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The Other Side

On the informational content of low trading volume prior to seasoned equity offerings

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ABSTRACT

Trading volume contains considerable information on future stock returns, as it should enhance the information set of investors (Bajo, 2010). Prior research into trading volume is extensive, however, has primarily focused on the effects of high trading volume. An influential study at the other side, i.e. into low trading volume, is by Akbas (2016) who finds low trading volume prior to scheduled events signals negative information on the forthcoming event. Again looking at the other side, i.e. at unscheduled events, this research analyzes low trading volume prior to seasoned equity offerings. Two regressions are run to explore this relation in general, and more in specific, taking into account several control variables. The results show that low trading volume prior to seasoned equity offerings holds no significant information for announcement or issue date stock performance. However, there is a significant negative effect of low trading volume prior to SEO announcements on post-issue stock performance.

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1. Introduction and research question

It is widely accepted that the main goal of the capital market is to facilitate the allocation of capital in an economy, by providing information. The more information the market holds on the future price of capital, the more efficient the prices of capital will be today. However, information on the future is rarely complete. Indeed, only a master of scrying can gaze into a crystal ball, see the future, and determine perfect current capital prices. In reality capital owners are left to deal with uncertainty (Fama, 1970).

The efficient market hypothesis provides a framework for dealing with uncertainty in capital prices. It distinguishes between different levels of information efficiency in capital markets. They are assumed to either rely on information from historical prices, both historical prices and public information, or all available price information. In general, the most efficient form rarely holds (Fama, 1970).

To solve this inefficiency, and cope with uncertainty, investors form expectations on the future price of capital. However, not all investors have homothetic expectations. Optimistic investors expect high capital prices, whereas pessimistic investors expect low capital prices. Consequently, optimistic investors have a higher willingness to pay than pessimistic investors. Pessimists will try to profit from price drops. Short selling proposes a suitable way for this. It is the process of borrowing and selling a stock in the market. If prices drop, the short seller will purchase a stock in the market and return it to the stock lender. However, short selling bears great risks if prices increase, and is often restricted, or prohibited. When pessimists cannot express their pessimism they step out of the market. Thus a preponderant amount of optimistic investors are present in the market, and stock prices tend to be biased upwards (Miller, 1977).

An important factor that can improve investor's information set is trading volume. Prior to public information becoming available investors will form an opinion on the information held in this announcement. If investors are completely uninformed on the information held in this announcement, prices should be set by optimists. Informed investors are those that do have knowledge on the information held in an announcement, either due to actual knowledge or due to market analysis. If informed investors expect the announcement to hold negative information, binding short selling restrictions will limit them in expressing their opinion or knowledge. Thus informed investors will step out of trade, leading to a drop in the selling side and a subsequent drop in trading volume. Thus low trading volume contains important information, signaling the negativity of the information released by a public announcement. Indeed, empirics show trading volume has considerable information content for future stock returns, as it should enhance the information set of investors (Bajo, 2010).

Moreover, the trading volume of a stock is a variable that is easy to observe and thus empiric research is extensive. In particular, much of this research has been focused on the causes and effects of high trading volume, primarily in response to the high volume return premium by Gervais, Kaniel and Mingelgrin (2001), who find evidence for the observation that high trading volume predicts higher future returns. One of the earlier researches at the other side of the margin, that is; into low trading volume, is the study by Ying (1966), who finds that low trading volume on the New York Stock Exchange (NYSE) leads to a fall in the price of the S&P500 Composite index. Since this research, theory and empirics on the topic

of low trading volume have grown steadily. The topic, however, remains underdeveloped even today.

A recently published study by Akbas (2016) drew more attention to the information content of unusually low trading volume. In specific this research focused on the information content of low trading volume preceding abnormal negative earnings announcements. Akbas (2016) concluded "that stocks experiencing unusually low trading volume over the week prior to earnings announcements have more unfavorable earnings surprises." This implies that low trading volume prior to scheduled corporate events should enhance the information set of investors. Even though this research supplies a considerable contribution to the literature on low trading volume, its specific nature leaves the field open for numerous inquiries into other aspects of low trading volume.

One of the more obvious subsequent researches, as suggested by Akbas (2016), could be to look at the other side of scheduled corporate events preceded by low trading volume; i.e. low trading volume preceding unscheduled corporate events. Empirical analysis of low trading volume prior to unexpected corporate events could supply investors with implicit information about the future performance of a stock. Recently Chae (2005) investigated trading volume prior to scheduled and unscheduled corporate events. He emphasizes the role of privately informed investors in unscheduled corporate events, as uninformed investors do not have information on the forthcoming event.

An interesting example of trading volume, and short sale restrictions, prior to an unscheduled event, is the seasoned equity offering (SEO). Secondary offerings are offerings that follow an initial public offering. They are primarily differ in the existence of a market price for the underlying stock. Setting a price for a secondary offering, the SEO, is therefore less uncertain. SEOs can be offered as rights or as cash. As opposed to a cash offer, a rights offer offers shares only to existing shareholders, preventing dilution. As rights offers are not offered to the market in general, they are less suitable for general stock market analysis. Equity issuances are generally undertaken to finance investments, however is also often seen as a signal of diluting overpriced stocks (Berk & DeMarzo, 2013).

Manipulative trading is often observed around SEO issues. The U.S. Securities and Exchange Commission (SEC) has enforced regulations preventing short positions around SEO issues in order to prevent informed investors abusing private information (Division of Economic and Risk Analysis of the U.S. Securities and Exchange Commission, 2014). By taking short selling positions and artificially driving prices up prior to the issue, malicious investors can profit from the diluting effect of an issue.[1] As a result anomalous trading volume, short selling and price inefficiency are observed around SEO issues. Around announcements, however, short selling is not as restricted (Henry & Koski, 2010).

Manipulative trading has also led to an increase in shelf offerings in recent years. The shelf offered equity became available in 1982 as a new way of raising capital. A traditional non-shelf offering is (publicly) registered with the SEC prior to its issuance. Non-shelf registrations do not necessarily lead to an offer after registration. Firms thus have the discretion to issue equity at will, and react to market conditions. This greatly decreased the time between the announcement and issue date, reducing manipulative trading (Autore, Kumar, & Shome, 2008).

[1] See e.g. Brav, Geczy, and Gompers (2000), or Lyandres, Sun, and Zhang (2005)

Even though Chae (2005) elaborates on trading volume preceding expected and unexpected corporate events, he primarily focusses on the high side of trading volume. Additionally he uses mergers and acquisitions as a proxy for unexpected corporate events. Henry and Koski (2010) include trading volume prior to SEOs, however they focus on short selling, rather than trading volume. Drawing from Akbas (2016), this research will focus on the relation between low trading volume and announcement, and issue, returns for SEOs. In light of these considerations this paper will aim to answer the following research question:

I. *To what extend does unusually low trading volume prior to seasoned equity offerings contain information on a firm's stock performance?*

In answering this question this research aims to develop empiric evidence for stock price anomalies related to low trading volume prior to SEOs. A SEO occurs on an irregular time interval, and thus only privately informed investors can determine its timing, especially with shelf offerings. In this way, SEOs are an example of unexpected corporate events.[2] Investors holding private information are often restricted prior to SEO issues due to SEC regulation, informed trading should thus be limited.[3]

Still, short selling restrictions bind around issues, not announcements. Additionally the SEC recently loosened its grip on short selling around SEO issues, allowing for investors acting in good faith (Federal Register, 2007). Furthermore, this research focusses on low trading volume, not high trading volume. Results may therefore differ from Akbas (2016) and Chae (2005). The former assumes a decrease in trading supply, whereas the latter assumes an increase in trading demand. This research will show the relevance of both regarding low trading volume prior to SEOs.

The relevant issues regarding the research question will be discussed in the following order. Section 2 examines the theories and research underlying pessimism, short-selling and trading volume, and SEO anomalies. Section 3 presents the sample selection and the variables, specifically paying attention to the event period, and to unusual volume. Section 4 presents the methodology, the results and their implication. Section 5 summarizes the leading results and concludes the paper.

[2] Baruch, Panayides, and Venkataraman (2013) provide a list of unexpected corporate events. The announcement of a SEO is one of them.
[3] Henry and Koski (2010) find no evidence of informed short selling around SEO announcements.

2. Theoretical framework

2.1 Divergence of opinion, short selling and the informational content of trading volume

The relationship between trading volume and stock performance is a complex one and requires a careful exploration in order to fully grasp the details of the subject. Divergence of opinion is the first theory that hints at the relevance this relationship has for the stock market (Miller, 1977). This theory sheds light on why there is an effect of short-selling constraints on the adjustment of stock prices to (private) information, as found in the influential work by Diamond and Verrecchia (1987). Empirical studies find evidence for the observation that high trading volume contains information on future stock performance (Gervais, Kaniel, & Mingelgrin, 2001). More recently Akbas (2016) combined these theories to prove the information contained by low trading volume, the main topic of this research. In the following paragraphs this development in literature will be explained.

Divergence of opinion builds on the rejection of the presence of homothetic expectations in a Capital Asset Prices Model (CAPM). That is, it rejects the notion of Sharpe (1964) that investors are similar in their estimates of future return distributions of securities. Instead the concept of divergence of opinion argues that investors differ in their expectations of future stock performance. When the amount of stocks is limited, the most optimistic investors, those with the highest willingness to pay, will hold stocks. When, on the other hand, a growing amount of investors have more negative expectations of the future performance of a stock, market prices should drop to adjust to the negative expectations on the future performance of the stock. This is the case when informed investors are present in the market, having perfect information on the distribution of future performance. When informed investors sense prices are too high they will act upon their information by taking a short position, decreasing the price due to a larger supply of stocks. Short selling, however, bears far greater risks than a long position, besides the fact that short selling is often constrained. Thus in a market with informed and uninformed investors, with a large enough divergence of opinion and short sale constraints, market prices will typically lie above their efficient level. As divergence of opinion decreases due to, for instance, public announcements prices should move closer towards an equilibrium (Miller, 1977).[4]

In an efficient market in the strong form rational investors act upon their information immediately, translating it into the market price without delay (Fama, 1970). Market prices should adjust to a preponderant pessimistic sentiment by dropping to such a point where the amount of (informed) pessimistic investors is in equilibrium with the amount of optimistic investors. Thus sentiment and prices should be in balance. However, if any short selling constraints are binding and divergence of opinion among investors is considerable, the actual market price is inadequate in explaining market expectations.[5] In this case investors with bad news are limited in expressing their information by betting against the market (Miller, 1977). Indeed, it follows from empirics that short sale restrictions affect investors with favorable information differently from those with unfavorable information (Figlewski, 1981).

[4] Similarly Mayshar (1983) argues that divergence of opinion among investors impedes the efficient market hypothesis.

[5] Boehmer, Jones and Zhang (2008) find that informed short sellers contribute to diminishing information asymmetry in stock markets thus improving price efficiency.

It should be noted, however, that there are other ways for pessimistic investors to express their sentiment. By buying put options and writing call options, an investor can replicate a short sale position, effectively circumventing short sale restrictions (Figlewski, 1981). Empirics support the observation that the option market can serve as a viable alternative to the short sale market (Figlewski & Webb, 1993). Thus increased activity in the option market for a stock under short sale restrictions can improve information efficiency.

If short sale restrictions and divergence of opinion are substantial, and not fully captured by the option market, trading volume should contain information about investors' expectations, not fully visible in the market price. Aside from prohibitions, restrictions on short selling should push uninformed investors from the short market relatively faster than informed investors. Informed investors are more certain of their expectations and thus less susceptible to the risk short sales bear. As a result binding restrictions should make short sales more informative. Additionally, short interests and option trading volume, as an indication of pessimism bound by short selling constraints, should be high. Until such time that optimistic stockholders adjust their expectations and start adjusting their willingness to pay, trading volume will decrease. A period of low trading volume should thus be bad news as an indication of informed investors unable to act upon their information. When public information becomes available, the divergence of opinion should decrease and investors will be less divided about stock prices relative to future firm performance. As a result, trading volume should stabilize (Diamond & Verrecchia, 1987).

The indicatory role of trading volume for price efficiency has been proven in empirics repeatedly in the past. Most notably Gervais, Kaniel, and Mingelgrin (2001) note that unusually high (low) trading volume, measured over a day or a week, predicts forthcoming higher (lower) future returns. This claim is supported by the visibility argument. As the visibility of a stock rises, its information content will increase (Mayshar, 1983; Merton, 1987; Miller, 1977). Evidence on the visibility argument, however, mainly focusses on the high volume return premium and offers little proof for a relation between stock visibility and low trading volume. It is unlikely investor's awareness of a stock will suddenly decrease due to unusually low trading volume (Akbas, 2016). A second explanation for the high-volume return premium could be risk compensation. There are several theories explaining the relationship between risk and trading volume. Many of these papers, again, focus on the relation between risk and high trading volume.[6]

Research at the other side of the margin, that is, into low trading volume, has been less extensive. An early example is by Ying (1966), who finds that low trading volume on the NYSE index leads to a subsequent fall in the price of the S&P500 stock index. He concludes that trading volume and stock prices cannot be seen as mutually exclusive. More recently Chae (2005) found that trading volume (measured as the log turnover) decreases before scheduled earnings announcements, but increases before unscheduled announcements. His leading argument for this phenomenon is adverse selection due to the asymmetry between informed and uninformed investors. Uninformed investors know when scheduled events take place and also know there are informed investors in the market. By postponing their

[6] See for instance Schneider (2009), who argues that trading volume helps investors to evaluate the precision of the aggregate information in the price. Banerjee and Kremer (2010) conclude from their model of investors' disagreement and the interpretation of public information, that high trading volume indicates a high level of disagreement, and thus risk, in the future.

trades until private information becomes public, uninformed investors can reduce their risk of engaging in a bad trade. If uninformed investors are unaware of a forthcoming public corporate event they will not postpone their investment, whereas informed investors will trade on their expectations in both cases. In this way Chae (2005) elaborates on Diamond and Verecchia (1987) by adding a temporal element to information asymmetry.

Akbas (2016) expands the trading volume literature further. In his paper 'The Calm Before the Storm', the empiric focus is explicitly on the information content of low and high trading volume rather than on the information content of aggregate trading volume. By classifying trading volume preceding scheduled earnings announcements as either low, normal, or high, he analyzes the information content of trading volume with regard to a firm's future performance. He finds that, under short selling constraints, low trading volume conveys negative information on forthcoming earnings announcements. On the other side high trading volume does not appear to convey any significant information on firm fundamentals. This result can be interpreted as showing that the information content of low trading volume is driven by the aforementioned information asymmetry between informed investors, bound by short sale restrictions, and uninformed investors. The presence of option markets does decrease the effect of low trading volume, however, it does not make it insignificant. Thus these empirics show evidence for the theory that pessimistic investors are forced to step-out of trade or engage in option trading if they are unable to express their sentiment through short sales. As a result low trading volume preceding unscheduled earnings announcements is an indication of information asymmetry and inefficient prices.

2.2 The informational content of trading volume and short selling preceding Seasoned Equity Offerings

The behavior of (un)informed investors before a scheduled corporate announcement, with regard to trading volume and short selling, is evaluated thoroughly, both theoretical and empirical, by Akbas (2016). Specific research into information asymmetry, in relation with trading volume, before unscheduled corporate events, however, could give further understanding on the way (un)informed investors cope with market restrictions.

One of the more interesting cases of unscheduled corporate events is the case of companies issuing additional equity in a Seasoned Equity Offering (SEO). There has been a substantial amount of research on SEOs, showing the release of a considerable amount of information on, for instance, (long-term) returns and trading volume. In general this literature documents the following observations: i. There is, on average, a negative announcement effect, ii. Offer prices are generally set at a discount of market prices, iii. There is significant post-event long-run underperformance and, iv. Large variations in trading volume can be observed around SEOs (Ritter, 2003).

Specifically the relation between SEOs and short selling is of a unique nature. SEOs have significant market anomalies around announcement and offer dates[7] (He, Wang, & Wei, 2014). The role of short selling in these anomalies is not only recognized by the market, but also by lawmakers. The Securities and Exchange Commission (SEC) recently, August 2007, published an amendment to Rule 105 of Regulation M (SEC Rule 105), concerning short sale

[7] See Bowen, Chen and Cheng (2008), Lee and Masulis (2009) and Mikkelson and Partch (1986) for various explanations of SEO underpricing. See Lin and Wu (2013) and Lyandres, Sun and Zhang (2005) for various discussions of post-SEO long-term underperformance.

restrictions around public offerings. This regulation should prevent manipulative trading by prohibiting investors to simultaneously engage in short positions, with the aim to drive market prices down, and partake in SEOs, in order to attain artificial profits (Federal Register, 2007).

Previous research has elaborated on the effect of SEC regulation on the presence of manipulative trading and market anomalies. Empirical studies have found that the predecessor of SEC Rule 105, SEC Rule 10b-21, was effective in reducing manipulative trading (Gerard & Nanda, 1993; Safieddine & Wilhelm, 1996). Additionally, however, SEO discounts increased tremendously due to the short sale restrictions, that were aimed at reducing manipulative trading (Altinkiliç & Hansen, 2003). Further research into the causes of these phenomena found Rule 10b-21 decreased informative short selling and increased SEO discounts due to information asymmetry (Corwin, 2003; Kim & Shin, 2004).

SEC Rule 105's most recent amendment is aimed at improving the efficiency of the legislation, while maintaining its effect on manipulative trading (Federal Register, 2007). Ever since regulation on short selling around SEO announcement dates was published, manipulative trading has been decreasing. Manipulative trading around issue dates and a lack of informative short selling, on the other hand, were still found to be present in the pre-amendment situation (Henry & Koski, 2010). Shelf offerings, as opposed to traditional non-shelf offerings, were found to mitigate these costs of manipulative trading (Autore, Kumar, & Shome, 2008; Henry & Koski, 2010).

As mentioned in the beginning of this chapter short-selling is a tool for informed investors to translate information into stock prices, improving market efficiency (Diamond & Verrecchia, 1987). However, in the case of equity offerings, this tool can also be used to manipulate markets (Safieddine & Wilhelm, 1996). Restricting short-selling reduces market manipulation, but increases information asymmetry, resulting in an increase in SEO underpricing (Corwin, 2003). Short sale restrictions are only partly covered by the option market (Kim & Shin, 2004). Restrictions on short-selling are in general found to be accompanied by low trading volume (Miller, 1977). The role of low trading volume in decreasing the information asymmetry around SEOs, has not been mentioned in detail in any recent literature.[8]

The main contribution of this paper to existing literature is the introduction of a more thorough analysis of low trading volume around SEOs predicting future performance. Secondly this paper will offer a modern analysis of trading volume around SEOs, by using post-Rule 105-amendment data. In order to provide the relevant information necessary to test the empiric results related to these contributions, the following hypotheses will be considered. First, the announcement of a SEO is by its nature unexpected. Investors not holding private information are unable to form expectations on the performance of the forthcoming event, if they unaware of its approach. As a result there should be no anomalous trading prior to the announcement related to information asymmetry. Therefore the first hypothesis is:

[8] Chae (2005) observes an increase in trading volume preceding unscheduled announcements, however he primarily focusses on the relation between information asymmetry, unscheduled announcements, and high trading volume. He, Wang, and Wei (2014) focus on the informational content of stock liquidity instead of trading volume. Henry and Koski (2010) primarily discuss the general relevance of trading volume in combination with market manipulation.

H1: There is no significant relationship between low trading volume prior to SEO announcements and announcement date stock performance.

Still informed investors, aware of the approach of the announcement remain in the market. Although they are limited in abusing their information, due to regulation, they are not entirely restricted in the use of their information. If their presence is significant, some influence might remain. Especially concerning their expectations on the issue performance, as the issue, rather than the announcement, influences the market directly. The effect at the issue date should be negatively related to the abnormal returns as the issue should entail a diluting effect on the stock price. Low trading should signal a pessimistic effect. Therefore the second hypothesis is:

H2: There is a significant negative relation between low trading volume prior to SEO announcements and issue date stock performance.

After the diluting effect of a SEO issue, at the issue date, generally the market stabilizes returning to an equilibrium that has assimilated the price information included by the issue. Therefore in the post-issue period returns should be positive. For low trading volume stocks, however, this could not be the case as uninformed investors assimilate information already assessed by informed investors. Therefore the third hypothesis is:

H3: There is a significant negative relation between low trading volume prior to SEO announcements and post-issue date stock performance.

In the following chapter the dataset required to answer the hypotheses is assembled. Using this dataset the fourth chapter perform several tests with which the hypotheses will be answered.

3. Sample selection and variables

This chapter will discuss the construction of the dataset, which is compiled out of three different sets. First a sample of companies issuing equity, together with their related issue and announcement dates and offer characteristics, is assembled. Secondly trading volume preceding the event date is determined and analyzed in order to find the variable of interest, low trading volume. Thirdly, the dependent variables, measuring future performance, and related control variables will be described.

3.1 SEO sample selection

There are several dates of interest associated with SEOs. First of all, the filing date lists the date at which a company files for the issuance of additional stock at the SEC. This date is primarily of interest in the case of a traditional non-shelf offering, as the filing contains specific information of the forthcoming issue. This differs significantly from a shelf offering, which rarely leads to an actual offer (Autore, Kumar, & Shome, 2008). In the case of a shelf registered issue, the information regarding the issue is released to the market, the announcement date, is communicated prior to the offer in but a small number of cases. Indeed, for many shelf offerings there is no identifiable announcement date prior to the actual offer. The only information available prior to the offer is the pricing of the deal itself at the issue date. Finding appropriate announcement dates for shelf offerings is thus challenging. However, finding them is key to this research as they identify the date at which information is communicated to the market (Henry & Koski, 2010).

The sample is obtained from the Securities Data Corporation (SDC) Global New Issues database by searching for all U.S. Public Common Stock firm commitment offerings that were issued between January 1, 2010 and December 31, 2011. Further data trimming is applied in line with (Henry & Koski, 2010) and (Safieddine & Wilhelm, 1996). IPOs, rights offerings, unit issues, closed-end funds, REITs, simultaneous international offerings, and offerings by non-U.S. firms are excluded from the sample. Additionally pure secondary offerings are excluded but mixed offerings containing both primary and secondary shares are included. The sample that remains contains 472 SEOs.

The announcement date for each SEO is gathered by searching the newswire services on Factiva. If the announcement occurs after trading hours the following trading date is assumed as the announcement date. Furthermore, some announcements may merely state the filing of the issue. Concerning these statements only announcements that contain information on the actual offer are counted as announcement dates (Henry & Koski, 2010).

Concerning the offer date, many of the issues are finalized after trading hours. As a result the offer dates reported by the SDC need to be correctly adjusted to account for this timing mismatch (Lease, Masulis, & Page, 1991). Corwin (2003) developed the volume correction procedure to account for offerings that occur after the close of trading. He notes that, if trading volume on the day following the SDC offer date is more than twice the trading volume on the SDC offer date and more than twice the average daily volume over the previous 250 trading days, the day following the SDC offer date should be assumed as the actual offer date.

Trade volume and return data, measured as the daily total raw number of stocks, is gathered from the Center for Research in Security Prices (CRSP) service between January 1 2009 and December 31 2011. The volume data is combined with the offer dates, acquired when creating the sample. Next, the trading volume on the day following the SDC offer date

(t=1) is compared with the trading volume on the SDC offer date (t=0), and the average daily trade volume over the [-251, -1] interval. This leads to 56.16% of the sample offer dates to be corrected. Stocks not containing sufficient information to perform the volume correction procedure are dropped. Leading to an adjusted sample of 292 SEOs.[9]

Furthermore, as an essential part of this research, stocks should be eligible for short selling. Following D'Avolio (2002), most stocks with prices less than $5 per share appear impossible to short. To account for this, firms with a stock price the day before the SEO issue date of less than $5 per share are dropped. This leads to a final sample of 239 offerings.

3.2 SEO sample characteristics

Table II provides the summary statistics for the SEO sample. The average offering held 12.88 shares, for an average of $276 million in proceeds. The mean relative offer size, which represents the ratio of the shares offered to the pre-issue shares outstanding, is 12.78%. Each market shows its own specific offering characteristics. The majority of the sample offerings (63%) are from firms listed on NASDAQ, the NYSE (31%) and AMEX (6%) account for a much smaller percentage of firms. However, shares offered, and corresponding offer price and proceeds, are by far the largest for the NYSE offerings. Additionally issue discounts and gross spread are smallest for the NYSE offerings.

The information contained in a shelf offerings is quite different from a non-shelf offering (Heron & Lie, 2004). The use of shelf registrations has increased dramatically in recent years (Autore, Kumar, & Shome, 2008; Bortolotti, Megginson, & Smart, 2008). Of the 239 offerings in the sample, 204 (85.4%) are shelf offerings. In contrast, only 5.4% of the SEOs in Heron and Lie's (2004) sample from 1980 to 1998 were shelf offerings. A more recent sample (from 2005 until 2007) showed only 63.5% of the SEOs being shelf offers (Henry & Koski, 2010).

Table II shows the summary statistics of the sample, it shows shelf offers tend to be offered by larger firms with higher stock prices and lower standard deviations of pre-offer returns. The issue discount is higher for shelf offerings (3.60%), than for non-shelf offerings (2.81%), reflecting information asymmetry (Altinkiliç & Hansen, 2003). The sample is divided into three subsamples based on the number of days between the announcement date (AD) and issue date (ID). This indicates the time span between the information released to the market and the actual issue.

Additionally rule 105 applies to short sales made within five days prior to the offering. As a result, it is not possible to engage in manipulative short selling if the AD is five or less trading days prior to the ID. As a result a preponderant part of the announcements (44.8%) is five or less trading dates prior to the offering, with an even larger amount of announcements at the issue of the offering (51.0%). In contrast with Henry and Koski (2010), only 4.2% of the announcements occurs more than five trading days prior to the offering. Due to a large number of stocks of AIG re-entering the market included in the relatively small (AD-ID)>5 subsample, this data may be biased (Ng & Smith, 2011).

In order to properly account for SEO specific information influencing results several variables, comparable to those included in the models of Henry and Koski (2010), described in Table II, are included. Shelf offers entail quite different market effects from non-shelf offers. To properly account for this the dummy SHELF is included which equals 1 if an offer

[9] See Appendix, Table I, Summary Statistics of the Volume Correction Procedure.

Table II.

Firm and offering characteristics for the SEO sample

		By Market			By Registration Method		By Length of Waiting Period		
	Total	NYSE	Amex	NASDAQ	Non-Shelf	Shelf	AD=ID	0<(AD-ID)<=5	(AD-ID)>5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
N	239	74	15	150	35	204	122	107	10
Shares offered (mil.)	12.88	23.50	6.84	8.25	7.78	13.75	12.22	11.35	37.30
Offer price ($)	21.46	31.97	12.26	17.20	19.56	21.79	19.15	24.53	16.80
Offer proceeds ($ mil.)	276.43	751.19	83.84	141.82	152.20	299.69	234.00	278.49	626.46
Relative Offer Size (%)	12.46	11.21	7.00	16.02	18.49	12.08	15.15	9.55	17.46
Gross Spread (%)	4.60	3.73	5.21	4.97	4.78	4.57	4.84	4.36	4.23
Close-to-Offer Return (%)	-3.49	-1.71	-3.11	-4.40	-2.81	-3.60	-3.97	-3.07	-2.16
Offer-to-Close Return (%)	3.17	0.90	2.46	4.37	3.35	3.14	3.67	2.71	2.10
Pre-Issue Shares Outstanding (mil.)	103.36	209.66	97.78	51.47	42.08	113.87	80.67	118.93	213.58
Pre-Issue Marketcap ($ mil.)	2687.70	6,871.00	1,745.51	718.15	973.48	2,981.80	1,695.01	3,507.83	6,023.03
Pre-Issue Volume (000s)	2897.32	5,967.24	1,362.64	1,536.30	681.72	3,277.45	3,082.09	2,801.48	1,668.66
Pre-Issue Date Closing Price	22.06	32.39	12.82	17.88	20.06	22.40	19.73	25.17	17.10
Issue Date Closing Price	22.00	32.23	12.72	17.88	20.10	22.32	19.71	25.06	17.13
Std Dev Returns (%)	2.74	2.18	4.90	2.81	2.81	2.73	3.28	2.28	1.11

This table gives mean values of various firm and offering characteristics for the sample of 239 SEOs from January 2010 through December 2011. Results are reported for the full sample (column 1), by market (columns 2-4), for shelf offerings versus non-shelf offerings (columns 5-6), and for different subsamples according to the length of the waiting period (columns 7-9). Offer Proceeds equals the Offer Price times the number of Shares Offered. Relative Offer Size is the number of shares offered as a percentage of Pre-Issue Shares Outstanding. Gross Spread is the gross underwriter spread on the deal. Close-to-Offer Return is the percentage difference between the closing price the day before issuance and the offer price. Offer-to-Close Price is the percentage difference between the Offer Price and the closing price on the day of issuance. Pre-Issue Shares outstanding, Marketcap, Volume, and Closing Price are all taken the day before the issue date. Std Dev Returns is the standard deviation of daily returns calculated over the 30 trading days ending 11 days prior to the offering.

is a shelf offer, and 0 otherwise. As issue characteristics differ greatly between the NYSE and the NASDAQ and AMEX, the dummy NYSE is included which equals one if an offer is made on the NYSE, and 0 otherwise. Furthermore the offer price is a variable that could influence post-issue stock performance as it sets an artificial benchmark for market prices. Therefore the variable PRICE, the price at which an offer is made, is included. To measure the impact the offer will have on the pre-issue equity value of a firm, the relative offer size, measured as the offer size divided by the pre-issue market value of equity, is included with the variable RELOFSIZE.

3.3 Unusual volume data

The previous chapter described the SEO dataset and supplied a list of companies, their corresponding event dates and summary statistics. In this paragraph the sample will be extended further by including unusual trade volume. The method to determine unusual trade volume is found in Akbas (2016) and is based on Gervais, Kaniel and Mingelgrin (2001). In these researches, unusual volume is measured by comparing a stock's average daily turnover over the week prior to the SEO announcement date (the *event period*; totaling five days, [-6, -2]), to the stock's previous 10 weeks of turnover prior to the SEO announcement date (the *reference period*; totaling 50 days, [-61, -12]). In this case, daily turnover is defined as daily total shares traded divided by the pre-issue total number of shares outstanding. In particular, a stock is classified as a low (high) volume stock if its event period volume is in the bottom (top) 20% of its 10-week reference period volume. This method categorizes a stock as either a low, normal or high volume stock by comparing its event period volume to its trading volume history. In this way absolute change, rather than relative change, in trading volume is captured.

Trading volume data and pre-issue total number of shares outstanding gathered in paragraph 3.1, are used to calculate the daily turnover. By calculating the average event period turnover and comparing this with the reference period daily turnover a stock is classified to fall in its corresponding tranche of trading volume. Using these tranches a stock can have high or low unusual volume (respectively indicated as D_HIGH and D_LOW) or normal trading volume (the reference group). Specifically, a dummy is constructed (D_LOW) that equals one if a stock's trading volume prior to an equity offering is classified as low, and zero otherwise. Similarly, the dummy D_HIGH equals one if a stock's trading volume prior to an equity offering is classified as high, and zero otherwise.

All stocks have complete daily trading volume data over the entire reference and event periods. However, there are sixteen observations with an average event period daily turnover higher than the maximum turnover of its reference period. It is unclear what might cause average event period turnover to exceed the maximum of the reference period turnover. Both Akbas (2016) and Gervais, Kaniel and Mingelgrin (2001) do not mention a similar observation. Following Chae (2005), a theoretical perspective could explain this anomaly by the fact that traders are unaware of the forthcoming event. The abnormal high turnover might therefore simply be due to coincidence or other external factors.[10] From a more practical perspective, however, this anomaly could be due to data errors such as

[10] See Chae (2005) who notes that if uninformed investors do not expect an announcement they cannot adjust their trading pattern. As a result, trading volume will not show any irregularities related to the unexpected announcement.

announcement date mismatches. Either way, in order to ensure that all high trading volume is accounted for a dummy is constructed for excessively high volume, D_EHIGH, which indicates that a stock's average daily event period volume is higher than the top quintile of its reference period volume.

By using dummies instead of continuous measures of unusual volume, it is possible to separately examine the effects of unusually high versus low volume shocks. As 40.17% of the offerings fall into the category of low trade volume, there is sufficient data to conduct the statistical analysis. Surprisingly enough, only a small percentage of the observations (6.69%) falls into the highest two categories, suggesting trading volume prior to SEOs tends to be low.[11]

3.4 Dependent variables

The goal of this research is to explain future performance by measuring pre-issue trading volume. There are several variables of interest that indicate a company's future performance. Akbas (2016) uses three measures, however only a firm's stock cumulative abnormal return is of interest to this research.[12] The cumulative abnormal return is defined as the accumulated difference between a firm's stock return and value-weighted market return over the three-day interval [-1, +1] around the announcement date (t=0). In a similar fashion Henry and Koski (2010) assess abnormal returns on the announcement date by comparing a firm's stock return with the value-weighted market return on that day. In particular their research looks at specific intervals prior to and subsequent to announcement and issue dates. For both measures, the CRSP Value Weighted Index is taken as an indication of the value-weighted market return. It contains the daily returns, excluding all distributions, on a value-weighted market portfolio. Abnormal returns are calculated with the following formula:

(1.) $$Abnormal\ returns_t = RETX_t - VWRETX_t$$

where $RETX_t$ is a stock's return without dividend at time *t*, and $VWRETX_t$ is the CRSP Value Weighted Index at time *t*, as gathered from the CRSP database.

Abnormal returns pose an interesting measurement of a firm's post-issue performance. Stock prices reflect changes in either expected cash flows or expected returns (Campbell, 1991). As equity offerings indicate firm-specific cash flow news, abnormal returns should capture essential information released by the announcement (Brav, Geczy, & Gompers, 2000). Additionally abnormal returns indicate the market's expectations of a firm's future cash flow, discounted into current market prices. However, returns capture more than just SEO announcement data, which could lead to a bias.

3.5 Firm specific control variables

In order to prevent the tests from capturing information besides the information release of the SEO, several firm specific control variables are included in the dataset in line

[11] See Appendix, Table III, Summary Statistics of the trading volume quintiles.

[12] Akbas (2016) also measures earnings surprises with standardized unexpected earnings using historical accounting information, and analyst forecast. However, both measures are related to earnings per share, which is a measure less applicable to research on equity offerings.

with Akbas (2016). First, firm size (SIZE) is included, calculated as the pre-issue shares outstanding times the pre-issue share price. A firm's size may influence the kind, size, and performance of the offering. Secondly, the book to market ratio (BM) is included, calculated as the pre-issue book to market value of equity. The book to market ratio shows the relative value of a firm and could therefore influence the market reactions to the issue of additional equity. The log of both variables is used in this research to mitigate skewness and outlier problems (Fama & French, 1992). In order to make sure abnormal returns are not subject to correlation between pre-announcement date returns and trade volume, the reference and event period returns (respectively RET50 and RET5) are included. They are calculated by taking the average of, respectively, the reference and event period daily stock returns. Return volatility (IVOL), calculated as the return volatility over the [-11, -2] interval, is included as it is closely related to trading volume (Wang, 1994). Finally, to prevent lagged trade volume from influencing abnormal returns, the reference period average turnover (TURN50) is included.[13]

[13] See Appendix, Table IV, Summary Statistics of the control variables, for an overview.

4. Unusually low volume predicting an offering firm's future performance

In this chapter the results of several statistical tests will be presented, which will shed more light on the information contained in low trading volume prior to equity offerings concerning a firm's stock future performance. First the general relation between the unusual volume quintiles and the abnormal return over the different time windows will be analyzed. Next, multiple regressions will be ran on the abnormal returns for the selected time windows with the dummy's for high and low trading volume, using firm and SEO specific control variables. Finally the hypotheses will be evaluated in light of these results.

4.1 Cumulative abnormal return and trading volume

4.1.1 Methodology

This paragraph will describe the relation between trading volume and abnormal returns in general. Using the tranches of trading volume, as calculated in paragraph 3.3, all stocks will be categorized into quintiles. The tranche of excessively high trade volume will be combined with the tranche of high trade volume to ensure there are enough observations in each category.[14]

Abnormal returns will be measured over several time windows around the announcement and issue dates in order to come to a general understanding on the different relations. The time windows over which the cumulative abnormal returns will be measured are as follows:

I. [AD-5, AD-1]
II. [AD-1, AD+1]
III. [AD]
IV. [AD+1, ID-1]
V. [ID]
VI. [ID+1, ID+5]

where AD is the announcement date and ID the issue date. The cross-sectional means for the cumulative abnormal returns over each time window will be calculated for each trading volume quintile, by running the following regression:

(2.) $$CAR_i[window_q] = \beta_1 \times D\_Quint1_i + \beta_2 \times D\_Quint2_i + \beta_3 \times D\_Quint3_i + \beta_4 \times D\_Quint4_i + \beta_5 \times D\_Quint5_i + \varepsilon_i$$

where $CAR_i[window_q]$ stands for the cumulative abnormal return for stock i over time window q; D_Quint1_i until D_Quint5_i define the dummy for each trading volume quintile.[15]

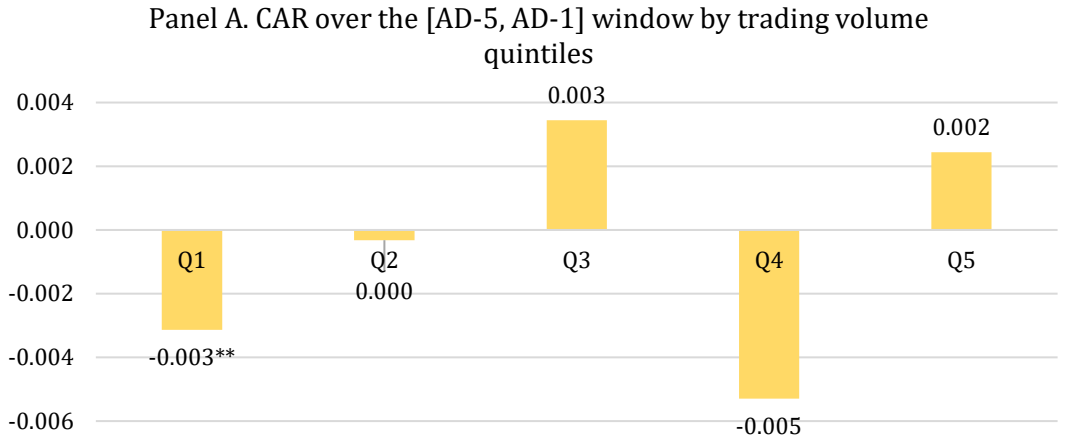
[14] See Appendix, Table V, Number of observations by trading volume quintile.
[15] See Appendix, Table VI, CAR over time windows I. until VI., by unusual volume quintiles, for the regression output.

4.1.2 Results

The results of the regression, as summarized in Table VI, are presented in Figure 1, Panels A until F, presenting time window *I*. until *VI.*, respectively.

Figure 1. CAR over time window I. until VI., by unusual volume quintiles

This figure presents the cross-sectional means of the cumulative abnormal returns, measured as the accumulated difference of the daily returns and the CRSP Value Weighted Index, over time window *I.* until *VI.*, by the unusual volume quintiles, as presented in Table V. ***, **, and * are indications of the significance at the 1%, 5%, and 10% levels, respectively.

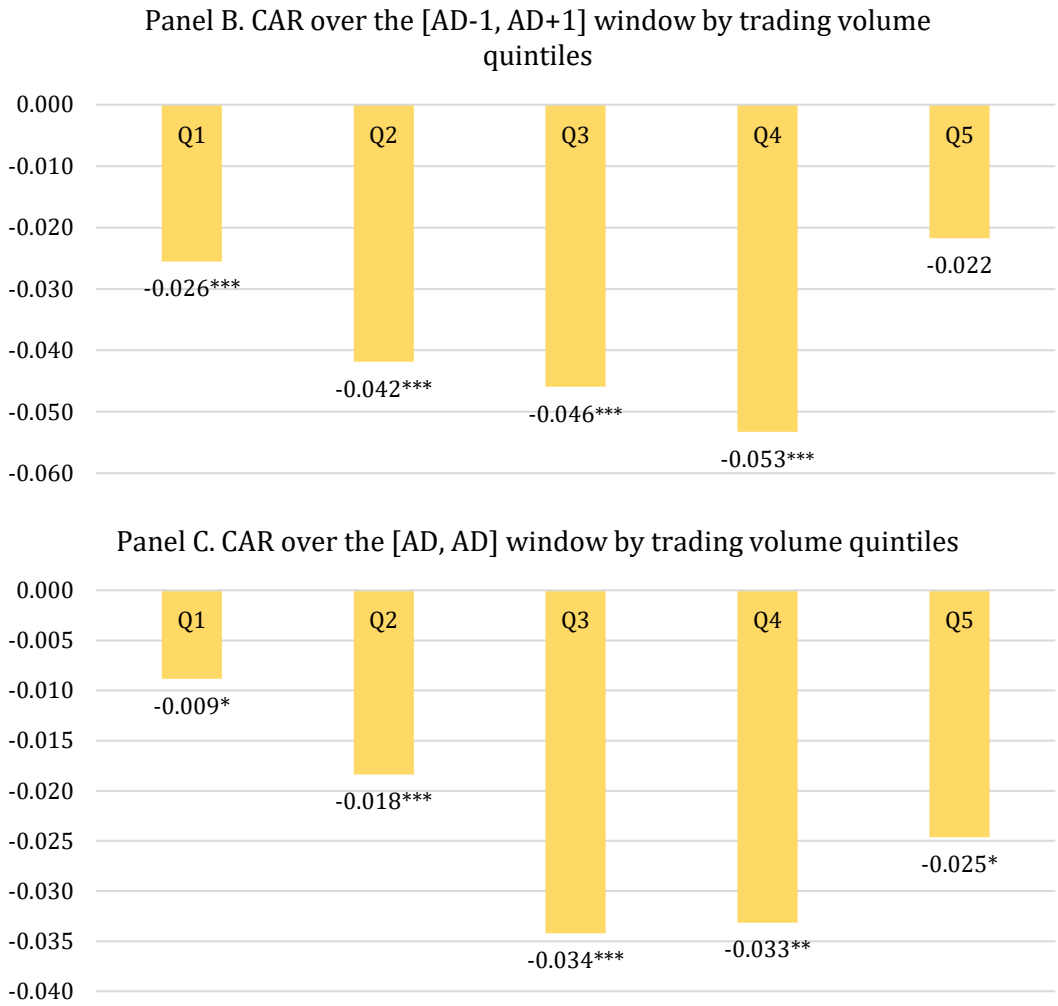


Panel A of Figure 1 presents the results of the regression of formula (2.) over the [-5, -1] window prior to the announcement date. Most of the quintiles seem to present non-significant results. Most of the results in Panel A are not significant, this can be explained by the fact that window *I.* represents a time window greatly overlapping the event period ([AD-6, AD-2]) over which the volume data is calculated. Only the first quintile, the quintile representing unusually low trading volume, seems to present a significant effect, at the 5% level, of -0.003. The significant relation between unusually low trading volume and the cumulative abnormal returns prior to the announcement date might be due to informed traders acting on their private information. As informed traders, expecting a SEO and subsequent price drops, act on their information by engaging in short positions. As a result they might signal to the market that bad news is on its way driving prices down. These findings could be in line with Akbas (2016), who finds that unusually low trading volume signals negative information.

More likely, however, is that the overlapping time windows lead to omitted variable biases or multicollinearity (Stock & Watson, 2015). Window *I.*, measures the dependent variable over the same time window as the independent variables. Therefore other variables, not accounted for, might influence the results. In all of the subsequent time windows, returns are measured out of the sample, after the event period. As Panel A is the only panel that shows very little relation between the quintiles and the abnormal returns, there might indeed be some degree of omitted variable bias or multicollinearity.[16]

[16] For an explanation of this relation see the Appendix, Addendum I, On the relation between the cumulative abnormal returns over the [-6, -2] window and the trading volume quintiles.

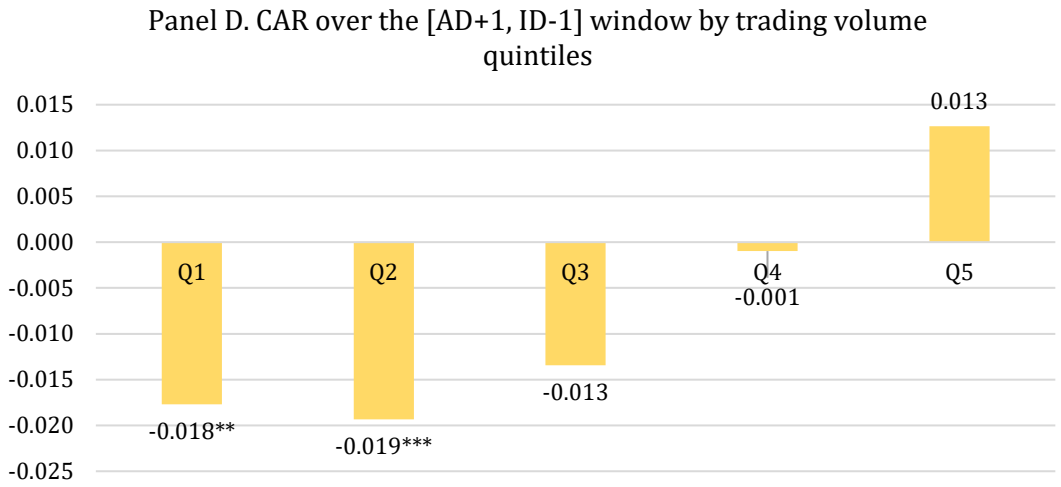
Figure 1. Continued



Panel B and C of Figure 1 present the results of the regression of formula (2.) over the [-1, +1], respectively [0, 0], window around the announcement date. The announcement date, together with the issue date, are the most important dates of interest concerning this research, as these are the dates on which information on the forthcoming event is first released to the market. Only the quintile indicating unusually high trading volume is not significant in Panel B. Regarding the other quintiles, both Panels seem to follow a linear pattern of a decreasing CAR with an increase in the quintile of trading volume. This result seems to suggest that unusually low trading volume possesses relatively positive information for the market about announcement returns of equity offerings. It shows that as trading volume increases the CAR on, and around, the event date decreases. This result is in contradiction with the finding of Akbas (2016) that unusually low volume preceding an expected event conveys negative information on a stocks future performance.

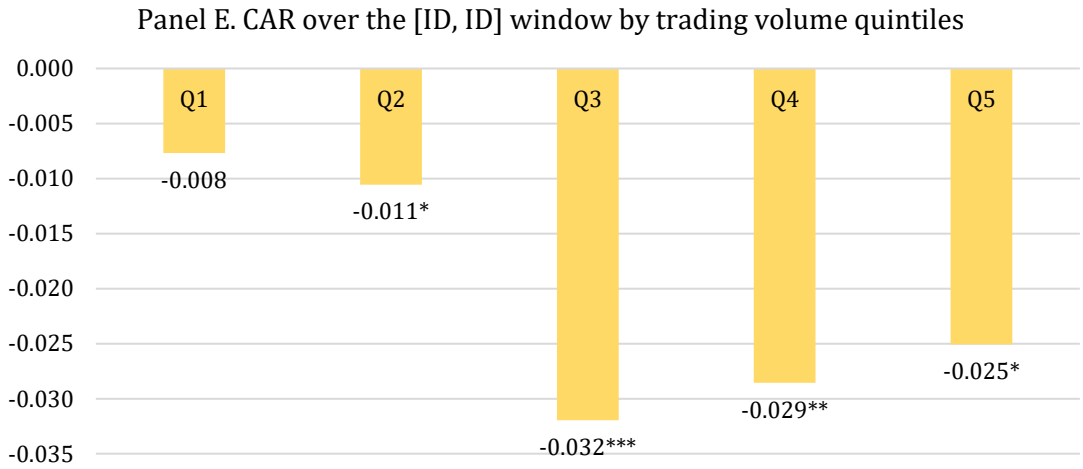
SEO announcements, however, are unexpected by nature. Thus informed investors are only those investors possessing inside information on the forthcoming announcement. Low trading volume might actually signal the market to adjust prices to the negative information contained in SEO announcements. As a result returns are less abnormal for stocks in the lowest quintile (Akbas, 2016).

Figure 1. Continued



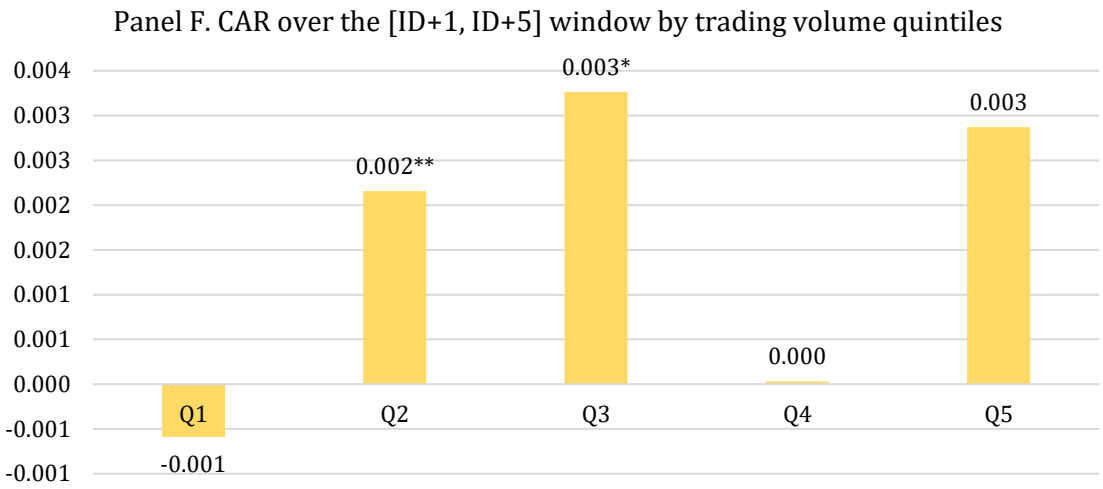
Panel D of Figure 1 presents the results of the regression of formula (2.) over the [AD+1, ID-1] window around the issue and announcement date. Most of the quintiles seem to hold results that are not significant. Only the two lowest quintiles present a significant relation between cumulative abnormal returns and trading volume. However, only a few firms have an issue date that is more than one day after the announcement date, largely due to the large amount of shelf offerings in the sample.[17] Therefore no statistical relevant inference can be made from this graph, as it is unlikely the conditions for the Ordinary Least Squares are met. Especially the normal distribution can be doubted as the standard error of the regression might be biased due to a small number of observations (Stock & Watson, 2015).[18]

Figure 1. Continued



[17] Only 35 offerings in the sample are non-shelf offerings, see Table II, Firm and offering characteristics for the SEO sample.

[18] There are only 47 observations in the [AD+1, ID-1] sample, see Appendix, Table VI, CAR over time windows I. until VI., by unusual volume quintiles.



Panel E and F of Figure 1 present the results of the regression of formula (2.) over the [0, 0], respectively [1, 5], window around the issue date. Only the first quintile of the abnormal return on the issue date is not significant, whereas the post-issue date results show significance only for the second and the third quintile. These panels show the relation between trading volume and (post-)issue date performance. The relation between trading volume and abnormal results on the issue date seems similar to that on the announcement date, although the pattern seems less linear. Additionally the difference between the lowest and the highest significant quintile (0.014 for the issue date results and 0.016 for the announcement date results) appear quite similar.

Regarding the cumulative abnormal returns in the post-issue period there seems to be an inverse relation. The lowest quintile of volume has the lowest CAR (-0.001) and the highest quintile the highest CAR (0.003) in the post-issue period, although both results are not significant. The difference between the effects for both observations can be explained by the effect of the issue on returns, which is usually negative (Ritter, 2003).

Overall the results of Panel B and C seem to suggest there is a significant positive relation between pre-announcement low trading volume and cumulative abnormal returns. Panel E shows a similar relation for cumulative abnormal returns on issue dates. The effect seems reversed for post-issue date returns, as is shown in Panel F. Taking these results into consideration, the next paragraph will more thoroughly evaluate the relation between low trading volume and abnormal returns around announcement and issue dates.

4.2 Regression analysis of low volume and future performance

4.2.1 Methodology

In this paragraph a cross-sectional ordinary least square regression will be performed exploring the relationship between unusual trading volume and a stock's future performance in the (post-)announcement, and (post-)issue, period. Several control variables, as mentioned in paragraph 3.2, will be taken into account to control for SEO specific information. Additionally several variables, discussed in paragraph 3.5, will be taken into account to control for firm specific information.

Some of these control variables might show considerable skewness or outliers, causing bias in the results. In order to ensure these factors do not influence the results the log values

of these variables are taken. Specifically, the natural logarithm is taken of PRICE, SIZE, BM and TURN50. As a result the firm specific control variables are Log_SIZE, Log_BM, Log_TURN50, RET5, RET50, and IVOL. The SEO specific control variables included are SHELF, NYSE, Log_PRICE, and RELOFSIZE.

To measure future performance, the cumulative abnormal returns for time window *II, III, V,* and *VI* are used as the dependent variable. In order to determine the effect of unusual trading volume the dummy's for low (D_LOW) and high (D_TotHIGH) are included. Incorporating the aforementioned variables, the following cross-sectional regression is ran:

(3.) $$Future\ performance_i = \beta_1 \times D\_LOW_i + \beta_2 \times D\_TotHIGH_i + \beta_x \times FirmControls_i + \beta_y \times SEOControls_i + \varepsilon_i$$

where i refers to a firm's stock, and $Future\ performance_i$ is the cumulative abnormal return of firm i's stock, measured over time windows *II, III, V,* and *VI*. $FirmControls_i$ refers to the firm specific control variables, as described in paragraph 3.5, for firm i. $SEOControls_i$ refers to the SEO control variables, as described in paragraph 3.2, for firm i. The regression is run using the aforementioned four different time windows. Additionally the results will be presented using either firm or SEO specific control variables, or both sets of control variables. Comparing the different models will provide the information necessary for answering the hypotheses and the research question.

4.2.2 Results

The results of the regression predicting future firm performance by unusually low volume, controlling for several firm and SEO specific characteristics, are presented in Table VII, Panels A until D, presenting the results for time window *II.*, *III.*, *V.*, and *VI.*, respectively.

The results of Panel A of Table VII present the regression output of formula (3.) over time window *II*. The low volume dummy (D_LOW) contains no significant information at any reasonable significance level on the CAR over the [AD-1, AD+1] period, for any of the models. In other words, low trading volume prior to SEO announcements cannot be said to hold significant positive information on the abnormal returns around SEO announcements. This is in line with Chae (2005) who argues no abnormal effects of low trading volume should be observed prior to unexpected announcements. Additionally this is in line with Henry and Koski (2010) who find that no informed short selling is observable around SEO announcements, meaning low trading volume cannot be expected to be informative. This seems to suggest evidence in favor of H1.

The high volume dummy (D_TotHIGH) is significant at the 10% level for model 1, including firm specific control variables, and significant at the 5% for model 3, including both firm, and SEO specific control variables. Interestingly enough, model 2 does not seem to be significant for either dummies. The effect of high trading volume on the abnormal returns can therefore be predicted by firm specific control variables, strengthening the results if SEO specific variables are included. The occurrence of high trading volume prior to SEO announcements can therefore be said to hold significant positive information on the abnormal returns around SEO announcements. This is in line with Chae (2005) who argues that, as opposed to low trading volume, high trading volume around announcements of unexpected events is informed. As a result high trading volume is found to hold significant

Table VII.

Unusually low volume as predictor of future firm performance

This table presents the results of the ordinary least squares regression using the abnormal returns over time windows *II.* (Panel A), *III.* (Panel B), *V.* (Panel C), and *VI.* (Panel D), as the dependent variable. CAR is the accumulated difference between the returns and the CRSP Value Weighted Index over the time windows. A stock is considered D_LOW (D_TotHIGH) if its trading volume is abnormally low (high), which is the case if its event period [-6, -2] turnover is in the bottom (top) tranche of the reference period [-61, -12] turnover, prior to the SEO announcement. The firm specific control variables (Log_SIZE, Log_BM, Log_TURN50, RET5, RET50, and IVOL) are described in Table IV. The SEO specific control variables (NYSE, SHELF, Log_PRICE, and RELOFSIZE) are described in Table II. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% levels.

Panel A. Unusually low volume as predictor of CAR over the [AD-1, AD+1] window

	1	2	3
D_LOW	0.0132	0.0131	0.0129
	(1.44)	(1.54)	(1.44)
D_TotHIGH	0.0342*	0.0211	0.0368**
	(1.84)	(1.24)	(2.07)
Log_SIZE	0.000397		0.000311
	(0.36)		(0.17)
Log_BM	-0.00600		0.000791
	(-1.45)		(0.18)
Log_TURN50	0.00556		0.00448
	(1.30)		(1.01)
RET5	-0.0657		-0.199
	(-0.23)		(-0.71)
RET50	-1.733*		-0.102
	(-1.78)		(-0.10)
IVOL	-0.788***		-0.622**
	(-2.91)		(-2.28)
NYSE		-0.0167*	-0.0249**
		(-1.71)	(-2.33)
SHELF		-0.0357***	-0.0270**
		(-3.39)	(-2.21)
Log_PRICE		0.00857**	0.0161**
		(2.17)	(2.07)
RELOFSIZE		-0.163***	-0.126***
		(-5.79)	(-3.48)
N	239	239	239
adj. R-sq	0.242	0.296	0.306

information on firm performance around SEO announcements.

The adjusted R-squared also increases from the model including just firm specific control variables to the model including SEO specific variables, and increases even further if both sets of control variables are included. The difference between model 2 and model 3, however, is quite small (0.01), while the difference between model 1 and model 3 is considerably larger (0.064). The additional explanatory power of combining firm and SEO

specific control variables is not very high, therefore firm and SEO specific control variables control for similar effects.

Table VII, continued

Panel B. Unusually low volume as predictor of CAR over the [AD, AD] window			
	1	2	3
D_LOW	0.0101	0.0117*	0.0104
	(1.45)	(1.72)	(1.49)
D_TotHIGH	0.0110	-0.00194	0.0123
	(0.78)	(-0.14)	(0.88)
Log_SIZE	0.00144*		0.000829
	(1.74)		(0.58)
Log_BM	-0.00417		-0.00124
	(-1.33)		(-0.37)
Log_TURN50	0.00739**		0.00693**
	(2.27)		(2.00)
RET5	-0.407*		-0.477**
	(-1.85)		(-2.18)
RET50	0.263		0.988
	(0.36)		(1.25)
IVOL	-0.673***		-0.570***
	(-3.27)		(-2.67)
NYSE		-0.00115	-0.0111
		(-0.15)	(-1.32)
SHELF		-0.0212**	-0.0139
		(-2.53)	(-1.45)
Log_PRICE		0.00378	0.0113*
		(1.20)	(1.85)
RELOFSIZE		-0.0755***	-0.0519*
		(-3.37)	(-1.83)
N	239	239	239
adj. R-sq	0.152	0.134	0.175

The results of Panel B of Table VII present the regression output of formula (3.) over time window *III*. The low volume dummy (D_LOW) contains slightly significant results, at the 10% level, for model 2. It seems that there is a slight positive effect of low trading volume on the CAR on the announcement date. The effect, and significance, however, seem to be small. Additionally the effect is only present in the model holding the lowest explanatory power (adj. R-sq is 0.134). Adding the firm specific control variables to the model reduces the significance of the low volume dummy. Low trading volume, again, seems to hold no significant information on the CAR on the announcement date, at least for models 1 and 3. This provides further evidence in favor of H1.

Panel A of Table VII already hinted at these results. There is only a slight difference between the time periods over which the CAR is measured in Panel A and Panel B. Panel B holds a more strict scope of the CAR around announcement days, merely taking into account

the CAR on the announcement date itself. It is therefore likely the significant effect of high trading volume on the CAR in Panel A is due to results prior, or subsequent, to the announcement date.

Overall Panel A and B, analyzing the relation between low trading volume and CAR around SEO announcements, show no significant effect of trading volume predicting CAR. The significant relationships found are likely due to a positive return after SEO announcements (considering the significance of high trading volume in Panel A), and omitted variable bias (as adding firm specific controls decreases the significance of the effect of low trading volume in Panel B). Comparing Panel A and B of Table VII with Panel B and C of Figure 1 supports these conclusions as low trading volume appears to be significantly related with CAR on, and around, announcements, when just taking into account volume. It is therefore likely the significance of Quint 1 is due to it capturing the effects of other factors, such as firm and SEO characteristics.

These observations seem to contradict the results of Akbas (2016). However, as opposed to earnings announcements, SEO announcements are unexpected by nature. The market is able to form an opinion, relatively informed, on a stock's performance prior to an expected event. However, it is impossible to expect the unexpected without private information on a forthcoming announcement.

Table VII, continued

Panel C. Unusually low volume as predictor of CAR over the [ID, ID] window

	1	2	3
D_LOW	0.00545	0.00621	0.00473
	(0.74)	(0.87)	(0.63)
D_TotHIGH	0.00358	-0.00767	0.00594
	(0.24)	(-0.54)	(0.40)
Log_SIZE	0.00143		0.00123
	(1.63)		(0.81)
Log_BM	-0.00505		-0.00247
	(-1.51)		(-0.69)
Log_TURN50	0.00643*		0.00712*
	(1.86)		(1.93)
RET5	-0.193		-0.248
	(-0.83)		(-1.07)
RET50	0.367		0.850
	(0.47)		(1.01)
IVOL	-0.669***		-0.592***
	(-3.05)		(-2.61)
NYSE		-0.00369	-0.0125
		(-0.45)	(-1.40)
SHELF		-0.0271***	-0.0213**
		(-3.06)	(-2.09)
Log_PRICE		0.00677**	0.0118*
		(2.04)	(1.83)
RELOFSIZE		-0.0555**	-0.0287

		(-2.35)	(-0.95)
N	239	239	239
adj. R-sq	0.090	0.087	0.114

The results of Panel C of Table VII present the regression output over time window *V*. The dummies for low and high trading volume hold no significant information on the CAR on the issue date. Additionally neither model seems to have a large explanatory power, when comparing Panel C to Panel A and B of Table VII. The dummy for shelf offerings, SHELF, however, does appear to be strongly significant at the 1% level. Shelf offers are often most unpredictable and are often announced on the same date they are issued. Indeed Table II shows that a large amount of offers are made on the day they are announced. Therefore, comparing Panel C to Panel B of Table VII, the dataset will contain largely similar data for the CAR on the announcement, and issue date, as in many cases the announcement dates are equal to the issue dates. It can thus be argued that the significance of SHELF indirectly shows the difference between the gap in time between the announcement and issue date and the time the market has to react to announcements.

Following this argumentation it should be concluded that these results further prove that investors without private information cannot react to unexpected events. As a result no significant informed trading takes place around SEO announcements in general, and issues of shelf offers whose announcement and issue dates coincide. This provides evidence against H2, as no significant relation is found.

Table VII, continued

Panel D. Unusually low volume as predictor of CAR over the [ID+1, ID+5] window

	1	2	3
D_LOW	-0.00303**	-0.00292**	-0.00359***
	(-2.40)	(-2.34)	(-2.79)
D_TotHIGH	0.00164	0.00100	0.00220
	(0.64)	(0.40)	(0.86)
Log_SIZE	-0.000339**		-0.0000549
	(-2.24)		(-0.21)
Log_BM	0.000420		0.000919
	(0.73)		(1.49)
Log_TURN50	-0.00201***		-0.00159**
	(-3.39)		(-2.50)
RET5	0.0536		0.0458
	(1.34)		(1.14)
RET50	0.427***		0.489***
	(3.17)		(3.38)
IVOL	-0.0628*		-0.0787**
	(-1.67)		(-2.01)
NYSE		-0.00356**	-0.00397**
		(-2.48)	(-2.59)
SHELF		-0.00101	-0.00177
		(-0.66)	(-1.01)

Log_PRICE		0.00111*	0.000184
		(1.92)	(0.17)
RELOFSIZE		0.00522	-0.00375
		(1.26)	(-0.72)
N	239	239	239
adj. R-sq	0.079	0.037	0.092

The results of Panel C of Table VII present the regression output over time window *V*. The dummy for low trading volume contains significant negative information on the CAR over the [ID+1, ID+5] time window. It is interesting to see this effect, as the event and reference period are prior to SEO announcement dates, not issue dates. The argument can be made again that, as announcement and issue dates coincide for many of the offers, these results seem to present an effect of low trading volume not observable on the issue date but subsequent to it. However, the effect of the dummy SHELF is not significant in this Panel. Therefore the effects of low trading volume on post issue stock performance cannot be related to the offer type (either shelf or non-shelf). It is therefore also unlikely the effect is related to the time span between the announcement and issue dates.

It might make more sense to put forward the argument that the real effect of a SEO is observed at the issue of additional equity, not the announcement of the issue. Indeed many of the well-known anomalies around SEOs occur at the issue, e.g. issue discounts and price dilution (Ritter, 2003). Both aforementioned anomalies are related to negative price effects, reflected in the negative component of the effect of low trading volume in Panel D. Comparing the data of Panel C to Panel D, Panel C contains the abnormal return on the issue date, on which the stock price is adjusted to the offer price (Altinkiliç & Hansen, 2003). On the days subsequent to the offer date stock prices should stabilize (Henry & Koski, 2010). The results of Panel D seem to signal that abnormal low trading volume prior to SEO announcements contains negative information concerning post-issue abnormal returns. This observation might be due to pessimistic insiders, acting upon their information under heavy short sale constraints. As the issue information becomes public the market considers whether the offer price is set at the right level. If the expectations of the market on a firm's stock are more negative prices will continue to underperform the market. This pessimism could be signaled by low trading volume.

Comparing the results of this paragraph to that of paragraph 4.1, there are relatively few significant results. This is especially interesting concerning the issue date results. The significance seems reversed for the results from paragraph 4.1 to paragraph 4.2. No significant observations can be made concerning the issue date, taking into account several control variables. Significance is observed taking into account just the volume quintiles. The opposite holds for post-issue stock performance. Regarding the announcement date effects, taking into account firm and SEO specific control variables leads to low trading volume losing its significance as opposed to paragraph 4.1. It should therefore be concluded that there is nog significant effect of just low trading volume on a stock's announcement date performance.

4.3 Evaluating the hypotheses

Drawing from prior research regarding equity offerings and trading volume chapter 2 developed several hypotheses aimed at exploring different parts of the relation between low trading volume prior to event announcements and seasoned equity offerings. The first hypothesis is:

H1: There is no significant relationship between low trading volume prior to SEO announcements and announcement date stock performance.

Evaluating the results from paragraph 4.1, a significant relation between the low volume quintile and announcement date stock performance was shown to exist both on and around SEOs. However, including firm and SEO specific control variables into the analysis, paragraph 4.2 showed no significant relation to persist between low trading volume prior to SEO announcements and announcement date stock performance. It should therefore be concluded that the results of paragraph 4.1 simply show a significant relation, not a significant effect of low trading volume on announcement stock performance. The results of paragraph 4.2 show the actual effect is caused by factors other than low trading volume. H1 can therefore not be rejected. The results show no significant relation between low trading volume prior to SEO announcements and announcement date stock performance.

Continuing with the second relevant event concerning SEOs, namely the issue, the research aimed to discover if there might be any effect of low trading volume on issue date stock performance. Therefore the second hypothesis is:

H2: There is a significant negative relation between low trading volume prior to SEO announcements and issue date stock performance.

Paragraph 4.1 showed no significant relation between the lowest volume quintile and issue date stock performance. Additionally, the more elaborate model from paragraph 4.2 did not show any significant relation either. An explanation for this inability to find any significant relation between low trading volume and issue date stock performance might be due to the period over which trade volume is measured, which is prior to the announcement, not the issue. The announcement of the issue most likely takes away the surprise effect of the event. Therefore research into trading volume prior to the issue date of SEOs and corresponding stock performance might prove better results. However, the intention of this research was to explore trading volume prior to an unscheduled event. At the announcement the forthcoming SEO becomes a scheduled event, as a result trading volume after the announcement falls outside the scope of this research. The results show no significant effect of trading volume prior to the announcement date on the issue date stock returns in either tests. H2 should therefore be rejected.

Some of the anomalous effects surrounding SEOs are concerned with post-issue performance. To see whether there is an effect of low trading volume prior to announcements related to these anomalies the third hypothesis is:

H3: There is a significant negative relation between low trading volume prior to SEO announcements and post-issue date stock performance.

The results of paragraph 4.1 compared trading volume quintiles to the post-issue abnormal stock returns. No significant relationship was found for the lowest quintile. This would be in line with the findings of the previous results that low trading volume prior to a SEO announcement does not entail any significant effect. However, the results of formula (3.) showed a significant negative effect of low trading volume for all three models. This is interesting as this seems to contradict the findings of the first two hypotheses. Furthermore, it seems to contradict the theoretical foundations suggested for the results of the first two hypotheses. However, a viable explanation might be that low trading volume prior to SEO announcements is actually due to investors acting upon their information and expectations of the forthcoming event. The expectations they form however are not confirmed in the announcement, or issue, but in the post-issue period. The information held in low trading volume prior to SEO announcements does not signal any direct effect, however does signal a more fundamental effect of long-term stock underperformance, a well-known SEO anomaly (Ritter, 2003). This would be contrary to the findings of Chae (2005) and Henry and Koski (2010) as both do not acknowledge any effect of informed low trading volume prior to SEO announcements. However, both researches do not look at lagged effects that low trading volume might entail. It goes beyond the scope of this research to look further into the specific characteristics of this effect. Still, the results show a significant negative relation between low trading volume prior to SEO announcements and the cumulative abnormal return over the days following the issue date. H3 can therefore not be rejected.

5. Conclusion

This research set out to explore the other side of trading volume, i.e. low trading volume. Specifically it looked at the informational content of low trading volume on post-event period stock performance. Akbas (2016) was the main inspiration for the empirics and theoretical background of this research. Elaborating on his study of low trading volume prior to scheduled corporate events, this research explored the other side of low trading volume prior to scheduled corporate events, i.e. unscheduled corporate events. Taking a SEO as an example of an unscheduled corporate event the research question was:

I. *To what extend does unusually low trading volume prior to seasoned equity offerings contain information on a firm's stock performance?*

Assembling a relevant dataset for performing the statistical tests showed some complications due to data availability and data processing. Especially determining the proper announcement dates proved challenging. However, an elaborate dataset of 239 SEOs and corresponding information was successfully composed.

Through several tests the relation between trading volume prior to SEO announcements and subsequent stock performance was analyzed. Taking a general approach at first, looking at just the relation between volume and abnormal returns, allowed this research to evaluate this relation from a broad perspective. Depending on the period over which the abnormal returns were measured the relation and its significance changed considerably. After selecting the most relevant time periods a more specific evaluation was conducted. A model including control variables for firm and SEO specific characteristics searched for effects solely attributable to trading volume. Interestingly, all relations that were significant in the first model, lost their significance in the second model. As a result H1 could not be rejected, concluding that, indeed, there is no significant relation between low trading volume prior to SEO announcements and announcement date stock performance. Furthermore H2 was rejected as no significant relation was found between low trading volume and issue date stock performance. The relation between trading volume and post-issue abnormal returns was not significant in the first model. In the second model, however, the relation was significant. Therefore H3 could not be rejected. It should therefore be concluded that low trading volume prior to SEO announcements signals a significant negative effect on post-issue stock performance. Concluding, unusually low trading volume prior to SEOs does not in general contain information on a firm's stock performance. However, low trading volume does hold significant negative information on a firm's stock performance in the post-issue period.

This would pose an interesting topic for further research. Low trading volume prior to SEOs might hold no information on a stock's performance in the short run, but does hold some information on stock performance in the long-run. This might be especially interesting as prior research has shown that stocks seem to underperform in the post-issue period. Low trading volume prior to SEO announcements might signal negative information on the underperformance, i.e. a stronger underperformance. Including short interest rates, and other proxies of short selling, such as call and put option trading, could also increase the validity of these tests. It would ensure low trading volume is caused by informed investors

rather than other external influences. The fact that short selling is not a specific part of the empiric analysis of this research could be seen as an additional limitation.

Further research assessing pre-issue trading volume in relation to issue date stock performance, and post-issue long-run underperformance might also prove interesting, especially in the light of the growth of shelf offerings. The analysis of SEOs requires a critical assessment of information releases and actual events (i.e. the announcement and issue dates) as these often coincide for shelf offers. This poses some challenges as issues should sometimes be considered scheduled (if the announcement occurs prior to the issue), and sometimes not (if the announcement and issue coincide).

Varying time spans between issue and announcement dates also proposed a limitation for this research. Although in the final model a dummy for shelf offerings is included, properly assessing information releases is complicated for SEOs. If announcement dates are improperly established, the stock market reaction is also improperly matched to the event. Paragraph 3.1 performed some procedures aimed at eliminating this data mismatch. Still, some mistakes could have been made due to the lack of officially registered announcement dates for SEOs.

Finally, this research set out to develop and explore the existing empirical research on low trading volume by evaluating the relation between low trading volume and seasoned equity offerings. The most important contribution of this research is that no significant relation is present between low trading volume prior to the announcement of a SEO and announcement and issue date stock performance. However, at the other side, there is a significant negative effect of low trading volume prior to SEO announcements on post-issue stock performance.

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Appendix

Table I.

Summary statistics of the volume correction procedure

Conditions	Number of issues	Relative number of issues
Condition 1 is met	167	57.19%
Condition 2 is met	239	81.85%
Both conditions are met	164	56.16%

This table presents the results of the Volume Correction Procedure. Using two conditions relative trading volume is assessed. Condition 1 holds if trading volume on the day after the SDC offer date is more than twice the trading volume on the SDC offer date. Condition 2 holds if trading volume on the day after the SDC offer date is more than twice the average trading volume over the [-251, -1] interval prior to the SDC offer date. The relative number of issues gives the percentage of the total sample of 239 offers that meets either, or both, conditions. The offer date is corrected if both conditions are met.

Table III.

Summary statistics of the trading volume quintiles

Volume quintile	# of observations	Relative # of observations
Quintile 1 (D_LOW)	96	40.17%
Quintile 2	85	35.56%
Quintile 3	27	11.30%
Quintile 4	15	6.28%
Quintile 5 (D_HIGH)	5	2.09%
Quintile 6 (D_EHIGH)	11	4.6%

The table presents the number of observations per unusual volume quintile for the SEO sample. Unusual volume is measured as the absolute change in trading volume in the event period, relative to the reference period. This procedure is executed for each stock, classifying them in each of their corresponding quintiles, depending on the absolute change in trading volume. The lowest quintile contains the lowest trade volume (the average event period volume is in the bottom 20% of the reference period volume) and the highest quintile contains the highest trade volume (the average event period volume is higher than the highest reference period volume). The relative number of observations gives the percentage of the total sample of 239 offers per quintile.

Table IV.

Summary statistics of the control variables

	Mean	Median	STD	P_10	P_25	P_75	P_90
SIZE	2.82	0.67	6.91	0.15	0.31	1.50	6.01
BM	0.65	0.54	0.53	0.09	0.26	0.88	1.30
RET50	0.31	0.25	0.46	-0.13	0.04	0.51	0.85
RET5	0.16	0.19	1.53	-1.75	-0.58	0.84	1.78
TURN50	0.01	0.01	0.01	0.00	0.01	0.01	0.02
IVOL	0.03	0.03	0.02	0.01	0.02	0.04	0.05

This table presents the summary statistics of various firm characteristics for the SEO sample. SIZE is the pre-issue market value of equity (in billions). BM is the pre-issue ratio of the book value to the market value of equity. RET50 is the 50-day reference period return (in percent) computed over the [-61, -12] interval prior to the SEO announcement date, RET5 is the return (in percent) computed over the [-6, -2] interval prior to the SEO announcement date. TURN50 is the average turnover over the [-61, -12] interval prior to the SEO announcement date. IVOL is the standard deviation of daily returns calculated over the 10 days [-11. -2] interval prior to the SEO announcement date.

Table V.

Number of observations by trading volume quintile

	Quint 1	Quint 2	Quint 3	Quint 4	Quint 5	Quint 6
Number of observations	96	85	27	15	5	11

This table presents the number of observations per trading volume quintile. Stock's are categorized based on the relation between the event period [-6, -2] average daily turnover and the reference period [-61, -12] daily turnover, prior to the SEO announcement date. This puts each stock in its corresponding volume quintile ranging from 0-20% (Quint 1), until 100-120% (Quint 6).

Table VI.

CAR over time windows *I.* until *VI.*, by unusual volume quintiles. Regression output for:

$$CAR_i[window_q] = \beta_1 D\_Quint1_i + \beta_2 D\_Quint2_i + \beta_3 D\_Quint3_i + \beta_4 D\_Quint4_i + \beta_5 D\_Quint5_i + \varepsilon_i$$

	I.	*II.*	*III.*	*IV.*	*V.*	*VI.*
Quintile 1	-0.00313**	-0.0255***	-0.00884*	-0.0177**	-0.00770	-0.000588
	(-2.01)	(-3.67)	(-1.66)	(-2.26)	(-1.38)	(-0.60)
Quintile 2	-0.000321	-0.0418***	-0.0184***	-0.0193***	-0.0105*	0.00216**
	(-0.19)	(-5.65)	(-3.25)	(-3.19)	(-1.78)	(2.08)
Quintile 3	0.00344	-0.0459***	-0.0342***	-0.0134	-0.0320***	0.00326*
	(1.17)	(-3.50)	(-3.42)	(-0.63)	(-3.03)	(1.77)
Quintile 4	-0.00530	-0.0533***	-0.0331**	-0.000976	-0.0285**	0.0000299
	(-1.35)	(-3.02)	(-2.47)	(-0.06)	(-2.02)	(0.01)
Quintile 5	0.00244	-0.0217	-0.0247*	0.0126	-0.0251*	0.00287
	(0.64)	(-1.27)	(-1.89)	(0.42)	(-1.83)	(1.20)
N	239	239	239	47	239	239
adj. R-sq	0.011	0.210	0.111	0.187	0.065	0.018

This figure presents the cross-sectional means of the cumulative abnormal returns for each stock *i*, measured as the returns minus the CRSP Value Weighted Index, over time window *q*, where *q* is *I.* until *VI.*, by the unusual volume quintiles, as presented in Table V. ***, **, and * are indications of the significance at the 1%, 5%, and 10% levels, respectively.

Addendum I.

On the relation between the cumulative abnormal returns over the [-6, -2] window and the trading volume quintiles

The relation between the cumulative abnormal returns over the [-5, -1] window and the trading volume quintiles is due to the trading volume quintiles being related to the average event period volume measured over the [-6, -2] window.

$$Event\ period\ volume_i\ (EPV_i) = \sum_{t=-6}^{t=-2} \frac{Vol_{i,t}}{5}$$

where Vol is the daily turnover for a firm's stock i, at time t, where t = 0 is the announcement date.

$$EPV_i = \left[\frac{\left(Max\left(Vol_{i,p}\right) - Min\left(Vol_{i,p}\right)\right)}{5} * (n+1) + Min\left(Vol_{i,p}\right)\right] - \left[\frac{\left(Max\left(Vol_{i,p}\right) - Min\left(Vol_{i,p}\right)\right)}{5} * n + Min\left(Vol_{i,p}\right)\right]$$

The quintile of trading volume n, is the tranche of trading volume EPV_i belongs to. It depends on the trading volume in the reference period p, measured over the days [-61, -12] prior to the earnings announcement, and the maximum and minimum trading volume during that period. This formula shows that the quintile of trading volume is dependent on the event period volume, which is measured over the [-6, -2] window.

$$Cumulative\ Abnormal\ Returns\ _i(CAR_i) = \sum_{t=-5}^{t=-1} Ret_{i,t} - VWRet_{i,t}$$

where RET is the daily return of stock and VWRET is the Value Weighted CRSP Index. The dependent variable in the first regression described in paragraph 4.1 is the CAR over the [-5, -1] window which clearly coincides with the event period volume time window [-6, -2]. As this is the only time window in which the results are not measured out of sample, there is likely less statistical relevance of the results.