriptive characteristics

Table 2 presents descriptive characteristics for each variable of interest with data obtained from the 164 stock rights issues that occurred on the Swedish OM and NGM exchanges in Sweden between January 1, 2020, and December 31, 2021.

Table 2: Sample descriptive characteristics

	N	Mean	Min	25th Percentile	Median	75th Percentile	Max	Standard Deviation
MarketCap	164	676.21	6.45	52.08	161.43	334.58	25,915.56	2,396.66
Volume	164	165.08	1.50	20.00	30.50	100.29	3 994.16	472.75
DiscClose	164	-31.32%	-74.03%	-40.65%	-31.80%	-22.08%	29.53%	16.70%
DiscTERP	164	-22.77%	-65.71%	-30.29%	-22.82%	-16.94%	25.22%	12.85%
AgCom	164	79.43%	0.00%	70.08%	100.00%	100.00%	100.00%	30.86%
SubCom	164	26.58%	0.00%	3.73%	24.35%	43.00%	88.50%	22.27%
WarCom	164	51.90%	0.00%	29.75%	56.29%	76.70%	100.00%	31.81%
AgSub	164	157.99%	16.21%	75.95%	138.00%	193.78%	1380.00%	135.23%
RightSub	162	76.88%	9.22%	61.34%	88.00%	95.60%	100.00%	24.05%
NoRightSub	162	80.43%	0.30%	12.10%	47.50%	100.43%	1281.00%	124.54%
WarEx	164	9.29%	0.00%	0.00%	0.00%	0.00%	69.00%	18.09%
Proceeds	164	167.33%	16.21%	100.00%	138.00%	193.78%	1380.00%	128.78%

Table 2: Sample descriptive statistics summary illustrating the 164 sample observations different variable characteristics. The table presents the number of observations, mean value, minimum value, 25th percentile value, median value, 75th percentile value, and maximum value for each respective variable outlined below. The variables are defined in Table 1.

We define a dummy variable ComDist as the commitment distribution variable, which takes a value of 0 for each transaction that has an AgCom of 0.00 percent, a value of 1 for each transaction with an AgCom greater than 0.00 percent but less than 100.00 percent, and a value of 2 for each transaction with an AgCom of 100.00 percent. The frequency table for the ComDist variable is presented in Table 3.

Table 3: ComDist frequency table

	Frequency	Percent	Cumulative Percent
0	13	7.9	7.9
1	66	40.2	48.2
2	85	51.8	100.0
Total	164	100.0	

Table 3: Frequency table of the commitment distribution (ComDist) dummy variable presenting frequency, percent, and cumulative percent. A value of 0 indicates that the offering had no commitment coverage, 1 indicates partial commitment coverage, and 2 indicates that the offering was fully covered by commitments.

Out of 164 sample transactions, 85 of the offerings are fully covered by subscription commitments and/or warranty commitments, corresponding to 51.8 percent of the sample. 13 of the offerings have no commitment coverage, corresponding to 7.9 percent of the sample, and the remaining 66 offerings (40.2 percent) are partially secured by subscription commitments and/or warranty commitments.

We define another dummy variable FullSub as the subscription distribution, which takes a value of 0 for each transaction that has an AgSub of less than 100.00 percent, and a value of 1 for each transaction with an AgSub of 100.00 percent or more. The frequency table for the FullSub variable is presented in Table 4.

Table 4: FullSub frequency table

	Frequency	Percent	Cumulative Percent
0	52	31.7	31.7
1	112	68.3	100.0
Total	164	100.0	

Table 4: Frequency table of the full subscription (FullSub) dummy variable presenting frequency, percent, and cumulative percent. A value of 0 indicates that the offering was not fully subscribed, whereas a value of 1 indicates full ex-post subscription.

Out of the 164 sample transactions, 112 of the offerings are fully subscribed or oversubscribed, corresponding to 68.3 percent of the sample. The remaining 52 offerings (31.7 percent) do not generate full subscription.

V.ii. Multiple regression

A hierarchical multiple regression is run with AgSub as the dependent variable, MarketCap and Volume as the control variables in block 1, and AgCom and DiscTERP added as the predictors in block 2. The aim is to assess whether there is any relation between the discount to the TERP and ex-ante commitment coverage on the ex-post subscription rate of a rights offering, and thus to conclude whether there is support for H_1 and/or H_2. For the sake of discussion, another hierarchical multiple regression is run with Proceeds as the dependent variable, MarketCap and Volume as the control variables in block 1, and AgCom and DiscTERP added as the predictors in block 2. Furthermore, in the robustness tests of said models, the Pearson correlation coefficient between any pair of the aforementioned variables is assessed, and any correlation between AgCom and DiscTERP is examined to conclude whether there is support for H_4.

The regression coefficients obtained from the hierarchical multiple regressions with AgSub and Proceeds as the respective dependent variables are presented in Tables 5–6.

Table 5: AgSub regression coefficients

Model		Unstandardized β	Coefficients Standard Error	t	Significance
1	(constant)	160.790	11.345	14.173	<0.001
	MarketCap	0.001	0.005	0.168	0.867
	Volume	-0.020	0.025	-0.820	0.413
2	(constant)	111.689	33.814	3.303	0.001
	MarketCap	0.000	0.005	-0.056	0.955
	Volume	-0.020	0.025	-0.811	0.419
	AgCom	0.110	0.343	0.321	0.749
	DiscTERP	-1.803	0.826	-2.182	0.031

Table 5: Regression coefficient analysis showing the unstandardized coefficient (unstandardized β), coefficient standard error, the t-value (t), and the 1-tailed p-value (Significance) of the Student's t-test against the null hypothesis that the coefficient is 0, for each regression variable. Model 1 regresses AgSub on Volume and MarketCap (control variables). Model 2 regresses AgSub on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table 6: Proceeds regression coefficients

Model		Unstandardized β	Coefficients Standard Error	t	Significance
1	(constant)	170.499	10.801	15.785	<0.001
	MarketCap	-3.231×10^{-5}	0.005	-0.007	0.994
	Volume	-0.019	0.024	-0.807	0.421
2	(constant)	113.747	32.182	3.534	<0.001
	MarketCap	-0.001	0.005	-0.208	0.836
	Volume	-0.019	0.023	-0.825	0.411
	AgCom	0.259	0.326	0.796	0.427
	DiscTERP	-1.617	0.786	-0.161	0.041

Table 6: Regression coefficient analysis showing the unstandardized coefficient (unstandardized β), coefficient standard error, the t-value (t), and the 1-tailed p-value (Significance) of the Student's t-test against the null hypothesis that the coefficient is 0, for each regression variable. Model 1 regresses Proceeds on Volume and MarketCap (control variables). Model 2 regresses Proceeds on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

The regression coefficient analysis implies that the market capitalization (MarketCap) of the issuer has no direct implication for the ex-post aggregate subscription (AgSub) outcome when the other variables of interest are considered. The issue volume (Volume) has a negative, albeit insignificant effect on the AgSub. The aggregate commitment coverage (AgCom) exhibits a positive coefficient which suggests, much in line with our prior reasoning and theory, that higher commitments yield higher subscription rates. However, this coefficient cannot be statistically rejected from 0 at any reasonable confidence level. Hence, H_2 is not supported by our data. The offering's discount to the TERP (DiscTERP), however, has a negative β of -1.803, which is significant at a 5 percent confidence level. H_1 is thus supported. This is to be expected since the AgSub variable captures subscriptions made with subscription rights (RightSub) and those made without the support of subscription rights (NoRightSub). While existing shareholders, i.e., the primary receivers of subscription rights, have little to gain from a higher discount, external investors can profit from participating in highly discounted rights issues at the expense of any holders of subscription rights which are not executed for subscription. A highly discounted, low DiscTERP, should thus make the offering more attractive primarily to external investors. However, the second hierarchical linear regression with Proceeds as the dependent variable suggests otherwise. While MarketCap, Volume, and AgCom are all insignificant variables in this regression, DiscTERP has a negative β of -1.617, which also is significant at a 5 percent confidence level. Since subscriptions with subscription rights have primary entitlement to the issued shares, RightSub tends to dominate the ex-post distribution of shares and represent a majority of the Proceeds. Since subscription rights are handed to existing investors, the RightSub variable, and thus also the Proceeds variable, should act as a reasonable proxy for the offering attractivity perceived by existing investors. Since our theoretical section has made the case that existing investors do not gain from higher discounts, it was less expected that the DiscTERP variable would have the same influence on Proceeds as to AgSub.

It should be noted that the ANOVA analyses of the two respective regression models (see Appendix *Table X2* and *Table X5*) do not allow us to statistically reject the null hypothesis that all regression coefficients are equal to 0 with reasonable significance. The coefficient of determination (R^2) only amounts to 3.5 percent in the AgSub regression, and to 3.6 percent in the Proceeds regression (see Appendix *Table X1* and *Table X4*) suggesting that the predictive power of our model is very weak and that many other factors could play a more important role in determining the attractivity and success of rights offerings.

On the positive side, our sample does indeed fulfill the necessary assumptions that underlie the hierarchical linear regression model. While the Kolmogorov-Smirnov and Shapiro-Wilks (see Appendix *Table X10*) tests both reject the assumption of normal distribution in the DiscTERP and AgCom variables, the sample size of 164 is more than sufficient to approximate normality with CLT. Since linearity is rejected for the Res and ResSquare terms (see Appendix *Table X10*), the Breusch-Pagan test does not provide a statistically reliable means of confirming homoscedasticity. White's test (see Appendix *Table X16*) does however not reject uniform variance in the error terms, so homoscedasticity can

be assumed. The VIF test (see Appendix *Table X17*) yields VIF statistics for all variables of interest below the most conservative 2.5 threshold, so the no-multicollinearity assumption is not rejected.

The final standard assumption of no linear relationship between the independent variables is assessed with the Pearson correlation coefficient. The findings are summarized in Table 7.

Table 7: AgSub regression correlations

		AgSub	MarketCap	Volume	AgCom	DiscTERP
Pearson Correlation	AgSub	1.000	-0.015	-0.065	0.031	-0.170
	MarketCap	-0.015	1.000	0.420	0.001	-0.110
	Volume	-0.065	0.420	1.000	0.050	-0.032
	AgCom	0.031	0.001	0.050	1.000	-0.057
	DiscTERP	-0.170	-0.110	-0.032	-0.057	1.000
Significance	AgSub	.	0.423	0.204	0.345	0.015
	MarketCap	0.423	.	0.000	0.496	0.081
	Volume	0.204	0.000	.	0.264	0.340
	AgCom	0.345	0.496	0.264	.	0.234
	DiscTERP	0.015	0.081	0.340	0.234	.

Table 7: Correlations analysis of the regression variables Agsub, MarketCap, Volume, AgCom, and DiscTERP. The table presents the Pearson correlation coefficient (Pearson's r) for each pair of variables, and the 1-tailed p-values (Significance) of the Pearson correlation coefficient test against the null hypothesis that there is no correlation between the pair of variables.

Although there is a significant positive correlation of 0.420 between the MarketCap and Volume variables at a 1 percent confidence level, this violation of the standard assumption is not particularly troubling since the two hierarchical linear regressions attributed a close-to-0, insignificant regression coefficient for each of said variables. A negative correlation coefficient of -0.110 is observed between the MarketCap and DiscTERP variables. This negative correlation is significant at a 10 percent confidence level, which is unexpected, albeit not of any particular concern for the same reason outlined above. No other correlations between any pair of independent variables are significantly distinguishable from 0 at a reasonable level of confidence. Thus, the hypothesis of a negative correlation between the DiscTERP and AgCom variables, H_4, cannot be supported. While it was hypothesized that the issuer's financial management would perceive a trade-off between discounts, which are costly to passive shareholders, and warranty commitments, which are costly to the firm, it was also believed that a higher discount in the offering price would make

the offering more attractive to external investors and incentivize such actors to sign warranty commitments. The rejection of H_4 does thus not necessarily imply that there is no trade-off between the costs of discounts and commitments but could potentially reflect instead the idea that such trade-offs are completely offset by the incentive synergies that arise.

V.iii. Mean comparison

The sample is divided into three groups to assess H_3 with a test for equality of means whether offerings with high commitment coverage and low discount yield more ex-post subscriptions than offerings with low commitment coverage and high discount. The High Discount : Low Commitment group consists of 18 transactions, and the Low Discount : High Commitment group consists of 25 transactions. A third group consisting of the remaining 121 transactions is omitted in accordance with the test design. The descriptive characteristics of the High Discount : Low Commitment group and the Low Discount : High Commitment group are summarized in Table 8.

Table 8: AgSub group statistics

	Group	N	Mean	Min	Median	Max	Standard Deviation
AgSub	**1**	18	168.47%	17.40%	147.10%	553.00%	129.68%
	2	25	120.34%	41.00%	98.50%	310.90%	74.51%

Table 8: Descriptive statistics table summarizing the number of sample transactions in each group as well as their mean value, minimum value, median value, maximum value, and standard deviation, all in terms of the AgSub variable. Group 1 denotes the High Discount : Low Commitment group. Group 2 denotes the Low Discount : High Commitment group.

Although Levene's test (see Appendix *Table X18*) cannot reject equality of variances between the two groups on a 5 percent confidence level, the Kolmogorov-Smirnov and Shapiro-Wilks tests (see Appendix *Table X10*) both reject the assumption of normal distribution in the AgSub variable. Since normal distribution is a necessary assumption for Student's t-test with small sample sizes, a non-parametric Mann-Whitney U-test is performed in place of the Student's t-test. The findings are summarized in Table 9.

Table 9: Mann-Whitney U-test group test statistics

	AgSub
Mann-Whitney U	175.000
Z	-1.219
Exact Significance (2-tailed p)	0.228
Exact Significance (1-tailed p)	0.114
Point Probability	0.002

Table 9: Summary of the Mann-Whitney U-test for equality of means in the AgSub variable between the High Discount : Low Commitment group and Low Discount : High Commitment group, presenting the Mann-Whitney U-statistic, Z-value, 1- and 2-sided p-values against the null hypothesis that the mean difference is 0, and point probability of the test.

We cannot, according to the Mann-Whitney U-test, statistically reject the null hypothesis that the mean difference is 0 on a 10 percent confidence level. However, the 1-tailed p-value of 0.114 suggests, with a 15 percent confidence level, that the High Discount : Low Commitment group does indeed have a higher central value than the Low Discount : High Commitment group. Thus, the result does not provide support for H_3, and if any conclusion were to be drawn from the performed test, it would have been the opposite of the evaluated hypothesis. Although this finding goes against the theoretical reasoning behind the hypothesis, it is very much in line with the prior results from the mean regression, which suggest that the DiscTERP variable, unlike the AgCom variable, has a significant negative impact on the AgSub variable. In other words, while the commitment coverage of a rights offering has not been proved to affect the subscription outcome, a higher discount does indeed increase the ex-post subscriptions, according to our data.

VI. Discussion

Dissecting the meaning of the results by hypothesis, we start with H_1. The causal relationship between DiscTERP and AgSub is negative, meaning that a larger discount, i.e., a more negative DiscTERP value, will effect a higher aggregate subscription rate. With a 1-sided p-value of 0.031, this is a statistically significant result at a 5 percent confidence level. Referring back to the theoretical section, this result strengthens the notion that a deep discount to the TERP has a positive effect on the existing shareholders' propensity to exercise or sell their rights as the cost of passivity increases. The driver of this result may also be the increased interest in the offering from external investors, or a combination of the two. Important to note is that although the DiscTERP variable shows a statistically significant relationship to AgSub, the explanatory value of the model is relatively minuscule. Considering that the coefficient of determination (R^2; see Appendix *Table X1*) for the block 2 of the hierarchical

linear AgSub regression, including predictors and control variables, is only 3.5 percent, it is clear that there are a large number of other parameters that affect the ex-post subscription rate and attractivity of the offerings in the sample.

Continuing with H_2, the null hypothesis that there exists no significant relationship between ex-ante commitments and subsequent subscription rate cannot be rejected. Thus, the study cannot show a statistically significant relation, either positive or negative, between the two variables. While this is not in line with the stated hypothesis based on existing theory, it does have important implications, nonetheless. Given our understanding that subscription rate is the best proxy for attractivity of the rights offering, our inability to show a significant relationship between aggregate commitment coverages and ex-post subscription rates suggests that commitments may not have the positive signaling impact on attractivity that we hypothesized. Taking this fact into consideration, the question of whether logical financial managers should spend time, energy, and oftentimes pay premiums of 8–12 percent of the committed volume for commitments is highlighted. If the ultimate motivation for commitments is to ensure that cash for the firm is raised, costly warranty commitments may still serve a purpose of securing proceeds. If, however, the motivation is to use underwriting as means of certification to justify a lower offering discount, the results of this study cannot support that purchasing warranty commitments is a logical action for a financial manager seeking to raise capital through an SEO.

Looking at H_3, the null hypothesis that there exists no significant difference in average subscription rate between offerings with High Commitment : Low Discount combinations (group 1) and those with Low Commitment : High Commitment (group 2) cannot be rejected. Since no rejection can be made, the study cannot find support for any subset having a higher subscription rate based on its identity as either of the two subsets. Given the understanding of subscription rates as a proxy for attractivity of the offering, the study does not confirm the hypothesis that the market finds group 2 inherently more attractive than group 1. In fact, the result points in the opposite direction, and suggests at a 15 percent confidence level that offerings with High Discount : Low Commitment yield higher subscriptions than those with Low Discount : High Commitment. This finding is very much in line with the findings from the regression studies that found a significant positive effect on aggregate subscription from higher discounts, but not for commitments. The implication of this finding for financial managers is that there is no inherent reason to pay for costly warranty commitments if the objective of the purchase is to automatically make the offering more attractive. There may of course exist situations where warranty commitments make the offering more attractive in the eyes of market participants, but this is not something that can be observed across a larger sample of cases.

Finally, examining the results relating to the H4, we are unable to find any significant correlation between the aggregate ex-ante commitment coverage and the offering discount to the TERP. Since the study cannot confirm that aggregate commitments are indeed positively correlated with firm quality or attractiveness of the offering, which was the case

for Balachandran, et al. (2008), the premising reasoning on which our hypothesis rests finds no support.

Reflecting upon the study and its scope, it is likely that it would have been valuable to obtain data on the rights issue firm price reaction upon announcement in order to widen the scope to include the more commonly used proxy for attractivity of rights offerings. This was the main variable tested in Balachandran et al (2008). Since the data obtained on the commitment coverages for the Swedish market has a large portion of offerings with 100 percent commitment coverage, the variability in the AgCom variable was limited to a small sample of firms. Complementing the subscription rate variable with the market announcement price reaction which likely has a higher and less clustered variance could be useful to supplement the study on the attractivity of rights offerings. Moreover, it would provide a useful comparison not only between the Swedish and Australian markets, but also between the use of subscription rate versus announcement price reaction to gauge the attractiveness of an offering. While we still favor the analysis of subscription rate outcome over announcement price reaction as it is arguably a purer measure of how attractive an offering is, the sample size likely must be larger to motivate the use of this measure, due to low variability in the explanatory variables of our sample. With more resources, the price reaction is not unfeasible to obtain but under the given constraints, the laborious manual data collection of subscription rates was prioritized.

As a final statement of limitation, we want to stress that the findings of our study stem from a sample that is highly concentrated in terms of time and place. It is thus not necessary that our conclusions are applicable outside the Nordic capital markets, nor is it certain that they will hold true in the far future. Limitations aside, our topic is ever so relevant, as many firms in Sweden are soon to need new capital infusions, and we posit that more research on the topic would be to the benefit of such troubled firms, financial managers, and the investor collective at large.

V. Conclusion

Given that the discount to TERP is the only tested variable that can be confirmed as having statistically significant explanatory value to the subscription rate of rights offerings, we conclude the study by relating our findings back to financial managers attempting to raise seasoned equity through the rights offering method. Seeing that we find support for the subscription rate being affected by the discount of the offering but not the aggregate commitment coverage, we encourage financial managers to consider the reason for electing to pay for warranty commitments. If electing to pay for such agreements, the intention should mainly be to secure proceeds and not to signal the quality of the offering to the market. Simultaneously, we encourage caution to be taken when using the findings of this study as the scope is limited and subscription rate rarely is the only relevant measurement financial managers seek to maximize. The study can be seen as a piece in a larger puzzle financial managers need to lay when deciding when, where, and how to raise capital.

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X. Appendix

X.i. Multiple regression

X.i.i. Aggregate subscription multiple regression

Table X1: AgSub regression model summary

Model	R^2	Adjusted R^2	Standard Error of Estimate
1	0.004	-0.008	135.771%
2	0.035	0.010	134.539%

Table X1: Model summary of hierarchical linear regression presenting the coefficient of determination (R^2), adjusted coefficient of determination (adjusted R^2), and the residual standard error. Model 1 regresses AgSub on Volume and MarketCap (control variables). Model 2 regresses AgSub on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X2: AgSub regression ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	13,110.523	2	6,555.262	0.356	0.701
	Residual	2,967,848.973	161	18,433.845		
	Total	2,980,959.496	163			
2	Regression	102,931.917	4	25,732.979	1.422	0.229
	Residual	2,606,991.985	159	16,396.176		
	Total	2,703,416.103	163			

Table X2: Analysis of variance (ANOVA) for hierarchical linear regression presenting the sum of squares of residual error, degrees of freedom, mean square of residual error, F-statistic of the regression, and 1-tailed p-value (Significance) of the F-test against the null hypothesis that all group means are equal to 0. Model 1 regresses AgSub on Volume and MarketCap (control variables). Model 2 regresses AgSub on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X3: AgSub regression residuals statistics

	Minimum	Maximum	Mean	Standard Deviation
Predicted Value	59.510%	237.985%	157.987%	25.129%
Standard Predicted Value	-3.919	3.183	0.000	13.070
Standard Error of Predicted Value	10.972	119.902	19.547	13.070
Adjusted Predicted Value	33.785%	409.450%	159.194%	32.843%
Residual	-158.504%	1,203.090%	0.000%	132.878%
Standard Residual	-1.178	8.942	0.000	0.988
Studentized Residual	-1.184	8.994	-0.003	0.998
Deleted Residual	-293.050%	1,217.175%	-1.207%	136.931%
Studentized Deleted Residual	-1.185	12.793	0.022	1.227
Mahalanobis Distance	0.090	128.468	3.976	12.148
Cook's Distance	0.000	0.754	0.008	0.061
Centered Leverage Value	0.001	0.788	0.024	0.075

Table X3: Regression residuals statistics showing the minimum values, maximum values, mean values, and standard deviations for prediction and residual parameters derived from the regression with AgSub as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

Figure X1: Agsub regression normal P–P plot of standardized residual

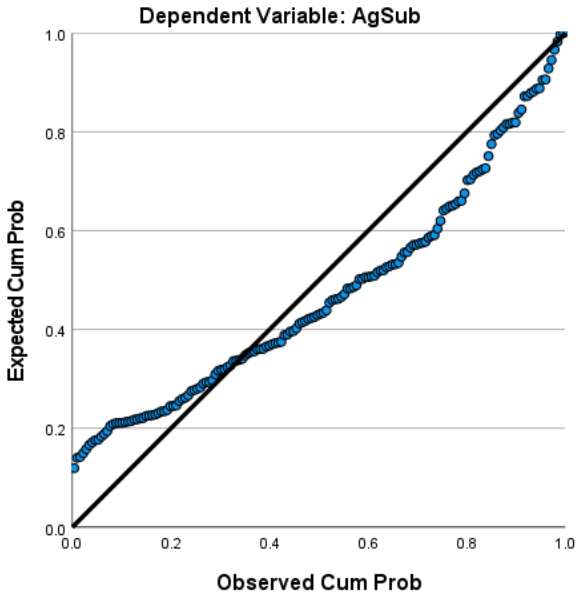

Figure X1: Normal probability–probability plot of regression standardized residual with observed cumulative probability (x-axis) and expected cumulative probability (y-axis), derived from the regression with AgSub as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

Figure X2: AgSub regression residual scatterplot

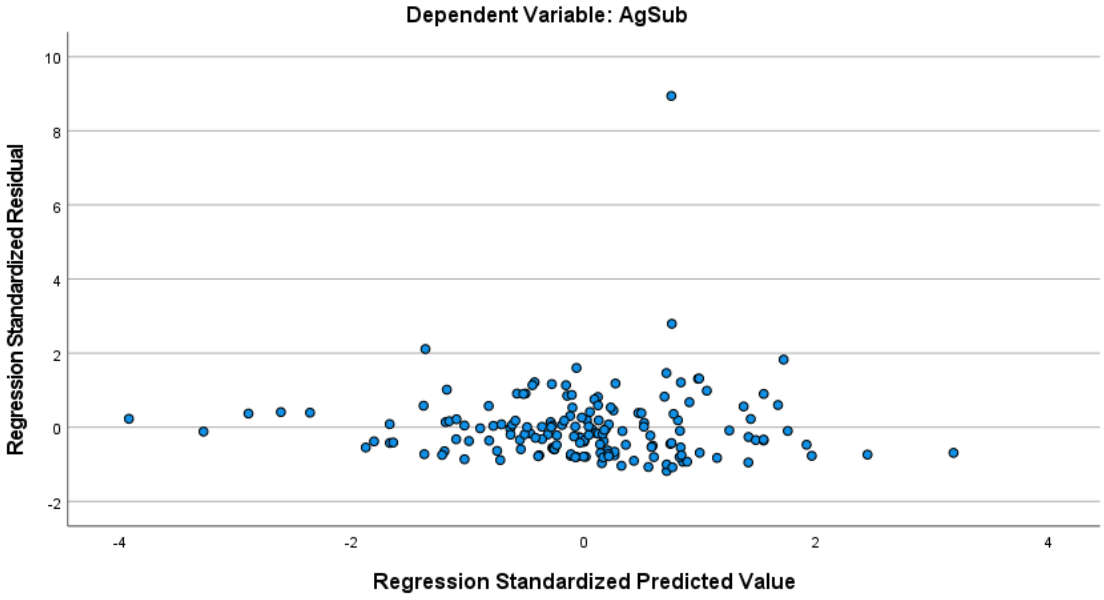

Figure X2: Scatterplot depicting the relation between regression standardized predicted value (x-axis) and regression standardized residual (y-axis), derived from the regression with AgSub as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

X.i.ii. Gross proceeds multiple regression

Table X4: Proceeds regression model summary

Model	R^2	Adjusted R^2	Standard Error of Estimate
1	0.005	-0.007	129.263%
2	0.036	0.011	128.048%

Table X4: Model summary of hierarchical linear regression presenting the coefficient of determination (R^2), adjusted coefficient of determination (adjusted R^2), and the residual standard error. Model 1 regresses Proceeds on Volume and MarketCap (control variables). Model 2 regresses Proceeds on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X5: Proceeds regression ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	13,299.621	2	6,649.811	0.398	0.672
	Residual	2,690,116.481	161	16,708.798		
	Total	2,703,416.103	163			
2	Regression	96,424.118	4	24,106.029	1.470	0.214
	Residual	2,606,991.985	159	16,396.176		
	Total	2,703,416.103	163			

Table X5: Analysis of variance (ANOVA) for hierarchical linear regression presenting the sum of squares of residual error, degrees of freedom, mean square of residual error, F-statistic of the regression, and 1-tailed p-value (Significance) of the F-test against the null hypothesis that all group means are equal to 0. Model 1 regresses Proceeds on Volume and MarketCap (control variables). Model 2 regresses Proceeds on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X6: Proceeds regression residuals statistics

	Minimum	Maximum	Mean	Standard Deviation
Predicted Value	74.911%	238.628%	167.334%	24.322%
Residual	-117.116%	1,191.831%	0.000%	126.467%
Standard Predicted Value	-3.800	2.931	0.000	1.000
Standard Residual	-0.915	9.308	0.000	0.988

Table X6: Regression residuals statistics showing the minimum values, maximum values, mean values, and standard deviations for prediction and residual parameters derived from the regression with Proceeds as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

Table X7: Proceeds regression correlations

		Proceeds	MarketCap	Volume	AgCom	DiscTERP
Pearson Correlation	Proceeds	1.000	-0.030	-0.070	0.068	-0.161
	MarketCap	-0.030	1.000	0.420	0.001	-0.110
	Volume	-0.070	0.420	1.000	0.050	-0.032
	AgCom	0.068	0.001	0.050	1.000	-0.057
	DiscTERP	-0.161	-0.110	-0.032	-0.057	1.000
Significance	Proceeds	.	0.352	0.186	0.194	0.020
	MarketCap	0.352	.	0.000	0.496	0.081
	Volume	0.186	0.000	.	0.264	0.340
	AgCom	0.194	0.496	0.264	.	0.234
	DiscTERP	0.020	0.081	0.340	0.234	.

Table X7: Correlations analysis of the regression variables Proceeds, MarketCap, Volume, AgCom, and DiscTERP. The table presents the Pearson correlation coefficient (Pearson's r) for each pair of variables, and the 1-tailed p-values (Significance) of the Pearson correlation coefficient test against the null hypothesis that there is no correlation between the pair of variables.

Figure X3: Proceeds regression normal P–P plot of standardized residual

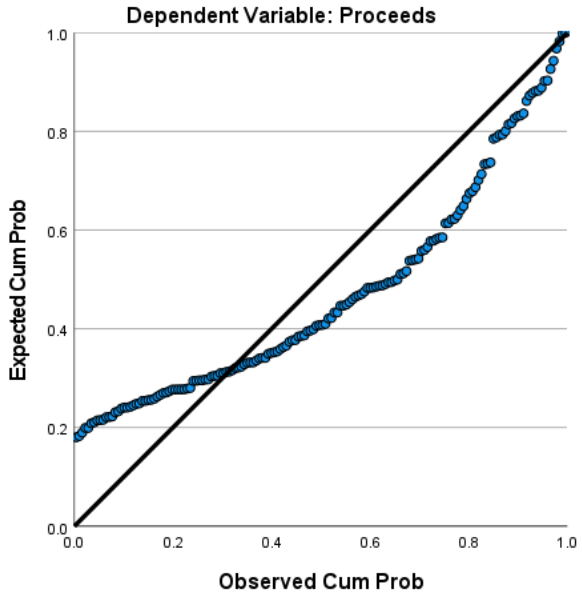

Figure X3: Normal probability–probability plot of regression standardized residual with observed cumulative probability (x-axis) and expected cumulative probability (y-axis), derived from the regression with Proceeds as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

Figure X4: Proceeds regression residual scatterplot

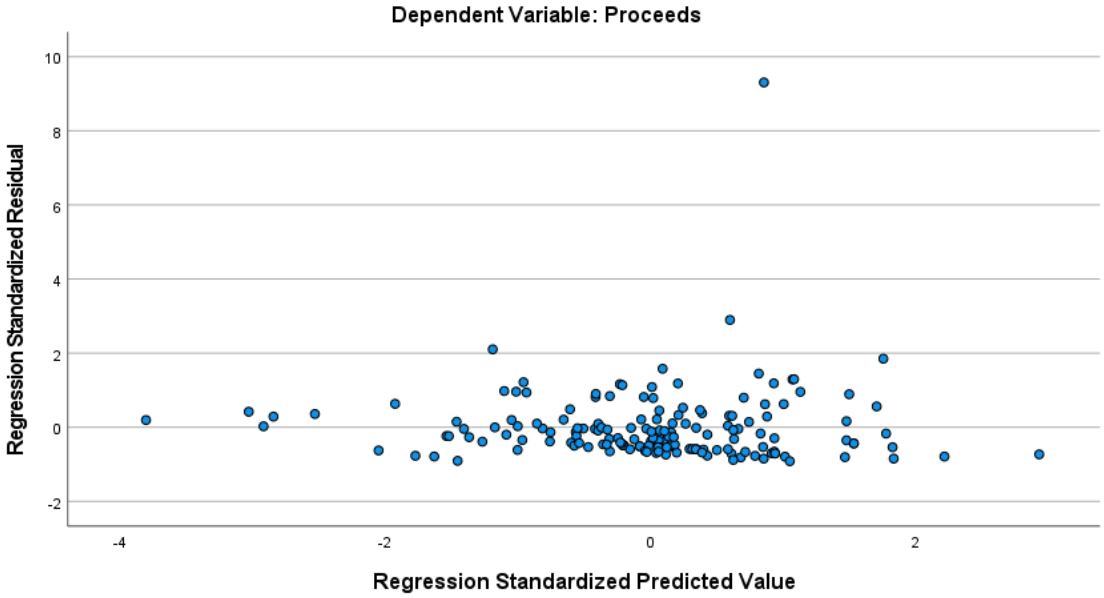

Figure X4: Scatterplot depicting the relation between regression standardized predicted value (x-axis) and regression standardized residual (y-axis), derived from the regression with Proceeds as dependent variable, Volume and MarketCap as control variables, and DiscTERP and AgCom as predictors.

X.ii. Mean comparison

X.ii.i. Student's t-test mean comparison

Table X8: T-test for equality of group means

				Significance			Standard
		t	df	1-sided p	2-sided p	Mean Difference	Error Difference
AgSub	Equal variances assumed	1.540	41	0.066	0.131	48.135%	31.255%
	Equal variances not assumed	1.415	25.039	0.085	0.169	48.135%	34.006%

Table X8: Summary of the Student's t-test for equality of means in the AgSub variable between the High Discount : Low Commitment group and Low Discount : High Commitment group, presenting the Student's t-value, degrees of freedom (df), 1- and 2-sided p-values against the null hypothesis that the mean difference is 0. The test statistics are presented with and without the assumption of equal AgSub variances.

X.ii.ii. Mann-Whitney U-test mean comparison

Table X9: Group ranks

	Group	N	Mean Rank	Sum of Ranks
AgSub	**1**	18	24.75	445.50
	2	25	20.02	500.50
	Total	43		

Table X9: Summary of rank statistics presenting the number of sample transactions in each group as well as the mean rank and sum of ranks for each group, ranked in ascending order of the AgSub variable. Group 1 denotes the High Discount : Low Commitment group. Group 2 denotes the Low Discount : High Commitment group.

X.iii. Robustness tests

X.iii.i. Normal distribution tests

Table X10: Tests of normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	**df**	**Significance**	**Statistic**	**df**	**Significance**
DiscTERP	0.080	164	0.013	0.976	164	0.006
AgCom	0.266	164	<0.001	0.698	164	<0.001
AgSub	0.165	164	<0.001	0.660	164	<0.001
Res	0.146	164	<0.001	0.670	164	<0.001
ResSquare	0.438	164	<0.001	0.099	164	<0.001

Table X10: Tests for normal distribution in the DiscTERP, AgCom, and AgSub variables based on the Kolmogorov-Smirnov test (with Lilliefors Significance Correction) and the Shapiro-Wilk test. The table presents the test statistic, degrees of freedom (df), and the 1-tailed p-value (Significance) against the null hypothesis that the variable is normally distributed, for each test.

X.iii.ii. Breusch-Pagan homoscedasticity test

Table X11: Breusch-Pagan regression model summary

Model	R^2	Adjusted R^2	Standard Error of Estimate
1	0.002	-0.011	113,945.414
2	0.008	-0.017	114,281.095

Table X11: Model summary of hierarchical linear regression presenting the coefficient of determination (R^2), adjusted coefficient of determination (adjusted R^2), and the residual standard error. Model 1 regresses ResSquare on Volume and MarketCap (control variables). Model 2 regresses ResSquare on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X12: Breusch-Pagan regression ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	1,571,593,844.8	2	1,785,796,922.4	0.138	0.872
	Residual	2.090×10^{12}	161	12,983,557,461		
	Total	2.094×10^{12}	163			
2	Regression	17,357,541,018	4	4,339,385,254.4	0.332	0.856
	Residual	2.077×10^{12}	159	13,060,168,579		
	Total	2.094×10^{12}	163			

Table X12: Analysis of variance (ANOVA) for hierarchical linear regression presenting the sum of squares of residual error, degrees of freedom, mean square of residual error, F-statistic of the regression, and 1-tailed p-value (Significance) of the F-test against the null hypothesis that all group means are equal. Model 1 regresses ResSquare on Volume and MarketCap (control variables). Model 2 regresses ResSquare on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

Table X13: Breusch-Pagan regression coefficients

Model		Unstandardized β	Coefficients Standard Error	t	Significance
1	(constant)	19 299.138	9 521.205	2.027	0.044
	MarketCap	-0.487	4.104	-0.119	0.906
	Volume	-8.606	20.805	-0.414	0.680
2	(constant)	-7 592.648	28 722.220	-0.264	0.792
	MarketCap	-0.758	4.141	-0.183	0.855
	Volume	-9.113	20.901	-0.436	0.663
	AgCom	190.651	290.933	0.655	0.513
	DiscTERP	-527.726	701.890	-0.752	0.453

Table X13: Regression coefficient analysis showing the unstandardized coefficient (unstandardized β), coefficient standard error, the t-value (t), and the 1-tailed p-value (Significance) of the Student's t-test against the null hypothesis that the coefficient is 0, for each regression variable. Model 1 regresses ResSquare on Volume and MarketCap (control variables). Model 2 regresses ResSquare on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

X.iii.iii. White's homoscedasticity test

Table X14: White's regression model summary

Model	R^2	Adjusted R^2	Standard Error of Estimate
1	0.006	-0.006	113,694.017

Table X14: Model summary of hierarchical linear regression presenting the coefficient of determination (R^2), adjusted coefficient of determination (adjusted R^2), and the residual standard error. Model 1 regresses ResSquare on Pred and PredSquare.

Table X15: White's regression ANOVA

Model		Sum of Squares	df	Mean Square	F	Significance
1	Regression	12,785,297,765	2	6,392,648,882.7	0.495	0.611
	Residual	2.081×10^{12}	161	12,926,329,486		
	Total	2.094×10^{12}	163			

Table X15: Analysis of variance (ANOVA) for hierarchical linear regression presenting the sum of squares of residual error, degrees of freedom, mean square of residual error, F-statistic of the regression, and 1-tailed p-value (Significance) of the F-test against the null hypothesis that all group means are equal. Model 1 regresses ResSquare on Pred and PredSquare.

Table X16: White's regression coefficients

Model		Unstandardized β	Coefficients Standard Error	t	Significance
1	(constant)	-39,748.606	171,152.002	-0.232	0.817
	Pred	-0.073	7.244	-0.010	0.992
	PredSquare	374.442	2,223.846	0.168	0.866

Table X16: Regression coefficient analysis showing the unstandardized coefficient (unstandardized β), coefficient standard error, the t-value (t), and the 1-tailed p-value (Significance) of the Student's t-test against the null hypothesis that the coefficient is 0, for each regression variable. Model 1 regresses ResSquare on Pred and PredSquare.

X.iii.iv. Multicollinearity test

Table X17: VIF test for multicollinearity

Model		Collinearity Tolerance	Statistics VIF
1	MarketCap	0.823	1.215
	Volume	0.823	1.215
2	MarketCap	0.813	1.229
	Volume	0.821	1.219
	DiscTERP	0.984	1.016
	AgCom	0.994	1.006

Table X17: Variance inflation factor (VIF) analysis showing the collinearity tolerance and VIF statistic. Model 1 regresses AgSub on Volume and MarketCap (control variables). Model 2 regresses AgSub on Volume and MarketCap (control variables), and DiscTERP and AgCom (predictors).

V.iii.v. Student's t-distribution equality of variances test

Table X18: Levene's test for equality of group variances

	F	Significance
AgSub	2.891	0.097

Table X18: Summary of Levene's test for equality of variances in the AgSub variable between the High Discount : Low Commitment group and Low Discount : High Commitment group, presenting the F-test statistic and the 1-sided p-value against the null hypothesis that variances are equal.