

# Short selling, subscription period price movements, and the attractiveness of rights issues to shareholders – a cross country study<sup>\*</sup>

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## Abstract

Rights issues are designed to safeguard shareholder interests, so it is puzzling that they tend to attract low small shareholder participation and have largely disappeared in some major markets like the US. We study a critical vulnerability faced by uninformed shareholders in a rights issue that arises from short selling activity. Using a comprehensive dataset of 10,952 rights issues in 43 countries, we document a significant decline in price and issue discount during rights subscription period that can be explained by firm-level and market-level proxies for short selling constraints. Short selling activity also increases before and unwinds sharply after the close of a rights issue. Our results are supported by an identification strategy based on a regression discontinuity design that exploits a naked short sale regulation in Australia. Overall, our evidence highlights the need for strengthening regulations of rights issues, especially in trading environments where short-sales related investor protection is still arbitrary.

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## 1. Introduction

*“In current market conditions, there is increased potential for market abuse through short selling during rights issues. As a result there has been severe volatility in the shares of companies conducting rights issues. This is potentially damaging not only to the issuers in question but also to confidence in the overall fairness and quality of the UK market. It can be particularly prejudicial to the interests of small investors.”*

*FSA Press Release, 13 June 2008*

On the 13<sup>th</sup> June 2008, the Financial Services Authority (FSA) of the United Kingdom introduced mandatory disclosure of short positions in stocks undertaking rights issues. Although this directive is part of a suite of measures aimed at curbing excess volatility during the Global Financial Crisis, it highlights that the FSA was particularly concerned about a significant perceived risk in the rights offering process. Indeed, the situation around rights offerings is a special one. These transactions often play out over a prolonged duration, adding a degree of execution risk for the offeror and creating vulnerability for small uninformed shareholders (Holderness and Pontiff, 2015). Short selling activity can complicate the rights offering process by creating temporary excess volatility and making stock prices potentially less informative. The possibility that short sales can distort the integrity of a seasoned equity offer is modelled in Gerard and Nanda (1993) and in the specific context of a rights offering, this risk is further exacerbated by the fact that the offer price is fixed at the announcement date (Eckbo and Masulis, 1992).

These concerns over potential adverse effects of short selling activity directly challenge the legal doctrines that historically created rights offerings as a way to safeguard interests of minority shareholders. The conventional wisdom is that – due to their legal structure – rights offerings provide a fair and equitable means for raising capital. This stems

from the “right of first refusal” principle, enshrined in company laws and corporate charters around the world, which requires that, without a shareholder resolution to the contrary, a seasoned equity offering (SEO) must be sold as a “rights offer” to existing shareholders (Eckbo, 2008). Other important regulations include the transferability of rights, which enables shareholders to trade their rights if they do not wish to partake in the offering, and uniform offer schedules, which allow shareholders to have sufficient time to consider an offer. Their general aim is to protect shareholders, particularly minority shareholders, from wealth transfers and dilution that can occur when new shareholders subscribe to the offering (Myners, 2005).

But do these mechanisms provide sufficient protection for shareholders in a rights issue? The FSA’s action mentioned above suggests that this might not be the case. Further, a number of recent corporate scandals<sup>4</sup> seem to demonstrate that the rights offering process can in fact be abused. Indeed, similar concerns have been raised in the existing academic literature as an explanation for the demise of rights offers in the US. Holderness and Pontiff (2015) explain the lack of US rights issues by arguing that they do not provide sufficient protection to uninformed or irrational existing shareholders. They suggest that rights offerings tend to transfer wealth to blockholders, insiders, and institutions at the expense of, typically smaller, individual shareholders. Such findings are also mirrored by Kothare (1997) who document that blockholder and insider ownership increases around rights offerings, and the Finnish study by Rantapuska and Knupfer (2008) that shows that unsophisticated shareholders are less willing to participate.

The wealth transfer hypothesis of Holderness and Pontiff (2015) and Kothare (1997)

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<sup>4</sup> For example, the £4 billion rights offer failure by HBOS in 2008 in the UK illustrates the substantial consequences of short selling during rights offers. Over the course of the two month offering, HBOS share price collapsed as it emerged that Harbinger Capital had naked short sold £300m-worth of HBOS shares. By the end of the offering, HBOS’s market price had dropped over 50 percent breaching its issue price in the process. A lack of shareholder subscription (8.3 percent take-up) forced underwriters Morgan Stanley and Desdner Kleinwort to take-up 1.375bn shares.

does not delve into how some market participants can take advantage of the rights offering process at the expense of existing (small) shareholders, but it is well established in the broader context of SEOs that short selling activity is a potential avenue. Safieddine and Wilhelm (1996) documented that, in the US, it is common for traders to establish short positions prior to seasoned equity offerings (SEOs) to create an artificial discount in the price of new shares. It is often difficult to disentangle whether such trading was driven by ‘manipulation’ or ‘information’, but regardless, the gravity of the threat was enough for the Securities and Exchange Commission (SEC) to adopt rule 10b-21 on August 25, 1988 in response to short selling practices around SEOs.<sup>5</sup>

The rationale behind this concern is formalised in Gerard and Nanda (1993). Their model predicts that, because the issue price of an equity offer is set (at a discount to the market price) with consideration for secondary market order flows, a strategic informed trader can conduct manipulative trading in a way that decreases the informativeness of order flows, thereby worsening the winner’s curse problem and forcing a larger issue discount. This means that even if an informed trader has positive information, he/she has an incentive to (short) sell shares in the secondary market to conceal his/her information prior to the SEO.

It is important to point out that SEOs in the US (as the setting of the Gerard and Nanda (1993) model), which are mainly *underwritten firm-commitment offerings*, differ quite significantly from the traditionally understood ‘rights offering’ process in an international context. Nevertheless, the characteristics of a rights issue are similar enough to potentially lend itself to the same concerns over short selling activity raised by the SEC. Extending the Gerard and Nanda (1993) theory, it is possible that informed investors in a rights offering could plausibly use short selling to create pressure on stock prices and/or make it less

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<sup>5</sup> 10b-21 prohibited the use of shares purchased at the offer price of an SEO to cover short positions established after the filing of a registration statement.

informative. By doing so, these short sellers may benefit from wealth transfers to the extent that other (mainly uninformed) rights holders do not subscribe to their rights. When uninformed shareholders sell their rights by themselves in the market, allow brokers to sell rights on their behalf, or forfeit rights altogether, informed investors can potentially pick up these shares/rights cheaply. In this regard, informed investors have an incentive to make stock prices less informative.

Another non-information-asymmetry based explanation of short selling activity around a right issue is raised by Eckbo and Masulis (1992). They suggest that such activities occur simply because the mechanical characteristics of rights offerings reduce the cost of hedging short positions. As more short positions are opened during the offering, the resulting sell orders reduce the market price making it less attractive for stockholders to exercise their rights.

In light of the above theoretical explanations and the puzzling phenomenon of low shareholder take-up in rights issues, our study investigates whether short selling activity actually increases during the process of completing a right issue, making it less attractive for existing shareholders. We measure the effect of such activity by analysing stock returns of rights-issuing firms during the rights subscription period and whether proxies for short selling incentives and constraints at the market and firm levels can explain such returns.

The majority of studies in the extant rights offering literature have focused on the informational content released at *the announcement date* of an issue (for a review, see Eckbo, Masulis and Norli, 2007). Our study differs as it focuses on the *rights subscription period* that follows the announcement – from the ex-date to the close of the offer – a period generally not characterised by new information events and one that has surprisingly been

neglected by the extant literature.<sup>6</sup> To do this, we construct a dataset comprising 10,952 international rights offerings by 7,260 firms in 43 countries from 2002 to 2014 which, to the best of our knowledge, is the most comprehensive international dataset on rights issues in the extant literature.

The baseline finding of our study is that, around the world, there is a significant decline in price and a corresponding erosion of issue discount over a rights subscription period. Issuing firms experience, on average, a negative 4.1 percent abnormal return and a 6.2 percentage point erosion of issue discount from the ex-date of a rights offering to the subscription end date.. We also find that the decline largely stops around the end of the subscription period and in some cases reverts to a positive return after this date. This price pattern that we document is highly perplexing, given that post the announcement date, the closing of a rights issue should be a non-information event, and hence, from an efficient market perspective, one should not expect any price trend.

Does short selling activity contribute to explaining this puzzling price phenomenon? As a first step to address this question, we explore several firm and issue characteristics that potentially explain the cross-sectional variations in subscription period price decline. We find that the decline is more significant for firms that are illiquid, have less information transparency, have more insider ownership, and have a greater stock price run-up prior to the commencement of the offering. In addition, rights issues with larger discounts, more generous offering ratios, and shorter durations tend to exhibit more negative subscription period returns. We argue that these characteristics are related to short selling incentives. For example, from a risk perspective, Eckbo and Masulis (1992), hedging short positions using

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<sup>6</sup> Technically, the ‘rights subscription period’ could also be considered as the period between the subscription start date and the subscription end date (i.e., the time period that rights holders can subscribe to their rights). In most cases, the ex-date and the subscription start date are very close together; thus, for the purposes of this paper, we consider the ‘rights subscription period’ as the ex-date to the subscription end date

rights is arguably more attractive when the issue is shorter, the company is more illiquid and when the stock price has experienced a large run-up prior to the offering. With a manipulation explanation, as raised by Gerard and Nanda (1993), short selling activities may propagate in firm environments with a high level of information asymmetry and significant scope for wealth transfers from uninformed investors.

Gerard and Nanda (1993) raise an important caveat in their theory that, empirically, not all observed short selling activity in an SEO context is for the purpose to conceal real information, but instead can be driven by private information (see e.g., Diamond and Verrecchia, 1987; Aitken, Frino, McCorry and Swan 1998; Boehmer and Wu, 2013). Our setting is based on the rights subscription period, which occurs well after the announcement of a rights issue and therefore should not, on average, produce new information. Nevertheless, this assumption may not always hold, and thus we also explore whether the observed pattern in rights subscription period return reflects informed trading. If this is the case, then one would *not* expect the negative prices during rights offerings to reverse after the offering. However, we actually find evidence indicating such a reversal. In all specifications that we examine, there is a strong negative correlation between returns during the subscription period and returns after the offering.

Motivated by the above evidence, we conduct a number of analyses that examine the role of short selling activity on the rights issue process more directly. We begin by examining the efficacy of different short selling constraints, imposed by regulators around the world, in mitigating the negative subscription period price pressure induced by short sales. In doing so, we closely follow the works of Beber and Pagano (2013), Bris, Goetzmann and Zhu (2007), and Jain, Jain, McInish and McKenzie (2013) among others, who all utilise the rich cross-country and time-series variation in short selling legality and feasibility. Similar to these studies, we construct a comprehensive set of measures related to market-level short sales

regulations that varies across countries and over time. Our results from this analysis support our expectation that constraints on short selling lead to less negative returns during rights offerings. Following Beber and Pagano (2013), we also examine variations in regulations within a country. In particular, rights issues by financial firms, for which shares are protected by temporary short selling bans during the global financial crisis, are less exposed to negative price pressure during the subscription period than rights issues of other firms.

Whilst the above results indicate that short sales constraints help ease the negative price pressure observed on average during rights subscription periods, they are not based on a direct measure of the extent of short selling activity. In another set of analyses, we narrow in on a more clinical setting – the Australian market – where short selling in Australian equities is subject to a mandatory disclosure regime that encompasses *both* short volume and short interest (Comerton-Forde et al., 2016). With these data, we document a sharp and immediate decrease in both short volume and short interest at the subscription end date, despite the fact that this date is not an information event. Following the methodology of Henry and Koski (2008), we also find that the ability to short a firm, as proxied by normal short volume before the issue, not only predicts negative returns during the subscription period, but also positive returns immediately after it. The result again implies that short selling during rights issues is unlikely to be informed.

While the ability to measure daily short selling activity is an advantage, it does not fully address endogeneity problems. Firms that can be short sold are different to those that cannot be in many unobservable ways. As an identification strategy, we employ a fuzzy regression discontinuity design (RDD), which takes advantage of a unique historical regulation in the Australian Securities Exchange (ASX) in relation to naked short sales.<sup>7</sup> Prior

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<sup>7</sup> A naked short sale is where a participant enters an order in the market and does not have in place arrangements for delivery of the security.



to 22 September 2008, naked short selling was permitted only for companies classified by the ASX as “approved instruments”, mainly based on whether a firm has a market value greater than A\$100 million. The fuzzy RDD design captures the impact of this regulation because the cut-off is not sharp but subject to the ASX’s discretion. We find that around the discontinuity point (i.e., A\$100 million), rights issuers that are also in the “approved instruments” list tend to have more negative returns during the subscription period, than those that are not. This finding puts the spotlight on the possibility that rights offerings are highly susceptible to naked short selling strategies, as suggested by Eckbo and Masulis (1992).<sup>8</sup> However, we note that similar implications apply to all types of short selling activities because the legality of *naked short selling* should also create a competitive pressure that reduces the cost of *covered short selling*.

This paper is one of the first comprehensive international studies of the rights offering market.<sup>9</sup> Our findings add to the debate that consider the benefits and costs of rights offerings – a debate that started with Smith’s (1977) work on the disappearing rights phenomenon. Existing studies on both SEOs and rights offerings have mostly been restricted to country specific analysis, and their attention is predominantly on announcement effects. Our study extends the extant literature by examining the price dynamic that ensues throughout the rights subscription period – a time frame that has surprisingly been neglected – and shows that the negative price effect is not only confined to just the announcement of an issue.

In an Australian context, a closely related study to ours is Balachandran et al. (2012), which also documents a decline in price during rights subscription period. However, their study and ours differ significantly in other aspects. We show that rights subscription period price decline is not specific to the Australian market but widely observed around the world.

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<sup>8</sup> Anecdotally, naked short selling was a key reason for HBOS’s £4 billion rights offering failure mentioned in Footnote 2. In that example, institutional investors naked short sold over £300m-worth of HBOS shares.

<sup>9</sup> The working paper of Massa, Vermaelen and Xu (2013) is the only other international study of rights issues.

Unlike our study, Balachandran et al. (2012) focus on the correlation between shareholder take-up and subscription period returns. The authors contend that the gradual revelation of shareholder take-up drives the negative price adjustments over the subscription period. If this explanation applies, the questions then become: “why does the market consistently overestimate take-up?” and “why is the market so slow at incorporating this information?” These questions are important given the theory in Eckbo and Masulis (1992) that the market should be able to infer the expected take-up at the point when the offeror reveals its choice of issuing method. After this point, no further information about take-up should be revealed, as in the ‘slow release’ explanation of Balachandran et al. (2012). In contrast, we propose a different explanation for the observed subscription period price decline based on short selling activity – an idea that, to our knowledge, has not been examined.

Our analysis provides evidence important for the worldwide debate regarding the optimal regulation of short selling by challenging the conventional wisdom that rights issues are a fair and equitable means of raising capital. As the FSA remarked, it appears that rights issues can indeed be, “prejudicial to the interests of small investors”, given the high correlation between rights subscription period returns and shareholder participation documented in Balachandran et al. (2012). To this end, our analysis mandates the need for regulators to re-examine the rights offering process taking into consideration the potential value of short sales bans, tick rules, and disclosure regimes, as ways to safeguard the integrity and fairness of this equity raising method.

The structure of this paper is as follows. In Section 2 we explain the mechanics of right issues and form our main research question. Section 3 describes the sample’s construction and notable characteristics of the international rights offering market. Section 4 discusses the empirical setup and the results. Section 5 concludes this paper.

## 2. Hypotheses Development

### 2.1 Choice of Rights Issues Relative to Other SEOs

What determines a company's equity capital raising choice? Starting with Smith (1977), this question has been the focus of a number of researchers most predominantly within the context of what is called the "disappearing rights phenomenon". The phenomenon describes the abandonment of rights offerings in the US post the 1950s and their eventual rarity by the 1970s.<sup>10</sup> This rarity is, in part, a puzzle given the finding of Smith (1977) that, on average, rights issues involve substantially less direct flotation costs than underwritten offers. In Eckbo and Masulis (1992), one explanation for this puzzle is that the implicit costs of rights issues are actually high to the lack of underwriter certification. The substitute for an underwriter's certification benefits is the expected shareholder take-up, but as this can be low, the use of an underwriter to certify the quality of the issue might be preferable.

Another reason raised in Eckbo and Masulis (1992) is more directly related to our paper. They argue that rights offerings are out of favour because they decrease the cost of hedging short sale positions in the offering company's stock. On the subscription end date, if the market price is above the offering price, then shareholders can exercise their rights and use the subscribed shares to close out their positions. If the market price is below the offering price, then shareholders can let their rights expire and buy the stock in the secondary market to close out their short position. As additional short positions are opened between the announcement of the offer and the close of the offer, the resulting short selling activity will depress the stock price and reduce the attractiveness of exercising the rights for most stockholders.

In a recent study, Holderness and Pontiff (2015) revisits the disappearing rights

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<sup>10</sup> Rights offerings were once the predominant method of raising equity by US public companies. Between 1935 and 1955, Stevenson (1957) shows that more than one-half of the 1,202 common stock issues with proceeds greater than US\$1 million used rights offerings.

phenomenon and attributes such incidence to the lack of sufficient protection to uninformed or irrational shareholders in the US. They document that less than two thirds of shareholders participate in rights offerings (via selling or exercising their rights) which causes wealth transfers of up to 7% of the offering between non-participants and participants. Moreover, they find that rights offerings are more common in countries that have institutional practices in place that limit non-participating shareholders' wealth losses. Similarly, Rantapuska and Knupfer (2008) also document low participation rates in Finland and that individual investors larger portfolios are less likely to leave rights unexercised.

## *2.2 Short Selling Activity during Equity Offers*

Whilst short sellers might be informed traders, they can have the incentive to hide their private information and can engage in manipulative strategies (Boehmer and Wu, 2013). Notably, and within an SEO context, such activity has always been a concern. For example, the SEC has Rule 10b-21 to regulate short selling in seasoned public offerings. The rationale for 10b-21 stems from the concern that short selling activity prior to SEOs may lower the price of the security before the offering date and thereby reduce the offering price. The short seller could then profit at the expense of the issuer by repurchasing their securities in the distribution at the reduced price.

Gerard and Nanda (1993) provide a formal theoretical analysis of this relationship. Their model predicts that issuers price their offering at a discount to the secondary market's closing price the day prior to the offering. Because the issue price is determined by order flow in the secondary market, a strategic trader can influence the issue discount via his/her own trades and net order flow. One important empirical prediction their model makes is that manipulative trading decreases the informativeness of the secondary market net order flow, thereby worsening the winner's curse problem and increasing the issue discount. This means that even if the shareholder has positive information, he/she has an incentive to sell shares in

the secondary market to conceal his/her information prior to the SEO.

A number of subsequent empirical studies have tested the Gerard and Nanda (1993) model by examining short selling around SEOs. Safieddine and Wilhelm (1996) provide evidence that short interest between the announcement of a SEO and the offer date is approximately three times the level observed during the three months preceding the announcement. They also find a positive correlation between short interest and size of the issue discount, meaning that short sales activity leads to lower proceeds from the issuance of new shares. Henry and Koski (2008) provide another test using daily short sales data. Their main findings support the Gerard and Nanda (1993) model. There is no evidence of informed short selling around SEO announcements. Instead, there is a strong positive relationship between high levels of short selling prior to the offering and the issue discount.

### *2.3 Research Question*

From the discussion above, all of SEO studies that examine short selling have focused on firm-commitment offers in the US, and not rights issues. Nevertheless, the evidence from these studies is clear that short selling has a tangible impact on the success of the offering, and overall market fairness. In view of these studies, we relate the concerns of short selling in SEOs to a rights offering context, specifically raising the following research question, “*does short selling increase during rights offerings making the process less attractive for existing shareholders?*”

We entertain two explanations for why rights issues in a trading environment with low short sales constraints could become an unfair process. First, informed short sellers benefit from wealth transfers when rights holders are discouraged from subscribing to their rights. When uninformed shareholders sell their rights by themselves, allow brokers to sell rights on their behalf, or forfeit rights altogether, informed investors (both existing and

outside) can pick up these shares/rights cheaply. Second, the offering price of a rights issuance is fixed and known in advance which reduces the risk of short selling strategies. When rights are in-the-money, investors can subscribe to the rights and use the offered shares to close out their position.

Both of the above explanations have the effect of depressing stock prices during the subscription period, making rights less attractive to current uninformed shareholders. What is most important to note is the difference between the two. In a similar vein to the theoretical predictions of Gerard and Nanda (1993), the first explanation assumes short sellers are informed and manipulative. In contrast, the second explanation follows a theoretical suggestion of Eckbo and Masulis (1992); in this case, no assumption is made regarding short sellers' motives or information. In other words, short sellers can introduce both information revelation and negative price pressure noise.

### **3. Sample Construction**

#### *3.1 Rights and Entitlement Issuances Data*

To examine the price dynamics in the rights offering process around the world, we compile a dataset of rights offerings using a number of sources. Our main source is the *Bureau van Dijk Osiris* database, which provides comprehensive information on international rights and entitlement issues. Entitlement issues are similar to rights issues but do not provide a tradable security (they can still be effectively made renounceable in certain cases). In our study, we also refer to entitlement issues as “rights” for convenience. To ensure the largest international coverage of rights offerings we further supplement our Osiris dataset with rights and entitlement offerings from *Bloomberg*, *Thomson Reuters' SDC Platinum*, and *Thomson Reuters' Datastream*.

To clean the data, we exclude cases that involve issues of options, dividend

reinvestment plans, non-equity securities, and equity securities outside primary listing venues (e.g. ADRs). We only consider issues from developed and emerging countries as defined by MSCI and remove all issues from frontier markets (Table 1 reports the full list of countries in our sample). In addition, we conduct numerous data accuracy checks and cross-checks across our data sources with respect to key variables such as offer schedule and offer price. Our final sample includes 10,952 rights issues by 7,260 firms from 43 different countries during the period January 2002 to December 2014.

### *3.2 Sample Statistics*

Figure 1 illustrates the number and value of rights offerings that were conducted during the years 2002 to 2014 in our international sample. From 2002 to 2007, the number of rights offerings conducted increased over two-fold from 435 to 1,071 at an international level. Whilst during the Global Financial Crisis that level decreased by 22.4% in 2008, the following year saw the number of rights offerings reach a peak of 1,310. Post 2009, the number of rights offerings conducted declined and appears to have hit a plateau, remaining close to the mark of 1,000 offerings per year. Figure 1 also shows that the dollar value of all rights offerings conducted each year increased from 2002 to 2007. Interestingly, whilst the number of rights offering decreased in 2008, the value of such offerings increased indicating fewer but larger offerings were conducted. This trend also continued throughout 2009 and ended in 2010. One potential reason highlighted by Eckbo (2008) is the popularity of rights offerings amongst large financial companies, especially during the distressed period of the Global Financial Crisis.

[INSERT FIGURE 1 HERE]

With regards to individual countries, Table 1 illustrates the number of rights offerings conducted for each country, in each year, during our sample period. Rights offerings have

continued to be the dominant method in Europe as well as Asia. The majority of rights offerings tend to be dominated by only a hand-full of countries, with the top five countries conducting 50 percent of the total number of rights issues worldwide: Australia (20.09 percent), South Korea (9.5 percent), Taiwan (8.47 percent), Hong Kong (6.52 percent) and Germany (5.76 percent). With this country distribution, our international sample is generally very comparable to that of the only other international study of rights offerings, Massa, Vermaelen and Xu (2013).

With regard to country specific studies, our sample also confirms other notable trends documented by the literature. In line with the findings around the disappearing rights phenomenon in the US, we find less than 1 percent (102 offerings) of our international sample of rights issues comprise offerings from the United States. Like the US, Canada also experienced a sharp decline in the use of rights issues during the 1970s and 1980s. In the Massa, Vermaelen and Xu (2013) sample, US and Canadian rights offerings also account for only 2.7 percent and 0.97 percent of the total respectively. Eckbo, Masulis and Norli (2007) also note a decline in the use of rights issues in Japan and our statistics confirm this trend.

[INSERT TABLE 1 HERE]

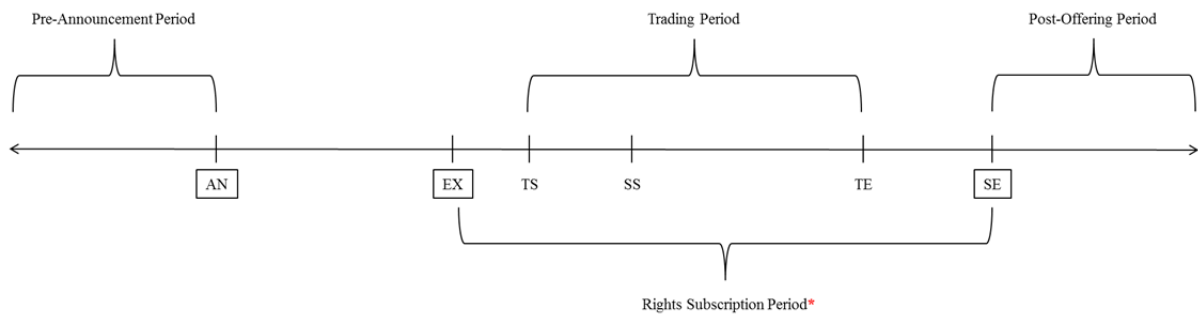
## **4. Empirical Analyses**

### *4.1 Subscription Period Returns*

In this section, we examine abnormal returns over the rights offering period. The diagram below documents the typical timeline of a rights offering and characterises the event windows relevant to our event studies. AN is the announcement date, and EX is the ex-date. When a rights offering provides transferability privileges, then TS and TE are the trading start and trading end dates respectively. SS and SE are the subscription start and subscription end dates respectively. Our main event study is conducted with the subscription end date (SE)



as the event date ( $t = 0$ ).



It is important to note that our event study results presented below are not driven by the mechanical adjustment to stock prices that occur in a rights issue. On the ex-date, the price of an issuing firm drops because its shares are no longer traded cum-rights. Without any new information, the ex-date price should adjust to reflect the dilution that arises purely due to the pro rata issue of new shares at a discount.<sup>11</sup> To incorporate this adjustment, we use Datastream adjusted prices that are adjusted for all dilution events.

In addition to the SE date, we also examine two other the event dates, the announcement date (AN) and the ex-date (EX). We specifically examine the ex-date given that theoretically, all mechanical adjustments (e.g., dilutive effects) of the rights offering are complete by this date, and that, in some cases, rights issuers have until the day before the ex-date to set the issue price. We can therefore assume that the market's response to the rights offering should be fully incorporated and from an efficient market perspective, there should be no abnormal price reaction after this ex-date.

Our event study uses the market model with Scholes-Williams (1977) betas to address non-synchronous trading issues. The market returns are computed using each country's MSCI index. We use the skewness-corrected transformed normal test (SC test) to evaluate means

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<sup>11</sup> The theoretical ex-rights price ( $E$ ) for an existing share is calculated as:  $E = \frac{NC+P}{N+1}$ , where:  $C$  = cum-rights price for an existing share;  $P$  = issue price for a new share;  $N$  = number of existing shares for an entitlement of 1 new share.

and the Wilcoxon signed-rank test (WSR test) to evaluate medians. In unreported robustness checks, we also use the standardised cross-sectional test Boehmer, Musumeci and Poulsen (1991) and the time-series standard deviation test from Brown and Warner (1985) but they do not change our findings.

Figure 2 graphs the buy-and-hold abnormal returns (BHAR) that ensue over the rights offering period for the entire international sample. The most notable feature of the graph is the substantial decline in BHARs between day -19, which is one day prior to the ‘median ex-date’, and the subscription end date ( $t = 0$ ). In terms of magnitude, from the ex-date to the subscription end date, the BHARs decline approximately four fold from -1.0% to -4.0%. The subsequent decline in BHARs, post the offering, underlines a recommencement in selling pressure which can plausibly arise when an offering is undersubscribed. In these cases, the issuer can extend the timeline of the offer or, alternatively, the underwriter will purchase all of the unsubscribed shares and subsequently sell them in the secondary market (for example, in a rump offering). It should be noted that post the offering, the negative trajectory of BHARs is not indefinite, rather a tapering occurs approximately 10 to 15 trading days after the subscription closes.

[INSERT FIGURE 2 HERE]

To provide comparability with prior studies on rights issues, Table 2 documents abnormal return statistics around the announcement date of an issue. We find a negative and significant BHAR (mean and median), on the announcement date ( $t = 0$ ) and for the two days following the announcement ( $t = +1$ ,  $t = +2$ ). One caveat to this analysis is that we do not have announcement dates for all rights issues. Utilising Bloomberg, Osiris, Datastream and SDC databases, we are only able to obtain announcement dates for 5,346 rights issues.

[INSERT TABLE 2 HERE]

Our main analysis considers the BHARs centred around the subscription end date. Table 3 documents the results and shows that the mean and median BHARs between the ex-date and the subscription end date are -4.10% and -3.94% respectively. The results are the same for various windows leading to the subscription end date, from up to 40 days earlier. These windows encompass the following key period:

- (i) The median announcement date relative to the event date, i.e., AN to SE, (-29, 0)
- (ii) The median ex-date relative to the event date, i.e., EX to SE, (-18, 0)
- (iii) The median subscription start date relative to the event date, i.e., SS to SE, (-11, 0)

The negative returns over the subscription period is a peculiar result given that rights offerings are non-information events after the announcement date or by the very latest, the ex-date. Given the non-information setting, the price decline is consistent with heightened short selling during the subscription period. If short selling is not driven by information, then we should expect a reversal in abnormal returns following the subscription end date.

[INSERT TABLE 3 HERE]

Two key observations are immediately noticeable about the post-subscription end windows. They remain negative but most importantly, they are much smaller in magnitude than their matching pre-subscription end windows. For example, the BHAR over the window (+1, +40) is only -0.32%. Whilst the evidence does not point to a complete price reversion, this result does suggest that rights offerings experience a negative and significant price decline between the ex-date of the offering and the subscription end date, which is subsequently followed by a gradual tapering in price after the offering ends.

It is also interesting to note that after the subscription end date, prices on average decline further in the (+1, +10) window. This indicates that the subscription end date is not

necessarily a 'sharp close'. Offerings can be extended for a number of reasons, for example, if the offering is undersubscribed the issuer might engage an underwriter to sell the remaining shares (e.g., in a rump-offering). Alternatively, if the offering is oversubscribed, or there is significant demand for rights, the issuer can engage in an overallotment round where the offeror issues additional shares. In both of these cases, the time frame of a rights offering would be extended lending itself to additional selling pressure. Because these extensions are not known at the announcement of the offering, the offering timeline is unclear and the subscription end date is not always the end of the rights offering process.

A number of alternative explanations could potentially apply to the above observed price decline. First, negative news could be released about the company causing a price drop. We consider this unlikely given that companies avoid releasing negative news during rights offerings since it would adversely affect the final level of subscription. Moreover, it does not explain why negative returns stop, or at least taper off, around the subscription end date as documented in the main results. Second, the price drop immediately post the ex-date could simply be the slow information processing of the announcement date news. This is quite unlikely. In a robustness check, we actually find that prices are stable, and in some cases rising, between the announcement date and the ex-date.

A third alternative explanation arises from Balachandran et al. (2012). The authors suggest that the negative returns over rights subscription period could be the result of shareholders inferring information about take-up during the offering. We consider this explanation unlikely in view of the studies by Eckbo and Masulis (1992) among others, who contend that expected shareholder take-up is inferred from the flotation method (e.g., uninsured, standby and firm commitment) which is known on the announcement date of the issue. This means that any negative price reaction to the expected take-up should be experienced on the announcement date rather than during the offering. Moreover, in the case

of fully underwritten offerings, take-up is 100% guaranteed by the underwriter which, under Balachandran et al.'s (2012) take-up theory, would mean that underwritten offerings should have no negative price reaction during the offering. In contrast to this theory, we find in a robustness check that price still declines significantly during fully underwritten offerings.

Finally, to ensure that the results reported in the previous section are not driven by a particular section of the sample, we also conduct the same event studies for different industries, developed and emerging nations, size quintiles, and for rights with transferability privileges. Our finding of a significant price decline during an issue's subscription period remains robust across these sub-samples.

#### *4.2 Issue Discount during the Offering*

Next we quantify the discount that shareholders experience at the close of a rights issue, given the evidence of subscription period price decline. Larger discounts reflect greater value for rights holders and increase the likelihood of a successful offering. The success of the offering is improved because when rights are in-the-money, then shareholders that do not participate experience wealth transfers away from them (Holderness and Pontiff, 2015). In this regard, issuers can use the discount as a tool to pressure shareholders to take action, given that deep discounts make it costly for shareholders not to exercise their rights (Bøhren, Eckbo and Michalsen, 1997). Any temporary or permanent price pressure that occurs during rights offerings will reduce shareholder take-up and cause greater transfers of wealth between rights holders (Rantapuska and Knupfer, 2008).

Figure 2 illustrates the trajectory of the issue price discount over the rights subscription period. Again, we observe a significant decline in the issue discount over the offering period. 21 trading days prior to the subscription end date, the median issue price discount is at its deepest for the international sample at 20.0 percent. By the subscription end

date, the median issue price discount is 13.8 percent reflecting a 6.2 percentage point erosion over the 21 day period. This result is larger than Holderness and Pontiff's (2015) US result where the discount dropped from 18 percent to 13 percent. Table 10 documents the results of formal tests of differences in the discounts at various time points during the subscription period. The differences are all statistically significant at the 1% level. Collectively, the erosion of the issue price discount and the negative abnormal returns experienced over the rights subscription period should be viewed as a concern to rights issuers given that it decreases the success of the offering. Moreover, it should be a concern to financial regulators given the potential for wealth transfers between shareholders.

#### *4.3 Firm and Issue Characteristics Explaining Subscription Period Returns*

In view of our previous two analyses, the natural question to ask is, “what explains the decline in price during the rights subscription period?” In this section, we first examine firm and issue characteristics that potentially explain buy-and-hold abnormal returns during the rights subscription period. Driven by our primary research question, we are particularly interested in the following factors that might play a role in incentivising market participants to engage in short selling activity: namely, liquidity, information transparency, insider ownership, rights characteristics and measures of risk.

Our expectation is that more illiquid companies will have negative BHARs during the rights subscription period. This is based on two premises. First, the unique mechanics of rights offerings (e.g., fixed offer price, ability to close out short sales positions using the shares from the rights, and so on) reduce the costs of short selling illiquid companies. Second, illiquid companies are also associated with greater information asymmetry, which is potentially conducive to short selling activity.

We use bid-ask spreads as our main measure of liquidity. Following Fong, Holden

and Trzcinka (2016), we also consider some alternative proxies, *Amihud*, *Trading Turnover*, and *Zero Trading Days*. All four measures of liquidity are calculated as the average for the immediate six trading months (128 trading days) ending 62 trading days prior to the ex-date. Given that not all rights offerings in our sample have data on the announcement date, the choice of 62 trading days prior to the ex-date is specifically chosen given this is the maximum distance between the ex-date and the announcement date in our sample. Hereinafter, we use “estimated announcement” to mean ‘62 trading days prior to the ex-date’. The *Closing Spread* measure is the closing bid ask spread scaled by the average of the closing bid and ask prices. *Trading Turnover* is computed as unadjusted trading volume scaled by the total number of outstanding shares. *Zero Trading Days* represents the proportion of days with zero returns. *Amihud* is calculated using the average absolute price change divided by the average trading value over the estimation period.

#### *Information Transparency*

Greater information transparency may have the effect of reducing short selling activity. In this regard, we expect companies that are more transparent to experience positive returns over the rights subscription period. Our primary proxy for information transparency is *Analyst Coverage*; however, we also consider *Company Size* and *Dividend Yield* as potential proxies. We construct *Analyst Coverage* as the maximum number of analysts issuing a recommendation for the firm that conduct a rights issue, in the immediate 12 trading months prior to the estimated announcement date of the issue. *Company Size* is the natural logarithm of average market value in the immediate one trading month (21 trading days) prior to the estimated announcement date. *Dividend Yield* is the dividend per share as a percentage of the share price. It is calculated as an average over the immediate one trading month (21 trading days) prior to the estimated announcement of the offering.

#### *Insider Ownership*

Regarding insider ownership, we use the level of *Free Float* as an inverse proxy for the presence of insiders, since strategic block holders have greater access to private information. In this regard, we expect an inverse relationship between *Free Float* and information asymmetry, and thus a positive relationship with returns during the subscription period. *Free Float* is constructed as the percentage of total shares in issue available to ordinary investors on the ex-date of the offering, obtained from Datastream and based on the total number of shares less the strategic blockholdings on the ex-date of the offering company.

#### *Pre-Issue Performance*

Drawing from Lucas and McDonald (1990), we consider the possibility that companies with large price run-ups before their right issues are more likely to be overvalued and in these cases contrarian strategies, such as short selling, are more appealing and less risky. We construct the variable *Run-up* as the raw return starting six trading months (128 trading days) prior the estimated announcement date and ending one day prior to the estimated announcement date. We expect that this variable has a negative correlation with the returns over the subscription period.

#### *Risk*

Because short selling is a leveraged strategy, companies with higher risk are typically less attractive for short sellers, some of who may be concerned about their own trading solvency. Given that the mechanics of a rights offering reduce the risks of short selling (e.g., fixed offer price, ability to close out short sales positions using the shares from the rights, and so on), the incentive to short sell issuing firms increase for all issuers, however, the marginal increase in this incentive is potentially larger for risky firms. If this relationship is true, we expect a negative correlation between the proxies for risk and returns during the rights



subscription period. We examine two measures related to a firm's price volatility. The first is *Leverage*, computed as the average ratio of total debt divided by total assets over the immediate trading month (21 trading days) prior to the estimated announcement date for each rights offering. The second is *Idiosyncratic Risk* computed as the root-mean squared error obtained from the estimation of our Scholes-William market model used to produce abnormal returns.

### *Issue Characteristics*

We also consider other characteristics of rights issues: *Discount*, *Duration*, *Transferability*, *Offering Ratio*, *Oversubscription* and *Underwritten* status. The most important issue characteristic in our analysis is *Discount*, when the size of the discount falls, then the value of the rights decreases and the cost of letting rights expire reduces. In these cases, shareholder participation can decline (Balachandran et al. 2012) which increases wealth transfers between participants and non-participants (Eckbo and Masulis, 1992; Holderness and Pontiff, 2015). In this regard, traders wishing to accrue greater wealth transfers have an incentive to impose negative price pressure to close this gap.

With respect to the other issue characteristics serving as control variables, *Transferability (Renounceability)* is indicator variable that equals to one if the offering is renounceable, and zero otherwise, *Oversubscription* is another a binary variable that is equal to one if the offering has an oversubscription privilege, and zero otherwise. *Duration* is the natural logarithm of the number of days between the ex-date and the subscription end date. *Offering Ratio* is the number of new shares a rights holder receives for every one share that he/she has of the issuer's stock. Finally, *Underwritten* is an indicator variable that equals to one if the offering is underwritten, and zero otherwise.

### *Dependent Variables*

We use two alternative dependent variables: Buy-and-hold Abnormal Returns (BHAR) over the windows of 10 (and 20) trading days prior to the subscription end date. If the number of trading days between the ex-date and subscription end date is less than 10 and 20 respectively, then BHARs are constructed between the ex-date and subscription end date.

### *Regression Results*

Table 4 documents the results. Consistent with our expectation, *Closing Spread* is negative and significant for the *BHAR (-10)* measure, but not for the *BHAR (-20)*. We do not report the results for the other alternative liquidity measures, but they are also inconsistent. The *Zero Trading Days* measure is negative and significant but the *Amihud* and *Trading Turnover* are insignificant. Thus, the results with respect to liquidity are tentative, possibly reflecting peculiarities of our international dataset. Regarding information transparency proxies, we find that our primary measure of information transparency, *Analyst Coverage*, is positive and significant at the 1% level across all four main specifications. Interestingly, *Company Size* is negative and significant at the 10% level in models (1) and (2). One explanation for this negative coefficient is that larger companies tend to be the focus of short selling activity for institutional investors. For example, in Australia, the primary benchmark for the market is the S&P/ASX200 which represents the investable universe for most institutional investors (Comerton-Forde et al., 2016).

[INSERT TABLE 4 HERE]

With regards to pre-issue performance, the negative coefficient of *Run-up* is consistent with our expectation and alludes to the fact that overvalued stock is less costly and more appealing to short sell. We examine the variable *Free Float* in a separate regression given that this variable reduces our sample size. This measure is significant and follows its expected sign. Assessing the results from Table 4 together, we find strong and consistent

evidence which suggests that specific issue characteristics (i.e., *Discount*, *Offering Ratio*, and *Duration*) strongly explain subscription period returns.

#### *4.4 Relationship between Returns before and after Subscription Close*

The previous analysis examines the relationship between buy-and-hold abnormal returns during the rights subscription period and both firm factors and issue characteristics. We contend that certain firm factors and issue characteristics might be conducive to short selling which, in turn, might explain price pressure experienced during rights offerings. In this analysis, we attempt to characterise the type of price pressure exhibited during rights offering, specifically whether it is temporary or permanent.

In order for the temporary price pressure explanation to be plausible, there must exhibit an inverse relationship between pre-offer returns and post-offer returns. If no reversal is found, then this would resonate with information based hypotheses that predict permanent price drops with no reversal.

Preliminary evidence of temporary price pressure is found in our event study experiment. We find that, at an international level, returns post the subscription end date tend to be substantially less negative than returns during the rights offering. Moreover, for developed countries, underwritten issues and for the agriculture, mining and construction industries, we find that BHARs in the event windows post (+1, +20) are all positive and significant. In this section, we more formally characterise the type of price pressure by examining the correlation between returns during the rights subscription period and returns post the offering. To do this we regress three new independent variables “*BHAR (+10)*”, “*BHAR (+20)*” and “*BHAR (+30)*” on two key independent variables *BHAR (-10)* and *BHAR (-20)*. *BHAR (+10)*, *BHAR (+20)* and *BHAR (+30)* are the buy-and-hold abnormal returns in the immediate 10, 20 and 30 trading days *after* the subscription end date respectively. In

conducting this analysis we follow a number of studies that examine the relationship between post-offer date returns and pre-offer date returns of US SEOs (see e.g., Korajczyk, Lucas and McDonald, 1991; Corwin, 2003).

If the price pressure is temporary, the expectation is that companies with negative returns during the offering will outperform companies with positive returns during the offering. That is, we expect a negative correlation between BHARs during the rights offering and BHARs after the offering. The results are reported in Table 5. Across all six models we find that this result holds. Specifically, the coefficient of *BHAR* (-10) and *BHAR* (-20) are both negative and significant at the 1% level.

Overall, what is most important is the main result, that companies that experience negative returns during the offering, tend to outperform stock that exhibit positive returns during the offering. This result is consistent with the theoretical prediction of Gerard and Nanda (1993) within an SEO context. It is, however, important to note that this is not definitive evidence of manipulative short selling activity – as suggested by Gerard and Nanda (1993) – it merely indicates that short sales during rights offerings are unlikely to be informed. Indeed, Eckbo and Masulis (1992) suggest that short sellers can be speculative and not fully informed, merely engaging in the practice given that rights offerings reduce the cost of hedging short sale positions.

[INSERT TABLE 5 HERE]

#### *4.5 Short Sales Restrictions, Tick and Disclosure Rules*

The previous analyses provide indicative results that suggest short selling could potential be driving negative price pressure during rights offerings. In this analysis we attempt to measure short selling more directly through market-level short selling constraints. Following the works of Beber and Pagano (2013), Bris, Goetzmann and Zhu (2007), and Jain,

Jain, McInish and McKenzie (2013), we manually construct a comprehensive set of measures of short sales restrictions across countries: *Restriction*, *Disclosure* and *Tick Rule*.<sup>12</sup> *Restriction* is constructed following a similar methodology to Jain, Jain, McInish and McKenzie (2013), whose variable is equal to 0 when no restrictions on short selling are in place, 1 if there is either an up-tick rule or a ban on naked short selling, 2 if both of these restrictions are present and 3 when there is a complete ban. Two additional categories are also considered, (a) complete bans on financial stocks and (b) naked short sales bans of financial stocks. In this regard, at a country level, their variable ranges from 0 to 5.

In addition to *Restriction*, we construct *Disclosure* as an indicator variable that equals to one if short sales disclosure regimes are in place in an issuer's primary market and in the same year as the issuer's rights offering, and zero otherwise. *Tick Rule* as an indicator variable that is equal to one if a tick rule is in place in the issuer's primary market and in the same year as the issuer's rights offering, and zero otherwise.

The results are reported in Table 6. The *Restriction* variable is positive and significant at the 10% and 1% level respectively under both *BHAR* (-10) and *BHAR* (-20), which strongly confirms our expectation. Examining the *Tick Rule*, we find that the variable is positive and significant at the 5% level under *BHAR* (-10) but insignificant with *BHAR* (-20). The result provides tentative evidence that tick rules have an effect at minimising the negative returns during rights offerings. Examining *Disclosure* in models (3) and (6), the variable is positive in both models, and significant at the 1% when specified with *BHAR* (-20)

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<sup>12</sup> To construct this index, we start by reviewing the body of literature dedicated to international short selling (Bris, Goetzmann and Zhu, 2007; Beber and Pagano, 2013; Gruenewald, Wagner and Weber, 2010; Lecce et al., 2011; Jain et al., 2013; among others). Most of these international studies focus on short selling during the Global Financial Crisis (GFC). Since we also examine rights offerings before, and after this period, we also rely on country-specific studies, for example, Sharif et al. (2014) for China; Felix, Kraussl and Stork (2013) for selected EU nations. In addition, we use practitioners' reports and briefings to verify these datasets (e.g., reports from Ashurst, Wilmer Hale, Morgan Stanley, J.P. Morgan, among others) as well as reports provided by regulatory bodies (e.g., ASX, European Securities and Markets Authority, the US SEC). Details with respect to our information sources are available on request.

only.

[INSERT TABLE 6 HERE]

Overall, the results in Table 6 are strong for the *Restriction* variable but tentative for *Disclosure* and the *Tick Rule*. Nevertheless, the results generally support our expectations. Regarding the *Tick Rule*, our analysis builds on the extant literature of Alexander and Peterson (1997) and Diether, Lee and Werner (2009), who have all examined the costs and benefits of the up-tick rule and other similar price tests. Regarding disclosure regimes, a number of studies (see e.g., Boehmer et al., 2005; Madhavan et al., 2005) examine this form of regulation on short selling activity, often with unclear results. Our evidence suggests that stricter short-sales regulations may be important in the context of rights issues. It supports the actions of the FSA who introduced mandatory disclosure of short sales during rights offerings in 2008.

One caveat to these results is that countries may differ in ways that we cannot observe. To overcome this problem, we conduct a robustness check using a difference-in-differences analysis that exploits within country differences in short-sales regulations. The specification is as follows:

$$BHAR_i = \alpha_1 + \alpha_2 Financial\ Dummy_i + \alpha_3 Financial\ Ban_i + \alpha_4 Financial\ Dummy_i \\ * Financial\ Ban_i + \alpha_5 Controls_i + \epsilon_i$$

where *Financial Dummy<sub>i</sub>* is a binary variable that equals to one if the rights issuer *i* is a financial company<sup>13</sup>, and zero otherwise. *Financial Ban<sub>i</sub>* is a binary variable that equals to one if the ex-date of the rights offering of company *i* falls within the time period when a short selling ban on all financial companies is in place within company *i*'s primary market, and

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<sup>13</sup> Financial companies are classified based on The Industry Classification Benchmark (ICB). The ICB is the merger of industry classifications of Dow Jones and FTSE. Data on the ICB for each rights issuer is acquired from Datastream.

zero otherwise. The key variable of interest is the interaction term  $Financial\ Dummy_i * Financial\ Ban_i$ . Our expectation is that this term will take a positive coefficient indicating that short sales bans on financial companies mitigates price pressure and improves returns during rights offerings of financial companies. We find that this is indeed the case for *BHAR* (-10) but the results are insignificant with respect to *BHAR* (-20). Collectively, the cross-country evidence provides credibility for the use of short sales regulation as a means to avert downward price pressure potentially caused by short selling during rights offerings.

#### 4.6 Short Selling Activity during Rights Offerings

In this analysis, we examine the level of short selling activity during Australian rights issues by considering two measures, short volume and short interest. For a number of reasons, empirical studies to date have typically been constrained by the availability of a single short selling metric – typically either short flow (volume) or short interest. Even in jurisdictions where both measures are available, the frequency with which they are collected and reported is often mismatched.<sup>14</sup> In this regard, our paper benefits significantly from Australia's daily reporting and disclosure regimes which are arguably the most comprehensive and timely reporting of short sales data in the world (Comerton-Forde et al., 2016). The current disclosure regime is comprised of two parts, the first part being short transaction reporting (which is used to calculate short volume), and the second part being short position reporting (which is used to calculate short interest).

Daily short transaction reporting has been mandated by Australian regulators since July 2001. Brokers are required to report the total number of shares short sold for each security to the Australian Securities Exchange (ASX) by 9 A.M. the following trading day by the latest. The ASX publishes short sales volume as a percentage of the total number of

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<sup>14</sup> For example, Boehmer et al. (2010) compare the relative informativeness of short interest (using changes in publicly released short interest data from the previous month) and short flow (estimated from proprietary intraday data aggregated over the most recent five days).

shares on issue for each security. For our analysis, we take the percentage value as our main measure of short volume. This measure is similar to those used by Boehmer et al. (2010), Diether et al. (2009), Engelberg et al. (2012), Boehmer and Wu (2013), and Comerton-Forde et al. (2016), but scaling by outstanding shares rather than seller initiated volume makes the measure less volatile.

Daily short positions (short interests) reporting was implemented in June 2010 to augment daily short transactions reporting. Under this regime, short sellers must report their short positions to the Australian Securities and Investment Commission (ASIC) within three business days of the trade, and each day thereafter until the position is covered. ASIC aggregates individual short positions by security and publically discloses this information the day following settlement (i.e.,  $T + 4$  days after the trade) in their “short positions report”.<sup>15</sup> ASIC also publishes short interest as a percentage of the total number of shares on issue for each security. We use this percentage as our formal measure of short interest to capture the ‘stock’ aspect of short selling, consistent with Boehmer et al. (2010), and Comerton-Forde et al. (2016).

Using both measures of short volume and short interest, this analysis conducts two event studies to document, (a) the change in short volume during rights offerings and, (b) the level of short interest during rights offerings. We specifically examine the change in short volume to clearly illustrate the additional short sales volume that occurs during rights offerings and is above the average amount that occurs before the ex-date of an offering. This change is calculated for each rights issue by first averaging the short sales volume in the 30 trading days immediately prior to the ex-date and subtracting this from the level of short sales volume for each trading day in the event window. We examine the level of short interest,

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<sup>15</sup> For further explanations see <http://asic.gov.au/regulatory-resources/markets/short-selling/short-selling-reporting-short-position-reporting/>



rather than the change, because short interest represents the cumulative outstanding short sales volume, thus subtracting the average does not change the pattern of this measure. In both event studies we examine a 100 trading day window starting from 70 trading days before the subscription end date and ending 30 trading days after the subscription end date.

Figure 3 illustrates a substantial increase in the change of short volume during Australian rights issues. The increase clearly begins around after the median announcement date. Importantly, the graph also illustrates a sharp and immediate decrease in short sales volume on the subscription end date which implies a rapid unwinding of short selling activity once the offering has ended. In Table 7, we confirm that the difference in the average change in short volume between 10, 15, and 20 days before and after the subscription end date is significant at the 1% level. Figure 3 also illustrates the average short interest for the Australian rights issues sample. As expected, the graph of short interest follows a similar pattern to the graph of short volume. One key difference is that the build-up of short interest begins approximately 30 to 40 trading days prior the subscription end date which is earlier than the median announcement date ( $t = -24$ ). Consistent with our short volume study is the significant drop in short interest positions close to immediately after the subscription end date. Again, In Table 7, we confirm that average short positions 5, 10, 15 and 20 trading days before the subscription end date are all significantly different than 5, 10, 15 and 20 trading days after the subscription end date respectively.

[INSERT FIGURE 3 AND TABLE 7 HERE]

#### *4.7 Short Selling Intensity and Subscription-Period Returns*

In this analysis, we examine the ability of short selling activities to predict returns both during rights offerings and after the offering. Specifically, we attribute short selling to negative returns during rights offerings and positive returns after offerings in the same way

that Henry and Koski (2008) did within a US SEO (firm-commitment offer). Outside of the equity offering context, strong empirical evidence exists regarding the negative relationship between short selling metrics and future returns, which is consistent with the idea that short selling contains value-relevant information (Comerton-Forde et al., 2016). For example, short flow is found to be inversely related to future stock performance (Asquith et al., 2005; Boehmer et al., 2010; Diether et al., 2009; Engelberger et al., 2012).

We follow a similar methodology employed by Henry and Koski (2008) by regressing abnormal returns during the rights subscription period against measures of pre-issue short sales intensity. An important note to make is that Henry and Koski (2008) examine announcement returns of SEOs. In contrast, our analysis focuses on the non-information period post the announcement of rights issues.

Implicit in this analysis is the assumption that the level of pre-issue short selling is an accurate reflection of a firm's typical daily short selling activity. In this regard, the amount of pre-issue short selling intensity reflects how easy/difficult it is to short sell the company on a normal day-to-day basis. Companies with high levels of pre-issue short selling intensity are assumed to be easier to short sell, whilst companies with very low levels of pre-issue short selling intensity are assumed to have constraints that impede short sellers. In this regard, and forasmuch as short interest/volume have predictive ability, our expectation is that companies that are easier to short sell (i.e., high levels of pre-issue short selling intensity) will experience a negative correlation with abnormal returns during the rights subscription period (reflecting an increase in short selling) but positive correlation with abnormal returns after the offering (reflecting an unwinding of short selling).

We use the ASX short transaction data as this provides coverage for the entire sample period. We create the following measure of pre-issue short selling intensity. *Short Interest*

(*pre-offer*) represents the average short volume scaled by the number of outstanding shares in the immediate trading month (21 trading days) prior to the ex-date for each rights issue.

Table 8 contains the results of the regression where our key independent variable is *Short Volume (pre-offer)*. Consistent with our expectations, we find that *Short Volume (pre-offer)* exhibits a negative and statistically significant correlation with *BHAR (-10)*. In contrast, we find no significant result for the specification with *BHAR (-20)*. We consider the relationship between pre-offering short volume and post-offering returns. Consistent with our expectation, *Short Volume (pre-offer)* is positive and significant at the 5% level in model (4), that is, when specified with *BHAR (+10)*. When read alongside the result from model (1), it suggests that companies that are easier to short sell experience negative returns in the 10 trading days prior to the subscription end date followed by a positive reversion in returns in the 10 trading days after the subscription end date. Over a long term horizon, we find a positive correlation between *Short Volume (pre-offer)* and both *BHAR (+20)* and *BHAR (+30)*, however, the relationships lack significance.

[INSERT TABLE 8 HERE]

Overall, given that rights offerings post the announcement date are non-information events, the evidence regarding short volume highlights that price pressure during rights offerings is unlikely to be from traders impounding information. In contrast, negative price pressure is more likely to be either manipulative or driven by speculative short sellers without precise information.

#### *4.8 Short Selling and Subscription Period Returns – an Identification Strategy*

Whilst the previous analyses directly measure short selling activity, they do not fully address endogeneity. Firms that can be short sold are different to those that cannot be in many unobservable ways. To overcome this problem employ a fuzzy regression discontinuity

design (RDD) to estimate the effects of naked short selling (NSS) bans on rights offerings.<sup>16</sup> This strategy is also used by Lecce, Lepone, McKenzie and Segara (2011). It exploits a unique ASX regulation in order to estimate of the effect of short selling constraints on returns during rights offerings. In particular, prior to 22 September 2008, naked short selling (NSS) was allowed for companies that had a market value (MV) greater than A\$100 million. For companies that were marginally on the other side of this discontinuity point (i.e., MV just lower than A\$100 million), their underlying characteristics would be very similar to the companies that just made the cut off, but these companies would have had different short sales constraints. In this regards, the difference in returns over the rights subscription period would be driven primarily by having different short selling constraints. From 22 September 2008, naked short selling was completely banned by the ASX.

We use a fuzzy RDD rather than a sharp RDD in part because the discontinuity point is not sharp. The A\$100 million MV cut-off was not the only threshold that a company was required to pass to be placed onto the approved NSS list. ASX market rules also required securities to have over 50 million shares of issue, and possess 'sufficient liquidity'. The ASX could exercise discretion regarding the 'sufficient liquidity' criteria (Lecce, et al. 2011). In this regard, the assignment to the treatment group (i.e. being assigned the status of 'approved SS instrument') could be ambiguous. In addition, the ASX usually revised the NSS eligibility list on a monthly basis yet the actual window used by the ASX to calculate A\$100 million MV was not disclosed. Indeed, stock prices can change rapidly in response to news, therefore stocks that were on the borderline of the A\$100 million MV cut-off could plausibly fall above and below the threshold frequently during the month.

An important issue when implementing regression discontinuity design is the choice

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<sup>16</sup> A naked short sale is where a participant, either proprietary or on behalf of a client, enters an order in the market and does not have in place arrangements for delivery of the security.

of bandwidth around the discontinuity point. A larger bandwidth yields more accurate estimates since more observations are used to estimate the regression. However, with linear specifications, larger bandwidths are less likely to be accurate because they can bias estimates of the treatment group. In this analysis, we employ the methodology of Calonico, Cattaneo and Titiunik (2014) to estimate the bandwidth. The authors propose confidence intervals for regression discontinuity treatment effects that offer robustness to “large” bandwidths.

The first-stage of our two-stage least squares method is modelled below:

$$NSS Dummy_i = \alpha_1 + \gamma_0 100MV Dummy_i + f_1(MV_i) + \epsilon_i$$

where,  $NSS Dummy_i$  is an indicator variable that equals to one if company  $i$  is in the ASX’s approved NSS list, and zero otherwise.  $100MV Dummy_i$  is a binary variable that equals to one if company  $i$  has a market value greater than A\$100 million on its ex-date, and zero otherwise.  $MV_i$  is market value of company  $i$  on the ex-date of its rights issue.  $f_1(MV_i)$  is the function of the relationship between the market value of company  $i$  and the likelihood of receiving treatment (i.e., being assigned the status of an approved short sales instrument by the ASX).

From this stage we are able to assess whether the A\$100 million MV threshold is a relevant instrumental variable (IV) for naked short sales bans – i.e., whether the A\$100 million MV criteria is accurate at separating out companies that were subject to NSS and those that were protected by NSS bans. We input the predicted value of the mediator,  $NSS \widehat{Dummy}_i$  in the second-stage modelled below:

$$BHAR_i = \alpha_1 + \gamma_0 NSS \widehat{Dummy}_i + f_2(MV_i) + \mu_i$$

Our expectation is that the coefficient of  $NSS \widehat{Dummy}_i$  is significant and negative which would indicate that companies that were legal to naked short sell, exhibited negative

BHARs during the rights subscription period.

Table 9 documents the results of the fuzzy RDD with estimations based on local linear regression. We also estimate the  $f(X)$  functions with higher order polynomials for robustness and find that they do not impact our findings. The first-stage results confirm that the A\$100 million MV threshold is a relevant instrumental variable for naked short selling bans as evidenced by the positive and statistically significant (5% level) coefficient on *100MV Dummy*. Examining the second-stage regression, the coefficient of  $NSS \widehat{Dummy}_i$  is negative and significant which implies that companies that are legal to naked short sell, experience negative BHARs during rights offerings. Examining the specification with *BHAR* (-10) the coefficient of  $NSS \widehat{Dummy}_i$  is negative but insignificant. In unreported results, this coefficient is actually significant in specifications with higher order polynomials.

[INSERT TABLE 9 HERE]

To ensure the validity of the above findings, we conduct an unreported robustness test imposing the ASX's additional criteria that companies must have 50 million of shares in free float to be an eligible member of the approved naked short sales list. Enforcing this constraint does not change our results. In Table 9, we examine the discount measured at the end of the subscription period, *Discount (Sub-End)*, as an alternative measure of the outcome of the price decline observed during the subscription period. Our expectation is that when specified with *Discount (Sub-End)* the coefficient of  $NSS \widehat{Dummy}_i$  will be positive given that the *Discount (Sub-End)* is constructed as a negative (i.e., a 20% discount = -0.2). Consistent with our expectation the coefficient  $NSS \widehat{Dummy}_i$  in the second stage regression is positive and significant.

Because naked short selling was permanently banned on all ASX listed stocks on the 22 September 2008, we conduct a falsification test by widening the time frame of our

analysis to consider rights issues in the period post 22 September 2008. Because the NSS approved list was abolished during this period, we use a sharp RDD design using the \$100 million MV cut-off as a deterministic discontinuity point. Panel A of Table 10 contains the results, and indeed the coefficient is insignificant consistent with our expectations. In undocumented results, we confirm that running higher order polynomial regressions does not impact this finding. In another falsification test, we go back to the pre 22 September 2008 sample and consider different MV thresholds that act as placebos for the A\$100 million MV cut-off. We specifically examine the cut-offs: A\$90 million and A\$110 million, to check whether the difference in BHARs is driven by the actual A\$100 million threshold or, alternatively, the functional form of BHARs around different market values of companies. The results are reported in Panels B and C of Table 10. They show that the coefficients of  $NSS \widehat{Dummy}_i$  are all insignificant.

[INSERT TABLE 10 HERE]

Overall, the evidence provided in this section strongly supports the idea that short selling induced price pressure can be alleviated with greater short selling restrictions. Importantly, whilst we specifically test the efficacy of naked short selling bans in this experiment, the ability to naked short sell a company has implications for the costs of covered short selling strategies; thus, this experiment more broadly assesses the efficacy of short sales constraint (in general) on subscription period returns. Specifically, the ability to naked short sell a company should reduce the cost of covered short selling strategies through competition, as a short seller would have different ways to short sell the stock up until the point where the cost of failure of NSS (e.g., from penalty fees) equals the costs of covered short selling (i.e., borrowing costs). In addition to the above, this analysis also highlights the fact that naked short selling could be a favoured strategy during rights issues. This was raised by Eckbo and Masulis (1992) who suggest that short sellers need not cover their positions through

borrowing if they can use the shares from the offering instead. Anecdotally, a number of corporate scandals regarding naked short selling have also highlighted the strategies prominence among institutional investors during rights issues.

## **5. Conclusion**

This paper poses the question, “does short selling increase during rights offerings and make the process less attractive for existing shareholders?” Whilst rights issues are in principal supposed to be fair, they force all shareholders (informed of uninformed) to make a decision, rather than delegating the power to raise capital at an appropriate price to an agent (underwriter) representing all shareholders. Because of this, there are opportunities for both informed investors (existing shareholders and outside speculators) to exploit information disadvantages of certain existing shareholders (e.g., small retail shareholders). To answer this research question, we entertain two explanations for why short selling is problematic for the rights offering process. The first explanation is grounded in the theoretical model of Gerard and Nanda (1993), that informed investors use short selling to create pressure on stock price and make it less informative which, in turn, discourages uninformed shareholder participation. The second explanation follows Eckbo and Masulis (1992), who suggest that because the issue price is set and known in advance, investors can use rights as warrants to hedge their short positions.

Our study documents a novel and international finding that post the ex-date, rights offerings experience a sharp and persistent decline in price and issue discount that ends on the subscription end date. The importance of this finding stems from the fact that rights offerings are non-information events post the announcement, in this regard, and from an efficient market perspective, no price discovery should occur during this period. Given the strong correlation between negative returns and low shareholder take-up (Balachandran et al.,



2012), the finding elucidates the phenomenon of low shareholder participation in rights issues that has recently been highlighted by Holderness and Pontiff (2015) and Rantapuska and Knupfer (2008).

We find that the presence of certain firm factors and issue characteristics that potentially encourage short selling activity is negatively associated with returns during the rights subscription period. We then characterise the nature of short selling and find a strong negative correlation between pre- and post-subscription end returns which suggests that short selling during rights issues is likely to be uninformed. In mitigating the price decline during the rights subscription period, we find that right issues conducted in countries with more short selling restrictions experience less negative returns. Using variations in short selling regulations across time, we further show that temporary short sales bans on financial companies help support prices of these companies when they issue rights during the restriction period.

Using Australian data, we also document significant increases in both the change in short volume and the level of short interest during rights issues and a subsequent rapid unwinding of short selling activity immediately after the issue ends. Given that short selling naturally induces negative price pressure this result strongly suggests that declines in price are, in part, a factor of abnormal short selling during rights issues. We show that short selling intensity is correlated with both returns during and after rights issues. As a final step, we show that this is more than mere correlation. Employing a fuzzy regression discontinuity design (RDD), we document that rights issuing companies with less binding short selling constraints tend to have more negative returns during the subscription period.

Despite the conventional wisdom that rights issues are a fair and equitable means of raising capital, rights issues can indeed be, “prejudicial to the interests of small investors”, as

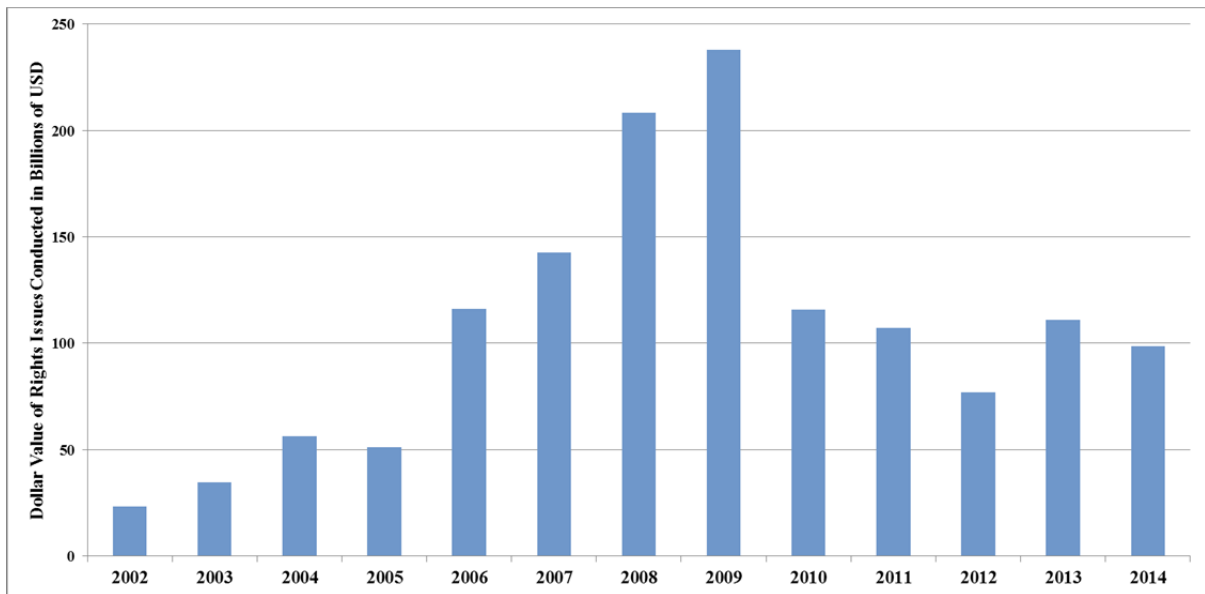
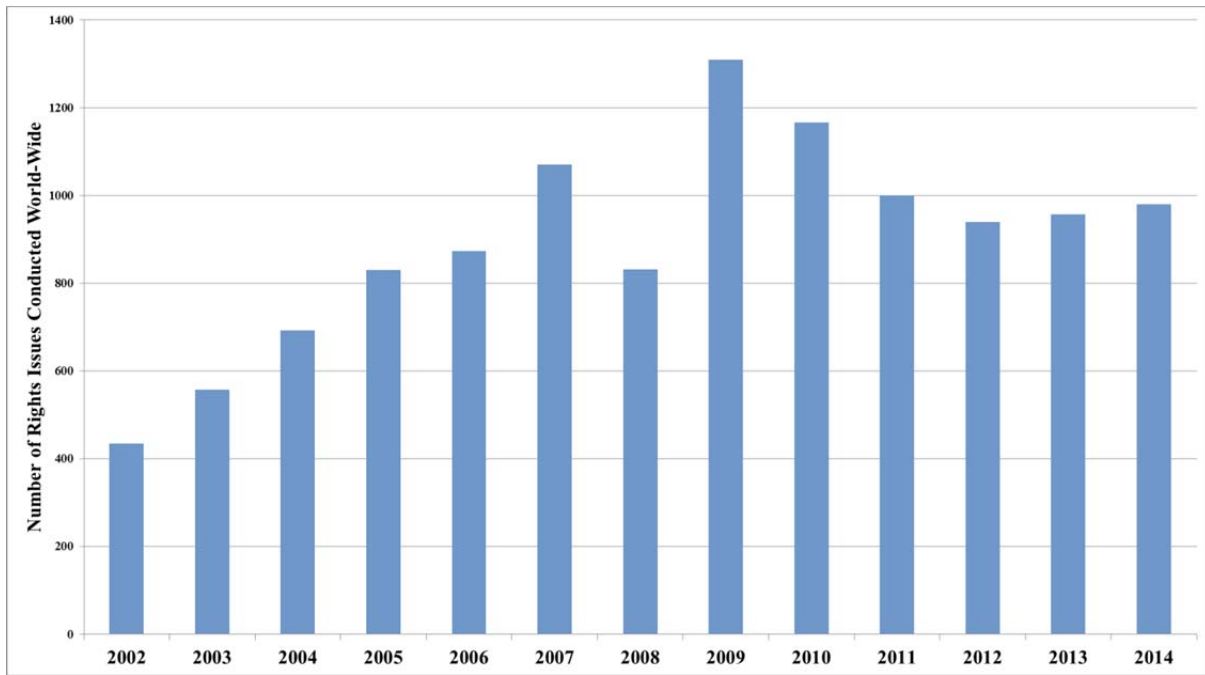
noted by the FSA, unless such investors are given adequate protection against more informed and potentially manipulative traders. Overall, our results highlight that short selling activity, while important to the general market trading, may lead to adverse outcomes for rights holders, especially if they are uninformed and are forced to make a subscription decision. To this end, our analysis mandates the need for regulators around the world to follow the FSA's footsteps and re-examine their regulations of rights offerings taking into consideration the potential value of strengthening short sales restrictions around these very important transactions.

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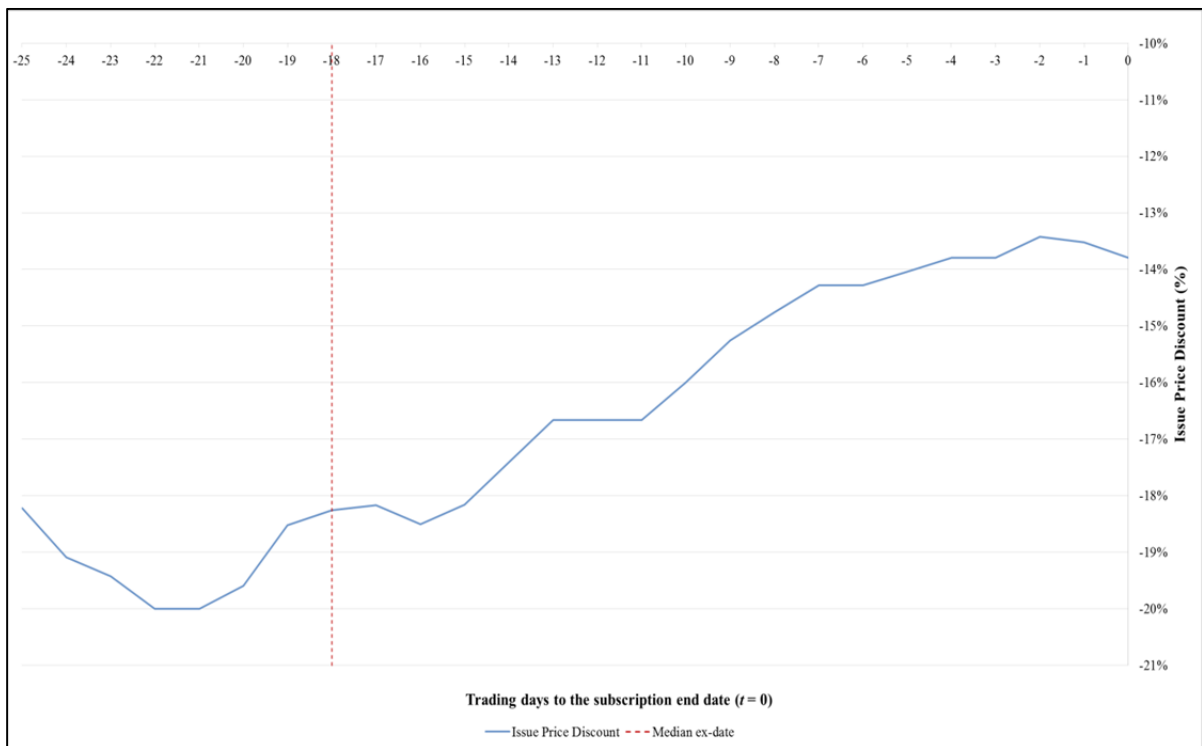
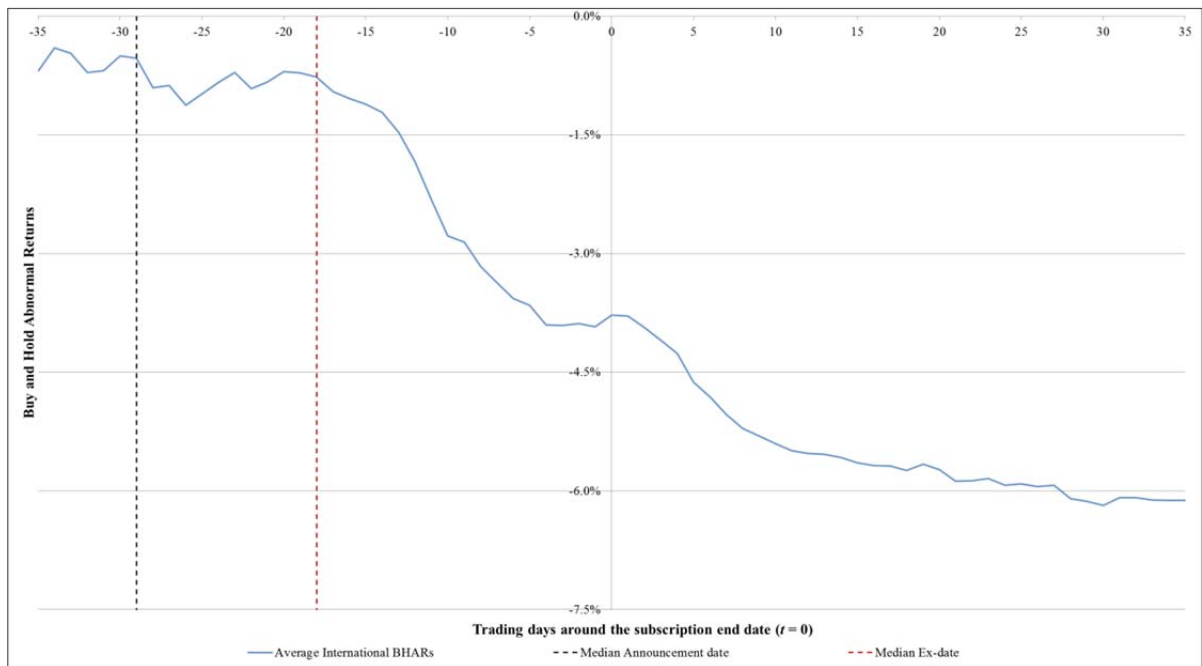
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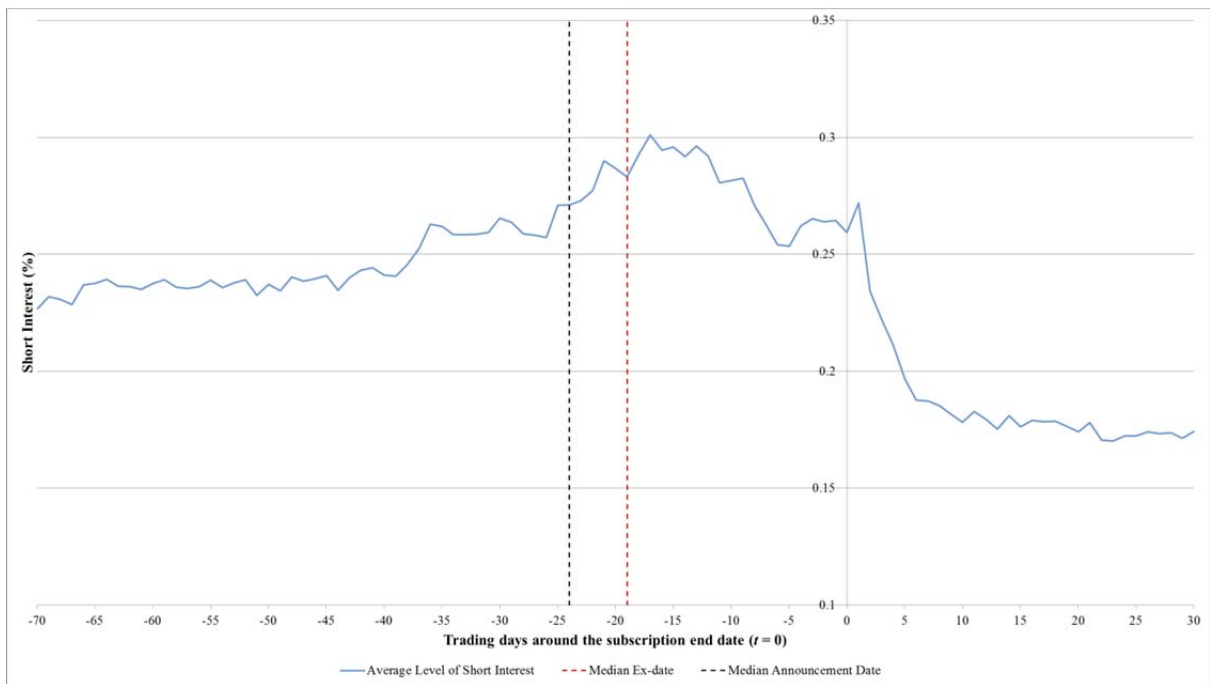
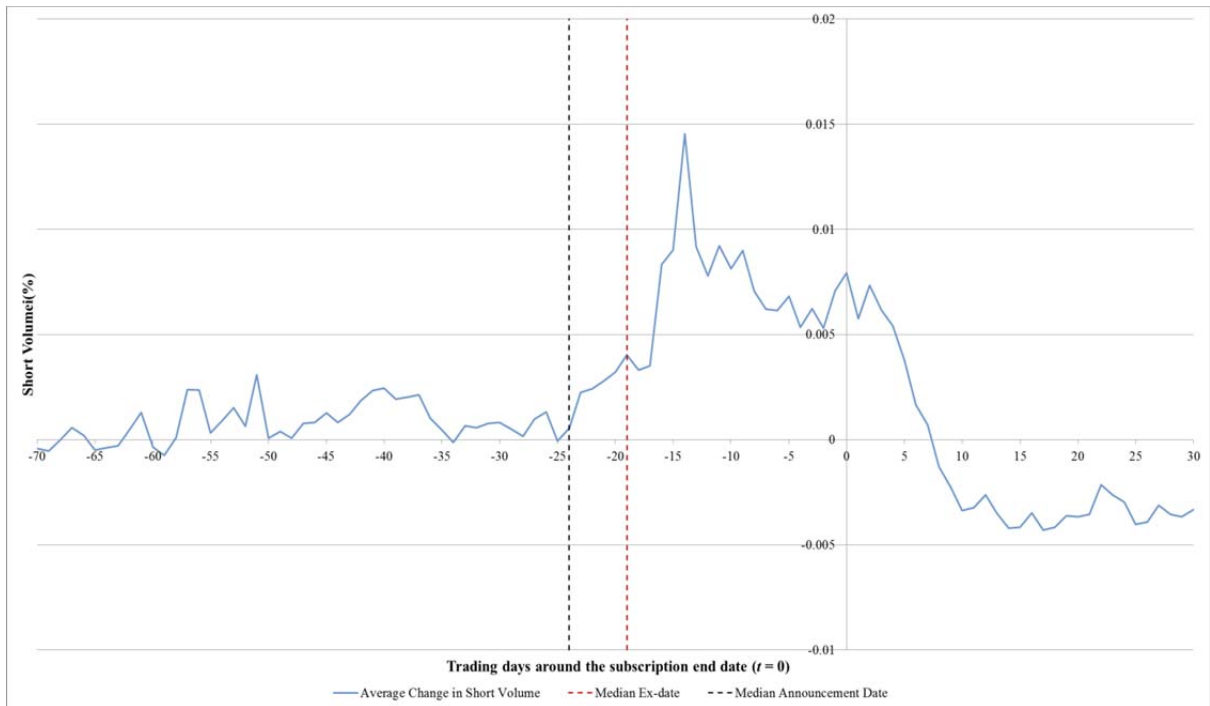
**Figure 1: Number and Size of Rights Issues Conducted Worldwide (2002-2014)**



**Figure 2: Buy-and-Hold Returns and Discounts During and After Rights Issues**



**Figure 3: Short Sales During and After Australian Rights Issues**



**Table 1: Number of Rights Offerings Conducted per Country per Year**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total	%
Australia	77	94	94	104	118	172	168	336	236	235	233	241	231	<b>2,339</b>	20.09%
South Korea	24	76	62	139	116	142	102	132	88	57	49	53	66	<b>1,106</b>	9.50%
Taiwan	45	20	38	52	65	88	37	79	135	104	92	108	123	<b>986</b>	8.47%
Hong Kong	35	25	34	49	56	69	47	87	63	65	69	62	98	<b>759</b>	6.52%
Germany	6	23	69	63	73	77	67	67	67	82	48	15	14	<b>671</b>	5.76%
United Kingdom	58	61	65	61	38	20	24	85	33	28	28	42	47	<b>590</b>	5.07%
Sweden	20	27	25	40	45	46	49	73	75	42	49	42	39	<b>572</b>	4.91%
Singapore	3	10	9	13	28	66	26	44	48	17	27	31	28	<b>350</b>	3.01%
Malaysia	21	42	27	17	1	28	21	15	30	29	28	35	39	<b>333</b>	2.86%
France	13	17	20	23	27	32	13	41	33	25	29	21	26	<b>320</b>	2.75%
Turkey	27	11	40	33	28	22	20	24	17	29	27	12	8	<b>298</b>	2.56%
Brazil	5	10	21	22	15	26	27	29	28	30	33	28	20	<b>294</b>	2.53%
Thailand	3	0	3	11	22	20	20	15	21	28	32	55	48	<b>278</b>	2.39%
Indonesia	2	8	13	10	16	21	24	11	28	26	21	27	21	<b>228</b>	1.96%
Italy	9	11	18	17	22	13	13	22	16	24	18	16	19	<b>218</b>	1.87%
India	2	11	16	19	33	17	17	20	19	18	16	11	12	<b>211</b>	1.81%
Israel	2	1	0	14	10	17	12	28	30	23	31	20	17	<b>205</b>	1.76%
Norway	6	11	11	11	6	18	14	27	19	14	17	16	9	<b>179</b>	1.54%
Canada	2	10	10	6	8	10	7	20	15	10	9	14	13	<b>134</b>	1.15%
Pakistan	0	0	1	0	15	35	13	5	15	16	3	10	14	<b>127</b>	1.09%
South Africa	8	8	5	5	5	4	13	13	16	12	9	8	17	<b>123</b>	1.06%
Egypt	0	1	0	7	11	20	26	11	13	5	0	2	8	<b>104</b>	0.89%
Greece	4	8	5	9	7	18	5	10	10	7	5	10	6	<b>104</b>	0.89%
United States	3	2	5	3	8	5	9	5	16	9	14	13	10	<b>102</b>	0.88%
New Zealand	8	8	7	10	7	10	8	14	9	7	3	2	5	<b>98</b>	0.84%
Chile	4	4	5	16	10	2	11	13	2	1	6	12	10	<b>96</b>	0.82%
China	23	25	22	2	1	2	0	2	5	3	3	3	1	<b>92</b>	0.79%
Austria	3	6	14	18	10	5	4	7	4	6	1	4	1	<b>83</b>	0.71%
Poland	2	7	6	6	22	10	0	3	7	5	8	2	0	<b>78</b>	0.67%
Mexico	4	4	11	6	8	8	6	9	6	2	2	3	2	<b>71</b>	0.61%
Denmark	0	0	3	4	5	6	5	9	17	7	5	6	0	<b>67</b>	0.58%
Spain	0	0	3	12	7	7	1	9	8	4	5	4	3	<b>63</b>	0.54%
Switzerland	1	2	8	5	4	4	1	9	7	7	4	8	2	<b>62</b>	0.53%
Philippines	4	1	0	6	4	8	5	7	9	4	3	0	5	<b>56</b>	0.48%
Finland	4	3	4	2	3	4	1	9	2	6	5	6	3	<b>52</b>	0.45%
Belgium	3	3	0	1	4	5	1	7	7	2	1	2	5	<b>41</b>	0.35%
Peru	2	4	3	3	3	2	6	2	2	1	2	6	2	<b>38</b>	0.33%
Portugal	2	0	4	0	6	3	4	2	3	3	3	0	2	<b>32</b>	0.27%
Netherlands	0	1	6	2	0	3	2	5	1	3	1	2	2	<b>28</b>	0.24%
Japan	0	1	5	3	1	0	0	2	2	0	0	2	2	<b>18</b>	0.15%
Argentina	0	0	0	4	4	3	2	0	2	0	0	0	0	<b>15</b>	0.13%
Ireland	0	1	1	2	0	1	0	2	2	3	0	1	2	<b>15</b>	0.13%
Russia	0	0	0	0	1	2	0	0	0	1	0	2	0	<b>6</b>	0.05%
<b>Total</b>	<b>435</b>	<b>557</b>	<b>693</b>	<b>830</b>	<b>873</b>	<b>1,071</b>	<b>831</b>	<b>1,310</b>	<b>1,166</b>	<b>1,000</b>	<b>939</b>	<b>957</b>	<b>980</b>	<b>11,642</b>	
	3.74%	4.78%	5.95%	7.13%	7.50%	9.20%	7.14%	11.25%	10.02%	8.59%	8.07%	8.22%	8.42%		



**Table 2: Announcement Date Reaction to Rights Issues**

The table reports daily market adjusted abnormal returns estimated with the Scholes-Williams market model around the announcement date of 5,346 rights issues of equity by international firms in 43 countries between 2002 and 2014. This event study is only conducted for rights issues with announcement date data. AN denotes the announcement date of a right issue. AN to EX (-10, 0) denotes the ‘special window’ which is calculated as the median number of days between the announcement and the ex-date for our international sample. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% level respectively using a two-tail test for the Wilcoxon signed rank test (applicable for the Median BHAR), and skewness corrected test (applicable for the Mean BHAR).

Days	Mean BHAR	Median BHAR
-10	0.13%	0.02%
-9	-0.09% *	0.01%
-8	0.12% *	0.05%
-7	0.07%	0.00%
-6	0.05%	0.01%
-5	-0.02%	0.00%
-4	-0.12% **	-0.01% **
-3	-0.04%	0.03%
-2	0.09%	0.06%
-1	0.05%	0.01%
0 (AN)	-1.97% ***	-0.23% ***
+1	-1.57% ***	-0.15% ***
+2	-0.37% ***	-0.05% ***
+3	0.00%	0.02%
+4	-0.06% **	0.01%
+5	-0.07%	0.01%
AN to EX	0.82% **	-0.38%

**Table 3: Abnormal Returns Before and After the Subscription End Date**

The table reports mean and median buy-and-hold abnormal returns employing the Scholes-Williams market model for various event windows centred around the subscription end (SE) date ( $t = 0$ ). EX is the ex-date. The symbols \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% level respectively using either the Wilcoxon signed rank test (for the Median BHAR) or the skewness corrected test (for the Mean BHAR).

Window	Mean BHAR (%)	Median BHAR (%)
(-39, 0)	-3.54***	-3.99***
(-29, 0)	-2.65***	-2.97***
(-19, 0)	-2.49***	-2.45***
(-9, 0)	-1.53***	-1.02***
(-4, 0)	-0.05	-0.05***
(+1,+5)	-0.22	-0.18**
(+1,+10)	-1.00***	-0.75***
(+1,+20)	-0.68***	-0.87***
(+1,+30)	-0.32***	-0.91***
(+1,+40)	-0.29***	-0.78***
EX to SE	-4.10***	-3.94***

**Table 4: Firm Factors and Issue Characteristics Explaining Returns**

The dependent variable, *BHAR (-10)* (or *BHAR (-20)*), is the buy-and-hold abnormal return in the shortest period of either: (a) 10 (or 20) trading days immediately prior to the subscription end date or (b) the ex-date and the subscription end date. *Closing Spread* is the average percentage bid-ask spread over 6 trading months ending 62 trading days before the ex-date. *Free Float* is the percentage of total shares in issue available to ordinary investors on the ex-date of the offering. *Company Size* is the natural logarithm of average market value over one trading month ending 62 trading days before the ex-date. *Dividend Yield* is the average dividend per share as a percentage of the share price over one trading month ending 62 trading days before the ex-date. *Discount* is the offering price on the ex-date divided by the unadjusted market price on the ex-date, subtract one. *Duration* is the natural logarithm of the number of days between the ex-date and the subscription end date. *Offering Ratio* is the number of new shares offered relative to one old share as specified by the terms and conditions of the rights. *Transferability* is a binary variable equal to one if the offering is transferable, and zero otherwise. *Run-up* is the raw return starting six trading months (128 trading days) prior the estimated announcement date and ending 63 trading days before the ex-date. *Idiosyncratic Risk* is the root-mean squared error obtained from the estimation of the market model used to produce abnormal returns. *Leverage* is the average ratio of total debt divided by total assets value over one trading month ending 62 days before the ex-date. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are adjusted for country-by-year clustering and are denoted in parentheses.

	(1)	(2)	(3)	(4)
	BHAR (-10)	BHAR (-10)	BHAR (-20)	BHAR (-20)
Closing Spread	-0.048* (-1.696)	-0.060** (-2.029)	-0.044 (-1.320)	-0.048 (-1.484)
Free Float		0.012* (1.684)		0.020** (2.187)
Analyst Coverage	0.008*** (3.752)	0.007*** (3.410)	0.013*** (5.123)	0.013*** (4.668)
Company Size	-0.002 (-1.414)	-0.002 (-1.429)	-0.003* (-1.885)	-0.002 (-1.365)
Dividend Yield	0.077 (1.199)	0.087 (1.263)	0.080 (0.963)	0.077 (0.855)
Discount	0.019*** (3.428)	0.020*** (3.174)	0.041*** (4.028)	0.046*** (3.838)
Duration	0.033*** (5.771)	0.031*** (4.974)	0.031*** (3.882)	0.028*** (3.062)
Offering Ratio	-0.004* (-1.653)	-0.003 (-1.486)	-0.006*** (-2.589)	-0.008*** (-3.140)
Transferability	0.000 (0.084)	0.001 (0.235)	0.007 (1.526)	0.009* (1.750)
Run-up	-0.009*** (-3.194)	-0.009*** (-3.677)	-0.015*** (-4.372)	-0.015*** (-4.921)
Idiosyncratic Risk	0.088 (0.741)	0.115 (0.962)	0.036 (0.238)	0.055 (0.336)
Leverage	-0.007 (-1.031)	-0.015** (-1.998)	-0.006 (-0.660)	-0.010 (-0.975)
Intercept	-0.104*** (-4.652)	-0.103*** (-4.217)	-0.112*** (-3.463)	-0.117*** (-3.227)
Country-year FE	Yes	Yes	Yes	Yes
Observations	9,834	8,559	9,834	8,559
R-squared	0.095	0.099	0.094	0.103

**Table 5: Relationship between Returns before and after Subscription End**

*BHAR* (-10) and *BHAR* (-20) are measures of subscription period returns, and are defined in Table 3 respectively. *BHAR* (+10), *BHAR* (+20) and *BHAR* (+30) are measures of post-offering returns, and are calculated as the buy-and-hold abnormal returns in the immediate 10, 20 and 30 trading days after the subscription end date respectively. All other independent variables are defined in Table 3. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are adjusted for country-by-year clustering and are denoted in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	<u>BHAR (+10)</u>	<u>BHAR (+20)</u>	<u>BHAR (+30)</u>	<u>BHAR (+10)</u>	<u>BHAR (+20)</u>	<u>BHAR (+30)</u>
BHAR (-10)	-0.110*** (-5.946)	-0.139*** (-5.715)	-0.105*** (-3.836)			
BHAR (-20)				-0.069*** (-5.062)	-0.095*** (-4.728)	-0.074*** (-3.104)
Closing Spread	0.020 (0.721)	0.087** (2.203)	0.121** (2.243)	0.021 (0.771)	0.091** (2.355)	0.121** (2.350)
Analyst Coverage	0.009*** (4.018)	0.019*** (5.549)	0.024*** (5.582)	0.009*** (3.903)	0.019*** (5.562)	0.024*** (5.584)
Company Size	-0.007*** (-4.883)	-0.013*** (-5.924)	-0.019*** (-6.738)	-0.007*** (-4.808)	-0.013*** (-5.874)	-0.020*** (-6.775)
Dividend Yield	0.086 (1.430)	0.113 (1.278)	0.095 (0.846)	0.086 (1.474)	0.104 (1.166)	0.091 (0.800)
Discount	-0.004 (-0.579)	-0.010 (-1.128)	-0.005 (-0.477)	-0.004 (-0.528)	-0.010 (-1.068)	-0.005 (-0.429)
Duration	0.000 (0.066)	-0.009 (-1.031)	-0.017 (-1.615)	-0.001 (-0.181)	-0.010 (-1.095)	-0.017 (-1.577)
Offering Ratio	-0.014*** (-5.606)	-0.020*** (-5.888)	-0.021*** (-6.058)	-0.014*** (-5.605)	-0.020*** (-5.978)	-0.022*** (-6.111)
Transferability	0.007 (1.379)	0.007 (1.103)	0.010 (1.315)	0.009 (1.611)	0.007 (1.166)	0.011 (1.417)
Run-up	-0.012*** (-5.521)	-0.026*** (-7.635)	-0.037*** (-9.052)	-0.013*** (-5.548)	-0.027*** (-7.619)	-0.038*** (-8.988)
Idiosyncratic Risk	-0.223* (-1.944)	-0.235 (-1.612)	-0.314 (-1.512)	-0.242** (-2.223)	-0.278* (-1.947)	-0.352* (-1.733)
Leverage	0.007 (0.736)	0.001 (0.105)	-0.003 (-0.226)	0.008 (0.766)	0.003 (0.228)	-0.002 (-0.135)
Intercept	0.035* (1.669)	0.099*** (3.201)	0.163*** (4.204)	0.039* (1.826)	0.103*** (3.204)	0.164*** (4.144)
Country-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,834	9,834	9,834	9,834	9,834	9,834
R-squared	0.109	0.121	0.136	0.107	0.120	0.137

**Table 6: Relationship between Returns and Short Sales Restrictions**

*Restriction* is a variable that is the cumulative sum, based on the following criteria: equal to 0 if no restrictions on short selling are in place in the home country, 1 if an up-tick rule is in place, 1 if there is a ban on naked-short selling, 1 if there is a disclosure regime in place, 1 if there is a ban on all financial companies, 0.5 if there is a partial ban on financial companies, and 0.5 if there are other preventative measures in place (e.g., circuit breakers). *Tick Rule* is a binary variable equal to one if a tick rule is in place in the issuer's primary market and in the same year as the issuer's rights offering, and zero otherwise. *Disclosure* is a binary variable equal to one if short sales disclosure regimes are in place in the issuer's primary market and in the same year as the issuer's rights offering, and zero otherwise. All other independent variables are defined in Table 3. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are adjusted for industry clustering and are denoted in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	BHAR (-10)	BHAR (-10)	BHAR (-10)	BHAR (-20)	BHAR (-20)	BHAR (-20)
Restriction	0.002* (2.034)			0.003*** (4.280)		
Tick Rule		0.009** (2.456)			0.008 (1.095)	
Disclosure			0.002 (0.440)			0.015*** (3.901)
Closing Spread	-0.034** (-3.098)	-0.083*** (-6.053)	-0.079*** (-3.547)	-0.007 (-0.295)	-0.056 (-1.527)	-0.068* (-2.350)
Analyst Coverage	0.012*** (9.938)	0.012*** (4.736)	0.010*** (4.641)	0.011*** (4.601)	0.011** (2.420)	0.016** (2.922)
Company Size	-0.005*** (-13.936)	-0.008*** (-16.780)	-0.002 (-1.555)	-0.002*** (-5.802)	-0.005*** (-6.082)	-0.003 (-1.672)
Dividend Yield	0.081 (1.376)	0.154* (2.018)	0.064 (0.683)	0.069 (1.070)	0.054 (0.509)	0.077 (0.923)
Discount	0.018* (2.043)	0.016 (1.368)	0.029** (3.080)	0.044*** (4.131)	0.036** (2.816)	0.062*** (7.704)
Duration	0.019*** (4.866)	0.018* (2.214)	0.031*** (6.742)	0.006 (1.306)	0.017** (2.456)	0.023*** (7.112)
Offering Ratio	-0.005** (-2.617)	-0.005 (-1.834)	-0.008*** (-3.657)	-0.006** (-2.697)	-0.004 (-1.104)	-0.011*** (-3.962)
Transferability	-0.005 (-1.695)	0.002 (0.381)	-0.000 (-0.057)	-0.007* (-1.896)	0.003 (0.541)	-0.006 (-1.175)
Run-up	-0.007*** (-7.794)	-0.004** (-2.686)	-0.012*** (-6.468)	-0.012*** (-6.256)	-0.016*** (-6.863)	-0.016*** (-7.517)
Idiosyncratic Risk	0.010 (0.088)	-0.020 (-0.115)	0.158 (0.850)	-0.071 (-0.543)	-0.147 (-0.872)	-0.007 (-0.045)
Leverage	-0.008 (-0.906)	0.002 (0.148)	-0.019 (-1.487)	-0.006 (-0.798)	-0.010 (-0.865)	-0.017* (-2.132)
Intercept	-0.052 (-1.445)	0.014 (1.025)	-0.072 (-1.452)	-0.005 (-0.078)	0.017 (0.183)	-0.010 (-0.086)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,437	4,540	5,818	9,437	4,540	5,818
R-squared	0.032	0.045	0.038	0.038	0.040	0.062

**Table 7: Short Selling Activity Before and After Issues**

Panel A tests the difference between the change in short volume averaged over 5, 10, 15, and 20 days *before* the subscription end date and the change in short volume averaged over 5, 10, 15, and 20 trading days *after* the subscription end date. Panel B tests the difference between the level of short interest averaged over 5, 10, 15, and 20 days *before* the subscription end date to the level of short interest averaged over 5, 10, 15, and 20 trading days *after* the subscription end date. Short volume is calculated as gross short sales volume as a percentage of total shares outstanding. To calculate the change in short volume we first average the short volume in the 30 trading days immediately prior to the ex-date and subtract this from the level of short volume in each trading day in the event window. Short interest is calculated as the short position as a percentage of total shares outstanding. Statistical significance of differences is tested using a difference of means test. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively.

<b>Panel A: Change in Short Volume</b>			
	Before Subscription End Date (A)	After Subscription End Date (B)	Difference (A) - (B)
5 days	0.0064	0.0057	0.0007
10 days	0.0067	0.0024	0.0043***
15 days	0.0077	0.0004	0.0073***
20 days	0.0072	-0.0007	0.0079***
<b>Panel B: Level of Short Interest</b>			
5 days	0.2630	0.2272	0.0358**
10 days	0.2639	0.2056	0.0583***
15 days	0.2721	0.1967	0.0754***
20 days	0.2774	0.1919	0.0855***

**Table 8: Subscription period and post-offering returns on short volume**

*Short Volume* is the average gross short sales volume as a percentage of total shares outstanding' over the immediate trading month (21 trading days) prior to the ex-date for each rights issue. All other dependent and independent variables are defined in Table 3. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are adjusted for year clustering and are denoted in parentheses.

	(1)	(2)	(3)	(4)
	Subscription Period BHARs		Post Offering Period BHARs	
	BHAR (-10)	BHAR (-20)	BHAR (+10)	BHAR (+20)
Short Volume	-0.059* (-1.986)	0.058 (1.109)	0.137** (2.550)	0.019 (0.196)
Closing Spread	-0.085** (-2.491)	-0.069** (-2.215)	-0.016 (-0.466)	0.005 (0.127)
Analyst Coverage	0.010 (1.242)	0.023** (2.586)	0.013* (1.918)	0.029* (2.128)
Company Size	-0.004 (-0.941)	-0.008 (-1.704)	-0.013*** (-3.484)	-0.025*** (-3.884)
Duration	0.052*** (3.398)	0.072** (2.988)	-0.007 (-0.823)	-0.032 (-1.645)
Discount	0.101*** (3.032)	0.299*** (6.818)	0.015 (0.987)	-0.013 (-0.658)
Idiosyncratic Risk	0.402** (2.307)	0.245 (0.815)	-0.096 (-0.356)	-0.221 (-0.870)
Transferability	0.014 (1.107)	0.015 (1.436)	-0.020 (-1.517)	-0.015 (-1.626)
Dividend Yield	0.187 (1.347)	0.113 (0.557)	0.012 (0.088)	-0.079 (-0.727)
Offering Ratio	0.000 (0.019)	-0.007 (-0.777)	0.001 (0.110)	0.002 (0.415)
Run-up	-0.007** (-2.866)	-0.018** (-2.929)	-0.013** (-2.957)	-0.024*** (-3.934)
Leverage	-0.010 (-0.762)	-0.040** (-2.550)	0.043 (1.420)	0.001 (0.037)
Intercept	-0.170** (-2.962)	-0.218** (-2.311)	0.071 (1.360)	0.211** (2.798)
Year FE	Yes	Yes	Yes	Yes
Observations	2,155	2,155	2,155	2,155
R-squared	0.050	0.163	0.032	0.057

**Table 9: Fuzzy Regression Discontinuity Analysis – Naked Short Selling (NSS) Regulation**

*100MV Dummy* is a binary variable equal to one if the issuer has a market value greater than A\$100 million on its ex-date, and zero otherwise. *NSS Dummy* is a binary variable equal to one if the rights issuer is in the ASX's approved NSS list. *BHAR (-10)* and *BHAR (-20)* are the same independent variables as defined in Table 3. *Discount (Sub-End)* is calculated as the offering price on the ex-date divided by the unadjusted market price on the subscription end date, subtract one. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are denoted in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
	First-Stage <i>NSS Dummy</i>	Second-Stage <i>BHAR (-10)</i>	First-Stage <i>NSS Dummy</i>	Second-Stage <i>BHAR (-20)</i>	First-Stage <i>NSS Dummy</i>	Second-Stage <i>Discount (Sub-End)</i>
100MV Dummy	0.337** (2.023)		0.334** (2.021)		0.327** (2.064)	
<i>NSS Dummy (estimate)</i>		-0.220 (-1.374)		-0.364** (-2.167)		0.305* (-1.676)
Effective Observations (Left)	52	52	52	52	60	60
Effective Observations (Right)	49	49	51	51	51	51
Polynomial	Linear	Linear	Linear	Linear	Linear	Linear



**Table 10: Placebo Tests using Hypothetical Naked Short Selling (NSS) Regulation**

The definitions of *100MV Dummy* and *NSS Dummy* are the same as Table 8. *BHAR (-10)*, *BHAR (-20)* are defined in Table 3. The symbols \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% level respectively. *t*-statistics are denoted in parentheses.

<b>Panel A: Hypothetical NSS Regulation (Post 22 September 2008 Period) - Sharp RDD</b>				
	(1)		(2)	
	<i>BHAR (-10)</i>		<i>BHAR (-20)</i>	
100MV Dummy	-0.013 (-0.271)		0.014 (0.515)	
Effective Observations (Left)	216		180	
Effective Observations (Right)	128		115	
Polynomial	Linear		Linear	

<b>Panel B: Pre-2008 NSS Regulation using A\$90 million as the placebo threshold</b>				
	(1)	(2)	(3)	(4)
	First-Stage <i>NSS Dummy</i>	Second-Stage <i>BHAR (-10)</i>	First-Stage <i>NSS Dummy</i>	Second-Stage <i>BHAR (-20)</i>
100MV Dummy	0.205 ( 1.121)		0.308 (1.610)	
<i>NSS Dummy (estimate)</i>		0.384 (1.122)		0.373 (-1.133)
Effective Observations (Left)	67	67	49	49
Effective Observations (Right)	50	50	37	37
Polynomial	Linear	Linear	Linear	Linear

<b>Panel C: Pre-2008 NSS Regulation using A\$110 million as the placebo threshold</b>				
	(1)	(2)	(3)	(4)
	<i>NSS Dummy</i>	<i>BHAR (-10)</i>	<i>NSS Dummy</i>	<i>BHAR (-20)</i>
100MV Dummy	0.305 (1.585)		0.303 (1.481)	
<i>NSS Dummy (estimate)</i>		-0.144 (-1.180)		-0.029 (-0.122)
Effective Observations (Left)	138	138	95	95
Effective Observations (Right)	61	61	56	56
Polynomial	Linear	Linear	Linear	Linear