The Buyers' Perspective on Security Design: Hedge Funds and Convertible Bond Call Provisions

Bruce D. Grundy and Patrick Verwijmeren*

25 February 2016

Abstract

Our study provides evidence that security design reflects the interplay of supplier and issuer preferences. While call provisions have historically been the default option in convertible security design, we find that only a minority of post-2005 issues are callable. Because hedge funds dominate the market for new convertibles today and convertible arbitrage is less risky without callability, the diminution in callability emphasizes the importance of the preferences of the suppliers of capital in determining security design. We show that further determinants of callability include rationales for issuing convertibles that emphasize issuer preferences.

JEL classification: G2, G32

Keywords: Security design, supply of capital, call provisions, convertibles, hedge funds

* Bruce Grundy (bruceg@unimelb.edu.au) is from the University of Melbourne, and Patrick Verwijmeren (verwijmeren@ese.eur.nl) is from Erasmus School of Economics and the University of Melbourne. We would like to thank Gil Aharoni, Howard Chan, Francois Derrien, Neal Galpin, Ning Gong, Vincent Gregoire, Andre Gygax, Thijs van der Heijden, Darren Kisgen, Bryan Lim, Garry Twite, David Yermack, and seminar participants at Deakin University, University of Glasgow and University of Melbourne for helpful comments. Corresponding author is Verwijmeren: Burg. Oudlaan 50, 3000DR Rotterdam, the Netherlands, T: +31104081392, F: +31104089165, E: verwijmeren@ese.eur.nl.

1. Introduction

Many studies have considered optimal security design from the viewpoint of the issuer. It has been argued that issuers design securities to minimize costs associated with agency problems (Harris and Raviv, 1989), with information asymmetries (Duffie and Rahi, 1995), and with financial distress, regulation and taxation (Miller, 1986; Myers, 2001). Alternatively, several recent studies of corporate financial decisions have taken the viewpoint of the supplier of capital. Baker (2009) reviews the evidence that supplier preferences are a determinant of corporate financial decisions and identifies supplier-driven security design as an important topic for future research in corporate finance.[1]

Our paper investigates the importance of supplier-driven security design and we do so by addressing the interplay of both supplier and issuer preferences. We examine a market that has witnessed a major shift in the suppliers of capital, namely the market for convertible securities. The convertible market is especially interesting as the shift in the supply side is observable and because the shift has been towards convertible arbitrage hedge funds, which have particular design preferences. Importantly, the issuer and the hedge fund perspectives can differ substantially on the question of whether or not to include a call provision.[2] Consequently, we focus on the fluctuating popularity of convertible call provisions to examine the interplay of supplier and issuer preferences in the design of securities.

[1] Papers that examine the effect of supplier preferences on corporate financial decisions include Baker and Wurgler (2004) and Baker, Greenwood and Wurgler (2009). Baker and Wurgler (2004) find that firms are more likely to pay dividends in times of increased investor preferences for dividend-paying firms. Baker, Greenwood and Wurgler (2009) show that managers supply shares at lower price levels when investors place higher valuations on low-price firms.

[2] A call provision allows the issuer to redeem the convertible before its maturity. Upon calling, the holder of the convertible is forced to choose between the call price and converting the convertible bond into a specified number of shares.

Traditional rationales for why firms issue convertibles take the issuer's perspective and assign substantial importance to call provisions. These models were developed at a time when call provisions were the norm. The information asymmetry rationale of Stein (1992) posits that high-quality firms issue debt, low-quality firms issue equity, and medium-quality firms issue convertibles. Call provisions are important in Stein's backdoor equity rationale for convertible issuance since they allow a firm to force conversion once the share price has risen. In Mayers (1998), convertibles are issued for sequential financing purposes and call provisions are important as they allow firms to reduce their leverage by forcing conversion if the sequential investment option proves valuable.

From an issuer's perspective, the inclusion of call provisions in both convertible and straight debt has also been explained as a reflection of agency problems (Bodie and Taggart, 1978; Barnea, Haugen and Senbet, 1980; Robbins and Schatzberg, 1986), bond issuers' desire to hedge against decreases in interest rates (Bowlin, 1966; Pye, 1966), and a means of avoiding hold-up problems by removing undesired covenants that restrict merger activity (Smith and Warner, 1979).

Now consider the preferences of the suppliers of capital. The principal buyers of convertibles today are hedge funds.[3] Hedge funds combine the purchase of a convertible with a short position in the firm's stock. Convertible arbitrage hedge funds are less attracted to callable convertibles (Woodson, 2002) since an unanticipated call redistributes wealth from the holders of convertibles to stockholders. Such a redistribution is not a hedgeable comovement of the bond and stock. In the event of a call, convertible arbitrage hedge funds lose both on their long position in the convertible and on their short position in the issuer's stock.[4]

[3] See Mitchell, Pedersen and Pulvino (2007), Choi, Getmansky and Tookes (2009), and Brown et al. (2012).

[4] Our focus on call provisions is unique. Prior work on convertible arbitrage has focused on the relation of convertible arbitrage to security mispricing (Mitchell, Pedersen and Pulvino, 2007), stock market

Korkeamaki and Moore (2004) reports that 98% of all convertibles issued between 1980 and 1996 contain call provisions. We confirm that the large majority of the convertibles in our sample that are issued before 2000 contain call provisions. If hedge fund preferences are an important determinant of the design of convertible securities today, then the inclusion of call provisions in convertible debt should have decreased in recent years. We find that the growth of the convertible arbitrage industry after 2000 has been accompanied by a rapid decrease in the popularity of convertible bond call provisions. In 2011 only 28.8% of new convertible issues were callable and since 2003 only 18.8% of new convertible issues have been callable within the first three years of their lives.

We document a negative relation between the size of the convertible arbitrage industry and the probability that a newly-issued convertible is callable. We also examine the impact of the private placement market for convertibles on the likelihood of incorporating a call provision.[5] Privately placing a security allows issuers and buyers to directly negotiate the design of the security and private placements have been particularly popular with convertible arbitrage hedge funds (Brown et al., 2012; Berkman, McKenzie and Verwijmeren, 2016). Consistent with the preferences of hedge funds, privately-placed convertibles are significantly less likely to include call provisions than are publicly-issued convertibles. As an additional test, we collect hedge fund involvement in specific convertible issues and confirm the negative relation between hedge fund involvement and the probability that an issue is callable.

We further document that the 21st century's reduction in the popularity of call provisions in new convertible issues is not simply a mirror of a similar diminution in the likelihood that

liquidity (Choi, Getmansky and Tookes, 2009), issue volume (Choi et al., 2010; De Jong, Duca and Dutordoir, 2013), stock repurchases (De Jong, Dutordoir and Verwijmeren, 2011), the announcement effects of an issue (Duca et al., 2012), and the cost of raising capital (Brown et al., 2012).

[5] Huang and Ramirez (2010) document that private placements of straight debt and convertible bonds have become increasingly common during the 1991 through 2004 period.

new straight debt issues will be callable. Although many theoretical rationales for including call provisions apply to both convertibles and straight debt, the straight debt market is not dominated by hedge funds.

Our results establish the importance of the supply side of capital for security design, and are the first to document the diminution in the popularity of convertible call provisions. A further important contribution of our study is that the recent diminution in the popularity of call provisions in convertible debt has provided sufficient cross-sectional variation to allow us to analyze the demand-side determinants of call provisions in convertible securities. This was not possible when call provisions were the default. We find evidence that in addition to the preferences of convertible arbitrageurs, other significant determinants of the inclusion of call provisions are the potential for reducing problems associated with information asymmetries, sequential financing, and incentives to reduce a hold-up problem.

The reduced likelihood that a convertible will contain a call provision has potential implications for some of the extant rationales advanced for issuing convertibles. In particular, the backdoor equity rationale of Stein (1992) and the sequential financing rationale of Mayers (1998) both assume that the convertible is callable.[6] The recent diminution in the likelihood that a convertible will contain a call provision does not imply that the backdoor equity and sequential investment opportunities rationales for convertible bond issuance are unimportant. Rather, short-term non-callable debt maturing after the resolution of an information asymmetry

[6] Other rationales for issuing convertibles are that convertibles can reduce risk-shifting incentives (Green, 1984); reduce the sensitivity of the value of a new debt issue to a change in the risk of the issuer's activities (Brennan and Kraus, 1987; Brennan and Schwartz, 1988); allow financing in the presence of an information asymmetry (Constantinides and Grundy, 1986); and provide the least-cost financing opportunity for firms with relatively high costs of issuing seasoned equity (Brown et al., 2012). The models of Green (1984), Brennan and Kraus (1987), Brennan and Schwartz (1988), Constantinides and Grundy (1986), and Brown et al. (2012) do not rely on the convertible being callable.

or the resolution of uncertainty surrounding an investment opportunity can be a substitute for callable long-term debt (Robbins and Schatzberg, 1986). We document that the average maturity of convertible bonds has been relatively short since the early 1990s, which reduces the need for call provisions in the rationales of Stein (1992) and Mayers (1998).

The paper is organized as follows. Section 2 discusses the growth of the convertible hedge fund industry and hedge fund preferences for non-callable versus callable convertibles. Section 3 describes the data and time trends in the callability of new issues of convertibles. Section 4 considers the traditional set of rationales for the inclusion of call provisions in both convertible and straight debt. Section 5 undertakes a logit analysis of convertible bond callability based on both the traditionally posited determinants of callability and the size of the convertible hedge fund industry. Section 6 investigates the implications of our findings for the backdoor equity and sequential financing rationales for issuing convertible bonds and Section 7 concludes.

2. The rise of convertible arbitrage hedge funds

The decision to call a convertible bond rests with the issuing firm and redistributes wealth between convertibleholders and stockholders. An unanticipated call will result in a convertible hedge fund losing on both its long position (in the convertible) and its short position (in the common stock of the bond issuer). Calamos (2003), a practitioner text, observes that convertible arbitrage strategies are easier to implement when a convertible is not callable. The uncertainty introduced by a call provision complicates hedging by making it more difficult to determine the optimal number of shares to short and complicates the detection of arbitrage opportunities due to the additional knowledge of the firm's call policy that is needed when valuing the convertible. Similarly, Woodson (2002) argues that (p. 131) "the hedge arbitrageur does not want to be exposed to the risk of forced conversion."

Calamos (2003) notes the increase in the size of the convertible arbitrage market after 2000. Choi, Getmansky and Tookes (2009) document this increase by reporting the assets under management of convertible arbitrage hedge funds between 1993 and 2006. Duca et al. (2012) report the number of news stories about convertible arbitrage in the Factiva database each year between 1984 and 2009. Brown et al. (2012) determine the level of hedge fund involvement in a large set of privately-placed convertibles issued between 2000 and 2008 and report that the average percentage of privately-placed convertibles purchased by hedge funds increased from around 60% in 2000 to approximately 85% in 2008. Figure 1 shows the time trends in the various measures of convertible arbitrage activity examined in Choi, Getmansky and Tookes (2009), Duca et al. (2012), and Brown et al. (2012).

[please insert Figure 1 here]

All three measures show a substantial increase after 2000. The total size of the assets under management in the convertible arbitrage industry does decrease in 2005, but this decrease does not reduce the level of hedge fund involvement in new issues. If the preferences of convertible arbitrage hedge funds are an important determinant of whether new issues of convertible bonds contain call provisions, then we expect to see a decline in the popularity of call provisions in the 21st century relative to when hedge funds were not the dominant buyers of new convertible issues.

3. Data and time trends

3.1. Data

We collect data on 4,568 convertible issues in the U.S. market from the Mergent Fixed Investment Securities Database (Mergent FISD) for the period 1-1-1985 to 1-7-2013.[7] To avoid

[7] Mergent contains data on only a small number of convertible issues before 1985.

double-counting, we delete observations that simply represent the registration of earlier (privately) placed convertible issues. This leaves 3,520 observations. Our sample consists of the subset of 2,479 convertible bond issues by industrial firms, i.e. we exclude issues by financial firms (566 observations), utilities (133 observations), firms with missing SIC codes (129 observations), and convertible preferred stock issues (213 observations).[8] In addition, we create a more restricted sample that consists of the subset of convertible bond issues by industrial firms that report information in Compustat in the year before the issue. This restricted sample contains 1,853 observations.

3.2. The changing frequency of convertible call provisions through time

The top panel of Figure 2 shows the popularity of convertible bond call provisions over time. The high percentage of convertibles with call provisions before 2000 is in line with the results of Korkeamaki and Moore (2004). Call provisions quickly lose their popularity early this century. The percentage of convertible issues in the main sample that contain call provisions falls to below 29% in 2011. When our sample period ends, in 2013, 38% of convertible bond issues contain call provisions.[9] The percentages for the restricted sample with Compustat information are virtually identical to those of the main sample.

[please insert Figure 2 here]

The bottom panel of Figure 2 shows the percentage of convertible securities that can be called in the first three years of the bond's life. This measure is the more relevant one for convertible arbitrage hedge fund buyers since hedge funds typically only hold the convertibles

[8] The exclusion of these issues does not affect our conclusions.

[9] Our sample contains 28 observations that do not have a regular call provision but do have a soft call provision. A soft call provision implies that a call is only possible if the stock price exceeds the conversion price by a specified percentage for a specific number of days. Our results are robust to excluding these observations and to classifying these issues as non-callable.

for a limited amount of time and hence can be indifferent between buying a non-callable convertible and buying a convertible that is call-protected for three years. Van Marle and Verwijmeren (2016) document that on average convertibles purchased by hedge funds in 2002 (2010) were subsequently held by the purchasing hedge fund for 6.5 months (14.6 months). Less than ten percent of the purchasing hedge funds still had a position in the convertible after three years.

Korkeamaki and Moore (2004) document that although a period of call protection was not uncommon for convertibles issued between 1980 and 1996, the majority of convertibles were callable in the first three years of their life. The bottom panel of Figure 2 shows that in the last decade of our sample period (ending in 2013), only 18.8% of new convertibles issues are callable within three years of issuance. The dramatic decline in the likelihood that new convertible bond issues are callable and in the likelihood that, if a new convertible is callable, it is callable during the first three years of its life is consistent with the preferences of convertible arbitrage hedge funds.

4. Traditional determinants of the incorporation of call provisions

Prior studies on whether to include call provisions have largely focused on straight debt. This section considers the factors identified in these studies and their potential importance as variables in our analysis of the call provisions in convertible bonds. Bowlin (1966) and Pye (1966) argue that interest rate variability is one important determinant of whether a bond will be callable. A call provision allows the issuing firm to refinance its debt if interest rates fall and hence the inclusion of a call provision can be viewed as optimal when the firm's managers predict a higher likelihood of a decline in interest rates than is predicted by buyers of the firm's debt. If this disparity in predictions is larger when interest rates are higher, then call provisions will be more common when interest rates are high. Kish and Livingston (1992) and Banko and

Zhou (2010) conclude that higher interest rates at the time of issue increases the probability that a straight debt issue will include a call provision.[10]

The Kish and Livingston (1992) and Banko and Zhou (2010) studies also report that the percentage of below investment-grade bonds issued in a year is related to the popularity of call provisions in new issues of straight debt. The authors argue that below investment-grade bond issuers are more likely to use call provisions to alleviate the more severe agency problems they face, as described in Bodie and Taggart (1978), Barnea, Haugen and Senbet (1980), and Robbins and Schatzberg (1986). Managers might have private information on improvements in general credit conditions or firm-specific credit quality. Since there is more room for improvement for firms whose current ratings are poor, below investment-grade issues may be more likely to include call provisions. Crabbe and Helwege (1994) report that nearly all below investment-grade straight bonds are callable, while fewer than 30% of investment-grade straight bonds are callable.

Additional explanations for call provisions considered in the straight debt literature include reductions of hold-up problems (Smith and Warner, 1979) and costs related to information asymmetry (Barnea, Haugen and Senbet, 1980; Robbins and Schatzberg, 1986).[11] If the set of explanations for call provisions in straight debt is also important for convertibles, then we predict a common movement through time in the popularity of call provisions in convertible and straight debt. But to the extent that the preferences of convertible arbitrage hedge funds drive the recent change in the popularity of convertible bond call provisions, the

[10] There is disagreement in the literature about this conclusion. Sarkar (2003) and Booth, Gounopoulos and Skinner (2013) report a negative relation between interest rates and the probability of the inclusion of a call provision in a new issue of straight debt.

[11] For example, in a world with asymmetric information, high quality firms could issue callable bonds to either signal their positive future prospects or to retain the option to refinance when their positive private information is revealed.

decline in the incorporation of call provisions in the design of convertibles will not be mirrored by a similar decline for straight bonds.

We obtain data on the popularity of call provisions in straight debt from Mergent FISD. From the straight debt issues in the U.S. market between 1985 and mid-2013, we delete issues by government and agency institutions as well as issues by banks and utilities, and observations with missing SIC codes. The resultant sample consists of 25,590 issues. Figure 3 shows the percentage of straight debt issues in a year that are callable (top panel) and the percentage that are callable within the first three years of their lives (bottom panel) as well as the comparable percentages for convertible issues.

[please insert Figure 3 here]

We observe very different time series behavior for straight and convertible debt. The decreased incorporation of call provisions into the design of convertible bonds in the early years of the 21st century is not matched by a decrease in the popularity of straight debt call provisions.

As seen in Figure 3, call provisions in straight debt issues declined in frequency in the late 1980s and then regained their popularity in the later part of the 1990s. Banko and Zhou (2010) study trends in the popularity of call provisions in straight debt issues over the period 1980 through 2003. The authors conclude that the decline in the frequency of call provisions in the late 1980s is explained by the decline in interest rates from historically high levels in the 1970s and 1980s, which reduced the need for firms to hedge interest rate risk. Banko and Zhou (2010) also conclude that the subsequent rebound in the frequency of call provisions in the late 1990s coincides with the contemporaneous revival of the below investment-grade bond market.

At any point in time straight and convertible debt issues face the same interest rate environment. Hence, changes in rates cannot explain the difference in the patterns in Figure 3. The difference in the patterns might potentially be explained by a time-varying difference

between the proportion of straight debt issues that are below investment-grade and the proportion of convertible issues that are below investment-grade; e.g., the proportion of straight debt issues that were below investment-grade increased after 1990 (as Banko and Zhou (2010) observe) while the proportion of convertible issues that were below investment-grade declined dramatically after 2000. This, however, is not the case for convertible issues. The average fraction of rated convertibles with below investment-grade ratings issued over the years 1985 through 1999 inclusive is 75.15%. The post-1999 average is 77.62%. Hence, the set of convertible bonds issued after 1-1-2000 are not more likely to receive an investment-grade rating than the set issued before 1-1-2000.

In addition, we document that the post-1999 decline in the proportion of convertible issues that are callable within three years of issuance occurred for both investment-grade and below investment-grade convertibles. For the set of below investment-grade convertibles, 77.45% of pre-2000 issues are callable within three years (91.27% contain call provisions) and this proportion declines to 26.08% (66.94%) after 1-1-2000. For investment-grade convertibles, 55.41% (83.78%) of pre-2000 issues are callable within three years and the proportion declines to 34.57% (78.72%) after 1-1-2000. For unrated convertibles, 76.27% (82.78%) of pre-2000 issues are callable within three years and the proportion declines to 30.47% (59.93%) after 1-1-2000. The incorporation of call provisions in convertible issues thus declined irrespective of the convertible's rating.

5. Logit analysis of call provisions in convertible bond issues

The reduction in the popularity of call provisions in the design of convertible bonds allows us to examine the determinants of whether a particular issue is callable. This was not possible when call provisions were the effective default. In this section, we report evidence that not only are the size of the convertible arbitrage industry and the fraction of an issue purchased

by convertible arbitrageurs significant determinants of whether a convertible issue is callable, but proxies for information asymmetries, sequential financing, and potential hold-up problems also help explain whether a convertible is callable.

The dependent variable in our analysis is a dummy equal to one if the issue is callable within the first three years of its life. This measure of callability is of most relevance for hedge funds, as the large majority of convertible arbitrage hedge funds (93%) have closed their position within three years (Van Marle and Verwijmeren, 2016). The independent variables are a measure of the size of the convertible arbitrage industry, whether the convertible bond was a Rule 144A private placement, and a set of variables related to traditional rationales for including call provisions in convertible and/or straight debt issues. Table I reports descriptive statistics for the variables in our analysis.

5.1. Variables related to convertible arbitrage

We use the Live and Graveyard databases of Lipper TASS and HFR to calculate the size of the convertible arbitrage hedge fund industry measured as the aggregate end-of-year assets under management of all hedge funds classified by Lipper TASS and HFR as convertible arbitrageurs.[12] Figure 4 shows our measure for the aggregate size of the convertible arbitrage industry over time. Since 2000, the aggregate size of the convertible arbitrage industry exceeds 20 billion dollars.[13]

[12] We also classify a hedge fund in these databases as a convertible arbitrageur when the self-reported description of the hedge fund's strategy makes it clear that convertible arbitrage is an important part of the fund's strategy. We examine end-of-year assets under management because a substantial number of hedge funds do not report their assets under management on a monthly or quarterly basis. We avoid double-counting when calculating the aggregate end-of-year assets under management for hedge funds in Lipper TASS and HFR.

[13] The aggregate size of the convertible arbitrage industry that we report exceeds the size reported by Choi, Getmansky and Tookes (2009). An important reason for this difference is that we also include

[please insert Table I and Figure 4 here]

Table I reports that 48% of our sample of convertibles are privately placed in the 144A market. Securities issued under Rule 144A do not require registration with the SEC but can be traded without restriction in the secondary market among qualified institutional buyers.[14] The private placement market is interesting since potential buyers can influence security design through direct negotiation with the would-be issuer. Brown et al. (2012) note that hedge funds are especially active in the 144A market (see also Berkman, McKenzie and Verwijmeren, 2016). If the preferences of hedge funds are an important determinant of the design of convertible bonds today, then we predict that 144A issues have a lower likelihood of being callable within three years of issuance.

5.2. Variables unrelated to convertible arbitrage

Call provisions in the Stein (1992) model of convertible bond issuance and the Barnea, Haugen and Senbet (1980) and Robbins and Schatzberg (1986) models of straight debt issuance arise because of asymmetric information between managers and investors. We use two variables to capture the level of information asymmetry. First, we include the size of the issuer as measured by total sales at the year-end before the issue following Frank and Goyal (2003) and Bharath, Pasquariello and Wu (2009), who argue that information asymmetries will be largest for small firms. The mean (median) sales by the issuers of our convertibles in the year prior to issue are $2426 ($560) million.

Our second proxy for the level of information asymmetry is whether the issue is shelf registered. Shelf registration allows a firm to issue securities to the public without a separate

convertible arbitrage hedge funds that report in HFR. A comparison of Figure 1 and Figure 4 shows that the overall pattern is similar across both studies.

[14] Qualified institutional buyers have over $100 million in assets under management.

prospectus for each issue and can be used by well-known seasoned issuers (WKSIs), defined by Securities Act Rule 405 as companies that have filed all annual and quarterly reports in a timely manner and that have a market capitalization of at least $700 million, or have issued at least $1 billion in registered debt offerings over the past three years. Firms that are able to issue securities via shelf registration are expected to be firms with relatively low informational asymmetry. Table I reports that 17.31% of our sample are issued via a shelf registration.

Mayers (1998) argues that financing with callable convertibles can be optimal for firms requiring sequential rounds of financing. We use a firm's capex in the financial year before the issue scaled by total assets at the end of that prior year as a proxy for a firm's likely continuing financing requirements. The mean (median) prior year capex by the issuers of our convertibles is seven percent (four percent) of year-end total assets.

Interestingly, shelf registration, which we interpret as a proxy for information asymmetry, facilitates multiple financing rounds. As such, the sequential financing rationale would predict that shelf registrations are more likely to contain call provisions, whereas the information asymmetry rationale predicts that shelf registrations are less likely to contain call provisions.

Smith and Warner (1979) argue that call provisions can facilitate the removal of restrictive covenants, for example in the case of a merger. We measure the perceived relevance of future takeovers at the time the security is designed by examining whether the security contains a poison put provision. Poison puts are relevant when there are potential takeovers since they allow the holders of a bond to sell it back to the issuer at a pre-specified price in the event of a change of control (Nanda and Yun, 1996). If the hold-up problem is important, then we predict that issues with poison put provisions, which reflect a heightened probability of a

future takeover, will also include call provisions.[15] Poison puts are contained in 44.7% of our sample.

Our analysis also includes the 10-year Treasury rate in the month of issue, whether the issue is investment-grade or below investment-grade, the number of years to maturity at the time of issue, and the offering proceeds. The majority of the convertibles in our sample are unrated, 10.57% have an investment-grade rating, and 30.74% are below investment-grade. The median number of years to maturity is nine and the median offering proceeds are $150 million.

5.3. Univariate analysis of the determinants of convertible call provisions

Table II contains an analysis of the relation between call provisions and the individual elements of the set of potential explanatory variables. The dependent variable in our analysis is a dummy equal to one if the issue is callable within the first three years of its life and equal to zero if the issue is either call-protected for more than three years or simply does not contain a call provision. Convertibles are significantly less likely to be callable within three years of issuance when the convertible arbitrage industry is larger and when the issue is privately placed. In addition, convertibles are less likely to be callable within three years when interest rates are lower, if the issuer is either larger or investment-grade, or if the issue is either larger or longer-lived. Both poison put provisions and capital expenditures are positively related to the likelihood that the convertible is callable within three years.

[please insert Table II here]

[15] Ex post, upon the actual change of control, only poison put provisions (to protect convertible bondholders) or call provisions (to protect equityholders by reducing holdup problems) may be required. Ex ante, when the specifics of a potential merger are unknown, a heightened probability of a takeover is likely to increase the probability of both call and poison put provisions being included in a convertible security's design.

5.4. Logit analysis of the frequency of call provisions and the size of the convertible arbitrage industry

We use a logit model to examine the relation between the likelihood that a convertible is callable within three years of issuance and the size of the convertible arbitrage industry (measured at the year-end prior to the issue), whether the convertible was privately placed, a set of variables related to traditional rationales for including call provisions in debt issues, and industry fixed effects. Industry fixed effects are based on the Fama-French 12 industry classification.[16] Table III reports the results of the logit analysis with standard errors clustered at the issuer level.

[please insert Table III here]

The size of the convertible arbitrage hedge fund industry allows us to isolate an important and observable measure of capital supply in the convertible market. We find strong support for the influence of hedge funds, and for the importance of the 144A dummy. Model 1 shows that the size of the convertible arbitrage hedge fund industry is negatively related to the probability that a convertible can be called in the first three years. Privately-placed convertibles are also significantly less likely to be callable within three years. Both these results are in line with a strong influence of the supply side of capital on convertible security design.

In Model 1, a higher Treasury rate at the time of issue increases the probability that a convertible will be callable. An issue's rating does not have a significant effect on its callability. The maturity of the convertible is an important control variable. Convertibles with longer maturities tend to have longer call protection periods and are thus less likely to be callable within three years of issuance.

[16] Our results are robust to using two-digit SIC codes.

Model 2 of Table III includes additional issue and issuer variables: whether the issue was shelf registered; whether the issue contained a poison put provision; the natural log of the issuer's total sales; and the issuer's capital expenditures as a percent of its total assets. These additional variables require information from Compustat and hence the sample size is reduced from 2479 to 1853. We find that convertibles with a poison put provision are significantly more likely to be callable. Since a poison put provision is indicative of an increased perceived likelihood of a future change in control, we interpret this as evidence in favor of the hold-up rationale. We also find that smaller firms are more likely to issue callable convertibles. This is consistent with the backdoor equity rationale, which argues that settings with high information asymmetries are more likely to involve the issue of callable convertibles. Additionally, in line with the sequential financing rationale, firms with higher investment needs are more likely to issue callable convertibles.

The shelf registration variable has a negative coefficient, but is not statistically significant. Since firms that are able to issue securities via shelf registration are expected to have relatively low informational asymmetry, the negative coefficient is in line with the backdoor equity rationale. The strength of the relation may be reduced by the sequential financing rationale since shelf registration facilitates multiple financing rounds in which call provisions can play an important role (Mayers, 1998).

To further examine the importance of interest rates, we examine the link between callability and the fixed versus floating-rate nature of the coupon on a convertible issue. If the firm's managers predict a higher likelihood of a decline in interest rates than is predicted by buyers of the firm's debt and this divergence of opinions is larger when interest rates are higher, then call provisions in fixed-rate convertible bond issues will be more common when interest rates are high. Such a disparity of views about interest rate variability will not though lead to the inclusion of call provisions in floating-rate issues.

Model 3 of Table III extends Model 2 of Table III by including a floating-rate dummy variable and a cross-product of the floating-rate dummy and the 10-year Treasury-rate variable. Since the refinancing rationale for call provisions is moot when the debt pays a floating rate, we expect that the coefficient on the floating rate dummy should be negative. The estimated coefficient is indeed negative, but the effect is not statistically significant. Further, if the estimated coefficient on the 10-year Treasury rate variable is positive because the level of interest rates serves as a proxy for the importance of a disparity in issuer and purchaser predictions, then the sign of the coefficient on the cross-product term should be opposite to that on the 10-year Treasury rate variable. The observed negative coefficient of the cross-product is in line with this prediction, but this effect is also not statistically significant. Overall, the results in Model 3 are not fully in line with interest rates being an important determinant of the likelihood that a convertible will be callable within three years of issuance.

Table IV reports the marginal effects of the explanatory variables in the logit analysis. Consider the explanatory variable of primary interest, namely the size of the convertible arbitrage industry. Industry size is measured in units of 100 billion USD. The standard deviation of the size of the convertible arbitrage industry is 33.2 billion USD. A one standard deviation increase in the size of the convertible arbitrage industry from its mean value, holding constant all other variables at their respective mean values, reduces the likelihood of a convertible being callable within three years of issuance by the product of one standard deviation and the marginal effect; i.e., by approximately $0.332 \times 0.768 = 25.50\%$. The marginal effect associated with a dummy variable is the change in the likelihood that a convertible is callable if the dummy is equal to one rather than zero when all the other independent variables are equal to their means. Privately-placed convertibles are 10.7% less likely to be callable within three years of issuance than are publicly-placed convertibles.

[please insert Table IV here]

5.5. Robustness

Rather than a measure of whether a convertible is protected from a call within the first three years of its life, we can instead use as the dependent variable a simple measure of whether or not a convertible contains a call provision. Models 1 and 2 of Table V show that a larger convertible arbitrage industry is related to a reduced likelihood of a call provision. Further, as an alternate dependent variable we can examine the number of years for which a convertible is call-protected. This examination reduces the dependence on any particular cutoff such as the three years examined in earlier sections. Models 3 and 4 of Table V report the results of a poisson regression where the dependent variable is the number of years for which the convertible is protected against a call. When the convertible is non-callable, the dependent variable is simply the bond's maturity. We find that the larger the convertible arbitrage hedge fund industry, the longer the length of call protection. The call protection period is also longer for privately-placed convertibles.

[please insert Table V here]

In Models 5 and 6, the dependent variable is the years of call protection divided by the maturity of the bond. Our results for these models suggest that the relative call protection period is longer when the size of the convertible arbitrage industry is larger, all else equal. Privately-placed convertible bonds also have call protection periods that are a larger fraction of the time to maturity.

As shown in Figures 1 and 4, convertible arbitrage hedge funds became a non-trivial supplier of convertible bond capital only after 1994; i.e., after a time when call provisions were the default option in convertible security design. We adjust the Table III logit analysis of convertible bond callability by performing a separate analysis of the set of bonds issued after

1994.[17] Models 7 and 8 of Table V show that the effect of the convertible arbitrage industry is highly significant in the post-1994 period. The significance of the Rule 144A private placement dummy in this period is consistent with issuer and purchaser negotiations leading to a lower likelihood of a bond being callable within three years of issuance.

Endogeneity of the explanatory variables can have an effect on the coefficient estimates in our tables. Most notably, a firm may jointly decide on whether its convertible will be callable and the number of years to its maturity, and whether it contains a poison put, is privately placed, and/or is shelf registered. We follow Korkeamaki and Moore (2004) and Tewari, Byrd and Ramanlal (2015) and conduct endogeneity tests of the explanatory variables as described in Wooldridge (2002, Section 15.7.2). In the first step, we regress each of the potentially endogenous variables on the exogenous variables in our model and an instrument. The exogenous variables are the preceding year's size of the convertible arbitrage industry, the Treasury rate, the issuer's rating, the offering proceeds, and the preceding year's total sales and capital expenditures. We use asset maturity as the instrument for the years to maturity (Stohs and Mauer, 1996). We use the firm's market leverage as the instrument for poison put provisions (Nanda and Yun, 1996). We use asset tangibility as the instrument for privately placing the security and for shelf registration (Huang and Ramirez, 2010). The residuals from the first-step regression are included as an additional explanatory variable in the second step, in which we estimate the probability that the convertible is callable within three years of issuance. In this second step, the test statistic for the coefficient of the residual provides a test of the null hypothesis of exogeneity of the instrumented variable. We conclude that we cannot reject this null hypothesis for any of the years to maturity, poison put provision, private

[17] A second rationale for separately examining this subperiod is that Booth, Gounopoulos and Skinner (2013) report a potential selection bias in Mergent FISD data prior to 1995. Mergent FISD created its pre-1995 data by backdating. Hence, bonds issued after 1985 that ceased to exist before 1995 will not be included in the FISD dataset.

placement, and shelf registration variables, with test statistics of –0.08, 0.98, 0.17, and 0.27, respectively. As such, we do not find evidence that endogeneity is a significant concern.

5.6. Logit analysis of hedge fund involvement in specific issues and the issue's callability

Brown et al. (2012) collect data on hedge fund involvement in privately-placed convertible offerings for the period 2000 through 2008 by downloading registration statements from SEC Edgar. For privately-placed issues, these registration statements contain the names of the buyers. This allows an analysis of the fraction of an issue placed with hedge funds. We follow their procedure to obtain information on hedge fund involvement in privately-placed convertible issues, but with two extensions. First, we extend the sample period to 1994 – 2013.[18] Second, we use PlacementTracker as an additional source of hedge fund involvement in security offerings. On average, hedge funds buy 53% of the 853 privately-placed convertibles for which we are able to obtain the names of the buyers.

[please insert Table VI here]

Table VI shows the relation between hedge fund involvement and the probability that a convertible is callable within the first three years of its life. We predict that issues with relatively high hedge fund involvement are less likely to be callable within three years of issuance. Consistent with this prediction, we find a negative relation between the percentage of an issue purchased by hedge funds and the likelihood the issue is callable within three years.

Using hedge fund involvement in a particular issue rather than the size of the convertible arbitrage industry as the explanatory variable has the disadvantage of a smaller sample size since the measure can only be determined for privately-placed convertibles. However, the advantages of using hedge fund involvement in particular issues are that it is the cleaner measure of the explanatory variable and that the cross-sectional variation in hedge fund

[18] 1994 is the first year for which we are able to find a registration statement with buyer information.

involvement allows us to control for year fixed effects in our regression specification. Model 3 and 4 of Table VI show that including year fixed effects does not change our conclusion that issues with relatively high hedge fund involvement are less likely to be callable within three years.

6. Implications for the backdoor equity and sequential financing rationales

A reduction in the popularity of convertible call provisions might seem to suggest that the backdoor equity and sequential financing models for convertible issuance have become less important. In the backdoor equity rationale of Stein (1992), call provisions are important for convertible issuance since they allow a firm to force conversion into equity once the share price has risen. In Mayers (1998), call provisions are important for sequential financing purposes as they allow firms to reduce their leverage by forcing conversion if the sequential investment option proves valuable. However, one should note that Stein's and Mayers' theories are applicable in a world without call provisions provided the convertibles' maturities are appropriately short.[19] In both rationales, short-term non-callable convertible debt can be a substitute for long-term callable convertible debt. We thus examine how the maturities of convertible bonds have varied through time. In our sample, maturities upon issuance were long before 1990, with a median time to maturity of 25 years. Call provisions play an important role in both the Stein (1992) and Mayers (1998) rationales for including call provisions in long-term convertibles. Since the early 1990s, however, maturities upon issuance for convertible bonds have decreased substantially, to eight years for the typical convertible issued in the 1990s

[19] In a world with long-term convertibles, the backdoor equity rationale for issuing a convertible could hold without call provisions if firms can induce voluntary conversion by paying sufficiently high dividends. However, Grundy and Verwijmeren (2016) show that voluntary conversion is never optimal for dividend-protected convertibles and document that dividend protection has become the default for convertible bonds.

and seven years for the typical convertible issued in the 21st century. In fact by 1995, when hedge funds started to implement convertible arbitrage, the typical maturity upon issuance had already fallen to seven years. Hence, the recent diminution in the frequency of call provisions does not imply that the Stein (1992) and Mayers (1998) rationales for issuing convertibles are no longer important.

7. Conclusions

Consistent with the prediction of Baker (2009), we confirm the importance of the preferences of the supply side of capital for the design of financing instruments. Convertible arbitrage hedge funds prefer to invest in convertibles that are not callable in the years immediately after issuance. We document that the popularity of convertible call provisions has declined substantially since the rise of convertible arbitrage. The world has changed from one in which almost all convertibles are callable to one in which the majority of convertible issues do not contain call provisions. We conclude that the change in convertible bond security design reflects the increased size of the convertible arbitrage industry and the increasing fraction of new convertibles issues that are purchased by hedge funds. A further observation consistent with the importance of a factor applicable to the convertible market but not the market for straight debt issues, a factor such as convertible arbitrage, as an explanation for the declining frequency of call provisions in convertible securities is that there has been no contemporaneous decline in the popularity of call provisions in straight debt issues.

Our findings relate to rationales for issuing convertibles. The models in Green (1984), Brennan and Kraus (1987), Brennan and Schwartz (1988), Constantinides and Grundy (1989), and Brown et al. (2012) do not rely on call provisions being included, while the rationales of Stein (1992) and Mayers (1998) assign importance to call provisions. We note that the shorter

maturities of more recently issued convertible bonds could substitute for call provisions in the rationales of Stein (1992) and Mayers (1998).

The diminution in the frequency of call provisions in convertible debt issues but not their complete elimination allows for sufficient variation in convertible callability to analyze the importance of a potential set of determinants of the inclusion of call provisions in convertible securities. This has not previously been possible since call provisions were the default. We find evidence that in addition to the preferences of convertible arbitrageurs, other significant determinants of the inclusion of call provisions are the potential for reducing problems associated with information asymmetries, sequential financing, and incentives to reduce a hold-up problem. Our study thus provides evidence of the interplay of supplier and issuer preferences in the design of securities.

References

Baker, M., 2009, Capital market driven corporate finance, Annual Review of Financial Economics 1, 1-41.

Baker, M. and J. Wurgler, 2004, A catering theory of dividends, Journal of Finance 59, 1125-1165.

Baker, M., R. Greenwood, and J. Wurgler, 2009, Catering through nominal share prices, Journal of Finance 64, 2559-2590.

Banko, J.C. and L. Zhou, 2010, Callable bonds revisited, Financial Management 39, 613-641.

Barnea, A., R.A. Haugen, and L.W. Senbet, 1980, A rationale for debt maturity structure and call provisions in the agency theoretic framework, Journal of Finance 35, 1223-1234.

Berkman, H., M. McKenzie, and P. Verwijmeren, 2016, Hole in the wall: Informed short selling ahead of private placements, Review of Finance, forthcoming.

Bharath, S.T., P. Pasquariello, and G. Wu, 2009, Does asymmetric information drive capital structure decisions? Review of Financial Studies 22, 3211-3243.

Bodie, Z. and R.A. Taggart, 1978, Future investment opportunities and the value of the call provision on a bond, Journal of Finance 33, 1178-1200.

Booth, L.D., D. Gounopoulos, and F.S. Skinner, 2013, The choice among non-callable and callable bonds, Working paper.

Bowlin, O.J., 1966, The refunding decision: Another special case in capital budgeting, Journal of Finance 21, 55-68.

Brennan, M. and A. Kraus, 1987, Efficient financing under asymmetric information, Journal of Finance 42, 1225-1243.

Brennan, M. and E. Schwartz, 1988, The case for convertibles, Journal of Applied Corporate Finance, 55-64.

Brown, S.J., B.D. Grundy, C.M. Lewis, and P. Verwijmeren, 2012, Convertibles and hedge funds as distributors of equity exposure, Review of Financial Studies 25, 3077-3112.

Calamos, N., 2003, Convertible Arbitrage: Insights and Techniques for Successful Hedging. John Wiley & Sons, New York.

Choi, D., M. Getmansky, and H. Tookes, 2009, Convertible bond arbitrage, liquidity externalities and stock prices, Journal of Financial Economics 91, 227-251.

Choi, D., M. Getmansky, B. Henderson, and H. Tookes, 2010, Convertible bond arbitrageurs as suppliers of capital, Review of Financial Studies 23, 2492-2522.

Constantinides, G.M., and B.D. Grundy, 1989, Optimal investment with stock repurchase and financing as signals, Review of Financial Studies 2, 445-465.

Crabbe, L., and J. Helvege, 1994, Alternative tests of agency theories of callable corporate bonds, Financial Management 23, 3-20.

De Jong, A., E. Duca, and M. Dutordoir, 2013, Do convertible bond issuers cater to investor demand? Financial Management 42, 41-78.

De Jong, A., Dutordoir, M., and P. Verwijmeren, 2011, Why do convertible issuers simultaneously repurchase stock? An arbitrage-based explanation. Journal of Financial Economics 100, 113-129.

Duca, E., Dutordoir, M., Veld, C., and P. Verwijmeren, 2012, Why are convertible bond announcements associated with increasingly negative issuer stock returns? An arbitrage-based explanation, Journal of Banking and Finance 36, 2884-2899.

Duffie, D. and R. Rahi, 1995, Financial market innovation and security design: An introduction, Journal of Economic Theory 65, 1-42.

Frank, M.Z. and V.K. Goyal, 2003, Testing the pecking order theory of capital structure, Journal of Financial Economics 67, 217-248.

Green, R., 1984, Investment incentives, debt, and warrants, Journal of Financial Economics 13, 115–136.

Grundy, B.D., and P. Verwijmeren, 2016, Disappearing call delay and dividend-protected convertible bonds, Journal of Finance 71, 195-224.

Huang, R. and G.G. Ramirez, 2010, Speed of issuance, lender specialization, and the rise of the 144A debt market, Financial Management 39, 643-673.

Ivashina, V., and Z. Sun, 2011, Institutional stock trading on loan market information, Journal of Financial Economics 100, 284-303.

Kish, R.J., and M. Livingston, 1992, Determinants of the call option on corporate bonds, Journal of Banking and Finance 16, 687-703.

Korkeamaki, T.P., and W.T. Moore, 2004, Convertible bond design and capital investment: The role of call provisions, Journal of Finance 59, 391-405.

Mayers, D., 1998, Why firms issue convertible bonds: The matching of financial and real investment options, Journal of Financial Economics 47, 83-102.

Miller, M.H., 1986, Financial innovation: The last twenty years and the next, Journal of Financial and Quantitative Analysis 21, 459-471.

Mitchell, M., L.H. Pedersen, and T. Pulvino, 2007, Slow moving capital, American Economic Review 97, 215-220.

Myers, S.C., 2001, Capital structure, Journal of Economic Perspectives 15, 81-102.

Nanda, V., and Y. Yun, 1996, Financial innovation and investor wealth: A study of the poison put in convertible bonds, Journal of Corporate Finance 3, 1-22.

Pye, G., 1966, The value of the call option on a bond, Journal of Political Economy 74, 200-205.

Robbins, H.R., and J.D. Schatzberg, 1986, Callable bonds: A risk-reducing signaling mechanism, Journal of Finance 41, 935-949.

Sarkar, S., 2001, Probability of call and likelihood of the call feature in a corporate bond, Journal of Banking and Finance 25, 505-533.

Smith, C.W., and J.B. Warner, 1979, On financial contracting: An analysis of bond covenants, Journal of Financial Economics 7, 117-161.

Stein, J.C., 1992, Convertible bonds as backdoor equity financing, Journal of Financial Economics 32, 3-21.

Stohs, M.H., and D.C. Mauer, 1996, The determinants of corporate debt maturity structure, Journal of Business 69, 279-312.

Tewari, M., A. Byrd, and P. Ramanlal, 2015, Callable bonds, reinvestment risk, and credit rating improvements: Role of the call premium, Journal of Financial Economics 115, 349-360.

Van Marle, M., and P. Verwijmeren, 2016, The long and the short of convertible arbitrage, working paper.

Woodson, H., 2002, Global Convertible Investing: The Gabelli Way. John Wiley & Sons, New York.

Wooldridge, J.M., 2002, Econometric Analysis of Cross Section and Panel Data. MIT Press, Cambridge, MA.

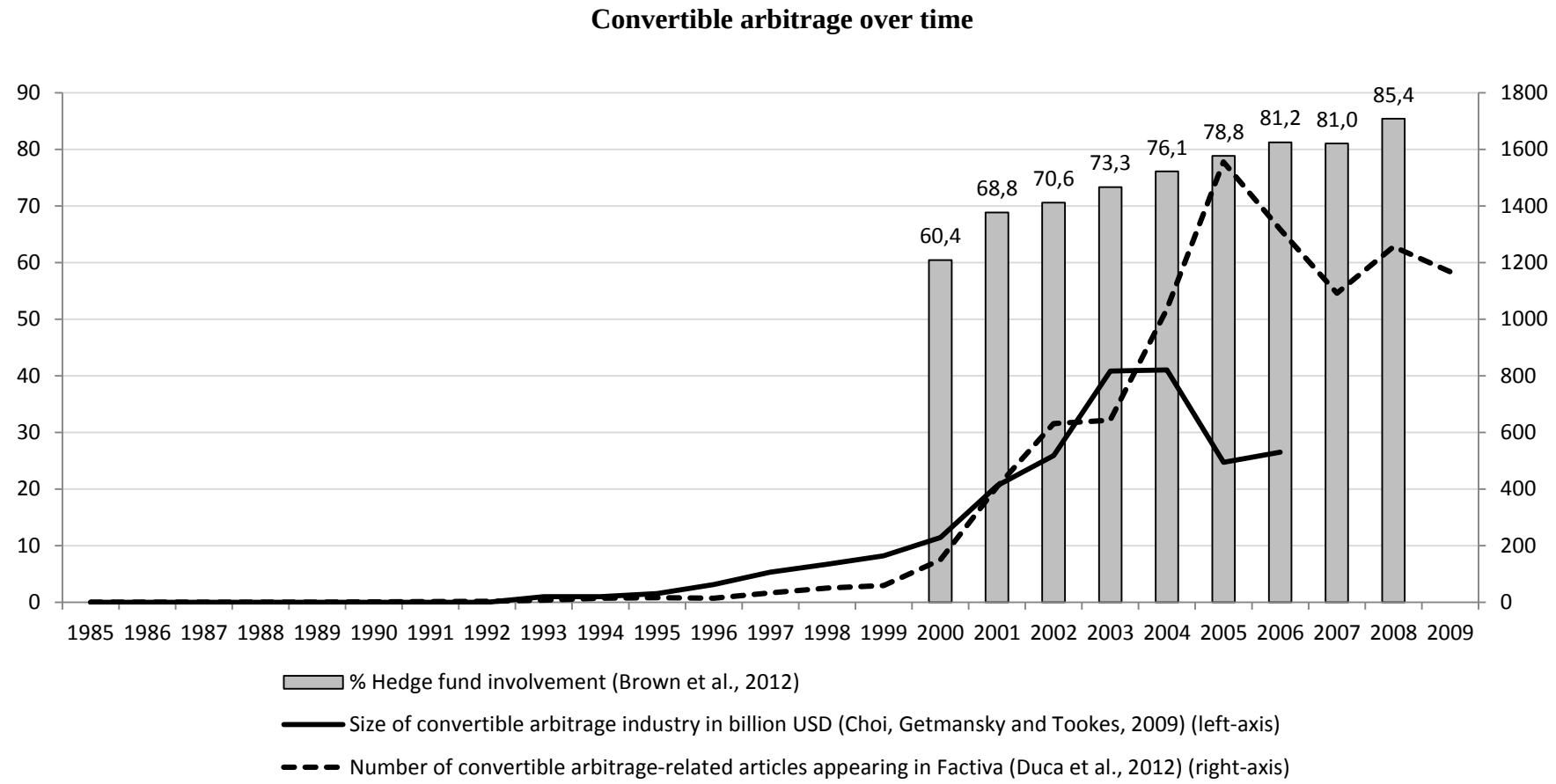

Figure 1.
This figure depicts measures of convertible fund activity through time: the annual percentage of privately-placed convertible bonds that are purchased by hedge funds, from Brown et al. (2012), reported above the columns; the end-of-year total assets of convertible arbitrage hedge funds in billions of USD, from Choi, Getmansky and Tookes (2009), on the left axis; and the annual number of press articles in Factiva about convertible arbitrage, from Duca et al. (2012), on the right axis.

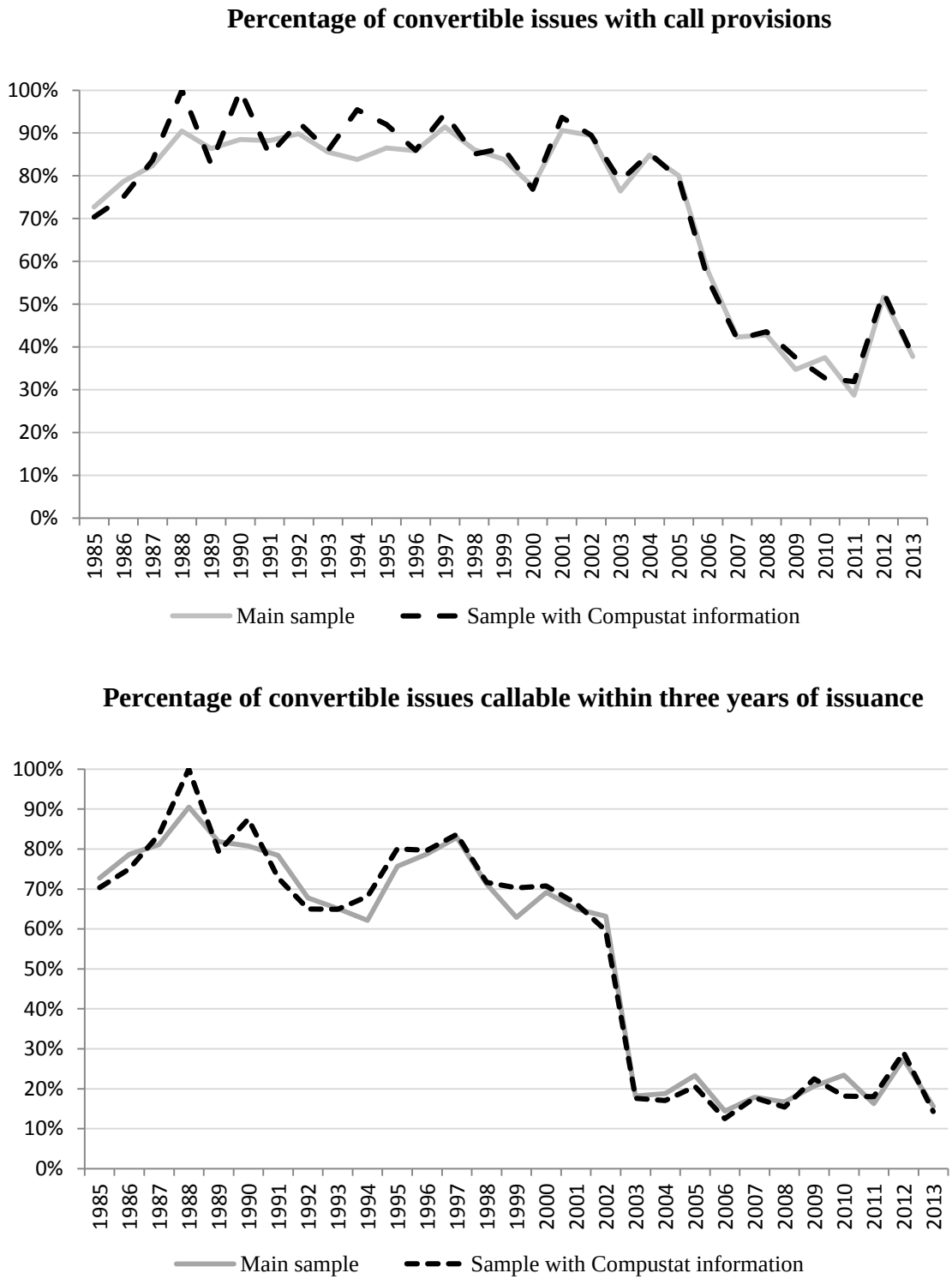

Figure 2.

This figure reports the annual fraction of convertibles with call provisions (top panel), and the annual fraction of convertibles that can be called within three years of issuance (bottom panel). Our main sample consists of convertible bonds issued by U.S. industrial firms. Our restricted sample imposes the requirement that the issuer reports information in Compustat in the year before the issue.

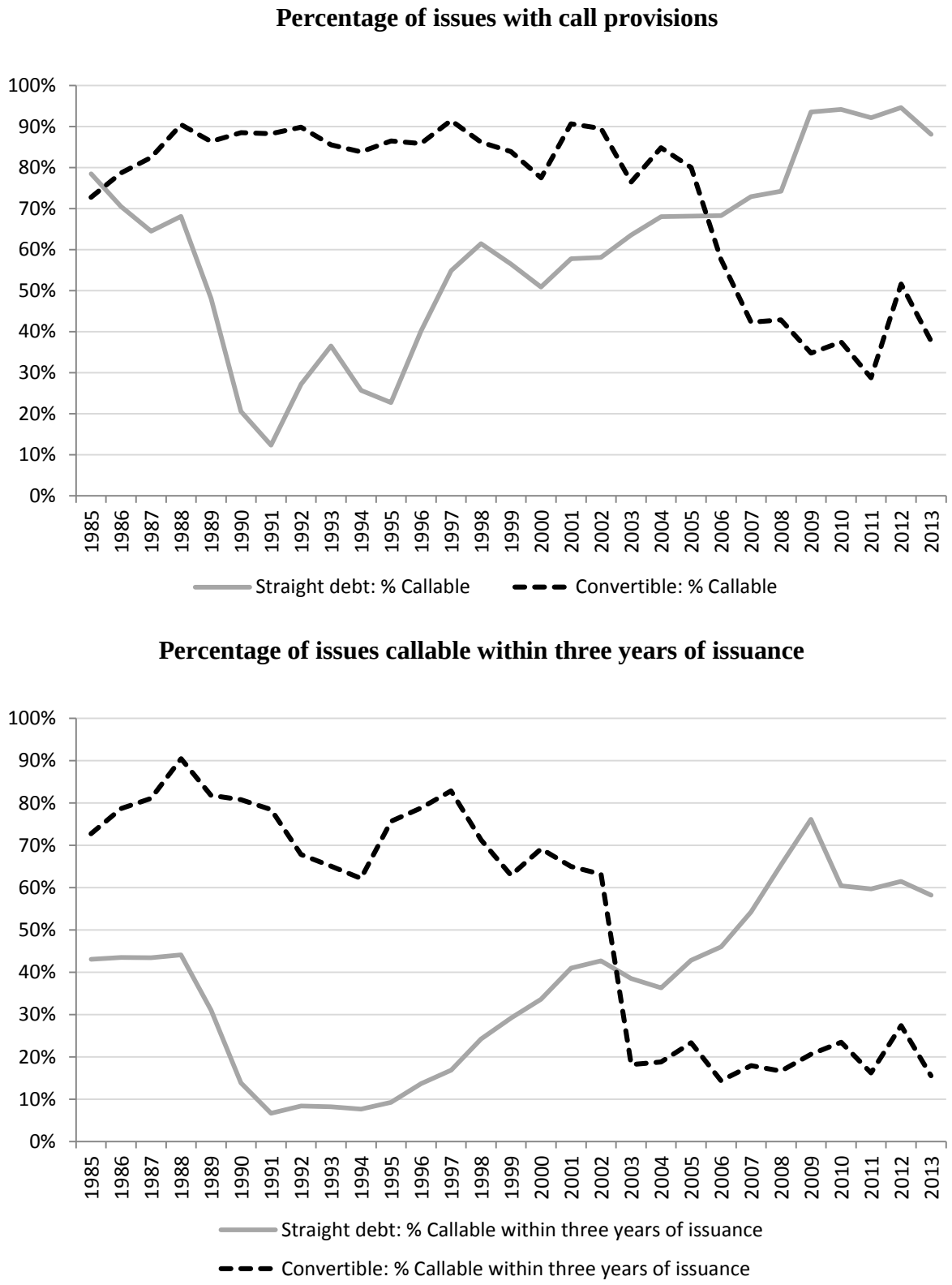

Figure 3.

This figure reports the fraction of straight debt and convertible issues with call provisions (top panel) and the fraction of straight debt and convertible issues that are callable within three years of issuance (bottom panel).

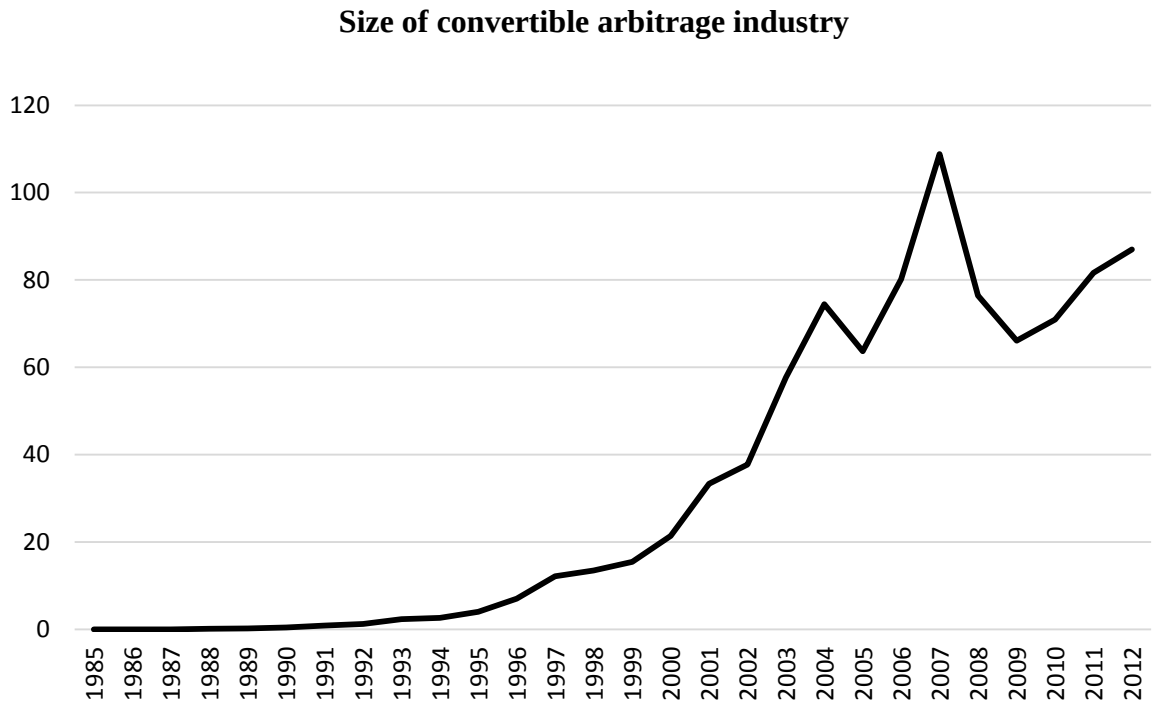

Figure 4.

This figure depicts the aggregate end-of-year total assets of convertible arbitrage hedge funds that report in Lipper TASS and/or HFR, in billions of USD.

Table I. Descriptive statistics

This table presents descriptive statistics for convertible issues during the years 1985 to 2013. Issue characteristics are based on information from Mergent FISD. Callable within three years of issuance is a dummy equal to one if the convertible contains a call provision and is not call-protected for more than three years, and zero otherwise. Convertible arbitrage industry is the aggregate AUM in billions of U.S. dollars of convertible arbitrage hedge funds at the year-end before the convertible issue, from Lipper TASS and HFR. 144A private placement is a dummy equal to one if the convertible is privately placed under Rule 144A, and zero otherwise. The 10 year Treasury rate is the monthly 10 year Treasury rate at the time of issue, reported in percent. Below investment-grade rating is a dummy equal to one for below investment-grade convertibles and zero for investment-grade and unrated issues. Investment-grade rating is a dummy equal to one for investment-grade convertibles and zero for below investment-grade and unrated issues. Years to maturity are the number of years between issuance and maturity. Offering proceeds are the gross proceeds in millions of dollars. Shelf registration is a dummy equal to one if the convertible is shelf registered, and zero otherwise. Poison put provision is a dummy equal to one if the convertible contains a poison put provision, and zero otherwise. A poison put provision allows the holder of the convertible to sell the security back to the firm in the event of a change in control. Total sales are the issuer's reported sales in millions in the financial year preceding the issue as reported in Compustat. Capex as a percent of assets is the issuer's capital expenditures during the financial year preceding the issue scaled by total assets at the end of that year as reported in Compustat.

	N	Mean	Median	St.dev.
Callable within three years of issuance	2479	46.39%		
Convertible arbitrage industry	2479	37.22	33.32	32.74
144A Private placement	2479	47.96%		
10 year Treasury rate	2479	5.24	4.99	1.79
Below investment-grade rating	2479	30.74%		
Investment-grade rating	2479	10.57%		
Years to maturity	2479	12.33	9.00	8.05
Offering proceeds	2479	278	150	418
Shelf registration	2479	17.31%		
Poison put provision	2479	44.70%		
Total sales	1895	2426	560	7873
Capex as a percent of assets	1875	0.07	0.04	0.09

Table II. Univariate analysis

This table presents a univariate analysis of the distinction between convertibles that are callable with three years of issuance and convertibles that are not callable in the first three years of their lives. See Table I for a description of the variables. For dummy variables we calculate whether the difference between two proportions is significant using a two-proportion *z*-test. For the other variables we calculate difference of means *t*-statistics with a t-test that does not assume equal variances. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Callable within three years of issuance		Difference of means statistic
	No	Yes	
Convertible arbitrage industry	52.12	19.99	28.23***
144A Private placement	61.93%	31.83%	14.96***
10-year Treasury rate	4.50	6.08	–24.14***
Below investment-grade rating	31.75%	29.57%	1.18
Investment-grade rating	11.74%	9.22%	2.04**
Years to maturity	13.08	11.45	5.07***
Offering proceeds	327	221	6.53***
Shelf registration	18.43%	16.00%	1.60
Poison put provision	37.02%	53.57%	–8.26***
Total sales	3026	1637	4.12***
Capex as a percent of assets	0.06	0.09	–6.39***

Table III. Logit analysis of the determinants of call provisions

The Table reports a logit analysis of convertible bond issues during the period 1985 – 2013. The dependent variable is a dummy equal to one if the convertible is callable within three years of issuance, and zero otherwise. See Table I for a description of many of the independent variables. In the regression analyses, the convertible arbitrage industry variable is measured in 100 billion of U.S. dollars. Log of years to maturity is the logarithm of the number of years between issuance and maturity. Log of offering proceeds is the logarithm of the gross proceeds in thousands of dollars. Log of total sales is the logarithm of the issuer's total sales in millions of dollars in the financial year preceding the issue as reported in Compustat. The floating rate measure is a dummy equal to one if the convertible pays a floating coupon rate, and zero otherwise. Heteroskedasticity-consistent standard errors clustered at the issuer level are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level.

	Callable within three years of issuance		
	(1)	(2)	(3)
Convertible arbitrage industry	–2.942***	–3.201***	–3.275***
	(0.285)	(0.339)	(0.345)
144A Private placement	–0.785***	–0.448***	–0.443**
	(0.101)	(0.173)	(0.174)
10-year Treasury rate	0.169***	0.139**	0.130*
	(0.054)	(0.061)	(0.066)
Below investment-grade rating	–0.119	–0.101	–0.128
	(0.118)	(0.138)	(0.140)
Investment-grade rating	–0.168	–0.234	–0.184
	(0.223)	(0.298)	(0.295)
Log of years to maturity	–0.741***	–0.677***	–0.616***
	(0.090)	(0.106)	(0.110)
Log of offering proceeds	–0.126*	–0.092	–0.053
	(0.067)	(0.089)	(0.093)
Shelf registration		–0.260	–0.241
		(0.195)	(0.195)
Poison put provision		0.628***	0.645***
		(0.163)	(0.164)
Log of total sales		–0.105**	–0.108***
		(0.041)	(0.041)
Capex as a percent of assets		1.532**	1.505**
		(0.756)	(0.758)
Floating rate			–0.332
			(0.689)
10-year Treasury rate × floating rate			–0.016
			(0.113)
Industry fixed effects	Yes	Yes	Yes
N	2479	1853	1853
McFadden Pseudo R^2	0.25	0.28	0.28

Table IV. Marginal effects in the logit analysis of the determinants of call provisions
The Table reports the marginal effects in the logit analysis of the likelihood that a convertible bond issued during the period 1985 – 2013 will be callable within three years of issuance as considered in Model 2 of Table III. See Table I and III for a description of the independent variables. The standard deviations are calculated for the 1853 observations that are included in the regression analysis.

	Callable within three years of issuance		
	Marginal effects	Standard deviation	Product
Convertible arbitrage industry	–0.768	0.332	–25.50%
144A Private placement	–0.107		
10-year Treasury rate	0.033	1.757	5.80%
Below investment-grade rating	–0.024		
Investment-grade rating	–0.055		
Log of years to maturity	–0.162	0.671	10.87%
Log of offering proceeds	–0.022	1.061	2.33%
Shelf registration	–0.061		
Poison put provision	0.150		
Log of total sales	–0.025	1.986	–4.97%
Capex as a percent of total assets	0.368	0.092	3.39%
Industry fixed effects	Yes		
N	1853		

Table V. Robustness tests

Model 1 and 2 of this table report a logit analysis of convertible bond issues in which the dependent variable is a dummy equal to one if the convertible is callable, and zero otherwise. Model 3 and 4 of this table report the results of a poisson model of the length of the call protection period in years for convertibles issued. Model 5 and 6 report an ordinary-least-squares estimation of the ratio of a convertible's call protection period over its years to maturity. Model 1-6 are over the period 1985 through 2013. Model 7 and 8 re-estimate the Table III logit specification for convertibles issued after 1994, in which the dependent variable is a dummy equal to one if the convertible is callable within three years of issuance, and zero otherwise. See Table I and III for a description of the independent variables. Heteroskedasticity-consistent standard errors clustered at the issuer level are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Callable		Convertible call protection period		Call protection as a fraction of maturity		Callable within three years of issuance (post-1994)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Convertible arbitrage industry	–3.169***	–3.558***	0.543***	0.605***	0.345***	0.355***	–2.944***	–3.320***
	(0.298)	(0.345)	(0.087)	(0.090)	(0.033)	(0.037)	(0.319)	(0.382)
144A Private placement	–0.648***	–0.070	0.258***	0.116**	0.084***	0.040*	–0.801***	–0.686***
	(0.106)	(0.187)	(0.030)	(0.055)	(0.013)	(0.021)	(0.112)	(0.203)
10-year Treasury rate	–0.280***	–0.300***	–0.002	0.016	0.009	0.013*	0.289***	0.208**
	(0.064)	(0.073)	(0.024)	(0.025)	(0.006)	(0.007)	(0.078)	(0.088)
Below investment-grade rating	0.117	0.216	0.106**	0.086*	0.017	0.010	–0.039	–0.006
	(0.132)	(0.160)	(0.041)	(0.046)	(0.015)	(0.016)	(0.133)	(0.158)
Investment-grade rating	0.083	0.262	–0.021	–0.039	0.007	–0.011	0.279	0.268
	(0.205)	(0.257)	(0.063)	(0.075)	(0.021)	(0.025)	(0.240)	(0.310)
Log of years to maturity	1.660***	1.954***	0.324***	0.284***	–0.272***	–0.301***	–0.772***	–0.694***
	(0.107)	(0.131)	(0.028)	(0.028)	(0.010)	(0.011)	(0.104)	(0.118)
Log of offering proceeds	–0.074	–0.136	–0.010	–0.010	0.013	0.010	–0.343***	–0.292***
	(0.077)	(0.103)	(0.024)	(0.029)	(0.008)	(0.011)	(0.079)	(0.101)
Shelf registration		–0.035		0.110**		0.026		–0.266
		(0.199)		(0.047)		(0.021)		(0.216)
Poison put provision		1.109***		–0.299***		–0.100***		0.502**
		(0.164)		(0.050)		(0.020)		(0.205)

Log of total sales		–0.096**		0.019		0.013**		–0.097**
		(0.045)		(0.015)		(0.005)		(0.046)
Capex as a percent of assets		0.211		–0.266		–0.064		2.061**
		(0.869)		(0.382)		(0.093)		(0.878)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		Yes
N	2479	1853	2479	1853	2479	1853	1965	1514
McFadden Pseudo R^2	0.25	0.30	0.07	0.08			0.26	0.27
R^2					0.38	0.43		

Table VI. Hedge fund involvement

The Table reports the results of a logit model. Our sample consists of privately-placed convertible bond issues by industrial firms. The dependent variable is a dummy equal to one if the convertible is callable within three years of issuance, and zero otherwise. Hedge fund involvement is the percentage of the convertible issue purchased by hedge funds. See Table I and III for a description of the independent variables. Heteroskedasticity-consistent standard errors clustered at the issuer level are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Callable within three years of issuance			
	(1)	(2)	(3)	(4)
Hedge fund involvement	–1.711***	–1.801***	–1.271**	–1.332**
	(0.375)	(0.430)	(0.556)	(0.643)
10-year Treasury rate	0.821***	0.732***	0.559***	0.479**
	(0.136)	(0.152)	(0.209)	(0.234)
Below investment-grade rating	0.104	0.267	–0.196	–0.045
	(0.197)	(0.217)	(0.214)	(0.244)
Investment-grade rating	0.636*	0.648	–0.022	–0.105
	(0.376)	(0.404)	(0.404)	(0.469)
Log of years to maturity	–1.007***	–0.818***	–0.952***	–0.783***
	(0.169)	(0.187)	(0.211)	(0.246)
Log of offering proceeds	–0.340***	–0.061	–0.291**	–0.092
	(0.123)	(0.146)	(0.137)	(0.160)
Shelf registration		–0.044		–0.685
		(0.327)		(0.537)
Poison put provision		–0.070		0.798**
		(0.252)		(0.314)
Log of total sales		–0.189***		–0.131*
		(0.062)		(0.073)
Capex as a percent of assets		4.437**		2.532
		(2.011)		(2.334)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
N	853	711	853	711
McFadden Pseudo R^2	0.26	0.25	0.34	0.34