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Hole in the Wall: Informed Short Selling Ahead of Private Placements*

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Abstract. Companies planning a private placement typically gauge the interest of potential buyers before the offering is publicly announced. Regulators are concerned with this practice, called wall-crossing, as it might invite insider trading, especially when the potential investors are hedge funds. We examine privately placed common stock and convertible offerings and find evidence of widespread pre-announcement short selling. We show that pre-announcement short sellers are able to predict announcement day returns. The effects are especially strong when hedge funds are involved and when the number of buyers is high. We also observe pre-announcement trading in the options market.

Keywords: Insider trading, Hedge funds, Private placements, Wall-crossing, Short selling

JEL Classification: G14, G32

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1. Introduction

The market for private placements has surpassed the traditional seasoned equity market in terms of both dollar volume and number of transactions.¹ When a firm is planning a private placement, it will typically gauge the interest of potential investors in a series of confidential conversations before the offering is publicly announced. This practice is commonly referred to as ‘wall-crossing’ and regulation Fair Disclosure (Reg FD) deems the investor receiving the private information to be a ‘temporary insider.’² Thus, having crossed the wall, an investor is expressly prohibited under the Securities Act from trading on the private information revealed during these conversations. This legal restriction of the trading activity of wall-crossers is understandable given that the announcement of a private placement will often have a material price impact.³

While the academic literature has yet to consider the issue of wall-crossings, it has drawn the attention of the regulatory authorities. For example, in a testimony before the U.S. Senate Banking, Housing and Urban Affairs Committee, the then chairman of the Securities and Exchange Commission (SEC), Christopher Cox, stated that the SEC would create a new working group to enhance the efforts to combat insider trading by hedge funds and one of the enforcement priorities was short selling based on insider information in private placements (Mahoney et al., 2008). The SEC’s decision to target hedge funds is understandable as hedge funds are often the subject of insider

¹ De Jong et al. (2011) document that approximately 95 percent of convertible issues in the period 2003 – 2007 were privately placed. Chen et al. (2010) and Floros and Sapp (2012) provide evidence that the Private Investment in Public Equity (PIPE) market has surpassed the traditional seasoned equity market in terms of both dollar volume and number of transactions.

² Wall-crossing is different from the typical form of book-building, which occurs after the public announcement of the intended security issue.

³ Variation in the observed announcement effects can be large. Wruck (1989), Hertzal and Smith (1993) and Hertzal et al. (2002) examine the announcement effects of private placements and observe positive average announcement effects. De Jong et al. (2011) and Duca et al. (2012) find negative average announcement effects for privately placed convertible bonds.

trading allegations.⁴ The focus on private placements is also unsurprising given that wall-crossings create an obvious opportunity for insider trading.

In this paper, we investigate the trading behavior of short sellers around private placements. The focus on short sellers is guided by statements of regulatory authorities, such as the SEC, which clearly highlight short selling as a potential problem. Moreover, using proprietary data from Dataexplorers, we measure changes in short interest at a daily frequency and are therefore able to closely monitor the actions of these sophisticated investors, who are predominantly hedge funds. Our sample consists of private placements of common stock and convertible securities between January 2007 and August 2011, which is the period for which we have data from Dataexplorers.

Our results may be summarized as follows. First, we document significant pre-announcement increases in average short interest, which is evidence of information leakage. Second, we find that abnormal pre-announcement increases in short interest are negatively related to the stock price reaction to the public announcement of the private placement. We also observe this negative relation when we replace actual announcement returns by predicted announcement returns that are solely based on information available to wall-crossers before the offering. Both results suggest that the information received during the wall-crossing procedure is material and that some privately-informed investors take speculative positions prior to the announcement in order to profit from this information. Third, we find that short selling before the announcement is more pronounced when there are more buyers involved in the private placement. As the number of buyers is likely to correlate closely with the number of investors who have crossed the wall, we interpret this result as supporting our hypothesis that the existence of more potential traders with private information increases the probability of informed trading in the pre-announcement period. Fourth, using information on hedge fund involvement in privately-placed security offerings, we find that the observed patterns are non-

⁴ The reputation of hedge funds as potential inside traders was reinforced with the very public arrest of the Galleon Group hedge fund founder, Raj Rajaratnam, in 2009. He has since been sentenced to 11 years in prison and fined over \$150 million. Empirical evidence of insider trading by hedge funds in the syndicated loan market and around mergers and acquisitions may be found in Massoud et al. (2011) and Dai et al. (2011), respectively.

existent when hedge funds are not involved and strongest when hedge funds are heavily involved. We show that this finding is robust to controlling for the endogenous nature of hedge fund involvement. Finally, we examine the options market and find that pre-announcement option trading is significantly elevated for private placements where hedge funds are involved.

Our study relates to the broader insider trading literature. Prior studies have examined situations in which private information has leaked through “Chinese walls” designed to separate, for example, commercial and investment banking within the same bank.⁵ We make three contributions to this insider trading literature. First, we differ from the above studies by examining an explicit breach of trust between a firm and potential investors. Second, we provide new evidence in the context of private placements. Henry and Koski (2010) find no evidence of increased pre-announcement short selling in *public* seasoned equity offerings. Public seasoned equity offerings are less likely to be targeted by insider traders, due to the lower involvement of hedge funds in that market and the higher scrutiny compared to private security offerings. We establish the important result that pre-announcement short selling is widely present in private placements but not in public offerings. Third, we are able to observe the identity of the buyers in private placements and contribute to the literature by showing how placing securities with hedge funds increases the probability of insider trading.

This study also contributes to the burgeoning literature on short selling. While it has been suggested that short sellers are informed traders who are particularly skillful at digesting public information (see Engelberg et al., 2012), we are able to focus on short sellers’ use of non-public information. Our findings are consistent with studies that observe increased short selling before negative earnings surprises (e.g., Christophe et al., 2004; Boehmer et al., 2012) and before the appearance of negative firm-specific news in the media (Fox et al., 2010).

⁵ Ivashina and Sun (2011) and Massoud et al. (2011) find evidence of insider trading by institutions that obtain private information by lending in the syndicated loan markets; Acharya and Johnson (2007) find that informed banks exploit information in the credit default swap market; and Bodnaruk et al. (2009), Dai et al. (2011), Beny and Seyhun (2012) and Augustin et al. (2014) find information leakage around merger and acquisition events. On the other hand, Griffin et al. (2012) find no evidence that investment bank clients use inside information to trade around merger and earnings announcements.

Our results have clear regulatory implications and suggest that the limited resources of the regulators should be focused on examining placements with a high degree of hedge fund involvement and a large number of wall-crossers. Furthermore, our results suggest that regulators may wish to provide more extensive and timely disclosures of short interest.⁶ Disclosure of short interest would be of great interest to the parties directly involved in private placements, and would help market participants and enforcement authorities in filtering out suspicious private placements, thereby increasing the integrity of stock markets.

2. Wall-Crossings and Insider Trading Regulation

Reg FD requires that companies disclose material information to all investors at the same time. Exemptions to this rule do exist, however, as communications without public disclosure can be made to those who owe the issuer a duty of trust or confidence, such as an attorney or an accountant. These exclusions also apply to communications made to any person for legitimate business purposes, subject to the proviso that they expressly agree to maintain the information in confidence. This class of exclusions is relevant when a firm is considering raising capital through a private placement, as it allows issuers and underwriters to confidentially gauge interest in an offering prior to any public disclosure.

In general, private placements are initially marketed on an anonymous basis by an underwriter to a limited number of institutional investors. This is sometimes called a pre-sounding, sounding-out or pre-marketing campaign. If an investor is interested, they sign a confidentiality agreement and are informed of the identity of the issuer and the specifics of the offering. It is at this point that the investor legally crosses the wall and becomes a temporary insider. As such, they are restricted from trading in the issuer's securities until a public announcement of the offering has been made or else face the risk of prosecution for insider trading.

⁶ Section 417 of the Dodd-Frank Act requires a study of “the feasibility, benefits and costs of requiring reporting publicly, in real time short sale positions of publicly listed securities.” The U.K., France and Spain have adopted rules requiring short sellers to disclose their positions (see Jones et al., 2012).

In 2004, potential irregularities in wall-crossing attracted the attention of the U.S regulator. The SEC sent out requests for documents to securities brokers and other firms that sell securities to hedge funds in private transactions. The agency was concerned that these firms may have leaked news of forthcoming deals to favored clients, allowing them to profit by trading the stock ahead of the announcement (Pulliam, 2004). Subsequently, the SEC made the decision to focus on the trading activity of hedge funds and one of the enforcement priorities was short selling based on insider information in private placements (Mahoney et al., 2008).

Since 2005, the SEC has filed complaints against a variety of hedge fund managers. The SEC accused them of engaging in illegal insider trading by short selling issuer securities on the basis of material, non-public information prior to the announcement of a private offering, notwithstanding their agreement to keep information about the offering confidential and to refrain from trading prior to the public announcement. Appendix A provides a brief description of these cases. Most of the defendants consented to final judgments, without admitting or denying the accusations, leading to civil fines and repayment of unlawful profits. The amounts can be high and exceeded \$15 million in the case of SEC versus Langley Partners. In the cases where the judges did make rulings, a not guilty verdict was returned in some cases because the judge ruled that the announcement effect was too small for information to be deemed “material” (see Hartlin, 2009).

It is important to distinguish pre-announcement short selling from post-announcement short selling. Regarding post-announcement short selling, the SEC requires that the closing out of post-announcement short sale transactions is done with shares acquired on the open market (referred to as the ‘double print’ technique). In the event that the short sale transaction is closed out using shares acquired under the PIPE (a ‘wash’ trade), the SEC has argued that the seller is delivering unregistered securities in violation of Section 5 of the Securities Act (for a detailed discussion see Sjostrom, 2007; Hartlin, 2009). Our paper does not focus on post-announcement short selling.⁷

⁷ Safieddine and Wilhelm (1996) and Henri and Koski (2010) find evidence of manipulative short selling before public seasoned equity offerings. Manipulative short selling occurs *after* the announcement of the offering and relates to short selling before the issue date in an attempt to produce an artificial discount in the price of the new

Pre-announcement short sellers with information about the upcoming announcement might trade for speculative reasons in an attempt to exploit a negative announcement effect. In addition, pre-announcement short sellers might be wall-crossed investors who decide to lock-in a profit on the securities they agreed to purchase, as the securities in a private placement are typically offered at a discount. Pre-announcement short selling, both speculation-induced and hedging-induced, is considered illegal by the SEC. The cases in Appendix A clearly illustrate the SEC's standpoint. For example, the SEC's complaint against Shane states: "This matter involves insider trading and the unregistered sale of securities by Defendant Hilary L. Shane ("Shane") in connection with a Private Investment in Public Equity ("PIPE") offering of stock by CompuDyne Corporation ("CompuDyne"). Specifically, in the fall of 2001, in breach of an express confidentiality agreement with CompuDyne, Shane engaged in short selling of CompuDyne stock in advance of the public announcement of the CompuDyne PIPE offering. As a result, Shane violated her duty of trust and confidence owed to CompuDyne, and reaped \$296,785 in ill-gotten gains for herself and for a hedge fund that she managed."⁸

The issue of insider trading by wall-crossed investors has also attracted the attention of regulators outside the United States. In the United Kingdom, the Financial Services Authority (FSA) accused a hedge fund manager of short selling after being wall-crossed in 2003 and fined him in 2006.⁹ In the course of the first half of 2012, the FSA released details of five market abuse enforcement cases involving improper disclosure and insider dealing on the basis of information released during a pre-sounding exercise.¹⁰ In France, the market regulator fined four hedge funds after an insider trading investigation into a Vivendi Universal SA securities sale in 2002. The hedge funds were accused of using information resulting from being wall-crossed and massively selling shares shares. In wall-crossings, where investors typically receive a price indication immediately after they cross the wall, this type of short selling is unlikely to occur.

⁸ See <http://www.sec.gov/litigation/complaints/comp19227.pdf>.

⁹ See <http://www.fsa.gov.uk/library/communication/pr/2006/077.shtml>

¹⁰ See the cases of Einhorn, Hannam, Kyprios, Osborne and Ten-Holter on http://www.fsa.gov.uk/pages/about/what/financial_crime/market_abuse/library/notices/index.shtml

ahead of the official announcement of the operation (Vivendi shares fell 14 percent in the three days before the offering).¹¹ Japan's Financial Services Agency also started investigations into allegations of insider trading ahead of share offerings.¹²

3. Hypothesis Development

In the spirit of Ritter (2008), who discusses the term “forensic finance,” we consider a large sample of private placements to empirically establish whether the problem of insider trading is limited to a few rogues, as implied by the small number of legal cases, or is more widespread. In fact, as our data start in 2007, we establish whether suspicious patterns are widespread after the SEC had already started filing complaints and after market participants would have known that the SEC had identified insider trading in private placements as an enforcement priority.

The first hypothesis considered in this paper is based on the argument that information leakage about the upcoming private placement should result in an increase in short interest prior to the announcement of a private placement. This statement assumes that at least some of those who are privy to the pre-announcement information are willing to trade on it. If wall-crossed investors trade before the announcement to lock-in a profit on the securities that they agreed to purchase at a discount, then they are expected to short sell regardless of the expected announcement effect. If traders obtain speculative positions in an attempt to exploit the expected announcement effect, then we still expect an increase in short interest as long as at least some traders expect a negative announcement effect. Reductions in short positions by those that expect positive announcement effects are unlikely as investors that are already holding short positions in the issuing firm's stock are not likely to be invited to be wall-crossed.

H1. Firms that privately place securities experience an increase in short interest prior to the public announcement of the offering.

¹¹ See <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=aCPasXEGQ8sw&refer=germany>

¹² See <http://biz.thestar.com.my/news/story.asp?file=/2012/7/21/business/11704988&sec=business>

Our second hypothesis examines the implications of the expected announcement effect. If short sellers are informed and speculating on expected announcement effects, then private placements with negative announcement returns, especially if these are relatively large in magnitude, should experience a larger increase in short interest before the announcement. A larger negative announcement return makes pre-announcement short selling more profitable and is expected to entice more short sellers to exploit their information. This leads to the second hypothesis.

H2. The change in short interest in the pre-announcement period is negatively related to the abnormal return at the time of the public announcement of the private placement.

The third test is designed to provide further insights into these previous results and examines whether short selling before the announcement is related to the number of buyers. Acharya and Johnson (2010) find that a larger number of financing participants increases the likelihood of observing suspicious patterns prior to bid announcements of private-equity buyouts. Assuming that the number of buyers (which we do observe) is positively related to the number of wall-crossed investors (which we do not observe), we argue that a larger number of buyers increases the probability that at least some privately-informed investors will be willing to risk possible prosecution by short selling before the public announcement.

H3. Pre-announcement short selling is more pronounced and the negative relation between changes in short interest in the pre-announcement period and announcement day returns is stronger, when there are more buyers involved in the private placement.

The fourth hypothesis focuses specifically on the role of hedge funds. As noted by Massoud et al. (2011), hedge funds are largely unregulated with respect to their long and short equity holdings in comparison with other institutional investors and have fewer internal information barriers (Chinese walls) between those involved in financing decisions and those involved in trading decisions. Hedge

funds also have an incentive-based fee structure that makes informational advantages extremely valuable. These factors, combined with the fact that short selling is part of the day-to-day activities of most hedge funds, lead us to expect that the involvement of hedge funds exacerbates the observed patterns in pre-announcement short selling and that the degree of informed short selling is a function of the number of hedge funds involved.

H4. Pre-announcement short selling, the impact of the number of buyers and the relation between pre-announcement changes in short interest and announcement returns are all more pronounced when the buyers are hedge funds.

Our final hypothesis relates to trading in the options market. Informed traders can use the options market to benefit from their informational advantage. Augustin et al. (2014), for example, show increased option trading before takeover announcements. We expect that option trading is elevated before the announcements of private placements.

H5. Firms that privately place securities experience an increase in option volume prior to the public announcement of the offering.

4. Sample Selection, Data and Descriptive Statistics

4.1. SAMPLE SELECTION

We obtain a sample of private placements from Securities Data Company (SDC) and Sagient's PlacementTracker.¹³ We obtain all placements for the period January 2007 to August 2011, which is the period for which we have daily data on short interest from Dataexplorers. The private placements include PIPE offerings, which can be structured as common stock or convertible

¹³ These databases only partially overlap. Most notably, the Sagient database includes more PIPE issues and is typically used in studies on PIPEs. The Sagient database also reports information on hedge fund involvement in the offerings.

securities.¹⁴ The private placements also include convertible offerings placed under Rule 144A, which allows companies to sell securities without registration under the U.S. Security Act of 1933, if the securities are issued only to qualified institutional buyers (QIBs).¹⁵

The sample is restricted to issuers whose ordinary common shares trade on the NYSE, AMEX and NASDAQ exchanges and have CRSP share codes 10 or 11 (i.e. we exclude REITS, Closed-End Funds, ADRs, Canadian Firms and Other Non-U.S. Incorporated Firms, Primes and Scores and HOLDRs). IPOs, right offerings, exchangeable securities, secondary offerings by current blockholders and shelf filings that only state the issuer “may sell shares periodically” (see Henry and Koski, 2010) are also excluded. The data are further filtered to include only stocks that have information in CRSP, Compustat and Dataexplorers at the time of the issue.¹⁶ It is also a requirement that, two weeks before the announcement, there is a non-zero number of shares available for lending and that the stock price is larger than one dollar.

Announcement dates are obtained from Factiva and we use the timestamp from the earliest newswire to assign an announcement date. If the announcement occurs after the close of trading, the following trading day is identified as the announcement date (day 0). When no announcement is available in Factiva or when the announcement coincides with another major announcement (like a

¹⁴ The main difference between PIPEs and traditional private placements is the duration of the resale restrictions on the participating investors. The restriction period was typically two years for traditional private placements, whereas for PIPEs, the shares can typically be publicly traded within 90 days. Traditional private placements have only been issued sporadically in the 21st century (Chen et al., 2010). The PIPE issues in our sample are traditional PIPEs rather than structured PIPEs, which have virtually disappeared since 2003 because of legal issues associated with potential market manipulation. Structured PIPEs are not price protected and conversion prices of structured PIPEs can be adjusted downward if there are, for example, adverse changes in market conditions (see Hillion and Vermaelen, 2004).

¹⁵ QIBs, which are typically large institutional buyers with more than \$100 million of investable assets, are allowed to trade the offering among themselves.

¹⁶ For our analysis of option trading, an additional requirement is that OptionMetrics provides data on trading in the options of the issuers. We discuss the option data in Section 8.

merger agreement), that observation is deleted from the dataset. After applying all these criteria, we are left with a sample of 323 convertible bond issues and 339 common stock issues by 536 unique firms. We find that the issuers are operating in many different industries, with no single industry dominating our sample.

4.2. SHORT INTEREST DATA

Daily short interest data are sourced from Dataexplorers, an independent data vendor whose clients include trading desks, hedge funds and industry participants. The Dataexplorers database is accessible through Bloomberg and provides daily aggregated inventory information for over 22,000 funds who lend through over 100 wholesale stock lending market participants across 33 countries.¹⁷ Dataexplorers provides daily security-level information on the quantity of shares available for lending, which is measured as the total number of shares held by all beneficial owners¹⁸ divided by the total number of shares outstanding. Volume information for loan transactions is also available, which provides information on the level of short interest and is measured as the total number of shares lent, divided by the number of shares outstanding. The daily average loan fee for new loans is also included, which provides information on the transactions cost to stock lenders.

There are a number of differences between publicly available short interest data from sources such as the NYSE and NASDAQ and the short interest data from Dataexplorers. Most notably, short interest in Dataexplorers is available on a daily basis, whereas short interest data from the NYSE and NASDAQ is available on a (semi-)monthly basis. Despite the obvious and unique value of the Dataexplorers daily data set, there are limitations. Firstly, not all custodians report to Dataexplorers. By their own estimates, the Dataexplorers database covers approximately 70 percent of trading in the

¹⁷ Further details of the Dataexplorers database can be found in Saffi and Sigurdsson (2011) and www.dataexplorers.com. Note that Dataexplorers was recently acquired by Markit and the database is now known as the Markit Securities Finance database.

¹⁸ Beneficial owners are the wholesale lenders of stock such as pension funds or mutual funds. Inventory and loan information is normally reported to Dataexplorers by the custodians, who are the beneficial owners' agents in the lending process.

stock lending market. Secondly, the Dataexplorers database captures lending for purposes other than short selling.¹⁹ Despite these differences, Dataexplorers document that the correlation between the publicly reported level of short interest in the U.S. market and the Dataexplorers data is almost 0.90. Our own validation of the database confirms this to be accurate.

Finally, note that alternative sources of daily short sales data are available, but these databases only cover small periods and, more importantly, these databases capture only sales by short sellers. For example, the Reg-SHO data and short sales data collected by the NASDAQ and NYSE only include additions to short interest, but not the reductions as brokers have to disclose whether a sell order is a short sale, but not whether a buy order is intended to cover a short.²⁰

4.3. DESCRIPTIVE STATISTICS

Panel A of Table I provides descriptive statistics for our total sample of 662 private placements and Appendix B provides the definitions of our variables. Variables are winsorized at the

¹⁹ While the lending captured in the Dataexplorers database reflects short selling, stocks are also loaned for reasons related to dividend arbitrage (typically to extract tax benefits through deals with foreign parties) and settlement (where a fund is unable to buy or sell a stock immediately, it must borrow the security). The data also include ‘pay-to-hold’ transactions, whereby a speculator will pay to hold borrowed stock to secure availability of lendable shares in case of an announcement. Our discussions with industry participants suggest that pay to hold is more common in companies with limited lending availability (due to limited free floats or company size) given the likely scramble for shares if an announcement eventuates. This type of strategy became much less popular in the post-GFC era. Note that the publicly available short data also do not solely reflect lending for short selling. The publicly available short interest data also capture lending for rehypothecation (where a prime broker borrows a fund’s long position to cover another fund’s short position) and exclusive trading (asset managers agree to lend a portfolio exclusively to a single counterparty).

²⁰ A contemporaneous paper by Li et al. (2013) uses Reg-SHO data to examine how short sales are affected by stock repurchases around convertible offerings in 2005 and 2006. They find increases in pre-announcement short selling for convertible offerings without accompanying stock repurchases. We examine the effect of accompanying stock repurchases in Section 7.

1 percent and 99 percent levels. The firms in our sample on average have total assets of \$8,279 million. The average issue raised \$166 million in proceeds or 22 percent of the firm's pre-issue market capitalization. The Dataexplorers data show that on the announcement date, day 0, the average short interest in firms privately placing capital is 6.20 percent, with a standard deviation of 7.39 percent. The percentage of shares available for lending on the announcement date is 13.25 percent, with a standard deviation of 12.49 percent. Thus, these data suggest there is a wide dispersion of short interest and institutional ownership among the private placements in the sample.

For a restricted sample of 451 private placements, we have additional information on the total number of buyers and the total number of hedge funds among these buyers. This information is obtained from either the Sagient database, or, if missing, from the registration statements available from SEC Edgar.²¹ The total number of buyers in a private placement has a mean of 14. Seventy percent of the private placements involve at least one buyer who is a hedge fund and the average number of hedge fund buyers is 7.

[insert Table I here]

Panel B of Table I presents a summary of the data distinguishing between Rule 144A and PIPE convertible debt issues as well as the sample of PIPE common stock issues.²² On average, a firm privately issuing common stock tends to be smaller, has higher market-to-book ratios, higher annualized volatility, lower return on assets, lower leverage and is less likely to pay dividends compared to firms issuing convertible debt. Both short interest and shares available for lending are lower for firms privately placing common stock than for firms with private placements of convertibles.

Rule 144A convertible debt offerings tend to have a substantially larger proportion of shares available for lending (26.37 percent compared to around 10 percent for PIPE issues). They also have a

²¹ The registration statements in SEC Edgar (either S-3/A, S-3, S-3ASR, or 424B filings) contain a list of buyers in their "Selling Securityholders" section. Obtaining the identity of buyers from registration statements follows the procedure in Brown et al. (2012).

²² As noted by Chen et al. (2010), there have been few non-PIPE private placements of common stock in the 21st century.

higher average level of short interest (9.2 percent compared to around 6.0 percent for PIPE issues) and a much lower average lending fee (100bps compared to 385bps for PIPE convertible debt and 539bps for common stock offerings).

The average number of buyers for private placements of common stock is 9, whereas this average is 38 for 144A convertible offerings and 14 for convertible PIPEs. Consistent with Choi et al. (2009) and Brown et al. (2012), hedge funds are frequently involved in convertible issues under Rule 144A. At least one hedge fund is involved in 94 percent of 144A issues and there are on average 21 hedge fund buyers, which is noticeably higher than in PIPE issues.

The last three rows of Panel B in Table I contain information specific to the 144A and PIPE convertible issues. The average time to maturity is longer for 144A convertibles, whereas the conversion premium and the mean delta are very similar for both types of convertibles.

4.4. ANNOUNCEMENT DAY RETURNS

As a first step in the analysis, we calculate the benchmark-adjusted cumulative abnormal returns on the announcement day and the following day (i.e., day 0 and day 1). For each stock, the abnormal return on day t is the actual return on day t , minus the return on the matching size and book-to-market portfolio on day t .²³ Table II, Panel A presents descriptive statistics for the cumulative abnormal return for the whole sample as well as for the three different types of private placements. The cumulative abnormal returns are winsorized at the 1 percent and 99 percent levels. The mean announcement return for the entire sample is 1.10 percent (t-statistic is 2.4) and the median announcement return is -0.06 percent.

The average cumulative abnormal return equals -3.44 percent (t-statistic is -5.4) for 144A convertibles, 2.90 percent (t-statistic is 2.6) for convertible PIPE issues and 2.22 percent (t-statistic is

²³ The benchmark return is the value-weighted return for the intersections of 5 size and 5 book-to-market portfolios from Ken French's website. The size breakpoints for year t are the NYSE market equity quintiles at the end of June of t . The book-to-market breakpoints are NYSE quintiles, where the book-to-market ratio for June of year t is the book equity for the fiscal year end in $t-1$ divided by the market value of equity for December of $t-1$.

3.8) for common stock PIPEs. The standard deviations for these three groups are 7.86 percent, 14.78 percent and 10.90 percent, respectively. These relatively high standard deviations highlight the diversity of market responses to private placement announcements, which we will exploit when testing our second hypothesis.

In Panel B of Table II we split the sample into private placements with hedge fund involvement, without hedge fund involvement, and with no information on hedge fund involvement.²⁴ Consistent with Dai (2007), Brophy et al. (2009), Duca et al. (2012) and Floros and Sapp (2012), we find that the share price reaction to the announcement depends strongly on the involvement of hedge funds. For the sample with no hedge fund participation, the average abnormal returns are significantly positive. For the sample with hedge fund participation and the sample where hedge fund participation is unknown, the average return is negative, but insignificant.

[insert Table II here]

5. Patterns in Short Interest, Lendable shares and the Lending Fee

The first hypothesis relates to whether firms with private placements experience an increase in short interest prior to a public announcement of the offering. Figure 1A and Figure 1B present plots of the pattern in mean short interest over the window -50 to +40 days around the announcement for convertible bond private placements and common stock private placements, respectively. Interestingly, both plots display a strong run-up in short interest prior to the announcement. Also of interest is that the speed with which this happens differs markedly. For convertible issues, most of the increase in short interest occurs in the few days prior to the announcement of the offering. For common stock issues, however, this increase begins about a month prior to the announcement and continues until a few days before the public announcement. Relatively long wall-crossing periods are not uncommon for common stock PIPEs. For example, the SEC versus Gryphon Partners outlines a 2003 Celsion Corporation PIPE offering, in which the executive summary of the offering was e-

²⁴ Because we observe buyers rather than wall-crossed investors, our subsample of issues “without hedge fund involvement” could include wall-crossed hedge funds that decided not to participate in the offering.

mailed on May 21st, the confidentiality agreement was received on June 3rd and the public announcement occurred on July 8th.

The relatively short period during which the build-up takes place for convertible bonds is consistent with the finding in Dong et al. (2013) that convertible arbitrage hedge funds tend to make their investment decisions very quickly, typically within a day.²⁵ Given their short decision time, it is not surprising that convertible hedge funds have relatively short wall-crossing periods.

[insert Figure 1 here]

For convertible issues, the level of short interest increases further upon the announcement of the private placement and then stays at an elevated level. This pattern most likely reflects the legal short selling activity of convertible arbitrageurs, who either replace or join the pre-announcement short sellers. By way of contrast, short interest in common stock issues peaks a few days prior to the announcement and falls thereafter. This observed pattern for the common stock PIPE issues seems in line with the increase in short interest prior to the announcement being the result of speculative positions taken by short sellers rather than pre-announcement (and therefore also illegal) hedging activity. Note however that it might also be the pre-existing short sellers who close out their positions upon the announcement of a private placement as the new funding may decrease the probability of bankruptcy for the firm.

To provide further insights, we tabulate average abnormal short interest, lendable shares, turnover and the value weighted average lending fee over the period -20 to +10 trading days, which is the period when the largest changes are observed. To calculate the abnormal values, we first define the ‘normal’ value of these variables as the event-specific average over the 30-day period from day -50 to -21. Then, for each event day in the period -20 to +10, we subtract this average from the actual value. Next, we average the daily abnormal values across all observations in each group. For each group, the *t*-statistics are based on the standard deviation across these daily abnormal values.

²⁵ Convertible hedge funds typically minimize their exposure to changes in the stock price by combining their purchase of convertible bonds with short positions in the underlying stock.

The first columns of Panel A of Table III present the results for the 323 private placements of convertible bonds. Consistent with the raw data presented in Figure 1, we observe the sharpest increase in abnormal short interest in the last three days before the announcement, but abnormal short interest is consistently elevated in the pre-announcement period and significant from day -9 onwards. Short interest increases further after the announcement, consistent with convertible arbitrageurs increasing their short positions. The abnormal lending fee is significantly positive on several days before the announcement and on most days after the announcement. Finally, abnormal turnover is significantly positive from day -1 to day +6, while there is no readily observable pattern in the number of lendable shares close to the announcement.

[insert Table III here]

The columns on the right of Panel A of Table III present the descriptive metrics for the 339 common stock offerings. There is a steady increase in abnormal short interest in the 20 days before the announcement for common stock offerings. Short interest peaks on day -3 at a level of 0.61 percent of shares outstanding above the normal level (the t -statistic is 4.1) and then decreases in the next 2 weeks to a level of 0.15 percent of shares outstanding above the normal level of short interest. There is no evidence of any abnormal patterns in the supply of lendable shares, whereas the lending fee and turnover are significantly elevated on the announcement day and the day immediately after the announcement.

In Panel B of Table III, we document the average abnormal short interest, lendable shares, turnover and the value weighted average lending fee for a sample of 128 common stock *public* offerings and 93 convertible bond *public* offerings that took place during our sample period. The sample is obtained from SDC using the same sample selection criteria as for our sample of private offerings. Consistent with Henry and Koski (2010), who consider U.S. public equity offerings in 2005 and 2006, we find no evidence of increased pre-announcement short selling for public seasoned equity offerings during our sample period from January 2007 to August 2011. Similarly, for public convertible bond offerings, there is no evidence of a significant increase in short interest in the pre-announcement period. These findings are interesting as they show an important difference between public and private issues. We only focus on private placements in the remainder of this paper.

6. Announcement Returns, Number of Buyers and Hedge Funds

6.1. DOES THE CHANGE IN SHORT INTEREST PREDICT ANNOUNCEMENT RETURNS?

The results in the previous section provide strong support for the first hypothesis that firms with private placements experience a significant increase in short interest prior to the public announcement of the offering. This increase in short interest in the days before the private placement announcement could suggest that informed speculators are positioning themselves to benefit from expected changes in the stock price following the announcement of the offering. On the other hand, the pre-announcement short selling could be due to wall-crossed investors illegally hedging the securities they agreed to purchase before the announcement of the security, without these investors expecting any particular abnormal return on the announcement date. Our second hypothesis provides insight into the importance of the speculation-based rationale as the hypothesis relates to whether short sellers are successful in exploiting their informational advantage about the upcoming announcement, in which case the pre-announcement change in short interest is expected to be negatively related to the announcement return. To test this hypothesis, we estimate the following regression model:²⁶

$$\Delta SI(-T,-1)_i = \alpha_0 + \alpha_1 CAR(0,+1)_i + \alpha_2 CAR(-T,-1)_i + \alpha_3 ATurn(-T,-1)_i + \alpha_4 Fee(-T,-1)_i + \alpha_5 Rel_Proceeds_i + \varepsilon_i \quad (1)$$

where:

$\Delta SI(-T,-1)$ = the change in short interest for stock i over day $-T$ to day -1 where $T = 10$ or 20 .

We present results for a 10- and a 20-day window in order to align the measurement period with the long period over which the increase in abnormal short interest is observed (see Figure 1 and Table III);

²⁶ Christophe et al. (2005) use a comparable model to test whether short sellers have the ability to predict abnormal returns in reaction to earnings announcements.

$CAR(0,+1)$ = cumulative abnormal return for stock i over day 0 and day 1, i.e. the abnormal announcement return measured over the period from the close on day -1 to the close on day +1;

$CAR(-T,-1)$ = cumulative abnormal return on stock i over the interval from day -T to day -1.

This variable is included to control for the possibility that changes in the stock price affect the change of short interest in the days leading up to the announcement;

$ATurn(-T,-1)$ = average daily abnormal turnover in stock i over the interval from day -T to day -1, where daily abnormal turnover is defined as the difference between actual turnover and average turnover over the period from day -50 to -21. This variable is included to account for the potential contemporaneous correlation between changes in short interest and changes in turnover;

$Fee(-T,-1)$ = average daily lending fee in stock i over the interval from day -T to day -1. We expect that stocks that are more expensive to short have a smaller increase in short interest; and

$Rel_Proceeds$ = the proceeds of the issue as a percentage of market capitalization. This variable is included as a control for the size of the issue.

For convertible issues, the estimated model is an extended version of Equation (1), in which we also include a dummy variable that indicates whether the convertible issue is a Rule 144A offering (D_{144A}) and an interactive term that captures the cross effects between a Rule 144A offering and the announcement return ($D_{144A} * CAR(0,+1)$). In order to reduce the influence of outliers, all continuous variables are winsorized at the 1 percent and 99 percent levels. All reported p-values for the coefficients in the panel regressions are based on standard errors that are clustered by firm and quarter.

[insert Table IV here]

Panel A of Table IV presents the results for convertible issues, where the change in short interest is measured over a 10- and 20-day window. The main coefficient of interest is α_1 in Equation (1), which measures the strength of the relation between the change in short interest in the pre-

announcement period and the abnormal announcement period return, $CAR(0,+1)$. The results show that, consistent with our hypothesis, the change in short interest in the pre-announcement period is negatively and significantly associated with the announcement period return. Of the other variables included in the equations, we find that the abnormal turnover and fee have significant effects. Consistent with expectations, higher turnover is positively related to the change in short interest and a higher fee is associated with a smaller increase in short interest.

In Panel B of Table IV, we consider the relation between short interest and announcement returns for common stock issues. The results show that the change in short interest is significantly and negatively related to the announcement returns for both the 10-day and 20-day windows. Regarding the other explanatory variables, we find that larger issues have greater changes in short interest in the pre-announcement period and there is a significant negative relation between short interest and the fee, again suggesting that stocks with higher fees experience smaller increases in short interest.

To summarize, the evidence in Table IV provides support for the hypothesis that informed short sellers establish their positions in anticipation of the market reaction to the announcement of private placements of convertible bonds and common stock. We provide several robustness tests related to our second hypothesis in Section 7.

6.2. THE NUMBER OF BUYERS IN A PRIVATE PLACEMENT

For 451 of our 662 issues, we have information on the number of buyers involved in the private placement. The actual number of wall-crossed investors is likely to exceed the number of buyers as wall-crossed investors are free to decline the invitation to invest in the security offering, even after they agree to be wall-crossed. However, while no information on the actual number of investors that have crossed the wall is available, it is reasonable to expect that this number would be positively correlated with the number of actual buyers.

Our third hypothesis is that pre-announcement short selling is more pronounced and the negative relation between pre-announcement short selling and announcement day returns is stronger when there are more buyers involved in the private placement. To test this hypothesis, the reduced sample is split into three groups based on the number of buyers: the first group consists of private

placements with one buyer (n=150); the second group consists of private placements with 2 to 10 buyers (n=134); and the third group consists of private placements with more than 10 buyers (n=167).

Figures 2 and 3 present plots of average short interest in the period -50, +40 for these three groups. Figure 2 represents convertible private placements and Figure 3 represents common stock private placements. It is interesting to note that the previously documented patterns of changes in short interest for both convertible bond and common stock placements are most apparent in the sample of issues that have more than 10 buyers. For convertible placements with 2 to 10 buyers the overall trend is still apparent, but some of the detail is lost and the magnitudes of change are far less than if there are more than 10 buyers. The plots for common stock placements with more than 10 buyers and 2 to 10 buyers are more similar, but again, the build-up in short positions in the pre-announcement period is more pronounced when there are more than 10 buyers.

Where there is only one buyer, the identified patterns are largely lost. Convertible issues with a single buyer exhibit no appreciable change in short interest until the time of the announcement, after which it falls by an average of around 1.5 percent. Short interest in common stock issues with a single buyer falls throughout the entire window and the magnitude of the decrease after the announcement is relatively small at about 0.4 percent. These obvious differences in the behavior of short sellers could reflect the lower probability to stay off the SEC's radar if only a small number of firms have crossed the wall. In addition, the share price reaction for the group of firms with only one buyer is relatively favorable with an average CAR(0,+1) of more than 4 percent, whereas for the group of events with 2 to 10 buyers and for private placements with more than 10 buyers, the average announcement return is very close to zero.

[insert Figures 2 and 3 here]

To formally test whether the number of buyers affects i) the change in short interest in the pre-announcement period and ii) the relation between the change in short interest and the announcement return, we estimate the following model:²⁷

²⁷ Because we require information on the number of buyers, our sample size is smaller than in the previous section. To increase the power of our test, we combine the sample of common stock and convertible issues. We

$$\begin{aligned} \Delta SI(-T,-1)_i = & \alpha_0 + \alpha_1 D_{B,2-10} + \alpha_2 D_{B,>10} + \alpha_3 CAR(0,+1)_i + \alpha_4 D_{B,2-10} * CAR(0,+1)_i + \alpha_5 \\ & D_{B,>10} * CAR(0,+1)_i + \alpha_6 CAR(-T,-1)_i + \alpha_7 ATurn_i(-T,-1)_i + \alpha_8 Fee(-T,-1)_i + \alpha_9 \\ & Rel_Proceeds_i + \varepsilon_i \end{aligned} \quad (2)$$

where $D_{B,2-10}$ ($D_{B,>10}$) is a dummy variable that takes a value of one if the number of buyers in the private placement is between 2 and 10 (greater than 10) and is zero otherwise. The other variables are as previously defined and the estimation results are presented in Table V. For both windows considered, we find that the increase in short interest in the pre-announcement period is significantly higher for private placements with more than 10 buyers compared to private placements with only one buyer (i.e., α_2 is positive and significant at the 1 percent level for both windows). For private placements with 2 to 10 buyers, short interest also increases more than for private placements with one buyer and this difference is significant at the 10 percent level for the 20-day window.

Moreover, for both windows, we find that the relation between the announcement return and the pre-announcement change in short interest is stronger (i.e. more negative) if there is more than one buyer. The difference in the coefficients for the cumulative abnormal announcement return is significant at the 10 percent level or better for private placements with more than 10 buyers. The difference is not statistically significant for placements with 2 to 10 buyers. All other coefficients are as previously discussed.

In summary, the results of Table V provide support for the hypothesis that informed short selling before the announcement is more prevalent if there are more buyers involved in the private placements. The results also provide support for the hypothesis that pre-announcement short selling is more informative about announcement day returns when there are many buyers involved in the private placement.

[insert Table V here]

have confirmed that inclusion of a dummy variable to distinguish common stock and convertible bond placements does not change the conclusions of our analysis.

6.3. HEDGE FUNDS

The final hypothesis concerns a formal test of the role of hedge funds. Hedge funds are thought to have greater opportunities to engage in insider trading as they are relatively unregulated, have few reporting requirements, can hold both long and short equity positions, have fewer internal information barriers and have an incentive-based fee structure that makes any informational advantage extremely valuable. Within private placements, Dai (2007) shows that hedge funds differ from other investors by keeping their stakes for shorter periods of time and by being less likely to obtain board seats. Brophy et al. (2009) show that hedge funds are typically considered as investors of last resort, which implies that they invest in companies that find it difficult to attract other buyers and that offer relatively large discounts. As such, a relatively large discount makes it more likely that hedge funds participate in the private placement (obtain a long position), but a larger discount also implies a more negative prediction for the announcement effect, due to signaling and dilution, which makes it more profitable to short in the pre-announcement period. Indeed, Table II has shown that issues to hedge funds are associated with less favorable announcement returns than issues to other investors. The long position is profitable as long as the discounted offering price is smaller than the post-announcement market price.

Panel A of Table VI provides some first insights into the relevance of hedge fund involvement. To examine the effects of hedge fund involvement on pre-announcement short selling, we create groups with the same announcement returns (based on quintiles) and split these groups based on whether or not hedge funds participate.²⁸

[insert Table VI here]

²⁸ Note that there is the possibility that unobserved wall-crossed investors who do not participate in the offering illegally trade before the announcement, which could lead to imperfections in our hedge fund involvement classification and could bias us against finding strong results.

When focusing on the issues with the more negative announcement effects (lower quintiles), we find that private placements with hedge fund participation show a substantial increase in short interest, whereas such an increase is absent for private placements where hedge funds do not participate. In addition, we find that if hedge funds participate, the change in short interest is strongly related to the announcement return. The F-test at the bottom of Panel A shows that we can reject the hypothesis that the average change in short interest is the same across the announcement return quintiles for the sample with hedge fund involvement. We cannot reject this hypothesis for the sample without hedge fund involvement.

To further test the impact of hedge fund involvement in private placements, we modify Equation (2) to include both the number of hedge funds and the number of non-hedge funds. Panel B of Table VI presents the estimation results. In line with our expectations, we find that the number of involved hedge funds in a security offering is positively related to the increase in pre-announcement short interest. Moreover, the involvement of hedge funds strengthens the negative relation between changes in pre-announcement short interest and the abnormal return in reaction to the announcement. Both these effects are statistically significant at the 5 percent level, irrespective of the window that we use. In addition, we do not find significant effects of the number of non-hedge funds, which again suggests that the profitable pre-announcement changes in short interest are explained by hedge funds.

To provide an alternative test of the impact of hedge funds, in Panel C of Table VI we consider a sample of private placements in which hedge funds have no involvement (135 observations) and in Panel D we consider a sample of private placements in which hedge funds are the sole participants (94 observations). To examine the effects of the overall number of buyers for these relatively small sample sizes, we include a dummy variable ($D_{B,>1}$) that takes a value of one if the number of buyers in the private placement is greater than one and is zero otherwise.

It can be seen that the sample with no hedge fund involvement (Panel C) suffers from a general lack of significance of the estimated parameters. On the other hand, for the 94 private placements in which hedge funds are the sole buyers (Panel D), we find evidence of a larger increase in short interest in the 20-day pre-announcement period if there is more than one hedge fund buyer. For issues solely purchased by hedge funds, the coefficient estimate for the interactive term is

consistently negative across both reported results and statistically significant at the 5 percent level, again indicating that the relation between short selling and announcement returns is more negative when more than one hedge fund buyer is involved in the private placement.

7. Additional Tests

In this section we perform some additional tests regarding pre-announcement short selling, before we examine trading in the options market in Section 8. We first examine whether the inclusion of variables that proxy for firm quality, information asymmetry and the probability of a private placement impact on our results, and then present an instrumental variable analysis to address the endogeneity of hedge fund involvement. Next, we discuss the results of a simulation analysis, which shows that the relation between the change in short interest and the subsequent return is exceptionally strong for the event that we study compared to non-events. We then explain the pre-announcement change in short interest using only information that is available to wall-crossed investors before the announcement of the private placement, instead of using actual announcement returns as explanatory variable. At the end of Section 7, we discuss the results of some additional extensions to our base models. In all these additional tests we consistently find that our results are robust.

7.1. ADDITIONAL VARIABLES AND ENDOGENEITY OF HEDGE FUND INVOLVEMENT

It is possible that our results are affected by the omission of ‘firm quality’ from the regression models. In order to control for firm quality, we include short interest at the start of the measurement window (i.e. $T = -10$, or $T = -20$), where lower quality firms are expected to have higher short interest. It is also known that companies with high information asymmetry tend to place more securities with hedge funds (see for example Brophy et al., 2009). We include the Durnev et al. (2003) *psi* variable as a proxy for the level of information asymmetry. This variable *psi* measures the firm-specific return variability in a given year relative to the total return variability. The underlying intuition is that firms

with a higher level of firm-specific variation in stock returns have more informative stock prices and therefore have a lower level of information asymmetry.²⁹

Our third additional control variable represents the probability of a private placement based on publicly observable firm characteristics. Inclusion of this variable could be important if the probability of a private placement affects the change in short interest in the pre-announcement period. To obtain this variable, we download the full sample of firms from Compustat for the period 2006 – 2010. We estimate a logit regression model in which the dependent variable equals one if the firm privately places an equity or convertible issue in the subsequent year and zero otherwise.³⁰ The explanatory variables included in the regression equation are based on Chen et al. (2010) and Ellis and Twite (2013) and all firm characteristics are measured at the fiscal year-end. Firms are only included if all the required data in Compustat, CRSP and IBES are available. Appendix C presents the estimation results for this model. Consistent with earlier studies, we find that companies that privately place securities are relatively small, volatile and have low profitability. These firms also tend to have low turnover and relatively high leverage and capital expenditure. In calculating the probability of a private issue for a particular firm in a particular year, we use the estimated coefficients in Appendix C, including industry and year dummies. We calculate the estimated probability of a private issue for each of the observations in our sample and include this estimated probability as an additional control variable in our regression models.

Because the possibility of information leakage might be related to the size of the firm, we also include the natural logarithm of market capitalization, measured at day -20. In addition, to control for potential differences in normal trading volume and the cost of trading, we include normal turnover, the supply of lendable shares, and the percentage bid-ask spread as our fourth, fifth and sixth

²⁹ The firm-specific stock return variation is obtained from the regression: $\text{Firm return}(t) = \beta_0 + \beta_1 \text{ market return}(t) + \beta_2 \text{ industry return}(t) + \varepsilon$, which is estimated for each firm, using monthly returns measured over the year prior to the security offering. *Psi* is the variance of ε scaled by the total variance of the dependent variable. A high estimate of *psi* indicates low information asymmetry. This variable is also used in, for example, Dittmar and Thakor (2007).

³⁰ That is, the dependent variable is collected for the period 2007 – 2011.

additional control variable. Normal turnover is calculated as the issuer's average turnover over days [-50, -21], whereas the supply of lendable shares and the percentage bid-ask spread is measured at the start of the window over which the change in short interest is measured (i.e. at day -10 or -20). We are able to obtain these additional variables for 602 of our observations.

For convertible issues, we further include a dummy variable that indicates whether the offering is accompanied by a stock repurchase. Combinations of convertible issues and stock repurchases are known as 'Happy Meals' and the accompanying stock repurchase facilitates convertible buyers in obtaining their post-announcement short positions (see De Jong et al., 2011). We follow De Jong et al. (2011) and classify a convertible as a Happy Meal when the firm announces to use the convertible proceeds to repurchase stock or when both the convertible offering and the stock repurchase are announced on the same date. Happy Meals represent 10.5 percent of the convertibles in our sample.

Panels A and B of Table VII show a re-estimated Equation (1) with the additional control variables. For convertible debt private placements, firms with a higher short interest at the start of the pre-announcement window have a larger increase in short interest, but not for common stock private placements. Our measure of information asymmetry is not significantly related to the change in short interest. Hence, it is unlikely that differences in information asymmetry are able to explain the results in Table IV. In addition, we do not find a significant effect of the Happy Meal variable.³¹ For convertible issues (Panel A), we find that the change in short interest is positively related to the probability of a private placement, whereas we do not find this relation for common stock issues (Panel B). Most importantly, in both panels we find that including the additional control variables

³¹ Li et al. (2013) predict a significant effect of Happy Meals on pre-announcement short sales as Happy Meals have differential announcement effects. Note that our regression analysis includes the announcement effect as a separate variable.

does not change our conclusions with regard to the ability of short sellers to successfully anticipate abnormal announcement returns.³²

[insert Table VII here]

Omitted variables could also affect our results on the relevance of hedge fund involvement. For example, Brophy et al. (2009) conclude that firms issuing to hedge funds are substantially different from firms issuing to non-hedge funds. Ideally, we want to keep the characteristics of the issuer constant and then examine what happens to pre-announcement short selling when there is a higher participation of hedge funds. For this purpose, we estimate a two-stage-least-squares regression and use the size of the long-short hedge fund industry as an instrument for hedge fund participation in a particular issue. If the hedge fund industry is relatively large (small) in a given time period, we expect that a given issue by a given issuer would have larger (smaller) hedge fund participation.³³

We obtain hedge fund data from the Live and Graveyard databases of Lipper TASS. We calculate the total assets under management in U.S. dollars per month for hedge funds with a long-short strategy, which are hedge funds that TASS classifies as “convertible arbitrage”, “fixed income arbitrage”, “long/short equity hedge” and “equity market neutral”. We use the log of total assets under management in the first stage of our regression analysis. The dependent variable is the number of hedge fund buyers in the first stage model and pre-announcement short selling in the second stage model. We report the coefficient estimate of our instrument in the first stage, and report the full results of the second stage estimation.

[insert Table VIII here]

Table VIII shows the results of our analysis. Regarding the first stage regression, the size of the hedge fund industry is an important determinant of the number of hedge fund buyers, with a statistically significant relation at the 1% level. On average, more hedge funds participate in a private

³² When we re-estimate our other models, we again find that the inclusion of the additional variables does not materially change our conclusions.

³³ The size of the hedge fund industry shows considerable variation over time, see for example Mitchell et al. (2007) and Choi et al. (2010).

placement when the size of the long-short hedge fund industry is larger.³⁴ Besides the size of the hedge fund industry, the set of variables in the first stage regression are identical to those in the second stage regression. Other variables with a significantly positive coefficient on the number of hedge fund buyers in the unreported first stage regression are the relative size of the issue, the issuer's information asymmetry, the probability of a private placement, the supply of lendable shares, and the market capitalization of the issuer. The lending fee is negatively related to the number of hedge fund buyers in the first stage.

Importantly, Model 1 of Table VIII shows that the positive effect of the number of hedge funds on 10-day pre-announcement short selling is also observed in our instrumental variable estimation. The effect is statistically significant, and indicates that endogeneity does not drive our main result for the effects of hedge fund involvement.

In Model 2, we include variables that relate to pre-announcement trading, namely the pre-announcement turnover and pre-announcement returns. In our third model, we also include the announcement return and the interaction of this return with the number of hedge fund buyers. We estimate an instrumental variable regression with interaction terms by following the procedure in Wooldridge (2010, p. 144), and add in the first stage an interaction term between our instrument and the announcement return. We find that the number of hedge fund buyers remains positively related to pre-announcement short selling, with high statistical significance. The interaction term in Model 3 shows that the pre-announcement increase in short interest is especially strong when the announcement return is negative and the involvement of hedge funds is high.

In additional analyses, we find that our results are robust to using a twenty-day window, as can be seen from Models (4)-(6). In an unreported analysis, we find that our results are also robust when we use the percentage of buyers that are hedge funds as our endogenous variable, instead of the absolute number of hedge funds.

³⁴ We obtain the weak instrument F-statistic to determine the strength of our instrument. The F-statistic is 21.159, which is statistically significant at the 1% level and higher than the 10% Stock Yogo critical value. We can thus reject a null hypothesis that our instrument is weak.

7.2. SIMULATION ANALYSIS

A possible concern with our analysis of Equation (1) is that the estimates for the relation between the pre-announcement change in short interest and the announcement return might reflect the typical relation between the change in short interest over a 10-day or 20-day window and the subsequent 2-day abnormal return, rather than being specific to the announcement of private placements. To provide evidence on this issue, we estimate Equation (1) for 100 pseudo-events which are centered on a new event day 0. For each observation, new event day 0 is equal to actual event day 0 plus T trading days. For this analysis, we let T start at a value of -110, increase in steps of 2 and end at a value of +110. We exclude all T's in the interval -10 to +10.

For each of the pseudo-events, we estimate Equation (1) and collect the t-statistic for the α_1 coefficient. This gives an empirical distribution of 100 t-statistics. For our sample of private placements of common stock, the t-statistic for the true event day 0 is between the first and second percentile of the empirical distribution for the 10-day window and smaller than the first percentile for the 20-day window. For the sample of convertibles, the t-statistic of α_1 for the true event day 0 is between the first and second percentile of the empirical distribution for the 10-day window and between the fourth and fifth percentile for the 20-day window. These results show that the strong relation between the pre-announcement change in short interest and the announcement return reported in Table IV is exceptional and is unlikely to be the result of a typical relation between the change in short interest and subsequent abnormal returns.

7.3. OFFERING DISCOUNT AND PREDICTED ANNOUNCEMENT RETURN

Throughout the paper we have used actual announcement returns as a proxy for wall-crossers' expectations of announcement returns. Instead of actual announcement returns, this section uses information on the offering discount to explain the pre-announcement change in short interest. Note that information on the offering discount is available to wall-crossed investors before the announcement of the private placement. In addition to the offering discount, we also use a predicted announcement return, which again is solely based on information available to wall-crossed investors

before the announcement. If short sellers are speculating on negative announcement effects, then we expect to observe a larger increase in pre-announcement short interest in case of a larger offering discount and in case of a more negative predicted price change on announcement.

We are able to obtain the offering discount for 301 common stock PIPEs with data from Sagent. The offering discount is calculated as the percentage difference between the stock price on day -1 and the price per share offered to the security buyers. For example, a value of -0.1 indicates that the offering price is 10 percent below the pre-announcement stock price. The average offering discount in our sample is -4.45 percent, with a standard deviation of 18.59 percent.³⁵

The explanatory variables included in the regression equation to obtain the predicted announcement return are based on Dai (2007), Brophy et al. (2009) and Floros and Sapp (2012). Firms are only included if all the required data in Compustat, CRSP and Sagent are available. Appendix D presents the estimation results for this model. Consistent with earlier studies, we find that announcement returns are significantly higher for larger issues and for issues that have a smaller discount (i.e. a less negative discount). Announcement returns are significantly lower for larger firms and for issues that have more hedge fund participation. In calculating the predicted announcement return, we use the estimated coefficients in Appendix D. The correlation between the actual announcement return and the predicted announcement return is 0.46 (significant at the 0.1 percent level). The correlation between the actual announcement return and the offering discount is 0.33 (significant at the 0.1 percent level).

Table IX shows the relation between these two measures of expected announcement returns and the pre-announcement change in short interest. In line with our expectations, both the offering discount and the predicted announcement return are negatively related to the change in pre-announcement short interest. The relation between the change in short interest and the predicted

³⁵ The average offering discount for issues with hedge fund involvement is -7.13%.

announcement return is the strongest, with statistical significance at the 1 percent level for both event windows.³⁶

[insert Table IX here]

7.4. ALTERNATIVE MEASURES, WINDOWS, AND SAMPLES

For our first set of additional robustness tests, we: i) estimate all models without winsorizing; ii) estimate all models after transforming the independent variables into decile ranks, scaled to range from -0.5 to 0.5 ; iii) examine the impact of removing the 15 security issues that occur during or within 20 days after the 2008 short sale ban; and iv) examine the impact of choosing particular event windows by re-examining our results when abnormal announcement returns are measured on day 0 or days $[-1, 1]$ and when abnormal announcement returns are measured over a 5-day window, starting on day 0, or over days $[-1, 5]$. We find that our results are robust in all of these instances.³⁷

In a second set of additional tests, we add a dummy variable (DUM) and an interaction variable ($CAR(0,+1) * DUM$) to our models. In a first additional test, we examine whether our results are specific to sub-periods in our sample. In this test, the dummy variable assumes a value of 1 if the private placement takes place in 2007 or 2008 and zero otherwise. In a second additional test, the dummy variable assumes a value of 1 if the private placement was preceded by another private placement for the same stock in the period going back to 2000, which represents the start of the Sagent database and zero otherwise. This dummy variable controls for an effect of repetitive issuers, which Floros and Sapp (2012) have found to be important in explaining announcement returns. In a final additional test, we control for events where short selling might have been relatively difficult because the stock was ‘on special’. In this test, the dummy variable assumes a value of 1 if the lending

³⁶ We further examine whether our results related to hypothesis 3 and 4 are robust to the inclusion of the offering discount. We find that both the positive relation between the number of buyers and changes in pre-announcement short selling (Table V) and the relation between the number of hedge funds and pre-announcement short selling (Panel B of Table VI) are robust to including the offering discount to the corresponding regression specifications.

³⁷ All the unreported results in the paper are available upon request.

fee in the 10-day period before the announcement was larger than 250 basis points and zero otherwise. Again, our results affirm the robustness of the main conclusions, as the estimation results are qualitatively similar to those detailed in the main body of the paper.

8. Informed Trading in the Options Market

Informed traders can also use the options market to benefit from their informational advantage. We examine pre-announcement trading in options by obtaining data from OptionsMetrics. To reduce the probability of recording errors and to eliminate options with low liquidity, we require that the bid-ask spread is smaller than 50% of the option price (at the mid-quote). We have options data for 225 of the events in our sample.

Panel A of Table X reports the daily average abnormal volume surrounding the announcement date. We rely on the arguments in Bamber et al. (2011) and define abnormal volume as the natural log of the ratio of actual volume on each event day in the period -20 to +10 and the event-specific average daily volume over the 30-day period from day -50 to -21. Consistent with information leakage, the results show significant abnormal volume in the options market before the announcement day. For private placements of convertibles, we see a particularly strong increase in put option volume, for example on days -1, -2, -4, and -7. For private placements of common stock, both average call option and put option volume are significantly higher on day -1, and also on various days before day -1. For both stock and convertible issues, option volume is also significantly elevated on the announcement day and the following days.

[insert Table X here]

In Panel B of Table X, we report the abnormal cumulative option volume over the 10-day and 20-day windows, where we split the sample into private placements with positive and negative announcement returns. A trader could profit from negative announcement returns by having a long position in a put option, or a short position in a call option, and vice versa for positive announcement effects. In addition, as indicated by Augustin et al. (2014), traders are likely to pursue a volatility trading strategy (such as a straddle) in case of uncertainty associated with the direction of the announcement effect, i.e. they would trade in both call and put options to benefit from a jump in stock

prices in either direction.³⁸ We find significant increases in abnormal option volume for the samples with positive and negative announcement returns, both for call and put options.

In Panel C we split the sample into private placements with and without hedge fund involvement. Requiring both option data and data on hedge fund involvement reduces the sample to 133 observations. We find that the increase in option trading volume in the days before the announcement is restricted to private placements with hedge fund involvement. These findings are in line with our analysis on pre-announcement short selling, which also shows that the suspicious patterns are restricted to issues with hedge fund involvement. Overall, the analysis of option volume provides evidence on significant information leakage and pre-announcement trading in options for private placements with hedge fund participation.

9. Conclusion

This paper examines privately placed common stock and convertible offerings in the U.S. over the period 2007 – 2011. Using proprietary short interest data, we document significant increases in short interest in the pre-announcement period. We find that the change in short interest in the pre-announcement period is negatively related to the abnormal return at the time of the public announcement of the private placement. The change in short interest in the pre-announcement period is also negatively related to predicted announcement returns that are solely based on information available to wall-crossers before the offering. We find that pre-announcement short selling is particularly informative when the number of buyers is high and when there is a high degree of hedge fund participation. When hedge funds participate in the offering, pre-announcement trading can also be observed in the options market.

These results reinforce the concerns expressed by regulators around the world that wall-crossing – the practice where companies that are planning a private placement gauge the interest of

³⁸ Augustin et al. (2014) examine option trading prior to takeover announcements. For acquirer firms, there is often uncertainty about the direction of the announcement effect, and they find evidence in line with traders pursuing volatility trading strategies before the takeover announcement.

potential buyers before the offering is publicly announced – might result in insider trading. Interestingly, we do not find evidence of substantial pre-announcement short selling in public offerings. Public offerings are less likely to be targeted by hedge funds and are associated with higher scrutiny compared to private security offerings. Our results thus highlight an important difference between public and private placements, and the friction that we document in the private placement market could be important for companies that are considering raising financing.

Our findings indicate that the limited resources of regulators should be directed towards examining those private placements with a high degree of hedge fund involvement and a large number of wall-crossed investors. The results are also relevant to the issues of hedge fund regulation and disclosure of short positions. Both these issues came to the fore with the implementation of the Dodd-Frank Act, which was aimed at closing regulatory gaps and ending the speculative trading practices that contributed to the 2008 financial market crisis. The Dodd-Frank Act mandates hedge fund advisers to increase record keeping and disclosure and also called for studies of costs and benefits of reporting, in real time, short sale positions. Our results suggest that more extensive and timely disclosure of short interest is of great interest to the parties involved in private placements and would help market participants and enforcement authorities in filtering out suspicious private placements.

Appendix A: Summary of SEC Cases of Alleged Pre-Announcement (Short) Selling after Wall-Crossings

SEC versus	Complaint filed	Number of securities	Alleged violation	Outcome
Pollet	April 2005	10 (a)	Shorting in 2001	Settled at \$150,000
Shane	May 2005	1	Shorting in 2001	Settled at \$1,075,015
Langley Partners	March 2006	7	Shorting during 2000-2002	Settled at \$15,817,928
Deephaven	May 2006	19	Shorting during 2001-2004	Settled at \$5,819,958
Mangan	Dec. 2006	1	Shorting in 2001	Not guilty (b)
Gryphon Partners	Dec. 2006	4	Shorting during 2001-2004	Settled at \$778,016
Berlacher	Sept. 2007	1	Shorting in 2004	Not guilty (c)
Cuban	Nov. 2008	1	Selling in 2004	Not guilty (d)

- (a) In four issues Pollet represented the issuer's investment bank
- (b) The judge ruled that the announcement effect was too small for information to be deemed "material"
- (c) The judge ruled that the announcement effect was too small for information to be deemed "material". Berlacher was found guilty of misrepresenting his short position to the issuer and sentenced to paying \$352,364.
- (d) This case differs from the other cases in that Cuban allegedly sold shares, rather than short-selling shares, as he was already a shareholder of the company planning a private placement. As a result, there were no transcripts available of the defendant agreeing to refrain from trading on the information, which would typically be the case for wall-crossings of new potential investors (see, for example, http://dealbook.nytimes.com/2013/10/21/potential-silver-lining-for-s-e-c-in-the-cuban-case/?_r=0).

Appendix B: Variable Definitions

Variables are calculated at the end of the fiscal year-end preceding the announcement date, unless indicated otherwise.

Variable	Definition
Market Capitalization	Market value of equity (closing price multiplied by number of shares outstanding) 20 days before the announcement of the private placement.
Total Assets	The value of total assets (Compustat Item #AT) at the end of the fiscal year-end preceding the announcement date (in millions of dollars).
Proceeds	The gross proceeds of the issue in millions of dollars, as reported in the SDC database or in Sagient.
Relative Proceeds	Proceeds divided by Market Capitalization (abbreviated to Rel_Proceeds in the estimation equations).
Market-to-Book Ratio	Market value of common stock over the book value (Compustat Items $(\#AT - \#CEQ + \#PRCC_F * \#CSHO) / \#AT$), measured at the end of the fiscal year-end preceding the announcement date.
Return Volatility	The annualized volatility of monthly stock returns based on the 12 months before the announcement month.
Book Leverage	Total Debt calculated as the sum of long-term debt and debt in current liabilities divided by total assets (Compustat Items $(\#DLC + \#DLTT) / \#AT$), measured at the end of the fiscal year-end preceding the announcement date.
Dividend Paying	A dummy variable equal to one if Compustat Item #DVC exceeds zero at the fiscal-year end preceding the issue date and zero otherwise.
ROA	Earnings before interest and taxes over the fiscal year-end preceding the announcement date (Compustat Item #EBIT) over total assets at the end of the fiscal year-end preceding the announcement date (Compustat Item # AT).
Short Interest	The total number of shares lent according to the Dataexplorers database divided by the number of shares outstanding.
Supply of Lendable Shares	The total number of shares held by all beneficial owners according to the Dataexplorers database divided by the total number of shares outstanding.

Lending Fee	Value weighted average fee for all new trades 10 days before the announcement, in basis points per annum as reported in the Dataexplorers database.
Number Buyers	The total number of buyers in the private placements is either from the Sagient database, or, if missing, from the registration statements, which we download from SEC Edgar.
Hedge Fund Involved	Dummy variable equals 1 if there is at least one hedge fund among the buyers in the private placement and zero if there is no hedge fund among the buyers in the private placement.
Number Hedge Funds	The total number of hedge funds among the buyers in the private placements is either from the Sagient database, or, if missing, from the registration statements, which we download from SEC Edgar.
Conversion Premium	The conversion premium is obtained from either SDC or Sagient and is the excess of the conversion price over the stock price at the time of issue expressed as a percentage of the stock price.
Delta	<p>Delta is the convertible's dollar sensitivity to small changes in the value of the underlying. It is calculated as</p> $Delta = e^{-T} N \left\{ \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}} \right\}$ <p>where $N(\bullet)$ is the cumulative probability under a standard normal distribution; S is the price of the underlying stock measured at day -5 relative to the issue date (from CRSP); X is the conversion price (from SDC or Sagient); r is the yield on a ten-year U.S. Treasury bond (from Datastream), σ is the annualized stock return volatility and T represents the stated maturity of the convertible as of its issuance date.</p>
Years-to-Maturity	Years to maturity is the number of years until the convertible matures at the time of issuance and is obtained from either SDC or Sagient.

Appendix C: Forecasting the Probability of a Private Placement

This table presents the results of a logit regression model, estimating the probability of a private placement of convertible debt or common stock. The sample period is 2006–2010. The dependent variable equals one if the firm privately places a convertible or common stock issue in the subsequent year and equals zero otherwise, and is thus collected for the period 2007–2011. Firm characteristics are measured at the fiscal year-end. Firm size is the natural logarithm of total assets in millions of dollars (Compustat Item #AT), Turnover is sales (#SALE) divided by assets, Slack is cash and short-term investments (#CHE) over total assets, R&D intensity are R&D expenses (#XRD) over sales, Profitability is #EBIT over total assets, Leverage is book leverage, calculated as (#DLC + #DLTT) / #AT, Patents is intangibles (#INTAN) minus goodwill (#GDWL), divided by total assets, Capital expenditures is #CAPX over total assets, Market-to-book ratio is (#AT - #CEQ + #PRCC_F * #CSHO) / #AT, Tangibility is #PPEGT / #AT, R&D growth is R&D (#XRD) over assets divided by R&D over assets in the prior year, minus one, Sales growth is sales divided by sales in the prior year, minus one, Return volatility is the annualized volatility of monthly stock returns, Stock price run-up is the average monthly stock return in a year, and Number of analysts is the number of analysts providing one-year earnings forecasts, obtained from IBES. We only include firms with all required data in Compustat, CRSP and IBES. Our regression model includes industry and year dummies. Industry dummies are based on two-digit SIC codes. The number of observations is 7,482.

	Parameter Estimate	p-value
Firm Size	-0.136	0.00
Turnover	-0.343	0.04
Slack	-0.356	0.35
R&D Intensity	0.042	0.16
Profitability	-0.917	0.00
Leverage	0.890	0.00
Patents	0.155	0.84
Capital Expenditures	6.244	0.00
Market-To-Book Ratio	-0.036	0.28
Tangibility	-0.344	0.29
R&D Growth	0.086	0.14
Sales Growth	0.053	0.26
Return Volatility	0.480	0.03
Stock Price Run-up	0.119	0.93
Number of Analysts	0.005	0.53
Pseudo Adjusted R ²		0.094

Appendix D: Predicting the Announcement Return

This table presents the results of an OLS regression model that generates the predicted announcement returns, used in Table IX. The dependent variable is the announcement return, $CAR(0,+1)$, for common stock PIPE issues. The independent variables are the offering discount (the percentage difference between the stock price on day -1 and the price per share offered to the security buyers) and several variables that have been used to explain the variation across announcement returns for common stock PIPE issues (see Dai, 2007; Brophy et al., 2009; Floros and Sapp, 2012). Firm characteristics are measured at the fiscal year-end in the year preceding the PIPE issue. Leverage is book leverage, calculated as $\text{Compustat Items } (\#DLC + \#DLTT) / \#AT$; Tangibility is $\#PPEGT / \#AT$; Proceeds is the natural log of the gross proceeds of the issue, as reported in Sagent; Firm size is the natural log of market capitalization measured 20 days before the announcement; Market-to-book ratio is $(\#AT - \#CEQ + \#PRCC_F * \#CSHO) / \#AT$; R&D intensity is R&D expenses ($\#XRD$) over sales ($\#SALE$); Sales proportion is sales ($\#SALE$) divided by total assets ($\#AT$); Dilution is defined as the number of shares issued in the private placement divided by the number of shares outstanding; Earlier PIPE offering is a dummy variable that equals 1 if the issuer was involved in one or more PIPE issues between the date of the observation and the start of the Sagent database in 2000; Number of buyers is the number of buyers involved in the issue; and Number of hedge funds is the number of hedge funds among these buyers. There are 222 observations with information on all variables.

	Parameter Estimate	p-value
Offering discount	0.144	0.01
Leverage	0.017	0.59
Tangibility	-0.001	0.98
Proceeds	0.024	0.01
Firm Size	-0.242	0.03
Market-To-Book Ratio	0.003	0.24
R&D Intensity	0.002	0.21
Sales Proportion	0.000	0.46
Dilution	-0.004	0.82
Earlier PIPE Offering	0.003	0.83
Number of Buyers	0.002	0.19
Number of Hedge Funds	-0.007	0.00
Adjusted R ²	0.143	

References

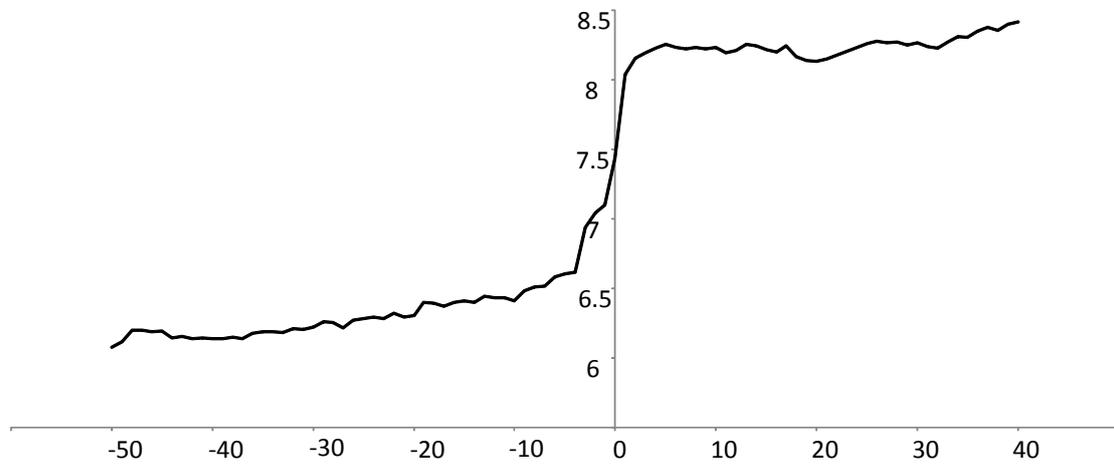
- Acharya, V.V. and Johnson, T.C. (2007) Insider trading in credit derivatives, *Journal of Financial Economics* **84**, 110-141.
- Acharya, V.V. and Johnson, T.C. (2010) More insiders, more insider trading: Evidence from private-equity buyouts, *Journal of Financial Economics* **98**, 500-523.
- Augustin, P., Brenner, M. and Subramanyam, M.G. (2014) Informed options trading prior to M&A announcements: Insider trading? unpublished working paper, McGill University, New York University.
- Bamber, L.S., Barron, O.E. and Stevens, D.E. (2011) Trading volume around earnings announcements and other financial reports: Theory, research design, empirical evidence, and directions for future research, *Contemporary Accounting Research* **28**, 431-471.
- Bodnaruk, A., Massa, M. and Simonov, A. (2009) Investment banks as insiders and the market for corporate control, *Review of Financial Studies* **22**, 4989-5026.
- Boehmer, E., Jones, C. and Zhang, X. (2012) What do short sellers know? unpublished working paper, Singapore Management University, Columbia Business School, Purdue University.
- Brophy, D, Ouimet, P. and Sialm, C. (2009) Hedge funds as investors of last resort? *Review of Financial Studies* **22**, 541-574.
- Brown, S., Grundy, B., Lewis, C. and Verwijmeren, P. (2012) Convertibles and hedge funds as distributors of equity exposure, *Review of Financial Studies* **25**, 3077-3112.
- Chen, H., Dai, N. and Schatzberg, J. (2010) The choice of equity-selling mechanisms: PIPEs versus SEOs, *Journal of Corporate Finance* **16**, 104-119.
- Choi, D., Getmansky, M. and Tookes, H. (2009) Convertible bond arbitrage, liquidity externalities and stock prices, *Journal of Financial Economics* **91**, 227-251.

- Choi, D., Getmansky, M., Henderson, B. and Tookes, H. (2010) Convertible bond arbitrageurs as suppliers of capital, *Review of Financial Studies* **23**, 2492-2522.
- Christophe, S.E., Ferri, M.G. and Angel, J.J. (2004) Short selling prior to earnings announcements, *Journal of Finance* **59**, 1845-1875.
- Dai, N. (2007) Does investor identity matter? An empirical examination on investments by venture capital funds and hedge funds in PIPEs, *Journal of Corporate Finance* **13**, 538-563.
- Dai, R., Massoud, N., Nandy, D. and Saunders, A. (2011) Hedge funds in M&A deals: Is there exploitation of private information? unpublished working paper, University of Pennsylvania, University of Melbourne, Brandeis University, New York University.
- De Jong, A., Dutordoir, M. and Verwijmeren, P. (2011) Why do convertible issuers simultaneously repurchase stock? An arbitrage-based explanation, *Journal of Financial Economics* **100**, 113-124.
- Dittmar, A. and Thakor, A. (2007) Why do firms issue equity? *Journal of Finance* **62**, 1-54.
- Dong, M., M. Dutordoir and C. Veld, 2013, Why do firms issue convertible bonds? Evidence from the field, unpublished working paper, York University, Manchester Business School, Monash University.
- Duca, E., Dutordoir, M., Veld, C. and Verwijmeren, P. (2012) Why are convertible bond announcements associated with increasingly negative abnormal stock returns? An arbitrage-based explanation, *Journal of Banking and Finance* **36**, 2884-2899.
- Durnev, A., Morck, R., Yeung, B. and Zarowin, P. (2003) Does greater firm-specific return variation mean more or less informed stock pricing? *Journal of Accounting Research* **41**, 797-836.
- Ellis, K. and Twite, G. (2013) Are PIPEs a bet on growth options? unpublished working paper, Australian Prudential Regulation Authority, University of Melbourne.

- Engelberg, J.E., Reed, A.V. and Ringgenberg, M.C. (2012) How are shorts informed? Short sellers, news and information processing, *Journal of Financial Economics* **105**, 260-278.
- Floros, I.V. and Sapp, T.R.A. (2012) Why do firms issue private equity repeatedly? On the motives and information content of multiple PIPE offerings, *Journal of Banking and Finance* **36**, 3469-3481.
- Fox, M.B., Glosten, L.R. and Tetlock, P.C. (2010) Short selling and the news: A preliminary report on an empirical study, unpublished working paper, Columbia University, Columbia Business School.
- Griffin, J.M., Shu, T. and Topaloglu, S. (2012) Examining the dark side of financial markets: Do institutions trade on information from investment bank connections? *Review of Financial Studies* **25**, 2155-2188.
- Hartlin, J.T. (2009) Despite recent setbacks in the courts, the SEC remains focused on short sales in PIPE transactions, *Securities Regulation Law Journal* **37**, 162-175.
- Henry, T. and Koski, J. (2010) Short-selling around seasoned equity offerings, *Review of Financial Studies* **23**, 4389-4418.
- Hertzel, M, Lemmon, M., Linck, J.S. and Rees, L. (2002) Long-run performance following private placements of equity, *Journal of Finance* **57**, 2595-2617.
- Hertzel, M. and Smith, R.L. (1993) Market discounts and shareholder gains for placing equity privately, *Journal of Finance* **48**, 459-485.
- Hillion, P. and Vermaelen, T. (2004) Death spiral convertibles, *Journal of Financial Economics* **71**, 381-415.
- Ivashina, V. and Sun, Z. (2011) Institutional stock trading on loan market information, *Journal of Financial Economics* **100**, 284-303.

- Jones, C., Reed, A. and Waller, W. (2012) Revealing shorts: An examination of large short position disclosures, unpublished working paper, Columbia Business School, University of North Carolina.
- Li, X., Lin, S. and Tucker, A.L. (2013) Convert arbitrage, happy meals and insider trading, unpublished working paper, Cheung Kong Graduate School of Business, Dalhousie University, Fudan University.
- Mahoney, C., Schwartz, E., Walker, C., Greenstein, L. and Lawrence, A. (2008) Recent SEC cases against hedge funds, Skadden, Arps memo.
- Massoud, N., Nandy, D., Saunders, A. and Song, K. (2011) Do hedge funds trade on private information? Evidence from syndicated lending and short-selling, *Journal of Financial Economics* **99**, 477-499.
- Mitchell, M., Pedersen, L., and Pulvino, T. (2007) Slow moving capital, *American Economic Review* **97**, 215-220.
- Pulliam, S. (2004) Mixed blessing: How hedge-fund trading sent a company's stock on wild ride, *Wall Street Journal* (28/12/2004).
- Ritter, J.R. (2008) Forensic finance, *Journal of Economic Perspectives* **22**, 127-147.
- Saffi, P. and Sigurdsson, K. (2011) Price efficiency and short-selling, *Review of Financial Studies* **24**, 821-852.
- Safieddine, A. and Wilhelm, W. (1996) An empirical investigation of short-selling activity prior to seasoned equity offerings, *Journal of Finance* **51**, 729-749.
- Sjostrom, W.K. (2007) PIPEs, *Entrepreneurial Business Law Journal* **2**, 381-413.
- Wooldridge, J.M. (2010) *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, Massachusetts.
- Wruck, K.H. (1989) Equity ownership concentration and firm value: Evidence from private equity financing, *Journal of Financial Economics* **23**, 3-28.

Panel A – Convertible Bond Issues



Panel B – Common Stock Issues

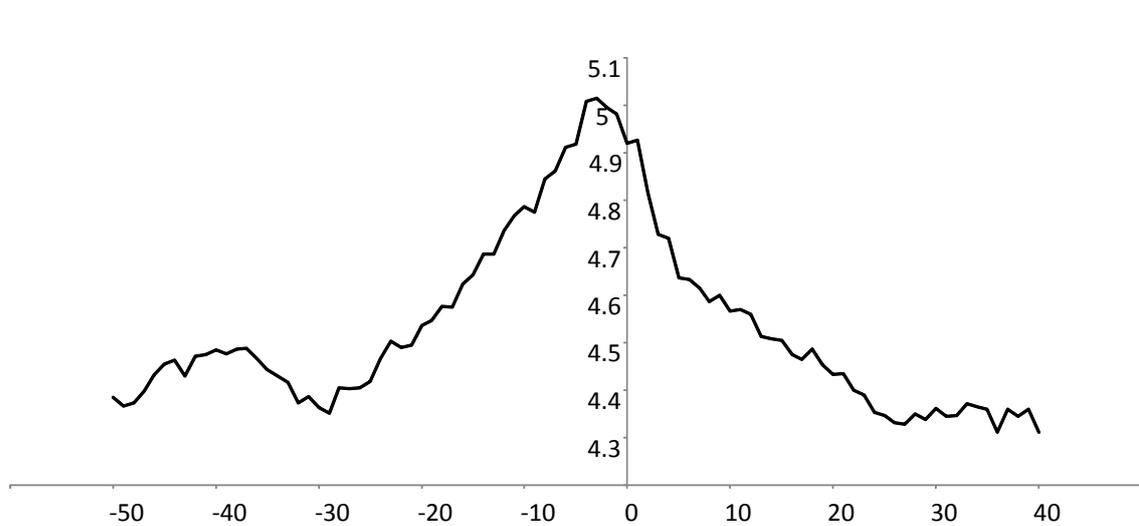


Figure 1. Changes in short interest around the announcement of a private placement. This figure plots the pattern in mean short interest (as a percentage of shares outstanding) over the window -50 to +40 days around the announcements of convertible bond private placements (Panel A) and common stock private placements (Panel B).

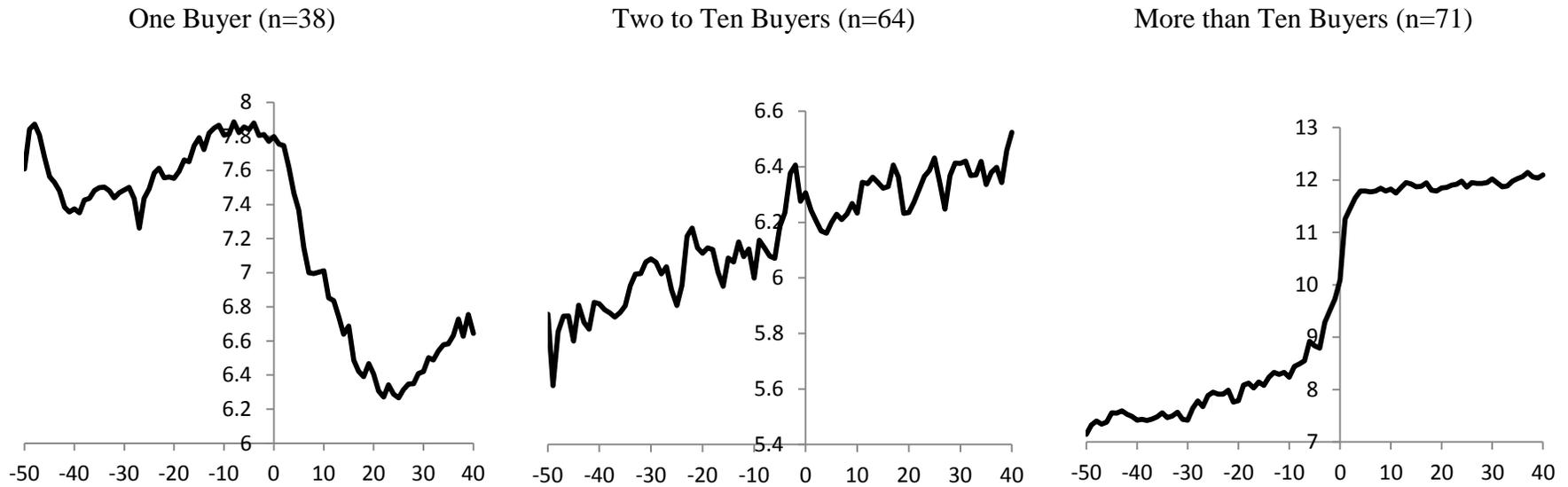


Figure 2. Changes in short interest around the announcement of a private placement of convertible bonds distinguishing between the number of buyers. This figure presents a plot of the average short interest (as a percentage of shares outstanding) in the period of -50 to +40 days around the announcement of a private placement of convertible bonds, where the sample is split into three groups based on the number of buyers: the first group consists of private placements with one buyer; the second group consists of private placements with 2 to 10 buyers; and the third group consists of private placements with more than 10 buyers.



Figure 3. Changes in short interest around the announcement of a private placement of common stock distinguishing between the number of buyers. This figure presents a plot of the average short interest (as a percentage of shares outstanding) in the period of -50 to +40 days around the announcement of a private placement of common stock, where the sample is split into three groups based on the number of buyers: the first group consists of private placements with one buyer; the second group consists of private placements with 2 to 10 buyers; and the third group consists of private placements with more than 10 buyers.

Table I. Descriptive statistics

Panel A presents descriptive statistics for the main variables used in this study, where the description of the variables is presented in Appendix B. We obtain a sample of 662 common stock and convertible bond private placements from Securities Data Company (SDC) and Sagient's PlacementTracker. The sample period is from January 2007 to August 2011, the period for which we have daily short interest data from Dataexplorers. The total sample of 662 private placements comprises 323 convertible bond issues (152 are 144A offerings and 171 are PIPE offerings) and 339 common stock issues by 536 unique firms. Panel B presents the average values for the variables when we distinguish between the type of issue. The final three rows contain additional information specific to the 144A and PIPE convertible issues. Variables are winsorized at the 1 percent and 99 percent levels.

Panel A: All Private Placements

	Mean	Median	Standard Deviation
Market Capitalization	1,811	199	11,057
Total Assets	8,279	219	67,661
Proceeds	166	25	621
Relative Proceeds	0.22	0.14	0.42
Market-to-Book Ratio	2.71	1.68	3.05
Return Volatility	0.73	0.64	0.39
Book Leverage	0.23	0.17	0.24
Dividend Paying	0.19	0.00	0.39
ROA	-0.18	-0.01	0.35
Short Interest	6.20	3.61	7.39
Supply of Lendable Shares	13.25	8.90	12.49
Lending Fee	379	29	979
Number of Buyers*	14	5	30
Hedge Fund Involved*	0.70	1	0.46
Number of Hedge Funds*	7	2	10

Note: * - These summary metrics are for a restricted sample of the data as information on the number of buyers is not available for all observations.

Panel B: Average Values When Distinguishing Between Placement Type

	Convertible Bond				Common Stock	
	144A		PIPEs		PIPEs	
	mean	median	mean	median	mean	median
Market Capitalization	4,947	1,088	1,673	126	475	114
Total Assets	8,720	1,090	21,289	336	1,519	68
Proceeds	319	185	281	30	40	13
Relative Proceeds	0.18	0.16	0.31	0.20	0.20	0.11
Market-to-Book Ratio	2.24	1.66	2.16	1.43	3.20	1.90
Return Volatility	0.52	0.43	0.74	0.64	0.81	0.71
Book Leverage	0.25	0.21	0.26	0.20	0.21	0.14
Dividend Paying	0.22	0.00	0.32	0.00	0.12	0.00
ROA	0.03	0.06	-0.12	0.00	-0.30	-0.18
Short Interest	9.17	7.73	6.01	2.23	4.95	2.57
Supply of Lendable Shrs	26.37	27.24	10.84	7.65	8.58	5.09
Lending Fee	100	14	385	74	539	84
Number of Buyers*	38	29	14	3	9	4
Hedge Fund Involved*	0.94	1	0.56	1	0.71	1
Number of Hedge Funds*	21	21	4	1	5	1
Conversion Premium	28	28	26	9	-	-
Delta	0.76	0.73	0.77	0.76	-	-
Years-to-Maturity	10	6	5	4	-	-

Note: * - These summary metrics are for a restricted sample of the data as information on the number of buyers is not available for all observations.

Table II. Cumulative abnormal returns around private placement announcements

This table presents the sum of abnormal returns on the announcement day (day 0) and the next trading day (day 1) for the full sample of private placements as well as for each class of asset issued. The sample consists of 662 offerings. The abnormal daily return is the difference between the actual return and the return on the same day of a value-weighted portfolio of all firms in the same size and book-to-market quintiles. The cumulative abnormal returns are winsorized at the 1 percent and 99 percent levels.

Panel A: All Private Placements

	N	Mean	t-statistic	Median	Standard Deviation
Full Sample	662	1.10	2.4	-0.06	11.72
Convertibles – Rule 144A	152	-3.44	-5.4	-2.59	7.86
Convertibles – PIPE	171	2.90	2.6	0.75	14.78
Common Stock – PIPE	339	2.22	3.8	1.61	10.90

Panel B: Private Placements Conditional on Hedge Fund Participation

	No Hedge fund participation			Hedge fund participation			Unknown		
	N	Mean	t-statistic	N	Mean	t-statistic	N	Mean	t-statistic
Full Sample	135	6.36	5.1	316	-0.16	-0.3	211	-0.38	-0.5
Convertibles – Rule 144A	3	5.12	0.8	52	-1.17	-1.0	97	-4.92	6.7
Convertibles – PIPE	51	5.96	2.5	67	0.31	0.2	53	3.29	1.6
Common Stock – PIPE	81	6.67	4.6	197	-0.04	-0.1	61	3.67	3.0

Table III. Average abnormal activity around offering announcements

This table presents average abnormal short interest, supply of lendable shares, lending fee and turnover in the days around the announcement of issues of convertible bonds and common stock. Panel A presents the results for private placements and Panel B presents the results for public offerings. For each event and for each variable, we first calculate the average value over the 30-day period from day -50 to -21. Next, for each event day, we subtract this average from the actual value and average these daily abnormal values across all observations in each group. For each group, the *t*-statistics are based on the standard deviation across these daily abnormal values. We report *t*-statistics in parentheses. Detailed definitions of the variables are in Appendix B.

Panel A: Private Placements

Event Day	Convertible Issues				Common Stock Issues			
	Abnormal Short Interest	Abnormal Supply of Lendable Shares	Abnormal Lending Fee	Abnormal Turnover	Abnormal Short Interest	Abnormal Supply of Lendable Shrs	Abnormal Lending Fee	Abnormal Turnover
-20	0.109 (1.4)	0.290 (3.8)	-4.975 (-0.4)	1.158 (1.1)	0.134 (2.2)	0.066 (0.7)	10.105 (0.4)	0.223 (0.2)
-19	0.206 (2.2)	0.353 (4.2)	16.057 (0.9)	0.037 (0.1)	0.144 (2.1)	0.078 (0.7)	-20.708 (-0.7)	4.043 (0.9)
-18	0.202 (2.1)	0.256 (2.6)	41.335 (1.6)	0.719 (0.6)	0.176 (2.3)	0.177 (1.4)	33.053 (1.3)	5.090 (0.9)
-17	0.174 (1.8)	0.265 (2.5)	53.350 (2.0)	3.821 (1.0)	0.171 (2.1)	0.250 (2.2)	62.184 (3.1)	1.305 (0.7)
-16	0.208 (2.1)	0.284 (3.0)	20.376 (1.2)	2.157 (1.3)	0.218 (2.5)	0.108 (0.9)	15.226 (0.6)	0.638 (0.3)
-15	0.221 (2.0)	0.237 (2.4)	29.494 (1.4)	5.314 (1.4)	0.237 (2.6)	0.146 (1.2)	16.631 (0.9)	0.347 (0.2)
-14	0.211 (2.0)	0.298 (3.4)	15.709 (0.8)	1.219 (0.7)	0.282 (3.0)	0.027 (0.2)	31.400 (1.2)	0.966 (0.5)
-13	0.253 (2.3)	0.222 (2.1)	17.024 (0.8)	0.844 (0.6)	0.277 (2.8)	0.140 (1.1)	77.018 (2.6)	-0.248 (-0.3)
-12	0.243 (2.2)	0.235 (2.3)	-16.44 (-0.8)	1.824 (1.2)	0.326 (3.0)	0.164 (1.3)	15.697 (0.5)	1.064 (0.7)
-11	0.244 (2.0)	0.254 (2.4)	6.772 (0.4)	2.971 (1.2)	0.359 (3.1)	0.070 (0.6)	32.835 (1.3)	2.161 (0.8)
-10	0.230 (1.8)	0.270 (2.5)	31.593 (1.5)	0.895 (0.9)	0.377 (3.2)	0.148 (1.2)	2.157 (0.1)	-0.989 (-1.5)
-9	0.312 (2.2)	0.268 (2.3)	-2.739 (-0.1)	1.615 (1.5)	0.368 (3.1)	0.033 (0.2)	14.073 (0.5)	0.556 (0.5)
-8	0.323 (2.3)	0.138 (1.0)	46.420 (2.3)	1.635 (1.5)	0.435 (3.6)	0.113 (0.8)	27.937 (1.4)	-0.370 (-0.4)
-7	0.334 (2.3)	-0.017 (-0.1)	28.236 (1.5)	2.155 (1.7)	0.453 (3.7)	0.133 (1.0)	44.192 (1.8)	-0.196 (-0.2)
-6	0.399 (2.5)	0.073 (0.5)	69.149 (1.9)	-0.094 (-0.1)	0.501 (3.8)	0.020 (0.1)	41.005 (1.5)	2.045 (1.2)
-5	0.421 (2.8)	0.078 (0.5)	45.192 (2.7)	1.745 (1.1)	0.506 (3.8)	0.037 (0.3)	33.991 (1.1)	2.367 (0.6)
-4	0.426 (2.8)	0.094 (0.7)	31.655 (1.5)	1.095 (0.8)	0.600 (4.2)	0.064 (0.5)	51.785 (1.8)	-0.039 (0.0)
-3	0.747 (4.5)	0.011 (0.1)	35.748 (2.0)	1.451 (1.0)	0.608 (4.1)	0.136 (0.9)	35.790 (1.4)	-0.323 (-0.3)
-2	0.855 (4.6)	0.084 (0.6)	53.931 (3.1)	5.612 (1.6)	0.586 (3.9)	0.058 (0.4)	28.640 (1.3)	0.720 (0.5)
-1	0.912 (5.0)	-0.01 (-0.1)	56.962 (2.4)	2.843 (3.0)	0.573 (3.9)	-0.017 (-0.1)	33.066 (1.2)	2.020 (0.8)

0	1.263 (6.5)	0.109 (0.7)	42.181 (2.8)	31.262 (10.6)	0.515 (3.4)	0.019 (0.1)	68.324 (2.4)	19.854 (4.9)
1	1.858 (8.6)	0.194 (1.3)	86.372 (4.7)	35.392 (10.8)	0.521 (3.4)	0.043 (0.3)	58.069 (2.0)	6.665 (2.7)
2	1.974 (8.9)	0.144 (0.9)	70.046 (3.6)	8.147 (6.8)	0.407 (2.7)	-0.098 (-0.7)	46.682 (1.5)	2.613 (1.7)
3	2.014 (8.9)	0.162 (1.0)	66.075 (3.2)	5.798 (5.3)	0.312 (2.0)	-0.143 (-0.9)	45.321 (1.8)	3.242 (1.0)
4	2.041 (8.7)	0.090 (0.5)	54.993 (3.0)	3.218 (3.1)	0.302 (1.9)	-0.210 (-1.3)	39.215 (1.4)	2.946 (1.4)
5	2.063 (8.6)	0.060 (0.4)	30.745 (1.5)	2.603 (2.2)	0.220 (1.4)	-0.123 (-0.8)	40.386 (1.2)	3.864 (1.0)
6	2.022 (8.5)	0.180 (1.2)	48.942 (2.7)	2.795 (2.6)	0.214 (1.4)	-0.270 (-1.7)	36.731 (1.5)	3.450 (1.1)
7	1.998 (8.2)	0.220 (1.4)	50.817 (2.7)	1.197 (1.2)	0.197 (1.3)	-0.204 (-1.3)	21.969 (0.9)	3.859 (1.3)
8	2.012 (8.2)	0.209 (1.3)	28.640 (1.6)	1.617 (1.4)	0.171 (1.1)	-0.262 (-1.6)	40.044 (1.1)	1.629 (0.8)
9	2.000 (8.2)	0.210 (1.4)	46.371 (3.2)	1.274 (1.1)	0.185 (1.2)	-0.276 (-1.7)	53.170 (2.0)	0.676 (0.6)
10	2.017 (8.0)	0.208 (1.3)	41.601 (2.4)	1.807 (1.2)	0.150 (0.9)	-0.218 (-1.4)	27.146 (0.7)	2.564 (0.8)

Panel B: Public Offerings

Event Day	Convertible Issues				Common Stock Issues			
	Abnormal Short Interest	Abnormal Supply of Lendable Shares	Abnormal Lending Fee	Abnormal Turnover	Abnormal Short Interest	Abnormal Supply of Lendable Shares	Abnormal Lending Fee	Abnormal Turnover
-20	-0.220 (-0.7)	-0.032 (-0.2)	5.392 (1.1)	1.477 (1.0)	0.029 (0.2)	-0.015 (-0.1)	0.400 (0.0)	-1.616 (-1.5)
-19	-0.209 (-0.7)	-0.010 (0.0)	-15.887 (-0.9)	1.559 (1.3)	0.074 (0.6)	-0.086 (-0.4)	35.160 (1.3)	-0.327 (-0.3)
-18	-0.262 (-0.8)	0.105 (0.5)	13.546 (1.6)	0.531 (0.4)	0.096 (0.8)	0.080 (0.4)	19.569 (1.2)	0.644 (0.5)
-17	-0.328 (-1.0)	0.046 (0.2)	-16.157 (-0.9)	5.286 (1.1)	0.104 (0.8)	0.133 (0.7)	68.015 (1.8)	-1.351 (-1.5)
-16	-0.309 (-0.9)	-0.049 (-0.2)	18.296 (1.0)	1.755 (0.8)	0.125 (1.0)	0.057 (0.3)	18.809 (1.0)	-0.268 (-0.3)
-15	-0.276 (-0.9)	0.168 (0.8)	1.469 (0.4)	1.771 (0.6)	0.100 (0.7)	-0.079 (-0.4)	31.319 (1.6)	0.553 (0.5)
-14	-0.207 (-0.6)	0.239 (1.2)	-5.493 (-0.3)	1.271 (0.5)	0.053 (0.4)	0.064 (0.3)	25.286 (1.0)	1.027 (0.9)
-13	-0.288 (-0.9)	0.191 (0.9)	8.644 (0.9)	-0.184 (-0.1)	0.093 (0.7)	0.048 (0.2)	-2.026 (-0.2)	1.228 (0.9)
-12	-0.324 (-1.0)	0.155 (0.7)	13.111 (1.2)	-0.774 (-0.6)	0.061 (0.4)	0.007 (0.0)	20.188 (0.9)	-0.827 (-1.0)
-11	-0.384 (-1.2)	0.234 (1.1)	0.586 (0.1)	-1.881 (-1.1)	0.080 (0.5)	0.068 (0.4)	7.188 (0.4)	0.413 (0.2)
-10	-0.368 (-1.1)	0.281 (1.3)	-22.091 (-1.2)	2.132 (0.8)	0.094 (0.6)	0.058 (0.3)	-5.213 (-0.5)	0.338 (0.2)
-9	-0.440 (-1.3)	0.319 (1.5)	16.053 (0.8)	-0.404 (-0.3)	0.134 (0.8)	0.226 (1.2)	-11.374 (-0.8)	1.773 (0.8)
-8	-0.415 (-1.2)	0.313 (1.5)	20.348 (1.0)	0.432 (0.3)	0.126 (0.7)	0.096 (0.5)	36.410 (1.4)	0.421 (0.3)
-7	-0.353 (-1.1)	0.389 (1.7)	-1.850 (-0.5)	1.284 (0.7)	0.153 (0.9)	0.056 (0.3)	-18.566 (-0.9)	-0.862 (-1.0)
-6	-0.451 (-1.3)	0.338 (1.5)	14.318 (0.8)	2.933 (1.3)	0.099 (0.6)	0.087 (0.4)	1.403 (0.1)	-0.704 (-0.8)

-5	-0.405 (-1.1)	0.383 (1.7)	11.747 (0.8)	3.147 (1.5)	0.128 (0.7)	0.103 (0.5)	61.845 (1.6)	0.127 (0.1)
-4	-0.513 (-1.4)	0.245 (0.9)	-2.030 (-0.4)	3.581 (1.8)	0.130 (0.7)	0.159 (0.8)	17.230 (0.9)	2.706 (1.1)
-3	-0.010 (0.0)	0.077 (0.3)	37.780 (2.1)	-0.280 (-0.3)	0.322 (1.4)	-0.049 (-0.2)	52.109 (1.3)	4.697 (1.7)
-2	0.294 (0.6)	0.149 (0.5)	16.345 (1.2)	0.183 (0.2)	0.310 (1.4)	-0.048 (-0.3)	72.591 (1.7)	4.825 (1.9)
-1	0.333 (0.8)	0.321 (1.2)	16.080 (1.8)	0.948 (0.8)	0.333 (1.4)	0.013 (0.1)	24.848 (1.5)	1.314 (0.8)
0	0.864 (2.1)	0.526 (2.0)	35.426 (2.4)	52.492 (10.5)	0.464 (1.7)	-0.042 (-0.1)	43.345 (1.5)	20.606 (4.9)
1	1.726 (3.8)	0.780 (3.0)	33.424 (2.0)	70.629 (4.3)	0.420 (1.5)	0.137 (0.4)	36.358 (1.6)	20.550 (3.7)
2	2.166 (4.4)	0.946 (3.3)	49.076 (1.7)	28.815 (5.2)	0.356 (1.2)	0.589 (1.9)	31.010 (1.1)	21.710 (2.9)
3	2.368 (4.6)	1.063 (3.5)	46.331 (2.1)	21.561 (4.0)	0.070 (0.2)	0.732 (2.2)	56.306 (1.3)	7.950 (2.4)
4	2.444 (4.9)	0.893 (3.0)	21.806 (0.9)	21.711 (4.4)	-0.065 (-0.2)	0.684 (2.0)	18.035 (0.9)	3.565 (2.3)
5	2.156 (4.2)	1.054 (3.3)	13.169 (1.4)	15.499 (6.4)	-0.145 (-0.5)	0.519 (1.5)	33.494 (1.4)	4.873 (2.5)
6	2.362 (4.7)	1.062 (3.4)	-17.303 (-0.7)	12.209 (4.9)	-0.293 (-1.1)	0.446 (1.4)	13.300 (0.7)	5.022 (2.5)
7	2.490 (4.8)	0.932 (2.8)	11.605 (1.5)	8.884 (4.3)	-0.412 (-1.5)	0.398 (1.2)	4.717 (0.3)	4.935 (2.6)
8	2.522 (4.8)	0.963 (2.9)	17.447 (2.7)	7.217 (3.1)	-0.448 (-1.7)	0.412 (1.2)	56.504 (1.5)	4.180 (2.5)
9	2.352 (4.5)	0.968 (2.8)	5.733 (0.7)	7.532 (2.6)	-0.462 (-1.8)	0.271 (0.8)	27.895 (0.9)	4.203 (2.1)
10	2.489 (4.8)	0.925 (2.7)	-6.249 (-0.4)	6.866 (3.2)	-0.520 (-2.0)	0.444 (1.3)	15.799 (0.7)	2.447 (1.4)

Table IV. Does the change in short interest predict announcement returns?

The following table presents the estimation results for Equation (1), i.e.:

$$\Delta SI(-T,-1)_i = \alpha_0 + \alpha_1 CAR(0,+1)_i + \alpha_2 CAR(-T,-1)_i + \alpha_3 ATurn(-T,-1)_i + \alpha_4 Fee(-T,-1)_i + \alpha_5 Rel_Proceeds_i + \varepsilon_i,$$

where the dependent variable, $\Delta SI(-T,-1)_i$, is the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 . The independent variables are the cumulative abnormal return (CAR), the average daily abnormal turnover (ATurn), the average daily stock lending fee (Fee) and the relative proceeds of the issue (Rel_Proceeds). For convertible issues, the model includes an additional dummy variable that indicates whether the convertible issue is a Rule 144A offering (D_{144A}) and an interactive term that captures the cross effects between a Rule 144A offering and the announcement return ($D_{144A} * CAR(0,+1)$). Panel A presents the estimation results for convertible debt private placements and Panel B presents the estimation results for common stock private placements. All continuous firm-level variables are winsorized at the 1 percent and 99 percent levels and reported p-values are based on standard errors that are clustered by firm and quarter.

Panel A: Convertible Debt (323 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	0.093	0.66	0.077	0.75
CAR(0,+1) _i	-3.271	0.02	-3.049	0.05
CAR(-T,-1) _i	-0.249	0.76	-0.180	0.87
ATurn(-T,-1) _i	0.026	0.01	0.052	0.00
Fee(-T,-1) _i	-0.023	0.06	-0.039	0.05
Rel_Proceeds _i	0.535	0.12	0.563	0.17
D _{144A}	0.312	0.35	-0.073	0.84
D _{144A} *CAR(0,+1) _i	0.230	0.92	0.209	0.93
Adjusted R ²	0.11		0.12	

Panel B: Common Stock (339 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	0.194	0.03	0.421	0.02
CAR(0,+1) _i	-1.338	0.02	-3.208	0.00
CAR(-T,-1) _i	0.201	0.77	0.777	0.09
ATurn(-T,-1) _i	0.009	0.22	0.016	0.18
Fee(-T,-1) _i	-0.016	0.00	-0.034	0.01
Rel_Proceeds _i	0.182	0.02	0.418	0.02
Adjusted R ²	0.01		0.04	

Table V. Estimating the impact of the number of buyers

The following table presents the estimation results for Equation (2), i.e.:

$$\Delta SI(-T,-1)_i = \alpha_0 + \alpha_1 D_{B,2-10} + \alpha_2 D_{B,>10} + \alpha_3 CAR(0,+1)_i + \alpha_4 D_{B,2-10} * CAR(0,+1)_i + \alpha_5 D_{B,>10} * CAR(0,+1)_i + \alpha_6 CAR(-T,-1)_i + \alpha_7 ATurn_i(-T,-1)_i + \alpha_8 Fee(-T,-1)_i + \alpha_9 Rel_Proceeds_i + \varepsilon_i$$

where the dependent variable, $\Delta SI(-T,-1)_i$, is the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 . The independent variable $D_{B,2-10}$ ($D_{B,>10}$) is a dummy variable that takes a value of one if the number of buyers in the private placement is between 2 and 10 (greater than 10) and is zero otherwise. The other independent variables are the cumulative abnormal return (CAR), the average daily abnormal turnover (ATurn), the average daily stock lending fee (Fee) and the relative proceeds of the issue (Rel_Proceeds). All continuous firm-level variables are winsorized at the 1 percent and 99 percent levels and reported p-values are based on standard errors that are clustered by firm and quarter. There are 451 private placements for which we have information on the total number of buyers.

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	-0.150	0.18	-0.197	0.19
$D_{B,2-10}$	0.315	0.14	0.405	0.10
$D_{B,>10}$	0.973	0.00	1.237	0.00
$CAR(0,+1)_i$	-0.516	0.55	-0.955	0.41
$CAR(0,+1)_i * D_{B,2-10}$	-1.064	0.59	-2.441	0.29
$CAR(0,+1)_i * D_{B,>10}$	-3.977	0.01	-4.053	0.09
$CAR(-T,-1)_i$	0.251	0.66	0.538	0.43
$ATurn(-T,-1)_i$	0.016	0.01	0.034	0.01
$Fee(-T,-1)_i$	-0.023	0.01	-0.040	0.01
$Rel_Proceeds_i$	-0.075	0.64	0.079	0.80
Adjusted R ²	0.11		0.12	

Table VI. Estimating the impact of hedge fund involvement in private placements

The following table examines the effect of hedge fund involvement. Panel A distinguishes between issues with and without hedge fund involvement and shows $\Delta SI(-T,-1)_i$, i.e. the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 , for quintiles of the announcement returns. The announcement return quintiles are based on the overall sample. The F-test reports the equality of means over the quintiles. Panels B, C and D present the estimation results for equations in which the dependent variable is $\Delta SI(-T,-1)$. The independent variables are the cumulative abnormal return (CAR), the average daily abnormal turnover (ATurn), the average daily stock lending fee (Fee) and the relative proceeds of the issue (Rel_Proceeds). Panel B also includes variables for the number of hedge funds involved, the number of non-hedge funds involved and the interaction terms between these variables and CAR. Panel C and D include a dummy variable that takes a value of one if the number of buyers in the private placement is greater than one and is zero otherwise ($D_{B,>1}$). Panel C presents the estimation results for the sample in which there is no hedge fund involvement ($n=135$, of which 91 placements had one buyer, i.e. $D_{B,>1} = 0$ and 44 placements had more than 1 buyer, i.e. $D_{B,>1} = 1$). Panel D presents the estimation results for the sample in which hedge funds are the sole participants ($n=94$, of which 59 placements had one buyer, i.e. $D_{B,>1} = 0$ and 35 placements had more than 1 buyer, i.e. $D_{B,>1} = 1$). All continuous firm-level variables are winsorized at the 1 percent and 99 percent levels and reported p-values are based on standard errors that are clustered by firm and quarter. There are 451 private placements for which we have information on the total number of buyers.

Panel A: Change in Pre-Announcement Short Interest With and Without Hedge Fund Involvement

	With Hedge Fund Involvement				Without Hedge Fund Involvement			
	Mean CAR	N	$\Delta SI(-10,-1)$	$\Delta SI(-20,-1)$	Mean CAR	N	$\Delta SI(-10,-1)$	$\Delta SI(-20,-1)$
1 (most negative CARs)	-0.120	71	1.184	1.692	-0.147	14	-0.038	0.008
2	-0.041	68	0.558	1.213	-0.044	14	-0.057	0.786
3	0.001	65	0.260	0.523	0.002	25	-0.061	0.015
4	0.047	61	0.295	0.361	0.048	37	0.161	0.050
5 (most positive CARs)	0.154	51	0.298	0.366	0.209	45	-0.104	-0.174
F-test (p-value)			0.02	0.01			0.86	0.53

Panel B: Number of (Non) Hedge Funds

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	0.070	0.51	0.170	0.31
Number Non-Hedge Funds	0.010	0.13	0.013	0.16
Number Hedge Funds	0.032	0.01	0.026	0.03
$CAR(0,+1)_i$	-0.888	0.16	-2.078	0.02
$CAR(0,+1)_i * \text{Number Non-Hedge Funds}$	0.028	0.57	0.050	0.51
$CAR(0,+1)_i * \text{Number Hedge Funds}$	-0.259	0.02	-0.253	0.05
$CAR(-T,-1)_i$	0.212	0.70	0.495	0.49
$ATurn(-T,-1)_i$	0.011	0.04	0.028	0.02
$Fee(-T,-1)_i$	-0.021	0.01	-0.039	0.00
$Rel_Proceeds_i$	-0.106	0.45	0.131	0.67
Adjusted R ²		0.13		0.11

Panel C: Issues with No Hedge Fund Involvement

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	-0.019	0.90	-0.062	0.77
$D_{B,>1}$	0.153	0.54	-0.153	0.63
$CAR(0,+1)_i$	-0.249	0.73	-1.208	0.44
$CAR(0,+1)_i * D_{B,>1}$	-1.080	0.55	-0.767	0.68
$CAR(-T,-1)_i$	1.716	0.02	1.231	0.25
$ATurn(-T,-1)_i$	0.016	0.10	0.032	0.20
$Fee(-T,-1)_i$	-0.009	0.52	-0.022	0.27
$Rel_Proceeds_i$	-1.159	0.16	-0.501	0.49
Adjusted R ²	0.07		0.06	

Panel D: Issues Solely Purchased by Hedge Funds

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	-0.009	0.95	-0.086	0.66
$D_{B,>1}$	0.220	0.53	0.717	0.04
$CAR(0,+1)_i$	2.228	0.32	3.656	0.37
$CAR(0,+1)_i * D_{B,>1}$	-8.168	0.03	-13.843	0.04
$CAR(-T,-1)_i$	0.493	0.58	0.917	0.43
$ATurn(-T,-1)_i$	-0.001	0.91	0.013	0.37
$Fee(-T,-1)_i$	-0.007	0.55	-0.011	0.51
$Rel_Proceeds_i$	-0.705	0.37	-1.542	0.25
Adjusted R ²	0.03		0.18	

Table VII. Additional control variables

The following table presents the estimation results for an augmented version of Equation (1), which includes additional control variables. The first three additional variables are pre-announcement short interest levels; Psi, which is the Durnev et al. (2003) measure for information asymmetry; and Probability of Private Placement, which follows from the logit model in Appendix C. The other additional variables are the natural logarithm of market capitalization, the issuer's normal turnover over days [-50, -21], the supply of lendable shares as a percentage of shares outstanding at day $-T$ and the bid-ask spread at day $-T$. In Panel A, we also include a Happy Meal dummy variable that equals one when the convertible offering is combined with a stock repurchase and zero otherwise. The dependent variable is $\Delta SI(-T,-1)_i$, i.e. the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 . The other variables are as in Table IV and the description of these variables is presented in Appendix B. Panel A presents the estimation results for convertible debt private placements, and Panel B presents the estimation results for common stock private placements. All continuous firm-level variables are winsorized at the 1 percent and 99 percent levels and reported p-values are based on standard errors that are clustered by firm and quarter.

Panel A: Convertible Debt (308 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	1.568	0.13	1.800	0.11
CAR(0,+1) _i	-2.626	0.05	-2.574	0.08
CAR(-T,-1) _i	-0.253	0.73	-0.209	0.84
ATurn(-T,-1) _i	0.019	0.12	0.067	0.01
Fee(-T,-1) _i	-0.036	0.03	-0.042	0.04
Rel_Proceeds _i	0.077	0.85	0.117	0.79
Short Interest (-T) _i	0.064	0.02	0.054	0.04
Psi	-0.166	0.74	0.212	0.77
Probability Private Placement	4.169	0.09	5.320	0.03
Log Market Capitalization	-0.137	0.11	-0.204	0.04
Normalized Turnover	-0.001	0.96	-0.038	0.09
Supply of Lendable Shares	-0.002	0.91	0.030	0.14
% Bid Ask Spread	-6.100	0.38	-2.017	0.82
Happy Meal	-0.218	0.50	-0.629	0.39
D _{144A}	0.627	0.16	0.241	0.65
D _{144A} *CAR(0,+1) _i	0.577	0.81	2.269	0.41
Adjusted R ²	0.15		0.14	

Panel B: Common Stock (294 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	-0.307	0.83	-1.437	0.50
CAR(0,+1) _i	-1.489	0.03	-3.624	0.01
CAR(-T,-1) _i	0.213	0.80	0.728	0.26
ATurn(-T,-1) _i	0.009	0.46	0.026	0.08
Fee(-T,-1) _i	-0.020	0.01	-0.026	0.08
Rel_Proceeds _i	0.215	0.01	0.455	0.03
Short Interest (-T) _i	0.020	0.22	-0.024	0.65
Psi	-0.210	0.71	-0.202	0.78
Probability Private Placement	1.342	0.27	0.809	0.59
Log Market Capitalization	0.047	0.61	0.156	0.31
Normalized Turnover	-0.006	0.65	-0.018	0.20
Supply of Lendable Shares	0.002	0.91	0.035	0.21
% Bid Ask Spread	-4.094	0.53	-4.275	0.58
Adjusted R ²	0.01		0.06	

Table VIII. Endogeneity of number of hedge fund buyers

This table shows two-stage-least-squares regressions. The dependent variable in the first stage models is the number of hedge fund buyers and the dependent variable is $SI(-T,-1)$ in the second stage models, which represents the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 . We report the results of the second-stage regression and further report the coefficient on our instrument from the first-stage regression. Our instrument is the natural logarithm of the total assets under management by the long-short hedge fund industry in the issue month, obtained from Lipper TASS. All other variables are as in Table VII. Reported p-values are based on standard errors that are clustered by firm and quarter. There are 406 private placements for which we have all the required information.

	T = 10			T = 20		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	1.948 (0.12)	1.891 (0.12)	1.701 (0.11)	5.122 (0.03)	4.921 (0.02)	4.626 (0.03)
Number of hedge funds	0.089 (0.01)	0.086 (0.01)	0.086 (0.01)	0.203 (0.00)	0.184 (0.00)	0.180 (0.00)
Fee(-T,-1) _i	-0.028 (0.01)	-0.029 (0.01)	-0.029 (0.01)	-0.021 (0.25)	-0.026 (0.14)	-0.026 (0.15)
Rel_Proceeds _i	-0.400 (0.14)	-0.399 (0.12)	-0.371 (0.18)	-0.813 (0.16)	-0.762 (0.14)	-0.728 (0.19)
Short Interest (-T) _i	0.061 (0.00)	0.057 (0.01)	0.056 (0.01)	0.069 (0.11)	0.056 (0.16)	0.054 (0.17)
Psi	-0.851 (0.03)	-0.812 (0.05)	-0.815 (0.06)	-1.718 (0.03)	-1.531 (0.06)	-1.527 (0.06)
Probability Private Placement	0.386 (0.77)	0.626 (0.63)	0.509 (0.77)	-3.350 (0.08)	-2.240 (0.24)	-2.228 (0.21)
Log Market Capitalization	-0.131 (0.15)	-0.130 (0.13)	-0.115 (0.13)	-0.376 (0.02)	-0.374 (0.01)	-0.350 (0.02)
Normalized Turnover	-0.002 (0.83)	-0.007 (0.52)	-0.008 (0.48)	-0.012 (0.31)	-0.037 (0.01)	-0.037 (0.01)
Supply of Lendable Shares	-0.009 (0.56)	-0.009 (0.57)	-0.008 (0.54)	0.011 (0.70)	0.011 (0.69)	0.012 (0.72)
% Bid Ask Spread	-6.607 (0.29)	-6.512 (0.28)	-5.840 (0.35)	-0.574 (0.96)	-2.851 (0.81)	-2.493 (0.89)
CAR(-T,-1) _i		0.229 (0.73)	0.088 (0.92)		0.212 (0.81)	0.159 (0.88)
ATurn(-T,-1) _i		0.009 (0.17)	0.009 (0.16)		0.044 (0.02)	0.043 (0.02)
CAR(0,+1) _i			-0.462 (0.15)			0.283 (0.58)
CAR(0,+1) _i * Number Hedge Funds			-0.170 (0.07)			-0.270 (0.02)
1st stage – Size Hedge Fund Industry	7.634 (0.00)	7.671 (0.00)	7.473 (0.00)	7.284 (0.00)	7.377 (0.00)	7.227 (0.00)

Table IX. Offering discount, expected announcement return and changes in short interest

The following table presents the estimation results of a variant of Equation (1), in which $CAR(0,+1)_i$ is replaced by either the offering discount of the issue (Panel A) or the expected announcement return for the issue (Panel B). The dependent variable is $\Delta SI(-T,-1)_i$, which is the change in short interest in stock i over day $-T$ to day -1 , where $T = 10$ or 20 . The offering discount of the issue is the percentage difference between the stock price before the announcement of the offering and the price per share offered to the security buyers. For example, a value of -0.1 indicates that the offering price is 10 percent below the pre-announcement stock price (i.e. the closing price on day -1). The expected announcement return is based on the regression model in Appendix E. The offering discount is available for 301 observations, all of which are common stock PIPEs and the expected announcement return can be calculated for 222 of these observations. The other independent variables are the cumulative abnormal return (CAR), the average daily abnormal turnover (ATurn), the average daily stock lending fee (Fee) and the relative proceeds of the issue (Rel_Proceeds). All continuous firm-level variables are winsorized at the 1 percent and 99 percent levels and reported p-values are based on standard errors that are clustered by firm and quarter.

Panel A: Offering Discount (301 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	0.198	0.04	0.406	0.03
Offering Discount _i	-0.550	0.15	-1.455	0.03
CAR(-T,-1) _i	0.207	0.78	0.631	0.21
ATurn(-T,-1) _i	0.008	0.30	0.013	0.25
Fee(-T,-1) _i	-0.018	0.02	-0.042	0.01
Rel_Proceeds _i	0.149	0.13	0.365	0.04
Adjusted R ²	0.00		0.03	

Panel B: Expected Announcement Return (222 observations)

	T = 10		T = 20	
	Parameter Estimate	p-value	Parameter Estimate	p-value
Intercept	0.441	0.00	0.746	0.01
Expected Announcement Return _i	-4.975	0.01	-9.044	0.01
CAR(-T,-1) _i	0.874	0.24	1.079	0.14
ATurn(-T,-1) _i	-0.003	0.62	0.010	0.42
Fee(-T,-1) _i	-0.028	0.01	-0.056	0.01
Rel_Proceeds _i	0.146	0.23	0.523	0.14
Adjusted R ²	0.02		0.04	

Table X. Average abnormal option trading around private placement announcements

This table presents average abnormal call and put option volume in the days around the announcement of private placements of convertible bonds and private placements of common stock. We define abnormal volume as the natural log of the actual volume on each event day in the period -20 to +10 over the event-specific average daily volume over the 30-day period from day -50 to -21. We average the daily abnormal values across all observations. The *t*-statistic is based on the standard deviation across these daily abnormal values. In Panels B and C, we report the average abnormal option volume in the options sample over 10-day and 20-day windows. In all Panels we report *t*-statistics in parentheses.

Panel A: Abnormal Option volume (225 observations)

Event Day	Convertible Issues		Common Stock Issues	
	Abnormal Volume Call Options	Abnormal Volume Put Options	Abnormal Volume Call Options	Abnormal Volume Put Options
-20	0.234 (1.7)	0.468 (2.8)	0.405 (2.5)	0.142 (0.7)
-19	0.087 (0.7)	0.370 (2.6)	0.328 (1.8)	0.208 (0.9)
-18	0.084 (0.6)	0.539 (3.3)	-0.037 (-0.2)	0.194 (0.8)
-17	0.110 (0.8)	0.326 (2.1)	-0.158 (-0.8)	0.050 (0.2)
-16	0.161 (1.3)	0.117 (0.9)	-0.139 (-0.7)	0.391 (1.4)
-15	0.115 (0.9)	0.080 (0.6)	-0.002 (0.0)	0.489 (2.8)
-14	-0.039 (-0.3)	0.220 (1.5)	-0.094 (-0.5)	0.218 (0.9)
-13	-0.006 (0.0)	0.430 (2.7)	-0.184 (-1.1)	-0.228 (-0.9)
-12	0.221 (1.7)	0.377 (2.3)	0.478 (2.2)	0.525 (2.1)
-11	0.239 (1.8)	0.133 (0.8)	0.256 (1.3)	0.721 (3.1)
-10	0.351 (2.8)	0.488 (3.0)	0.107 (0.6)	0.016 (0.1)
-9	0.202 (1.4)	0.497 (2.8)	0.162 (1.0)	0.269 (1.1)
-8	0.207 (1.4)	0.412 (2.3)	0.323 (1.8)	0.548 (2.0)
-7	0.339 (2.7)	0.686 (4.6)	0.165 (0.8)	0.540 (2.1)
-6	0.253 (2.0)	0.314 (2.0)	0.256 (1.3)	0.822 (3.5)
-5	0.183 (1.5)	0.274 (1.9)	0.459 (2.4)	0.454 (1.9)
-4	0.189 (1.3)	0.386 (2.3)	0.101 (0.5)	0.442 (1.5)
-3	0.143 (1.1)	-0.020 (-0.1)	0.150 (0.7)	0.250 (0.9)
-2	0.200 (1.3)	0.366 (2.5)	0.079 (0.4)	0.390 (1.3)
-1	0.189 (1.3)	0.590 (3.5)	0.519 (2.9)	0.570 (2.1)
0	1.173 (7.5)	1.522 (9.2)	1.444 (6.7)	1.098 (4.8)
1	0.908 (6.0)	1.325 (7.5)	0.862 (4.3)	0.857 (3.5)
2	0.400 (2.7)	0.558 (3.7)	0.522 (2.2)	0.491 (2.0)
3	0.409 (3.3)	0.406 (2.7)	0.534 (2.7)	0.408 (1.7)
4	0.348 (2.6)	0.452 (2.8)	0.282 (1.6)	0.134 (0.6)
5	0.098 (0.7)	0.494 (3.2)	0.300 (1.5)	-0.203 (-0.8)
6	0.093 (0.6)	0.249 (1.4)	-0.135 (-0.7)	0.036 (0.1)
7	0.014 (0.1)	0.357 (2.0)	0.361 (1.8)	0.399 (1.4)
8	0.053 (0.4)	0.013 (0.1)	0.317 (1.6)	0.365 (1.3)
9	-0.008 (-0.1)	0.237 (1.3)	0.453 (1.9)	0.415 (1.7)
10	0.039 (0.3)	0.370 (1.9)	0.271 (1.2)	0.071 (0.3)

Panel B: Abnormal Option Volume for Negative and Positive Announcement Returns

	Negative Announcement Return		Positive Announcement Return	
	10-Day Window	20-Day Window	10-Day Window	20-Day Window
Abnormal Volume Call Options	1.836 (2.4)	2.312 (1.8)	1.812 (2.4)	2.974 (2.3)
Abnormal Volume Put Options	3.457 (3.6)	6.124 (3.6)	3.095 (3.2)	4.779 (3.1)

Panel C: Abnormal Option Volume for Issues with and without Hedge Fund Involvement

	With Hedge Fund Involvement		Without Hedge Fund Involvement	
	10-Day Window	20-Day Window	10-Day Window	20-Day Window
Abnormal Volume Call Options	2.425 (3.1)	3.100 (2.0)	0.465 (0.4)	1.178 (0.6)
Abnormal Volume Put Options	4.142 (4.1)	6.599 (3.7)	-0.181 (-0.1)	0.383 (0.2)