Convertibles and Hedge Funds as Distributors of Equity Exposure

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By buying convertibles and shorting the underlying stock, hedge funds distribute equity exposure to well-diversified shareholders. We find that firms with characteristics that make seasoned equity offerings expensive are more likely to issue convertibles to hedge funds. We conclude that hedge funds provide opportunities for firms to issue convertible securities at a lower cost than seasoned equity by serving as relatively low-cost distributors of equity exposure. A higher fraction of a convertible is privately placed with hedge funds when institutional ownership, stock liquidity, issue size, concurrent stock repurchases, and limitations on callability suggest that shorting costs will be lower. (*JEL* G2, G32)

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Convertible arbitrage hedge funds combine long positions in convertible securities with short positions in the convertible issuer's stock. In effect, hedge funds use their knowledge of the borrowing and short-sale market to hedge themselves while distributing equity exposure to a large number of well-diversified investors into the open market via their short positions. In this article, we argue that "would-be" equity issuers that would pay high equity issue costs optimally choose to issue convertible debt to hedge funds rather than issue seasoned equity in order to utilize hedge funds' expertise in distributing equity exposure. This allows issuing firms to receive financing today while avoiding the discounts and underwriter fees associated with a secondary equity offering.

Our article is related to Constantinides and Grundy (1989) and Stein (1992), who show that firms can prefer convertible issues over seasoned equity issues because of the ability of convertible securities to resolve problems associated with asymmetric information. Constantinides and Grundy present a model of a signaling equilibrium with optimal investment in which the proceeds of convertible issues are used partly to finance investment and partly to repurchase stock, whereas Stein presents a model in which firms issue convertible debt as a type of deferred equity issue. In this model, a convertible issue provides a more favorable signal than a direct equity issue, because a company only favors a convertible issue over an equity issue when it is optimistic that the stock price will exceed the conversion price before the bond matures.

We provide a rationale for issuing convertible debt that does not rely on signaling explanations. We argue instead that firms facing relatively high costs of issuing seasoned equity may find convertible debt to be the preferred issue choice, as certain factors that characterize high equity issue costs, like high stock return volatility and a high probability of financial distress (Altinkilic and Hansen 2003; Corwin 2003; Eckbo, Masulis, and Norli 2007), do not necessarily increase the costs of issuing convertibles to hedge funds. For example, convertible arbitrage hedge funds typically prefer the underlying stock to have higher return volatility, because their hedging strategy leads them to buy stock after a stock price decline and sell after a stock price increase. This strategy is inherently profitable when part of the stock price movements are liquidity-induced and subsequently reverse.

To test whether firms with characteristics that make a seasoned equity offering expensive issue convertibles to hedge funds, we obtain hedge fund involvement for 803 privately placed convertibles issued under Rule 144A. Rule 144A was introduced by the SEC in 1990 and 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).[1] Because the names of the QIBs are contained in the registration statement, we can directly

[1] QIBs are typically large institutional buyers with more than $100 million of investable assets. Rule 144A also permits QIBs to trade these securities among themselves and has thereby increased the liquidity of the securities affected.

examine the participation of hedge funds in the issue. We document that hedge funds are heavily involved in the convertible security market: In our 2000–2008 sample, 73.4% of the financing of newly issued convertibles is provided by hedge funds. We compare firms that issue convertibles to hedge funds to firms that issue seasoned equity and find that firms selling convertibles to hedge funds are more financially distressed and have more volatile returns than do seasoned equity issuers.

Using a two-stage model that accounts for self-selection, we estimate the issue costs that would have been incurred if the set of firms that chose to issue convertibles to hedge funds had instead chosen a seasoned equity offering. The estimated issue cost of a seasoned equity offering (defined as the sum of the offering discount and gross spread) is 11.21% for our sample of convertible issuers. By comparison, the actual cost of selling convertibles to hedge funds is 9.23%, consistent with convertibles being the least-cost financing option for these firms.

We argue that the attractiveness of convertibles to hedge funds also depends on the design of the security and on the cost of shorting the issuer's stock. We find that hedge funds purchase a smaller fraction of a particular issue if the issue is callable. A call will redistribute wealth between convertibleholders and stockholders, and because an unanticipated redistribution is not a hedgeable comovement of the bond and the stock, it complicates determining the optimal number of shares to short. The aversion to call features may appear at variance with the importance of the call feature in Stein (1992), who argues that call features are important, as they increase the likelihood that a bond will be converted into equity. However, we find that firms have found ways to make convertibles relatively equity-like without using call features, for example, by choosing a relatively low conversion premium. In fact, we document that more than 92% of the bonds issued to hedge funds are effectively converted within five years.

Hedge funds are also more involved in issues that are combined with concurrent stock repurchases. De Jong, Dutordoir, and Verwijmeren (2011) argue that these concurrent stock repurchases facilitate hedge funds in establishing their short positions. In addition, convertible issuers have a higher average level of institutional ownership and have more liquid stock than do firms that make seasoned equity offers. Institutional ownership facilitates the borrowing of stock to establish a short position (D'Avolio 2002), and stock liquidity also reduces the costs of establishing and maintaining a short position.

Our article provides a new rationale for the issuance of convertible bonds by hypothesizing and testing the role that hedge funds can play as low-cost distributors of equity exposure. We further contribute to the literature by showing hedge funds' preferences for particular issue and issuer characteristics. We provide a final piece of evidence that supports the distribution role of hedge funds by considering whether the ownership structure of issuing firms changes following convertible issues. The idea is that well-diversified institutional

investors are willing to increase their investments in the common stock of firms issuing convertible debt, because the anticipated increase in hedge fund short-selling reduces the trading costs of institutional buyers. This explanation is based on two reinforcing effects. First, the additional selling activity allows institutional investors to accumulate shares without the price impact that would normally be associated with trades of this size. Second, because the additional selling activity is anticipated, institutional investors are less concerned that the increase reflects sales by traders with an informational advantage. Consistent with this hypothesis, we find that institutional ownership increases following the issuance of convertible debt and that this increase is more pronounced when there is greater hedge fund involvement.

The remainder of the article is organized as follows. Section 1 discusses prior studies of convertible arbitrage and constructs testable predictions on the role that hedge funds play. Section 2 describes our data set and the proportion of convertible securities purchased by hedge funds. Section 3 presents empirical tests on the relation between hedge fund involvement and characteristics of both the issuing firm and the issue itself. Section 4 investigates differences between the set of firms that raise capital through secondary equity offerings and those firms that issue convertibles to hedge funds. Section 5 compares the issue cost of our convertible sample with the cost that would have been incurred had capital been raised via a seasoned equity offering. Section 6 reports the results of using a multinomial logit model of the link between issuer characteristics and the decision to issue straight debt, seasoned equity, a debt-like convertible to a hedge fund, an equity-like convertible to a hedge fund, or to issue a convertible publicly. In Section 6, we also examine additional rationales for issuing convertible bonds. Section 7 examines the call features of convertibles issued to hedge funds and documents the short effective lives of convertibles issued to hedged funds. Section 8 examines the change in institutional ownership after companies issue convertible bonds to hedge funds. Section 9 contains our conclusions.

1. Hedge Funds and the Convertible Bond Market

Hedge funds are not restricted by the provisions of the Investment Companies Act of 1940 that relate to short sales. In convertible arbitrage, hedge funds' typical buy-and-hedge strategy is to buy convertibles and to short the stock of the issuing firm with the short position being determined by the convertible's delta (Agarwal et al. 2011). The effects of hedge fund purchases of newly issued convertibles have been examined by focusing on short interest in the stock of the issuer.[2] Most notably, Choi, Getmansky, and Tookes (2009) use the change in monthly short interest around convertible issue dates as a proxy for arbitrage

[2] A second way of examining convertible arbitrage is to examine aggregate fund flows into convertible arbitrage hedge funds (Choi et al. 2010; De Jong, Duca, and Dutordoir, forthcoming).

activity. They conclude that arbitrage activity increases the liquidity of the stock because arbitrageurs trade in the opposite direction to the market's movements: Arbitrageurs add to their short position when the stock price increases (as an increase in the stock price increases the delta) and close out part of their short position when the stock price decreases.

The main downside of using short interest data to examine convertible arbitrage is that changes in short interest may be due to changing beliefs about whether the share is overvalued. Thus, it might be that issue announcements are associated with valuation shorting by those who take a relatively more pessimistic view of an announcement's implications for firm value. Our data allow us to directly examine the involvement of specific hedge funds in specific convertible issues. For each convertible in our sample, we are able to observe how much of the issue is purchased by hedge funds. In this sense, our article is most closely related to Brophy, Ouimet, and Sialm (2009), who report the involvement of hedge funds in PIPE (private investments in public equity) issues. They find that hedge funds obtain substantially higher discounts than do other investors, and they conclude that hedge funds are investors of last resort for PIPE issuers. Our sample of convertible bonds issued to hedge funds consists of much larger firms than those issuing PIPEs, which tend to be very small. As a result, our data allow us to examine the role that hedge funds play when issuers are likely to have a choice of financing methods open to them.

1.1 Empirical predictions

Consider a firm that seeks to sell shares when an underwriter would be unwilling to bear a large exposure to the firm's equity unless the firm pays a substantial fee and/or offers a large discount on its shares. Such a firm may be able to use the expertise of hedge funds to instead distribute equity exposure via short sales: Hedge funds engaged in convertible arbitrage are able to use their knowledge of the borrowing and short-sale market to hedge themselves while distributing risk to a large number of well-diversified investors. Thus, issuing convertibles may allow "would-be" equity issuers to raise capital at lower costs. Although an underwriter could also hedge by shorting stock, underwriters may not have the comparative advantage at shorting that is the heart of a successful hedge fund business. Further, the underwriter's marketing claims about the shares to be distributed may not be seen as credible while they maintain a large short position in the same shares they are seeking to place.

1.2 Empirical predictions about the decision to issue a convertible

We predict that firms will issue convertibles to hedge funds when the costs of issuing seasoned equity are high relative to the costs of establishing and maintaining a short position. We use three main proxies for the costs of issuing seasoned equity. The first proxy is the firm's *probability of financial distress*, as the firm's financial condition is a strong predictor of the costs of issuing securities (Eckbo, Masulis, and Norli 2007). Kim, Palia, and Saunders (2005)

show that underwriter spreads are higher for firms with higher leverage and lower profitability. If an increase in the likelihood of financial distress leads to a rise in the cost of a seasoned equity offering that is larger than the rise in the cost for a hedge fund to establish and maintain a short position, firms with higher probabilities of financial distress will be more likely to choose to issue convertibles to hedge funds.

Our second proxy is the *return volatility* of the firm's stock. Altinkilic and Hansen (2003) and Corwin (2003) report that the costs of seasoned equity offerings are significantly higher for issuers with more volatile stock returns. Provided that the costs of establishing and maintaining a short position are not comparably higher for more volatile firms, volatile firms are predicted to be more likely to issue convertibles to hedge funds. Altinkilic and Hansen (2003) and Corwin (2003) also find that NASDAQ firms have substantially higher costs of issuing seasoned equity, even after controlling for variables like return volatility. We use a *NASDAQ listing* dummy as our third proxy for the costs of issuing seasoned equity.[3]

Constantinides and Grundy (1989) and Stein (1992) argue that firms choose to issue convertible securities when adverse selection costs make the alternative of a seasoned equity offering expensive. We include two variables related to information asymmetries. The first is a firm's asset *tangibility*. Firms with few tangible assets have a higher potential for an information asymmetry (see, e.g., De Jong, Dutordoir, and Verwijmeren 2011). The second proxy is *R&D intensity*. Aboody and Lev (2000) analyze asymmetric information in relation to gains from insider trading and conclude that uncertainty about the success of research and development (R&D) is a major contributor to information asymmetries.

Just as certain firm characteristics may make a secondary equity offering more expensive, other characteristics of the issuing firm affect the cost of establishing and maintaining a short position. The difficulty of shorting shares depends on the ease with which shares can be borrowed. D'Avolio (2002) finds that institutional ownership explains about 55% of the variability in loan supply across stocks. Since issuers with higher *institutional ownership* have more shares available to be borrowed (see also Asquith, Pathak, and Ritter 2005), such issuers are more likely to find that issuing convertibles is cheaper than issuing seasoned equity.

In addition, a would-be arbitrageur is more likely to be able to short the desired number of shares when that number of shares is small relative to the

[3] A potential fourth proxy for the costs of issuing equity is *firm size* as measured by the market value of equity. However, evidence on the effect of firm size on the costs of issuing securities is mixed. Hansen and Torregrosa (1992) and Corwin (2003) provide some evidence that larger firms have lower costs of issuing equity, whereas Gompers and Lerner (1999) find that issuing costs are positively related to firm size for venture-capital-backed IPOs. Many other studies find no strong effect of firm size on underwriter spreads and security underpricing; see Eckbo, Masulis, and Norli (2007) for an overview of studies on the relation between firm characteristics and the costs of issuing seasoned equity.

number of shares outstanding. When investigating the choice between issuing seasoned equity and distributing exposure via hedge funds, we take the ratio of the issue proceeds to the market value of the equity outstanding as a measure of *relative size*. Similarly, the costs of establishing and maintaining a short position will be lower when the issuer's stock has greater *liquidity*, and again there should be a higher likelihood of a convertible issue rather than a seasoned equity offering. Finally, because short sellers must pay cash in lieu of dividends to the lenders of stock, the management of a hedge fund's cash flows may be more complex when the convertible is issued by a *dividend-paying* company.

1.3 Empirical predictions concerning hedge fund purchases of convertible issues

When a firm decides to issue a convertible, it does not necessarily follow that the bond is more attractive to hedge fund buyers than to other investors. But if the decision to issue the convertible is in part driven by an investigation of potential demand from hedge funds, then the same factors that predict an increased likelihood of a convertible issue may be associated with a higher fraction of the convertible being purchased by hedge funds. This implies that the fraction of a convertible issue purchased by hedge funds may be higher when the *probability of financial distress* is higher, when the issuer's *return volatility* is higher, and when the issuer's stock has a *NASDAQ listing*.

There also is a second, but distinct, reason for why hedge fund involvement may be high when the issuer's *return volatility* is high. Part of a hedge fund's profits comes from playing the role of a market-maker willing to buy stock after a stock price decline and sell after a stock price increase. When stock price movements are liquidity-induced and subsequently reverse, the fund's dynamic hedging strategy can be inherently profitable and hedging a more volatile stock provides more opportunities to trade profitably.

We do not have strong predictions for the effect of information asymmetries, as measured by *tangibility* and *R&D intensity*, on the involvement of hedge funds. Still, the delta-neutral strategy of hedge funds might in fact make these traders less averse to information asymmetries (Brophy, Ouimet, and Sialm 2009).

Following the reasoning in subsection 1.2, certain issuer characteristics, such as higher *institutional ownership*, greater *liquidity* of the issuer's stock, and a smaller *relative size* of the issue, are predicted to make a convertible more attractive to hedge fund investors.[4] We take as our measure of *relative size* the ratio of the delta-neutral short stock position to the number of shares outstanding.

[4] Note that high institutional ownership and great liquidity might reduce the offering discount that is related to the convertible offering, which could make the convertible less interesting to hedge funds. We examine the effect of institutional ownership and liquidity on the offering discount in Section 5.

Those firms that decide to issue convertibles should structure the issue so as to reduce the cost of establishing and maintaining a short position. There are two ways to do this: first, by restricting or eliminating the bond's call features and second, by undertaking a concurrent share repurchase. *Limits on callability* increase the attractiveness of convertibles to hedge funds, because the decision to call remains in the hands of the issuing firm. Whenever the occurrence of a call is not a deterministic function of the stock price and time, hedging cannot be perfect.

A *concurrent stock repurchase* by the issuing firm will cater to the needs of hedge funds by allowing them to short-sell borrowed stock at a predetermined price, namely, the repurchase price. De Jong, Dutordoir, and Verwijmeren (2011) examine instances in which firms combine convertible issues with stock repurchases (the combination is known as a Happy Meal) and conclude that convertible arbitrage explains both the size and speed of execution of these stock repurchases. We predict that hedge funds will purchase a larger fraction of convertible bond issues with limited callability and a larger fraction of convertible issues accompanied by a stock repurchase.

2. Data and Summary Statistics

We collect a sample of 1,142 privately placed convertible issues in the period January 2000 to March 2008 from the SDC database. Most recent convertible issues in the United States have been privately placed under Rule 144A.[5] For our sample period, the percentage of privately placed convertibles is 85%, which represents 84% of the total proceeds raised by the convertible bond issues in the SDC database.

We require that firms have an offering prospectus available in the SEC's Edgar database. This eliminates 201 of the 1,142 issues. We also require a registration statement, which eliminates an additional 138 issues. The registration statement lists the buyers of the convertible issue.[6] This leaves 803 offerings with detailed information on the design of the convertible and the identity of the buyers.

Although many buyers have the words "convertible arbitrage" in their name and are thus easily classified as hedge funds, we examine the full lists of hedge fund managers in Bloomberg and Lipper TASS and undertake an extensive Internet search on each buyer to correctly classify all the buyers (various Web sites allow for a search of self-registered hedge funds, for example,

[5] Marquardt and Wiedman (2005) report that 84% of convertibles issued during the 2000–2002 period are privately placed, and De Jong, Dutordoir, and Verwijmeren (2011) report that for the period 2003–2007 around 95% of convertible issues are privately placed.

[6] The registration filings are typically S-3/A filings, although in some cases the selling securityholders can be found in S-3, S-3ASR, or 424B filings.

Table 1
Hedge fund involvement

	Mean	Median	SD	Min.	Max.
Number of buyers	64.1	54.0	44.6	1	320
% Of buyers classified as hedge funds	56.4	55.6	18.6	0.0	100.0
% Of issue purchased by hedge funds	73.4	75.3	15.9	0.0	100.0

The sample period is January 2000–March 2008. The table reports the number of buyers per privately placed convertible issue in our sample of 803 convertible issues, the percentage of buyers classified as hedge funds, and the fraction of the issue purchased by hedge funds.

www.hedgeco.net). We can classify 39.4% of the 4,335 different buyers as hedge funds.[7]

Table 1 reports the average number of buyers per privately placed convertible issue.

On average, the 803 convertible issues are purchased by 64 different identified buyers. Note that 64×803 is much larger than 4,335, that is, many buyers are involved in multiple convertible offerings. The number of buyers varies considerably across convertible issues: Some convertibles are bought by a single buyer, whereas the maximum number of different identified buyers of a single issue is 320.

That less than half of all buyers are hedge funds is not inconsistent with financial press reports that hedge funds buy 70% to 80% of all convertible issues.[8] A typical hedge fund is involved in a larger number of different convertible issues than is a typical non-hedge-fund buyer of convertibles. Table 1 indicates that on average more than half the buyers of *individual* convertible bond issues (56.4%) can be classified as hedge funds. Further, hedge funds often buy a larger percentage of a particular offering than do other buyers. The average investment by an individual hedge fund expressed as a fraction of the offering proceeds is 2.31% in the sample. The average individual non-hedge-fund investor buys 0.82% of an issue. Table 1 reports that on average hedge funds purchase 73.4% of the convertibles in our sample.

The amount purchased by investors that are identified in the registration statements can be lower than the total offering proceeds reported in the SDC

[7] There are three hedge funds in our sample that Lipper TASS classifies as "Global Macro" hedge funds, and an additional two hedge funds in our sample have the words "Global Macro" in their name. As global macro funds do not necessarily combine a long position in a convertible with a short position in stock, we have re-estimated all the results in this article with global macro hedge funds classified as non-hedge funds. We have also checked the impact of the classification of brokerage firms on our results, as one practitioner has suggested that brokerage firms possibly trade on behalf of small hedge fund clients. Our conclusions are robust to changing the classifications of global macro hedge funds and brokerage firms.

[8] A *Financial Times* article (Skorecki 2004) states that in 2003 "some [convertible] bonds have been issued exclusively to hedge funds and on average they have been responsible for buying about 70% of new issues." A 2004 *Wall Street Journal* article (Pulliam 2004) reports that "hedge funds play a big role in the roughly $600 billion convertible-bond market, which saw $97 billion in new issues last year. As much as 80% of those issues were bought by hedge funds, according to brokers who work on convertible-bond trading desks." Mitchell, Pedersen, and Pulvino (2007) state that "convertible arbitrage funds account for up to 75% of the convertible market."

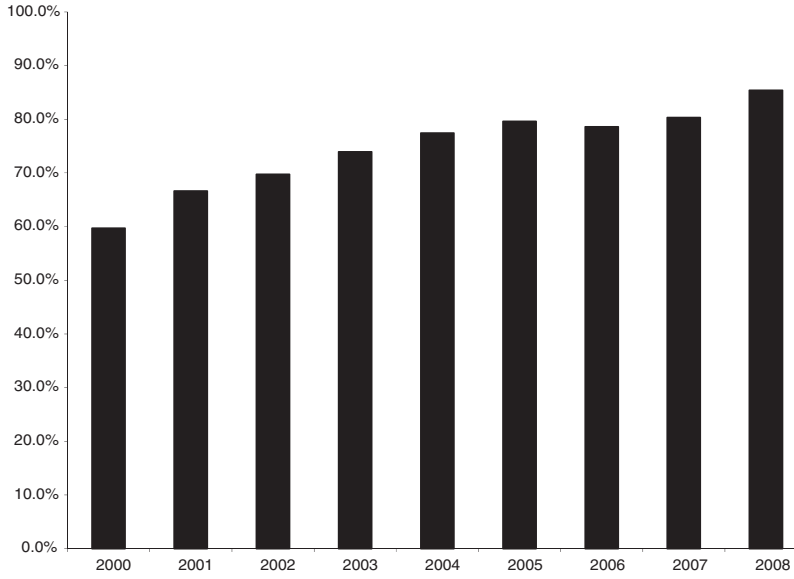

Figure 1
Percentage of convertible proceeds purchased by hedge funds
This figure shows the average involvement of hedge funds in convertible securities that are privately placed under Rule 144A in a given year. The year 2008 percentage applies to convertible issues during the first quarter of the year.

database.[9] Throughout the article, we calculate the involvement of hedge funds in an issue as the number of hedge fund investors divided by the number of identified investors and/or as the total investment by hedge fund investors divided by the total investment by identified investors.

Table 1 further shows that there is dispersion in the percentage of each issue purchased by hedge funds: Some issues are purchased entirely by hedge funds, whereas other issues have no hedge fund involvement at all.[10]

Figure 1 reports the average percentage of convertible issues purchased by hedge funds in each year from 2000 through 2008. What is clear is that hedge fund involvement has grown through time. Hedge funds account for about 60% of the investment in privately placed convertibles in 2000. By the first quarter of 2008, this percentage had grown to 80%.

[9] This indicates that there can be unidentified investors involved in the security offering. The sum of investments by identified investors is on average 91.7% of the reported proceeds of the convertibles in our sample (the median is 94.0%). We have no reason to believe that the group of unidentified buyers will strongly bias the results in this article. For example, we find that the fraction purchased by hedge funds is very similar for issues in which identified investors buy more than 94.0% of the reported proceeds and issues in which identified investors buy less than 94.0% of the reported proceeds: In both subsamples, hedge funds account for between 73% and 74% of the investments by identified investors.

[10] In an attempt to shed light on this heterogeneity, we examined the fraction of the issue purchased by hedge funds per industry. Hedge funds account for the majority of the convertible proceeds in every one of the twelve Fama-French industry classifications, and no simple industry effect is apparent.

We construct a final sample in order to examine the relation between hedge fund involvement, security design, and firm characteristics. Following common practice, we delete financial firms and utilities (112 issues). We also require that the issuing firms have data available in Compustat, CRSP, and the Thomson-Reuters Institutional Holdings database. This requirement deletes an additional sixty-two issues and leaves a sample of 629 issues.

3. Determinants of the Fraction of a Convertible Issue Acquired by Hedge Funds

In this section, we examine the relation between the fraction of a convertible issue privately placed with hedge funds and characteristics of the issuing firm and the issue itself. The set of issuer characteristics examined include the likelihood of *financial distress* as measured by a firm's Altman Z-score (Z-scores are higher for firms with a lower chance of bankruptcy); the *return volatility* of the issuer's stock; a dummy for whether the issuer's stock has a *NASDAQ listing*; *firm size* as measured by the natural log of the market value of equity; *tangibility* calculated as the ratio of tangible assets over total assets; an *R&D dummy* that takes the value unity for firms that report R&D expenses; *R&D intensity* measured as R&D expenses over total sales; percentage *institutional ownership* of the firm's stock; *relative size* of the issue as the fraction of the outstanding stock that would have to be sold short in order to hedge ownership of the entire bond issue; the Amihud *liquidity* measure (a high Amihud-score denotes illiquidity); and a dummy that takes the value unity when the bond is issued by a *dividend-paying* company.[11]

The set of issue (as opposed to issuer) characteristics examined are those predicted in subsection 1.3 to be related to hedge fund involvement, namely, callability and concurrent stock repurchases, plus other issue characteristics studied in Lewis and Verwijmeren (2011). We do not assume that firms design securities in isolation. Although design choices can be attempts to attract certain buyers, it is also likely that the design choices are made in direct negotiations with buyers. In either case, the relation between security design and the involvement of particular buyers shows the preferences of these buyers.[12]

Issue characteristics involve both dummy and continuous variables. The set of dummies denote whether an issue is *callable*; whether an issue is accompanied by a *stock repurchase*; whether an issue occurs in conjunction with a *call spread overlay*; whether an issue has a *cash settlement* feature; and whether an issue is accompanied by *put rights*. The continuous variables measure the size of the convertible's *delta* and the size of the *issue proceeds*. We make no prediction about how the issue characteristics other than callability

[11] More complete definitions of the issue and issuer characteristics are reported in Appendix A.

[12] We formally examine the causality between hedge fund involvement and call features in Section 7.

Table 2
Issuer and issue characteristics and hedge fund involvement

	All Issues	Subsamples with differing levels of hedge fund involvement					
		Above-median	Below-median	Diff. of means *t*-statistic	Majority	Minority	Diff. of means *t*-statistic
Issuer characteristics							
Financial distress (Z-score)	16.070	13.813	18.349	−1.907	15.946	17.674	−0.367
Return volatility	0.326	0.339	0.312	2.898**	0.327	0.303	1.393
NASDAQ listing	0.536	0.595	0.476	3.006**	0.543	0.444	1.266
Firm size ($ million)	4143	3860	4429	−0.609	4299	2126	3.555**
Tangibility	0.238	0.226	0.250	−1.424	0.240	0.211	0.884
R&D dummy	0.544	0.565	0.522	1.077	0.545	0.533	0.413
R&D intensity	0.321	0.394	0.249	2.383**	0.340	0.086	5.720**
Institutional ownership	0.680	0.684	0.676	0.481	0.677	0.721	−1.306
Relative size: Delta-neutral short position ÷ shares outstanding	0.134	0.138	0.130	0.715	0.130	0.180	−1.323
Amihud liquidity	0.030	0.024	0.037	−0.581	0.031	0.018	0.926
Dividend-paying	0.197	0.168	0.227	−1.865	0.200	0.156	0.784
Issue characteristics							
Callable	0.723	0.646	0.802	−4.448**	0.714	0.844	−2.258*
Stock repurchase	0.116	0.152	0.080	2.837**	0.123	0.022	3.878**
Call spread overlay	0.081	0.127	0.035	4.265**	0.086	0.022	2.530*
Cash settlement	0.404	0.494	0.313	4.689**	0.411	0.311	1.373
Put rights	0.424	0.421	0.428	−0.183	0.425	0.422	0.032
Delta	0.867	0.860	0.873	−1.681	0.865	0.888	−1.834
Issue proceeds ($ million)	313	304	322	−0.478	319	241	2.537*

The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. This table presents a univariate analysis of the differences in mean issuer and issue characteristics for subsamples of privately placed convertible issues with above-median participation by hedge funds (hedge funds purchasing more than 75.3% of the convertible) and below-median participation of hedge funds. The table also reports the differences for issues in which the majority is purchased by hedge funds versus issues with only a minority purchased by hedge funds. The difference in means *t*-statistics do not assume equal variances for the two samples being compared. See Appendix A for a description of issuer and issue characteristics. * and ** indicate significance at the 5% and 1% levels.

and concurrent stock repurchases will be related to hedge fund involvement but include these additional variables simply as controls.

Table 2 provides a univariate analysis of the relation between various issuer and issue characteristics and the fraction of a convertible issue sold to hedge funds. For our sample of 629 convertible issues, the average equity value of the issuing firms is in excess of $4 billion, and the average issue proceeds are $313 million. A substantial fraction (53.6%) of the issuing firms are listed on NASDAQ, 54.4% of the firms in our sample report R&D expenses, 72.3% of the convertible issues are callable prior to their maturity, 8.1% involve a call spread overlay, 40.4% have a cash settlement feature, and 42.4% have put rights.

Table 2 also reports average values of issuer and issue characteristics for subsamples. The first two subsamples consist of (1) convertible securities with above-median hedge fund participation (meaning that hedge funds purchase more than 75.3% of the issue) and (2) issues with below-median hedge fund participation. The second two subsamples are based on whether hedge funds

buy (1) the majority of the convertible offering (584 of the 629 issues) or (2) only a minority of the issue (45 issues).

We find that differences in issuer characteristics are significant at the 1% level in four instances. Convertibles with above-median hedge fund involvement are significantly more likely to have been issued by firms whose shares are listed on NASDAQ and by firms with higher return volatility.[13] The third and fourth significant univariate relation between issuer characteristics and hedge fund involvement is that hedge funds are more involved when R&D intensity is high and hedge funds are more likely to buy only a minority of a convertible issue when the issuing firm is smaller.

When focusing on issue characteristics, we find that hedge funds have a significantly lower involvement in convertibles with a call feature. This is in line with our prediction that hedge funds prefer noncallable convertible bonds. Note, however, that in Stein's (1992) theory, call features are crucial in allowing a separating equilibrium in which good-quality firms issue debt, bad-quality firms issue equity, and medium-quality firms issue callable convertibles and subsequently call and force conversion. We examine this issue further in Section 7. We also find significantly higher hedge fund involvement in convertible issues accompanied by a stock repurchase, which is in line with our prediction regarding lower issue costs in subsection 1.3. We further find that hedge fund involvement is significantly higher in issues with call spread overlays and issues with cash settlement features.

We draw our main conclusions from the multivariate analysis reported in Table 3. For ease of interpretation, Table 3 sets out the predictions for the signs of the coefficients developed in subsection 1.3. We cluster standard errors at the firm and year level.[14]

In Model 1, the dependent variable is the percentage of the convertible purchased by hedge funds.[15] Firms that issue convertibles because they face high costs of directly issuing equity are likely to have first confirmed that demand from hedge funds will be high. Thus, we predict that a higher fraction of convertibles issued by relatively distressed, more volatile, and/or NASDAQ-listed firms will be purchased by hedge funds. We find that hedge fund involvement is positively related to (1) the likelihood of *financial distress* (low values for the Altman Z-score), (2) *return volatility*, and (3) a *NASDAQ listing*.

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[13] We measure return volatility as the annualized stock return volatility, estimated with (up to) ten years of monthly stock return data prior to the issue. In robustness tests, we have measured volatility as the annualized daily stock return volatility over trading days [-240, -40] relative to the issue date, as in Lewis, Rogalski, and Seward (1999). The results throughout our article are qualitatively unchanged.

[14] Some firms in our sample are responsible for multiple convertible offerings. The 629 convertibles in the sample are issued by 474 different firms: 364 firms issue a single convertible, seventy-six firms issue two convertibles, twenty-six firms issue three convertibles, five firms issue four convertibles, and three firms are responsible for five different convertible issues.

[15] One observation in our sample has an involvement of hedge funds close to 0%, and fourteen observations have 100% hedge fund involvement. Estimating a Tobit regression in which one or both of these boundaries are censored provides results that are very similar to the results from our OLS estimation.

Table 3
Hedge fund involvement, issuer characteristics, and issue characteristics

	Prediction	% Of issue purchased by hedge funds (1)	% Of purchasers classified as hedge funds (2)
Constant		0.871**	0.773**
		(0.083)	(0.087)
Financial distress (Z-score)	–	−0.043**	−0.035
		(0.014)	(0.027)
Return volatility	+	0.212**	0.282**
		(0.078)	(0.067)
NASDAQ listing	+	0.024**	0.014
		(0.009)	(0.015)
Firm size		−0.021**	−0.035**
		(0.008)	(0.009)
Tangibility		0.006	−0.013
		(0.010)	(0.031)
R&D dummy		−0.003	−0.011
		(0.006)	(0.014)
R&D intensity		0.027**	0.030**
		(0.009)	(0.006)
Institutional ownership	+	−0.042	−0.068
		(0.025)	(0.039)
Relative size: Delta-neutral short position ÷ shares outstanding	–	−0.196**	−0.187**
		(0.041)	(0.061)
Amihud liquidity	–	−0.005	−0.017*
		(0.009)	(0.008)
Dividend-paying	–	0.023*	0.029
		(0.009)	(0.015)
Callable	–	−0.058**	−0.044**
		(0.017)	(0.032)
Stock repurchase	+	0.032	0.021
		(0.019)	(0.020)
Call spread overlay		0.049*	0.044
		(0.024)	(0.032)
Cash settlement		0.038**	0.034**
		(0.013)	(0.012)
Put rights		0.039*	0.068**
		(0.018)	(0.017)
N		629	629
R^2		0.144	0.141

The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. This table presents the results of an OLS regression model, estimating the relation between various issuer and issue characteristics and the involvement of hedge funds. The dependent variable in Model 1 is the percentage of the issue purchased by hedge funds. The dependent variable in Model 2 is the percentage of the issue's buyers classified as hedge funds. See Appendix A for a description of the issue and issuer characteristics. We report standard errors clustered at the firm and year level in parentheses. * and ** indicate significance at the 5% and 1% levels.

Hedge funds' attraction to convertibles issued by companies with highly volatile stock may also reflect the potential for trading profits from market-making while dynamically hedging. With respect to information asymmetries and hedge fund involvement, we find a positive relation between *R&D intensity* and hedge fund involvement but no relation between *tangibility* and hedge fund involvement.

Hedge fund involvement is predicted to be higher when the costs of establishing and maintaining a short position are lower. The significant relation between *relative size* and hedge fund involvement is in the predicted direction and, also as predicted, convertibles with call features are of less interest to

hedge fund investors. We find some evidence (at the 10% level) that hedge fund involvement is positively related to the concurrent repurchase of stock. Regarding the control variables, we find that cash settlements, call spread overlays, and put features are all significantly positively related to the fraction of a convertible issue purchased by hedge funds.

In Model 2, we use the percentage of buyers classified as hedge funds as the dependent variable. This variable focuses on the number of hedge funds serving as distributors, instead of the size of their involvement. The variables *financial distress* and *NASDAQ listing* are no longer significant at the 5% level, but the overall results are qualitatively similar to those of Model 1.

4. Determinants of the Decision to Distribute Equity Exposure via Hedge Funds

In this section, we compare seasoned equity issuers to firms that issue convertibles to hedge funds. This analysis can shed light on whether selling equity-like convertibles to hedge funds is indeed a substitute for "would-be" equity issuers with relatively high costs of directly issuing seasoned equity, and it is for this reason that we exclude convertibles where the bulk of the issue is sold to non-hedge-fund buyers in this analysis. We obtain seasoned equity offerings from the SDC database from January 2000 to March 2008 and impose the same restrictions as on our sample of convertibles, that is, we delete financial institutions, utilities, and firms with missing data in Compustat, CRSP, or the Thomson-Reuters Institutional Holdings database. Our seasoned equity sample consists of 2,198 offerings.[16]

We use a binary logit model to compare the firm characteristics of seasoned equity issuers to the characteristics of the 584 convertible issues in which hedge funds purchase the majority of the issue. Table 4 reports the results.

The dependent variable equals one for convertible issues in which the majority of the issue is purchased by hedge funds and zero for seasoned equity offerings. We find that firms issuing convertibles to hedge funds are more financially distressed than are equity issuers. The coefficient on the Altman Z-score is negative and statistically significant at the 1% level.

Altinkilic and Hansen (2003), Corwin (2003), and Eckbo, Masulis, and Norli (2007) show that stock return volatility increases the issue cost of seasoned equity offerings. In contrast, convertible arbitrageurs might be attracted to the issuers' stock price volatility, because their trading profits from market-making are higher for more volatile stock. Consistent with both observations, we find that high stock return volatility increases the probability that firms issue convertibles to hedge funds instead of issuing seasoned equity.

[16] A difference with our convertible sample is that not all of our seasoned equity offerings are privately placed. In our sample of 2,198 seasoned equity offerings, only two offerings are identified by the SDC database as 144A private placements. The private placement information is missing for 1,412 of the seasoned equity offerings.

Table 4
Determinants of the decision to distribute equity exposure via hedge funds

	Convertible issues to hedge funds versus seasoned equity issues			
	(1)		(2)	
	Coefficients	Elasticities	Coefficients	Elasticities
Constant	−2.563**		11.612	
	(0.934)		(7.348)	
Financial distress (Z-score)	−1.277**	−0.125	−1.034**	−0.095
	(0.204)		(0.192)	
Return volatility	0.691**	0.393	0.739**	0.396
	(0.219)		(0.244)	
NASDAQ listing	0.063	0.006	0.044	0.004
	(0.186)		(0.182)	
Firm size	0.264**	0.026	0.363**	0.033
	(0.093)		(0.063)	
Tangibility	−3.299**	−0.324	−3.367**	−0.310
	(0.332)		(0.365)	
R&D dummy	−0.277	−0.028	−0.320	−0.030
	(0.154)		(0.174)	
R&D intensity	−0.134	−0.013	−0.183	−0.017
	(0.104)		(0.117)	
Institutional ownership	1.674**	0.164	1.558**	0.144
	(0.369)		(0.325)	
Relative size: Proceeds ÷ market value of equity	0.032	0.003	0.038	0.004
	(0.021)		(0.021)	
Amihud liquidity	−10.169**	−0.998	−9.841**	−0.909
	(1.701)		(1.621)	
Dividend-paying	−0.067	−0.006	−0.071	−0.006
	(0.202)		(0.209)	
Equity market return			0.521	0.048
			(0.768)	
Interest rate			−1.140**	−0.105
			(0.392)	
Credit spread			−0.729	−0.067
			(0.640)	
Leading indicators			−0.083	−7.871
			(0.044)	
N	2,782		2,782	
Pseudo-R^2	0.257		0.289	

This table compares convertible issues in which the majority of the issue is purchased by hedge funds with seasoned equity offerings. The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. The dependent variable of the binary logit model is a dummy variable equal to one for convertible issues in which the majority of the issue is purchased by hedge funds and to zero for seasoned equity offerings. The elasticities are in the form $d(lny)/d(lnx)$. See Appendix A for a description of the issue and issuer characteristics. We report standard errors clustered at the firm and year level in parentheses. ** indicates significance at the 1% level.

We find some evidence for the prediction that firms issuing convertibles have higher information asymmetries, in that tangibility is significantly lower for convertible issuers. The results in Table 4 also show that firms issuing to hedge funds are larger companies with more liquid stock and higher institutional ownership than are firms that issue seasoned equity. Greater liquidity and higher institutional ownership make it easier for hedge funds to establish their desired short positions.[17]

[17] In Model 2 of Table 4, we include a number of macroeconomic variables as additional controls. Macroeconomic conditions could potentially have an impact on the choice between a seasoned equity offering and a convertible

The results of Table 4 suggest that firms choosing to issue convertibles to hedge funds rather than to issue seasoned equity are firms that face relatively high costs of directly issuing equity and have characteristics that facilitate the establishment and maintenance of short positions, that is, that have relatively low costs of indirectly distributing equity exposure via hedge funds.

5. Offering Discounts and the Total Issue Costs of Convertibles Issued to Hedge Funds versus Seasoned Equity Offerings

Convertible securities are typically issued at a discount (Ammann, Kind, and Wilde 2003; Chan and Chen 2005; Loncarski, ter Horst, and Veld 2009; De Jong, Dutordoir, and Verwijmeren 2011). Potential reasons for offering discounts include illiquidity (Batta, Chacko, and Dharan 2010) and complexities associated with the valuation of hybrid securities Lhabitant (2002). In Section 5.1, we use offering discounts to distinguish the distributional role of hedge funds from their possible role as a last resort provider of finance. In Section 5.2, we examine the total issue costs, including discounts for convertible issuers, and compare these costs to an estimate of what issue costs would have been if these firms had instead issued seasoned equity.

5.1 Convertible offering discounts and the role of hedge funds

As distributors of equity exposure, hedge funds require a discount to cover their costs of shorting the underlying stock. But, we do not expect issuers to provide a discount that is substantially larger than discounts on convertibles issued to other investors. In contrast, under the hypothesis that hedge funds are the buyers of last resort, we expect higher discounts for convertibles issued to hedge funds. Brophy, Ouimet, and Sialm (2009) report that when the majority of a PIPE is sold to hedge funds, the average discount is 14.12%, whereas the average discount is significantly lower (9.02%) when the majority of a PIPE is issued to non-hedge-fund investors.

We follow Ammann, Kind, and Wilde (2003), Chan and Chen (2005), Loncarski, ter Horst, and Veld (2009), and De Jong, Dutordoir, and Verwijmeren (2011) in using a variant of the Tsiveriotis and Fernandes (1998) model to calculate the theoretical value of convertibles.[18] The model takes the call

debt offering: Choe, Masulis, and Nanda (1993) and Korajczyk and Levy (2003) show that macroeconomic conditions affect capital structure choice, and Mann, Moore, and Ramanlal (1999) conclude that macroeconomic variables are related to the timing of convertible issues. The macro-variables we examine are the one-year stock return on the S&P 500, the yield on a ten-year Treasury bond, the credit spread between the Moody's Baa corporate bond yield and the yield on a ten-year Treasury bond, and a composite index of leading indicators. Macro-data for the month before the issue are obtained from Datastream. It can be seen from Model 2 that the significant effects of the financial distress, return volatility, firm size, tangibility, institutional ownership, and liquidity variables are robust to controls for macroeconomic conditions. The yield on a ten-year Treasury bond is positively related to the likelihood of a secondary equity offering rather than a convertible offering.

[18] According to Grimwood and Hodges (2002), this model is the most popular convertible bond valuation method among practitioners. Tsiveriotis and Fernandes (1998) use a binomial-tree approach to model the

schedule into account and requires, as additional data, the risk-free rate and credit spread data. Risk-free rates and credit spreads are taken from *Datastream* and are matched as close as possible with the maturity of the convertible bond; the relevant credit rating for the spread is obtained from *Mergent*.[19] Detailed call schedules and coupon rates are taken from the issue prospectuses. We calculate the offering discount by dividing the difference between the theoretical price and the offer price by the theoretical price. We are able to calculate the offering discount for 603 convertible issues.[20]

Panel A of Table 5 provides a univariate analysis of the average offering discount. The average offering discount on the 603 issues is 4.9%. As in Brophy, Ouimet, and Sialm (2009), we distinguish firms in which hedge funds purchase the majority of the convertible issue from firms with a minority of hedge fund involvement. Firms with a majority involvement of hedge funds have an average discount of 4.8% on their convertible issues, whereas firms with a minority hedge fund involvement have an average discount of 6.1%. The difference between the two subsamples is not significantly different (t-statistic equals -0.510). The finding that the discount is not significantly higher for issues to hedge funds is evidence against the view that convertibles are sold to hedge funds as a last resort source of financing.[21]

5.2 Total issue costs: Convertible issues to hedge funds versus seasoned equity issues

We can use our estimates of convertible offering discounts to compare the costs of issuing convertibles to the costs of a seasoned equity offering. Following the procedure of Dunbar (1995) and Ng and Smith (1996), we estimate what the

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stock price process and decompose the total value of a convertible bond into an equity component and a straight debt component. This approach is the basis of MATLAB's convertible bond pricing algorithm—see www.mathworks.com/access/helpdesk/help/toolbox/finfixed/cbprice.html for a description of this algorithm.

[19] Following Loncarski, ter Horst, and Veld (2009) and De Jong, Dutordoir, and Verwijmeren (2011), we assume a BBB rating when the credit rating of the convertible is unavailable.

[20] We are not able to calculate the offering discount with MATLAB's pricing algorithm for our full sample of observations, as twenty-six convertibles in our sample have a floating or varying coupon rate. We have re-estimated all the regression models in this article when we exclude these twenty-six convertibles and find that our results are qualitatively unchanged.

[21] In unreported analyses, we have examined issue discounts, in a multivariate setting. The dependent variable is the offering discount, and the primary explanatory variable is a dummy variable equal to one when hedge funds buy the majority of the security offering and zero otherwise. Control variables are the Altman Z-score, return volatility, NASDAQ listing, firm size, institutional ownership, relative offering proceeds, Amihud liquidity, whether the firm pays a dividend, and whether the convertible is callable, putable, combined with a stock repurchase, or a cash settlement. We again find no evidence that hedge funds obtain higher discounts than other investors. In fact, discounts are insignificantly *smaller* when the majority of the issue is sold to hedge fund investors (the t-statistic on the coefficient on the dummy is -0.769). Regarding our control variable institutional ownership, we find a negative relation with the offering discount, which suggests that high institutional ownership could reduce the profits for convertible arbitrage hedge funds, even though high institutional ownership facilitates the establishment of short positions.

Table 5
Hedge fund involvement and offering discounts

Panel A: Offering discount

	All issues	Issues with a majority of the issue purchased by hedge funds	Issues with a minority of the issue purchased by hedge funds	Difference of means *t*-statistic
Offering discount	0.049	0.048	0.061	−0.510

Panel B: The relation between issue costs and issuer characteristics

	Issue costs	
	(1)	(2)
	Seasoned equity issue	Convertible issue to hedge funds
Constant	0.154**	−0.083
	(0.013)	(0.114)
Financial distress (Z-score)	−0.011**	−0.003
	(0.004)	(0.003)
Return volatility	0.016**	0.002
	(0.004)	(0.040)
NASDAQ listing	0.005*	0.050*
	(0.002)	(0.023)
Firm size	−0.007**	0.013
	(0.001)	(0.011)
Institutional ownership	−0.008*	0.090
	(0.004)	(0.052)
Relative size: Proceeds ÷ market value of equity	0.042	0.109
	(0.061)	(0.085)
Amihud liquidity	0.016	0.003
	(0.018)	(0.281)
Dividend-paying	0.006*	0.025
	(0.003)	(0.030)
Inverse Mills ratio	−0.002	0.067**
	(0.001)	(0.018)
N	1,343	151
R^2	0.269	0.191

Panel C: Actual and forecasted issue costs

	Issue costs	
	Convertible sample	Seasoned equity sample
Mean actual cost of issuing	9.23%	7.75%
Mean forecasted cost of issuing if other security was issued	11.21%	10.98%
Mean change in cost of issuing if other security was issued	1.98%	3.23%
Difference of means *t*-statistic	2.021*	4.627**

The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. Panel A reports the offering discount for our overall sample, issues in which the majority of the convertible is bought by hedge funds, and issues in which the minority of the convertible is bought by hedge funds. The offering discount is the difference between the theoretical price and the offer price relative to the theoretical price. Theoretical prices are calculated using MATLAB's pricing algorithm: www.mathworks.com/access/helpdesk/help/toolbox/finfixed/cbprice.html. Panel B presents the estimated relation between issue costs and issuer characteristics. Issue costs are the sum of the offering discount and gross spread. We estimate the cost of a seasoned equity issue in Model 1, and we estimate the cost of a convertible offering in which the majority is purchased by hedge funds in Model 2. See Appendix A for a description of the issuer characteristics. We report standard errors clustered at the firm level in parentheses. In Panel C, we use the estimated coefficients in Panel B (excluding the inverse Mills ratio) to forecast the issue costs for firms had they chosen the alternative security issue. The difference in means *t*-statistics do not assume equal variances for the two samples being compared. * and ** indicate significance at the 5% and 1% levels.

issuance costs would have been for our sample of convertible issuers had they chosen a seasoned equity issue instead.[22]

The convertible sample in this subsection consists of convertible issues in which hedge funds account for the majority of issue proceeds. Firms in 144A offerings typically sell their convertibles to qualified institutional buyers through an underwriter, who demands a spread. We calculate the issue costs of a security as the sum of the offering discount and the gross spread. We obtain the gross spread (as a percentage of gross issue proceeds) from the SDC database.[23] For SEOs, we calculate the offering discount as the difference between the offer price and the closing price on the offer date and scale by the closing price on the offer date. Because issue cost data are not available for all observations, our analysis in this subsection relates to a subset of our earlier sample. We have all the necessary information for 151 convertible issues in which hedge funds account for the majority of proceeds and for 1,343 SEOs.

The average issue cost of a seasoned equity offering for the 1,343 firms in our sample is 7.75%, which consists of an average SEO discount of 3.01% and an average gross spread of 4.74%. These averages are similar to those reported in other articles (see Eckbo, Masulis, and Norli 2007). The average issue cost for the 151 convertibles in our sample is 9.23%, which consists of an average issue discount of 6.55% and an average gross spread of 2.68%.

Self-selection can be an issue in calculating what the cost of an offering *would have been* because we only observe those choices that are regarded by the firm as most favorable. To control for self-selection, we use a two-stage model. The first stage consists of the choice between a seasoned equity offering and issuing a convertible to hedge funds. We modeled this choice in Table 4, and we use Model 2 of that table to estimate the inverse Mills ratio.[24] We then analyze the determinants of SEO and convertible issue costs by including the estimate of the inverse Mills ratio as an independent variable in regressions of issue costs on a set of issuer characteristics. These regression estimates are reported in Panel B of Table 5.

Model 1 of Panel B of Table 5 shows that issue costs of an SEO are higher for firms that have a higher likelihood of financial distress, have more volatile returns, and are listed on NASDAQ. Issue costs are on average lower when firms are large, when institutional ownership is high, and when firms do not pay dividends. The coefficients of Model 1 of Panel B of Table 5 are used to estimate what the issue costs of an SEO would have been for our sample of

[22] Dunbar (1995) and Ng and Smith (1996) examine the use of warrants as underwriter compensation. The articles conclude that warrants are used to compensate underwriters if the cost is lower than what it would have been had only cash compensation been used. Both articles stress the importance of using a two-stage procedure to control for self-selection issues.

[23] We have checked and extended the gross spread data for convertible issues in the SDC database (available for 143 observations) with data from the Mergent Fixed Income Securities Database (five additional observations) and the issue prospectuses (three additional observations).

[24] See Dunbar (1995) for a more detailed description of this procedure (which is based on Lee 1978).

convertible issuers. More specifically, we calculate estimated issue costs if our convertible issuers had instead issued equity as the product of the regression coefficient estimates and the independent variables, excluding the inverse Mills ratio. The coefficient for the inverse Mills ratio is not used in obtaining cost estimates, because the ratio's unique purpose is to adjust for potential bias in the regression errors.

The results, presented in Panel C, show that for the 151 convertible issuers in our sample, the estimated issue cost for the average SEO would have been 11.21%. This estimated cost is significantly higher than the 9.23% cost of issuing convertibles to hedge funds, and this finding is consistent with convertible issues to hedge funds being the least-cost financing choice for firms with relatively high costs of issuing seasoned equity.

Model 2 of Panel B shows the estimation of the determinants of issue costs when a firm sells the majority of a convertible issue to hedge funds. In contrast to seasoned equity offerings, we find that the Altman Z-score, return volatility, and firm size do not significantly affect the cost of issuing convertibles. Similar to seasoned equity offerings, a NASDAQ listing is positively related to issue costs. The significant positive coefficient on the inverse Mills ratio indicates that self-selection is important and, consistent with Dunbar (1995), firms choose securities to minimize issue costs. We use the estimates in Model 2 to predict what SEO firms would have paid if they had instead chosen to sell convertibles to hedge funds. We estimate that the average cost of this alternative would have been 10.98%, indicating that our sample of SEO firms would have found it more expensive to instead issue a convertible.

6. Straight Debt Issues, Debt-like Convertibles, Equity-like Convertibles, and Public Convertible Issues

In a world with adverse selection problems and costly financial distress, Stein (1992) predicts that good-quality firms issue straight debt, medium-quality firms issue convertible debt, and bad-quality firms issue equity. In this section, we extend our analysis to include straight debt issues and provide insight into theories focusing on incentives to issue convertible debt instead of straight debt (see Green 1984; Brennan and Kraus 1987; Brennan and Schwartz 1988; Mayers 1998). We obtain a sample of straight debt issues from the SDC database and impose the same requirements as on our sample of seasoned equity issues, resulting in a sample of 2,753 straight debt issues.

We also distinguish between debt-like and equity-like convertible issues. Lewis, Rogalski, and Seward (2003) classify a convertible issue as debt-like when its delta is below 0.6. Approximately a quarter of the convertible issues over their 1978–1992 sample period are classified as debt-like. In our case, only 7 out of 629 convertibles have a delta below 0.6. To form two groups of relatively debt-like and relatively equity-like convertibles, we classify a convertible as debt-like when the delta of the convertible is in the lowest quartile

of deltas. We thus extend our model to include four choices: a seasoned equity offering, an equity-like convertible issue, a debt-like convertible issue, and a straight debt offering. The result of estimating a multinomial regression model that includes these four choices is shown in Panel A of Table 6.

The base outcome is issuing an equity-like convertible bond, meaning that the coefficients relate to the alternate choice of an equity-like convertible issue. The results from the multinomial model corroborate the results from the binary logit model in that firms issuing equity-like convertibles have higher levels of financial distress, higher stock return volatility, higher institutional ownership, and more liquid stock than seasoned equity issuers. In line with Stein's (1992) predictions, we find that straight debt issuers have some features indicative of a "good" firm, like relatively high asset tangibility and a higher propensity of paying dividends. Equity-like convertible issuers have higher stock return volatility than do debt-like convertible issuers.

Table 6
Multinomial logit model

Panel A: The choice between debt, equity, debt-like convertibles, and equity-like convertibles

	(1) Seasoned equity offering	(2) Debt-like convertible offering	(3) Straight debt issue
Constant	−19.763**	−13.471**	−13.093**
	(3.521)	(5.072)	(4.012)
Financial distress (Z-score)	0.901**	−0.479	−0.254
	(0.200)	(0.439)	(0.373)
Return volatility	−0.940**	−2.565**	−3.052**
	(0.247)	(0.512)	(0.474)
NASDAQ listing	−0.074	0.313	−0.156
	(0.169)	(0.253)	(0.204)
Firm size	−0.256**	−0.073	−0.007
	(0.059)	(0.076)	(0.203)
Tangibility	3.563**	−0.510	4.187**
	(0.348)	(0.608)	(0.370)
R&D dummy	0.340*	0.464*	0.613**
	(0.156)	(0.215)	(0.187)
R&D intensity	0.297**	0.226	−7.122**
	(0.092)	(0.123)	(1.492)
Institutional ownership	−1.571**	−0.194	−1.695**
	(0.316)	(0.450)	(0.552)
Relative size: Proceeds ÷ market value of equity	−0.203	0.072	0.422
	(0.140)	(0.048)	(2.005)
Amihud liquidity	11.066**	−2.338	−68.650**
	(2.009)	(4.309)	(11.245)
Dividend-paying	−0.023	0.149	0.705**
	(0.221)	(0.316)	(0.208)
Equity market return	−1.557**	−2.790**	−1.301*
	(0.541)	(1.017)	(0.628)
Interest rate	1.335**	0.578*	0.913**
	(0.158)	(0.266)	(0.164)
Credit spread	1.082**	0.739	1.161**
	(0.317)	(0.430)	(0.326)
Leading indicators	0.146**	0.104**	0.094**
	(0.023)	(0.033)	(0.025)
N	5,580		
Pseudo-R^2	0.429		

(continued)

Table 6
Continued

Panel B: The choice between debt, equity, privately placed convertibles, and publicly placed convertibles

	(1) Seasoned equity offering	(2) Public convertible offering	(3) Straight debt issue
Constant	−15.044**	−14.913*	−8.418**
	(3.092)	(7.485)	(2.590)
Financial distress (Z-score)	1.005**	−1.240	−0.152
	(0.188)	(0.814)	(0.364)
Return volatility	−0.680**	0.422	−2.752**
	(0.247)	(0.511)	(0.456)
NASDAQ listing	−0.009	0.602	−0.213
	(0.159)	(0.316)	(0.196)
Firm size	−0.251**	−0.144	0.001
	(0.058)	(0.231)	(0.191)
Tangibility	3.675**	3.809**	4.328**
	(0.318)	(0.534)	(0.337)
R&D dummy	0.222	0.472	0.524**
	(0.146)	(0.287)	(0.175)
R&D intensity	0.243**	−1.180**	−7.377**
	(0.081)	(0.318)	(1.531)
Institutional ownership	−1.528**	−0.181	−1.656**
	(0.283)	(0.744)	(0.514)
Relative size: Proceeds ÷ market value of equity	−0.214	0.456	0.441
	(0.133)	(1.857)	(1.925)
Amihud liquidity	11.466**	−97.014**	−68.593**
	(1.841)	(27.719)	(10.719)
Dividend-paying	−0.068	0.039	0.641**
	(0.202)	(0.343)	(0.197)
Equity market return	−0.975	−0.349	−0.687
	(0.515)	(1.419)	(0.585)
Interest rate	1.127**	1.076**	0.712**
	(0.143)	(0.362)	(0.150)
Credit spread	0.788**	0.278	0.868**
	(0.272)	(0.601)	(0.284)
Leading indicators	0.108**	0.073	0.056*
	(0.020)	(0.045)	(0.022)
N	5,655		
Pseudo-R^2	0.429		

This table compares convertible issues with seasoned equity offerings and straight debt offerings. The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. In Panel A, the dependent variable of the multinomial logit model is a variable equal to zero for an equity-like convertible issue (base outcome), one for a seasoned equity offering, two for a debt-like convertible issue, and three for a straight debt issue. We classify a convertible issue as debt-like if the delta is in the bottom quartile and classify a convertible as equity-like otherwise. In Panel B, the dependent variable of the multinomial logit model is a variable equal to zero for a 144A privately placed convertible issue (base outcome), one for a seasoned equity offering, two for a public convertible issue, and three for a straight debt issue. See Appendix A for a description of the issue and issuer characteristics. We report standard errors clustered at the firm level in parentheses. * and ** indicate significance at the 5% and 1% levels.

We have constructed additional variables to further test the predictions of studies by Green (1984), Brennan and Kraus (1987), and Brennan and Schwartz (1988). Green (1984) argues that the substitution of convertible debt for straight debt reduces risk-shifting costs that are caused by conflicts of interest between bondholders and shareholders, because conversion privileges mitigate shareholders' incentives to substitute low-risk projects with riskier projects. Lewis, Rogalski, and Seward (1999) argue that one of the main predictions of this theory is that convertible issuers have higher idiosyncratic

volatility than do straight debt issuers. We define idiosyncratic volatility as the standard deviation of the residuals in a regression of a firm's daily stock returns on the value-weighted market return in the year before the offering.[25] In an untabulated comparison of debt-like convertibles to straight debt issues, we find that idiosyncratic volatility is higher for straight debt issuers, a result that is not in line with the predictions of Green (1984).

Brennan and Kraus (1987) and Brennan and Schwartz (1988) argue that an important benefit of convertibles compared to straight debt is the relative insensitivity of their value to the risk of the issuing company. Table 6 shows that both equity- and debt-like convertible issuers have higher R&D intensity than do straight debt issuers, which is some evidence that convertible issuers have more asset risk uncertainty than do straight debt issuers.

We also examine whether hedge funds that might be particularly skilled in estimating asset risk, like older and larger funds, are more involved in convertible issuers with high R&D intensity. We estimate difference of means t-tests for samples segregated by whether a firm has above-median R&D intensity (provided that the firm reports R&D expenses). We examine hedge fund characteristics related to age, size, and specialization.[26] We find that hedge funds involved in issuers with above-median R&D intensity are on average 6.10 years old, whereas the average age for hedge funds involved in issuers with below-median R&D intensity is 5.88 years (t-statistic of 0.91). Hedge funds purchasing convertibles in issuers with above-median R&D expenses have average assets of $672 million against $480 million for hedge funds involved in issuers with below-median R&D intensity (t-statistic of 1.72), whereas reported specializations are very similar. We might interpret these results as weak evidence that larger hedge funds are specialized in estimating asset risk and the more natural buyers of more risky issues.

Mayers (1998) predicts that convertibles are preferable to straight debt issues when sequential financing is important. To test this prediction, we add the market-to-book ratio to our multinomial model in Table 6 as a proxy for growth opportunities. With a straight debt issue as the base outcome, we find in untabulated results that the market-to-book ratio has a statistically significant positive effect on the likelihood of choosing either a debt-like convertible offering or an equity-like offering (a coefficient of 0.194 with a t-statistic of 3.03 for a debt-like convertible and a coefficient of 0.227 with a t-statistic of

[25] We find a correlation coefficient of 0.86 between this measure of idiosyncratic volatility and our return volatility variable. When we include both return volatility and idiosyncratic volatility in our models, we find qualitatively unchanged results for the return volatility variable in Tables 3 and 4, whereas the idiosyncratic variable has no significant effect (a coefficient of –0.239 with a t-statistic of –0.53 in Model 1 of Table 3 and a coefficient of –3.215 with a t-statistic of –0.54 in Model 1 of Table 4).

[26] We obtain information on hedge fund characteristics from Lipper TASS. For hedge funds that report in TASS, we calculate age in years as of the record date since the reported inception date of the fund and the size of the fund at the record date. If fund size is missing for a particular record date, we grow the last reported fund size by the reported hedge fund return. TASS also reports the specialization for a hedge fund, for example, "convertible arbitrage."

3.14 for an equity-like convertible). We thus find some evidence in line with Mayers (1998). Note, however, that, in the Mayers model, convertibles not only economize on issue costs, they also play a role in limiting the overinvestment problem by returning funds to the bondholders when the future investment opportunity is determined to be not viable. When the investment opportunity does not prove valuable, the conversion option will not pay off and bondholders will demand the return of the bond's principal. As a convertible becomes more equity-like, there is a reduced likelihood that the overinvestment problem can be controlled in this manner. The fact that recent convertibles are very equity-like suggests that the Mayers rationale for convertible bond financing may have become less important during our sample period.

The analysis in Panel A does not include public convertible issues. We focused on privately placed convertible debt because we could obtain information on the initial purchasers of the bonds and hence on hedge fund involvement for these issues. Information on purchaser identity is not available for public convertible issues. Panel B of Table 6 examines whether firms that publicly issue convertible debt are similar to firms that privately place convertible debt. The base outcome is a privately placed convertible offering (629 observations). We collect public convertible issues from the SDC database. Over our sample period, we have seventy-five public convertible issues, for which we also have information on all the variables in our model.

It can be seen from Panel B of Table 6 that there are significant differences between firms choosing a private and public convertible issue. On average, firms choosing a public convertible issue have higher asset tangibility, lower R&D intensity, and a lower Amihud score. Table 3 indicates that R&D intensity is significantly and positively related to hedge fund involvement. Together, Tables 3 and 6B suggest that public issues of convertible securities may have lower hedge fund involvement than do issues that are privately placed. The other variables that have a significant impact on hedge fund involvement in Table 3 are not significantly different between firms that publicly issue a convertible and firms that select a private placement.

7. Call Features, Causality, and the Realized Life of a Convertible

The results in our article suggest that hedge funds have a significantly lower involvement in convertibles with a call feature. This relation could be due to hedge funds avoiding convertibles without call protection or hedge funds demanding in private negotiations with firms that call protection is included. To provide more insight into what comes from the supply side versus the demand side, we estimate a two-stage least squares simultaneous equations model of hedge fund involvement and years of call protection. The explanatory variables for the hedge fund involvement regression model are identical to those in Table 3. In our regression on call decisions, we control for other factors that are believed to influence the call protection of a convertible offering.

Stein (1992) assumes asymmetric information and argues that call features could help a firm in avoiding financial distress. We therefore control for information asymmetries (with the variables R&D dummy, R&D intensity, and asset tangibility) and the probability of financial distress (with the Altman Z-score). Mayers (1998) argues that call features are beneficial for firms requiring sequential financing. We therefore control for the market-to-book ratio as a proxy for growth opportunities. Lewis and Verwijmeren (2010) argue that call features are beneficial when the status of an accounting treatment is tenuous, which is the case for convertibles with cash settlement features. We also include the years to final maturity, the size of the firm, the offering proceeds, and hedge fund characteristics. These hedge fund characteristics are the average age of the hedge funds that are involved in the convertible offering, the average size of the hedge funds, and the average alpha of the hedge funds, all obtained from Lipper TASS.[27]

Table 7 shows that variables with statistically significant effects on the length of call protection include asset tangibility, cash settlement features, years to maturity, and the average age of the involved hedge funds. Most importantly, the years of call protection has a positive and statistically significant effect on hedge fund involvement, whereas the effect of hedge fund involvement on the years of call protection is not statistically significant. These results suggest that hedge funds are less likely to purchase a convertible when the issuer decided to provide little call protection. A likely explanation for this finding is that call features complicate hedging because the decision to call is in the hands of the firm.

Call features can also have benefits for the issuers. Stein (1992) argues that call features are important, as they increase the likelihood that a bond will be converted into equity. In line with this prediction, Korkeamaki and Moore (2004) report that 98.2% of convertibles issued during the period 1980–1996 have call features. In our sample period, the percentage of convertible bonds with call features is 72.3% (see Table 2). Potentially, firms have found ways to make convertibles relatively equity-like without using call features, in line with the argument of Lewis and Verwijmeren (2011) that different combinations of contractual features can lead to similar security designs. Indeed, our analysis shows that virtually all the privately placed convertibles in our sample are "equity-like" in that the average convertible delta at the time of issue is 0.867, and only three of 803 issues have deltas below one half.

A straightforward way in which issuers can make a convertible more equity-like is by choosing a relatively low conversion premium. The conversion premium is the excess of the conversion price over the stock price at the time of

[27] We calculate alpha using twenty-four months of data up to the record date with the Fung and Hsieh (2004) hedge fund factors, which are also used in Fung et al. (2008). We thank David Hsieh for making the data available at his Web site (http://faculty.fuqua.duke.edu/~dah7/HFData.htm). The difference between the number of observations in Models 1 and 2 of Table 7 is due to observations in which none of the involved hedge funds report their age, size, or returns in the Lipper TASS database.

Table 7
Simultaneous equations of hedge fund involvement and call features

	% Of issue purchased by hedge funds	Years of call protection	% Of issue purchased by hedge funds	Years of call protection
	(1)		(2)	
Constant	0.608**	0.337	0.592**	0.074
	(0.088)	(0.527)	(0.086)	(0.567)
Fitted years of call protection	0.067**		0.074**	
	(0.022)		(0.021)	
Fitted hedge fund involvement		0.679		0.107
		(0.601)		(0.657)
Financial distress (Z-score)	−0.047**	0.101	−0.043**	0.157
	(0.016)	(0.095)	(0.015)	(0.095)
Return volatility	0.298**		0.314**	
	(0.085)		(0.085)	
NASDAQ listing	0.018		0.014	
	(0.019)		(0.019)	
Firm size	−0.033**	0.007	−0.033**	−0.001
	(0.007)	(0.034)	(0.007)	(0.034)
Tangibility	−0.033	0.327*	−0.051	0.306*
	(0.037)	(0.131)	(0.037)	(0.132)
R&D dummy	−0.012	0.120*	−0.016	0.110
	(0.016)	(0.058)	(0.016)	(0.058)
R&D intensity	0.032**	−0.071	0.028*	−0.045
	(0.011)	(0.047)	(0.011)	(0.045)
Market to book ratio		−0.011		−0.017
		(0.012)		(0.012)
Institutional ownership	−0.063		−0.049	
	(0.035)		(0.035)	
Relative size: Delta-neutral short position ÷ shares outstanding	−0.199**		−0.198**	
	(0.072)		(0.073)	
Relative size: Proceeds ÷ market value of equity		0.301		0.292
		(0.205)		(0.211)
Amihud liquidity	−0.015		−0.010	
	(0.028)		(0.027)	
Dividend-paying	0.016		0.019	
	(0.028)		(0.021)	
Stock repurchase	0.014		0.003	
	(0.025)		(0.024)	
Call spread overlay	0.066*		0.064*	
	(0.030)		(0.029)	
Cash settlement	0.020	0.221**	0.023	0.156**
	(0.018)	(0.060)	(0.018)	(0.060)
Put rights	0.058**		0.053**	
	(0.016)		(0.016)	
Years to maturity		0.323**		0.376**
		(0.043)		(0.044)
Average hedge fund age				0.048**
				(0.015)
Average hedge fund size				0.021
				(0.027)
Average hedge fund alpha				−3.193
				(4.422)
N	629		598	

The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. This table presents the results of a two-stage least squares simultaneous equations analyses of the percentage of the issue purchased by hedge funds and the years of call protection. Years of call protection is the natural logarithm of (1+ years to first call). The market-to-book ratio is calculated with Compustat items as (CSHO x PRCC_F – CEQ + AT)/AT. Years to maturity is the natural logarithm of the number of years until the convertible matures at the time of issuance. Average hedge fund age is in years as of the record date since the reported inception date of the fund, and hedge fund size is the natural logarithm of assets at the record date. Hedge fund alpha is calculated using twenty-four months of data up to the record date by using the Fung and Hsieh (2004) hedge fund factors. See Appendix A for a description of the other issue and issuer characteristics. We report standard errors in parentheses. * and ** indicate significance at the 5% and 1% levels.

issue expressed as a percentage of the stock price. When we split our sample into convertibles with and without call features, we find that the average (median) conversion premium is 31% (27%) for convertibles without call features and 35% (32%) for convertibles with call features. The difference is significant at the 1% level.[28]

Although call features are less likely for issues with above-median hedge fund involvement, Table 2 shows that 64.6% of the convertibles with above-median hedge fund involvement still contain call features. This could still be considered high if hedge funds have a strong preference for call protection. In further analyzing the call protection of callable bonds with an above-median hedge fund involvement, we find that only 4.9% of these issues have no call protection, that is, a time to first call of zero. The average (median) time to first call for the issues is 4.69 (5.00) years. To the extent that hedge funds expect to hold their positions for less than five years, many callable convertibles may be treated as noncallable by hedge funds. Moreover, the difficulty in hedging a callable convertible is reduced when call policy is a deterministic function of the issuer's stock price. Grundy and Verwijmeren (2012) show that the design of U.S. convertible bonds has changed markedly since 2000 in that it is common for recent convertible issues to be dividend-protected, meaning that the conversion rate is adjusted for dividend payments. Dividend protection makes moot the set of rationales for call delay based on the difference between the dividends to be received upon conversion and the coupon on the bond, and Grundy and Verwijmeren (2012) document that dividend-protected convertibles are in fact called as soon as conversion can be forced. Call policy is then a deterministic function of the stock price, and the post-2000 change in the design of convertible bonds is consistent with hedge fund demand for convertible bonds that can be accurately hedged.

The question arises as to how long hedge funds maintain their ownership of a newly issued bond, that is, for how long do hedge funds bear the cost of maintaining their short positions? The period could be very short if hedge funds quickly sell their convertibles to non-hedge-fund qualified institutional buyers. The period could also be relatively short if, as Huang and Ramirez (2010) find for a sample of convertibles issued during the 1996 to 2004 period, 88% of 144A convertible offerings are subsequently registered for public trading, typically within ninety days after the deal's closing date.

If hedge funds intend to hold their positions to maturity, they would need to hedge for the life of the bond. The realized life of a convertible will often be less than its contractual life: The issuer may go bankrupt; the convertible holder may voluntarily convert; a call may force conversion; or the convertible holder may exercise a put option inherent in some bonds. Therefore, in order

[28] Encouraging convertible bondholders to convert their bonds when the conversion option is in-the-money and there is no call feature can be, for example, achieved by paying a higher dividend on the stock than coupons on the bond (see Brigham 1966; Constantinides and Grundy 1986; Dunn and Eades 1989).

Table 8
Estimated percentage of convertible issue outstanding in years after issue and changes in institutional ownership after issue

Panel A: Percentage of convertible issue outstanding

% Outstanding after *n* years	Total	Above-median hedge fund involvement	Below-median hedge fund involvement	Difference of means *t*-statistic
1 year	94.22% (280)	93.02% (144)	95.50% (136)	−1.12
2 years	86.69% (221)	83.17% (110)	90.17% (111)	−1.73
3 years	65.40% (172)	64.14% (80)	66.50% (92)	−0.35
4 years	41.42% (145)	33.45% (64)	47.71% (81)	−1.89
5 years	13.38% (104)	7.82% (48)	18.15% (56)	−1.73

Panel B: Percentage of institutional owners that increase their holdings of convertible issuers

	Total	Above-median hedge fund involvement	Below-median hedge fund involvement	Pearson's χ^2-statistic
Percentage of institutions increasing ownership when proceeds <10%	60.8%	63.5%	59.4%	59.83**
Percentage of institutions increasing ownership when proceeds >10%	63.7%	66.3%	60.9%	316.23**
Total	62.8%	65.7%	60.4%	423.68**

The sample period is January 2000–March 2008. Issues by utilities and financial institutions are excluded. In Panel A, we determine the fraction of a convertible still outstanding in the five years after issue. We assign a missing value code to a particular year for a given bond if a second convertible bond is issued by that firm. We also assign a missing value code if the firm no longer exists. The number of issues used in calculating the average is shown in parentheses. Panel B shows the percentage of 13F filings where the institution increases its holdings of the stock during the quarter of the convertible issue. We report the results for those observations where the offering proceeds are less than and exceed 10% of the issuer's market value. An above-median participation by hedge funds indicates that hedge funds purchase more than 75.3% of the convertible. ** indicates significance at the 1% level.

to estimate an upper bound on how long hedge funds may remain short in an issuer's stock, we investigate how long convertible issues survive in practice.

Using balance sheet data, we determine the fraction of a convertible still outstanding during the five-year window after issue. We examine only instances in which the firm did not already have convertibles outstanding (from an earlier offering) at the time of issue, because we are unable to assign aggregate reductions in a firm's convertibles outstanding to particular issues. We assign a missing value code to a particular year for a given bond if a second convertible bond was issued by that firm in either that year or an earlier year that is within the five-year window. We also assign a missing value code if the firm ceases to exist in Compustat.

Panel A of Table 8 reports the average (across the nonmissing data) percentage of the original issue still outstanding each year after issue. There are two reasons why this average is likely to be an upward-biased estimate of the fraction of a convertible issue that actually survives. First, if a firm no longer exists, its convertible bonds may have effectively "matured" as a

result of bankruptcy. Or the firm may have been taken over, in which case the bondholders may have voluntarily converted. Second, instances in which a firm makes a second convertible bond issue may be instances in which the first bond was called (and the holders forced to convert). In both cases, 0% of the (initial) issue remains outstanding. The number of observations used in calculating the average each year is reported in parentheses. Panel A also reports the results for subsamples of bonds with below-median and above-median hedge fund involvement.

On average, no more than 13.38% of convertibles are still outstanding five years after their issue. For bonds with above-median issuance to hedge funds, the average survivorship rate after five years is only 7.82%.[29] Because the mean (median) time to maturity at the issuance of our sample of 629 privately placed convertible bond issues is 15.26 years (twenty years), we can conclude that the effective life of convertible bonds privately placed with hedge funds is much less than their notional maturity.

8. Changes in Institutional Ownership After a Convertible Issue

Our thesis is that by buying convertibles and shorting the underlying stock, hedge funds can distribute equity exposure to well-diversified shareholders at a lower cost than the firm would face if it sold equity directly. Therefore, as a natural final test, we compare the institutional ownership of a company's equity before and after a convertible bond issue to hedge funds. Institutional investors may be willing to increase their investments in the common stock of firms issuing convertible bonds because the increase in selling activity resulting from the short-selling strategies of hedge funds can reduce or eliminate the price impact of the institutions' purchases. And, because the additional selling activity is anticipated, institutional investors should be less concerned that the increase in selling activity reflects sales by traders with an informational advantage.

We obtain institutional ownership of a firm's stock at the end of the quarter before and after a convertible bond issue from the 13-F filings in the Thomson-Reuters Institutional Holdings database. One of the 13-F filing requirements is that institutional investors must report their equity positions regardless of whether the securities have been loaned to a third party. This can result in a situation in which loaned shares are double counted: Once by an institution lending the shares and again by an institution that has just purchased them.[30] We examine all 13-F filers with positions in the firm's stock before and/or after the convertible issue and examine the quarterly change in holdings associated with

[29] For the noncallable convertible bonds in our sample, the average survivorship is even lower, with only 3.6% of noncallable convertibles surviving for five years. The survivorship of these bonds after one, two, three, and four years are 90.0%, 80.4%, 64.8%, and 33.5%, respectively. This highlights that even convertible bonds without call features can have relatively short effective maturities.

[30] In fact, short-selling can lead to counts of institutional ownership that exceed the amount of outstanding shares (Asquith, Pathak, and Ritter 2005).

the convertible issue. Panel B of Table 8 reports the percentage of institutions that increase their holdings of convertible issuers. For issues with above-median hedge fund involvement, 65.7% of institutions increase their holdings of the stock. By contrast, only 60.4% of institutions increase their holdings when there is below-median hedge fund involvement. The difference is significant at the 1% level.

In untabulated results, we find that convertible issues and the associated short sales by hedge funds lead to a change in the relative share ownership of individual and institutional investors. The average increase in the fraction of institutional ownership is 7.71% per issue for our sample of 629 convertible issues, and for firms with above-median hedge fund involvement, the average increase is 8.59%.

To obtain more insight into the institutions that increase their equity exposure when convertibles are issued to hedge funds, we focus on the institutions that initiate a position in the stock of convertible issuers with above-median hedge fund involvement. On average, twenty-nine institutional shareholders add the convertible issuer to their portfolio in the quarter of the convertible issue. We find that these institutional shareholders hold long positions in an average (median) of 674 firms (339 firms) at the end of the issue quarter. The average (median) assets under management for these institutions are $10.14 billion ($1.37 billion). The value of the institutional shareholder's position in the convertible issuer's stock represents on average only 0.30% of the value of the institutional shareholder's total portfolio. The median fraction invested in the issuer's stock is 0.04%. The new institutional holders of the convertible issuer's stock are thus both large and well-diversified. The characteristics of these institutional investors are consistent with hedge funds distributing equity exposure to diversified share investors and thereby lowering the effective cost of capital for issuers.

9. Conclusion

We document that firms with high expected costs of seasoned equity offerings privately place convertibles with hedge funds. These hedge fund purchasers simultaneously short the underlying stock so as to hedge themselves against changes in the stock price. In effect, hedge funds are distributing equity exposure into the open market via their short positions.

Our study provides a rationale for issuing convertible securities rather than seasoned equity that does not depend on adverse selection problems. By placing a convertible with hedge funds, a firm can receive financing today while avoiding the discounts and underwriter fees associated with a secondary equity offering. Where those costs are higher than the costs associated with the private placement, for example, because of a relatively high likelihood of financial distress and more volatile stock returns, the firm will have issued equity at a lower cost. We estimate that issue costs of 11.21% would have been incurred if

the firms that issued convertibles to hedge funds had instead chosen a seasoned equity offering. The actual cost of selling convertibles to hedge funds is 9.23%, in line with convertibles being the least-cost financing option for these firms.

We also hypothesize and test the relations between hedge fund involvement and issue and issuer characteristics. We find that hedge funds have a significantly lower involvement in convertibles with a call feature and a significantly higher involvement in issues accompanied by a stock repurchase. We argue that repurchases allow hedge funds to establish short positions at a predetermined price, whereas limits on callability increase the attractiveness of convertibles to hedge funds because when the occurrence of a call is not a deterministic function of the stock price and time, hedging cannot be perfect. We further find that firms that issue convertibles to hedge funds have significantly more liquid stock and significantly higher institutional ownership, which are characteristics that facilitate the establishment and maintenance of short positions.

Our final result is that institutional ownership increases in firms that have active hedge fund participation in their convertible issue. This finding is consistent with hedge funds playing an active role in reducing issue costs by distributing the equity exposure in a convertible issue to a large set of well-diversified institutional investors.

Appendix A. Description of Variables

Amihud *liquidity.* The Amihud (2002) measure for liquidity is the daily average of a firm's absolute return relative to the day's dollar volume for the year prior to the offering ($\times 10^6$). We use CRSP data to calculate this variable. A high Amihud score denotes illiquidity.

Call spread overlay. A dummy variable equal to one if the convertible is issued with a call spread overlay and zero otherwise. In a call spread overlay, the issuer purchases a call option that mimics the call option embedded in the convertible bond and simultaneously writes a call option on the same number of underlying shares at a higher strike price. The net effect is analogous to issuing a convertible bond with a higher conversion price. We obtain information on call spread overlays from the issue prospectuses.

Callable. A dummy variable equal to one if the convertible has a call feature and zero otherwise. We obtain call information from the SDC database.

Cash settlement. A dummy variable equal to one if conversion of the bond can potentially be settled in cash and zero otherwise. Settlement information is obtained from the issue prospectuses, as in Lewis and Verwijmeren (2011). Securities that contain cash settlement features include one of the following conversion choices. Either an issuer (1) must pay the conversion value (the number of shares a bondholder is entitled to receive times the stock price at the conversion date) in cash; (2) may choose to pay either fully in cash or the number of shares a bondholder is entitled to receive; (3) must pay cash for the accreted value (principal value plus accrued interest) and may satisfy the conversion spread (the excess of the conversion value over the accreted value) in either cash or equity (known as a net share settlement); or (4) may pay any combination of cash and equity, but often there is a stated policy to settle in cash.

Delta. Delta is the convertible's dollar sensitivity to small changes in the value of the underlying and is calculated as

$$Delta = e^{-\delta T} N(d_1) = e^{-\delta T} N \left\{ \frac{\ln\left(\frac{S}{X}\right) + \left(r - \delta + \frac{\sigma^2}{2}\right) T}{\sigma \sqrt{T}} \right\},$$

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 the SDC database); r is the yield on a ten-year U.S. Treasury bond (from Datastream); δ is the continuously compounded dividend yield (calculated as Compustat Item DVC divided by the equity market value (Item PRCC_F $\times$ CSHO)); σ is the annualized stock return volatility estimated from ten years of monthly stock return data (from CRSP); and T represents the stated maturity of the convertible as of its issuance date (from the SDC database). Dividends are set to zero when the convertible is dividend-protected (see Grundy and Verwijmeren 2012).

Delta-neutral short position. The delta-neutral short position is the total number of common shares that buyers of the convertible issue have to short to obtain a delta-neutral position. This number of shares is calculated as

$$\textit{Delta-neutral short position} = \frac{\textit{face value of entire issue}}{\textit{conversion price}} \times \textit{delta}.$$

We obtain information on the face value and the conversion price from the SDC database.

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.

Financial distress (*Z-score*). The Altman Z-score is an estimate of the probability of a firm's bankruptcy and is calculated as 1.2 (Working capital / Total assets) + 1.4 (Retained earnings / Total assets) + 3.3 (EBIT / Total assets) + 0.6 (Market value of equity / Book value of liabilities) + (Sales / Total assets), which is implemented using Compustat Items as 1.2 ((ACT − LCT) / AT) + 1.4 (RE / AT) + 3.3 (OIADP / AT) + 0.6 ((PRCC_F $\times$ CSHO) / (DLTT + DLC)) + SALE / AT. All variables are measured at the beginning of the fiscal year. Z-scores above 100 and below −100 are winsorized. In reporting our regression estimates, we multiply the coefficient on the Altman Z-score by 100.

Firm size. Firm size is the market value of equity (measured at the beginning of the fiscal year) calculated with Compustat Items PRCC_F $\times$ CSHO. In regression analyses, we employ the natural logarithm of the market value of equity as the measure for firm size.

Institutional ownership. The level of institutional ownership reported in the Thomson-Reuters Institutional Holdings database scaled by total shares outstanding (both measured at the fiscal year-end preceding the issue date).

Issue proceeds. Issue proceeds are the gross proceeds of the issue in millions of dollars, as reported in the SDC database.

NASDAQ listing. A dummy variable equal to one if the firm is listed on *NASDAQ* (Compustat Stock Exchange Code 14) and zero otherwise.

Put rights. A dummy variable equal to one if the convertible has a put feature and zero otherwise. We obtain put information from the SDC database.

R&D dummy. A dummy variable equal to one if the firm reported R&D expenses in the year before the offering (Compustat Item XRD) and zero if the R&D expenses were missing.

R&D intensity. The R&D expenses (Compustat Item XRD) divided by total sales (Compustat Item SALE) in the year before the offering. We set R&D intensity equal to zero if the firm does not report R&D expenses in the year before the offering.

Relative size. A measure of the additional equity exposure being distributed compared to the initial equity exposure. When comparing convertible bonds with each other, we measure relative size as the ratio of the delta-neutral short position to the shares outstanding. When comparing convertible issues to hedge funds with seasoned equity offerings, we measure relative size as the ratio of the issue proceeds to the market value of equity.

Return volatility. Volatility is calculated as the annualized standard deviation of monthly stock return data (from CRSP) for up to ten years of data preceding the issue or for a shorter period if ten years of data are not available. We set the minimum requirement to twelve months of data. In our sample of 629 convertible issues, we have ten years of stock return data available for 330

observations. On average, the firms in our convertible sample have eight years of stock return data available before the convertible issue.

Stock repurchase. A dummy variable equal to one if the convertible issue is combined with a stock repurchase. This is the case if either the firm announces that it uses part of the proceeds of the convertible issue to repurchase stock (in the SDC database or Factiva), or if both transactions are announced separately on the same date (in Factiva).

Tangibility. The tangible assets (Compustat Item PPEGT) divided by total assets (Compustat Item AT) at the fiscal year-end preceding the issue date.

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