Risk Changes around Calls of Convertible Bonds

Luis García-Feijóo*
Florida Atlantic University

Scott Beyer
University of Wisconsin Oshkosh

Robert R. Johnson
CFA Institute

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We examine changes in equity and asset betas around convertible bond calls and report two major findings. First, calling firms exhibit an increase in asset betas following the call. We argue that the finding is consistent with the implications of the sequential financing theory but not of the backdoor equity financing theory. Second, abnormal returns at call announcements are negative only for the subsample of firms that also exhibit an increase in equity beta. We conclude that risk changes help explain the market reaction to convertible bond calls.

Keywords: convertible bond; conversion-forcing call; risk change

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*Corresponding Author. Florida Atlantic University, College of Business, Liberal Arts Building, 2912 College Avenue, Davie, FL 33314; luis.garcia@fau.edu, Phone: (954) 236-1239, Fax: (954) 236-1298. We acknowledge helpful comments of an anonymous referee, Arnold Cowan (the editor), John Howe, John Stowe, and seminar participants at Auburn University, Northern Illinois University, the 2004 Midwest Finance Association, the 2005 Financial Management Association, and the 2005 Southern Finance Association meetings.

1. Introduction

We test the implications for risk changes surrounding a convertible bond call of two prominent convertible bond theories: Stein's (1992) backdoor equity financing theory, and Mayers' (1998) sequential financing theory.

In Stein's theory, firms offer convertible bonds to signal quality when financial distress is costly; in Mayers' theory, firms issue convertible bonds to minimize overinvestment agency costs. Both theories view convertible bonds as a form of deferred equity issuance that is particularly suitable for companies with limited capital and abundant growth opportunities. However, in the backdoor equity theory, convertible bonds solve a financing problem at the time of issue, whereas in the sequential financing theory convertible bonds facilitate the future financing of valuable investment options (Mayers 2000). Consequently, the call provision plays a very different role in the two theories.

We argue that the two theories have different implications regarding changes in the systematic risk of the calling firms around the call. In Stein's theory, the call provision helps high-quality firms avoid financial distress because they are able to force conversion, in contrast to low-quality firms, which end up in distress. A convertible bond call is thus a leverage-decreasing event unrelated to the calling firm's asset structure (Alderson, Betker, and Stock, 2006, p. 898). Therefore, we contend that the theory predicts a decrease in the calling firm's equity beta and no change in the asset beta (i.e., operating risk) following the call.

In contrast, Mayers' theory links the convertible bond call to the exercise of investment options. Recent theoretical models predict a decrease in systematic risk following the exercise of investment options (e.g., Carlson, Fisher, and Giammarino, 2006; Eckbo, Masulis, and Norli, 2007, p. 90). These models suggest that calling firms should experience a decrease in both asset and equity beta as a consequence of the new project investment and debt conversion. However, the new project can significantly increase operating leverage and hence operating risk (Ritter, 2003, p.273; Novy-Marx, 2007). Additionally, when interactions between investment and financing decisions are considered, Mayers' theory is consistent with an increase in asset beta and possibly no change in the equity beta of the calling firm.

We test these predictions and find that calling firms exhibit increases in asset beta but no changes in equity beta following the call. This is true for the full sample as well as for the subsample of firms that are arguably more likely to fit into Stein's theory, namely, calling firms that are highly levered prior to the call but that reduce their financial leverage drastically following the call. Our findings are consistent with the sequential financing theory but not with the backdoor equity financing theory.

We also report that calling firms exhibit risk changes in the year of the call that are significantly negatively associated with the abnormal stock return at call announcement. This is true for the full sample as well as for the subsample of firms that remain highly levered after the call, which experience an increase in both equity and asset beta in the year of the call. The subsample of firms that are highly levered prior to but that significantly reduce their financial leverage following the call and for which there is no change in equity beta, experience no statistically significant stock price reaction at the call announcement.

2. Literature review and hypotheses development

Stein (1992) suggests that firms use convertible bonds to signal quality when financial distress is costly. Convertible bond issuers obtain equity "through the backdoor" by calling the bonds and forcing conversion as soon as the market learns the true quality of the firm. Because the convertible bond call lowers the calling firm's financial leverage, financial theory suggests that the calling firms should experience a decrease in equity beta and hence in the cost of equity following the call. In addition, financial theory predicts no change in operating risk (asset beta) at the time of the call because the bond offering and subsequent conversion is a pure financing event.

Mayers (1998) considers a firm that needs financing for an initial project followed by an investment option that could also require funding. In this situation, convertible debt lessens the agency costs of free cash flow and minimizes the issue costs of sequential financing relative to straight-debt offerings. Furthermore, by forcing conversion when the project is revealed to be a profitable one, a highly levered firm can surmount underinvestment incentives that arise from potential conflicts between shareholders and creditors (Myers, 1977). Consistent with the sequential financing theory, Mayers reports increases in investment and financing activity around the time of conversion-forcing calls of convertible bonds.

Mayers' theory links a convertible bond call with the exercise of investment options. Recent theoretical models (e.g., Carlson, Fisher, and Giammarino, 2006) predict that systematic risk decreases with option exercise because an option is a leveraged position that is riskier than a position on the underlying asset. The joint implications of the models and Mayers' theory is that there will be a decrease in both equity and asset beta following the call. There are, however, reasons to expect increases in operating risk when firms exercise growth options. First, the new project can significantly increase operating leverage (Novy-Marx, 2007). Second, if firms trade off operating and financial leverage to control the risk of their common stock (Mandelker and Rhee, 1984), a conversion-forcing call of convertible bonds and the subsequent reduction in financial risk will coincide with an increase in operating risk.[1]. Third, the capital structure literature (Ross, 1985) shows that the interplay of investment-related and debt-related tax deductions can induce a negative association between asset beta and financial leverage. Thus, we conclude that evidence of increases in asset beta and evidence of no changes or increases in equity beta will also be consistent with the sequential-financing theory. As mentioned, Stein's theory predicts a decrease in equity beta and no change in asset beta.

Mayers (1998) points out that much of the existing empirical evidence is consistent with both theories. In particular, both theories apply to firms with similar characteristics for which straight debt and equity have significant costs; and both theories are consistent with the empirical observation that the majority of the bonds are ultimately converted through a conversion-forcing call. Some recent studies focus on unique implications of the sequential financing theory, with mixed results. Korkeamaki and Moore (2004) examine the security design implications of sequential financing and find that, consistent with the theory, firms that issue convertible bonds with weaker call protection provisions or shorter call protection periods tend to invest more following the convertible offering. In contrast, Alderson, Betker, and Stock (2006) find that firms that call out-the-money convertible bonds exhibit increases in investment and financing activity around the year of the call. This finding contradicts the basic premise of the theory that firms will be able to increase

[1] This tradeoff is at least partially incorporated into existing models. For example, in a model of the interactions between investment and financing decisions, Childs, Mauer, and Ott (2005, p.683) predict: "When exercising the option replaces assets-in-place with the riskier asset underlying the growth option…a firm…chooses a lower initial level of debt to mitigate the risk of being over-leveraged when the growth option is exercised."

investment only when the market has been persuaded that the firm has found a valuable opportunity, and hence when conversion can be forced by the call. [2]

Our study sheds additional light on the relative merits of the sequential financing theory and the backdoor equity theory by focusing on their different implications for risk changes surrounding calls of convertible bonds.

3. Sample and methods

3.1. Sample selection

We gather our sample of convertible bond calls from Standard & Poor's Bond Guide and Lexis-Nexis over the period 1986 to 2001. Following previous studies, we exclude calls made by regulated utilities or financial institutions, as well as call announcements that contain other material information. We require calling firms to have common stock returns available in CRSP and financial information available on Compustat in the year prior to the call. We examine conversion-forcing calls only.

The final sample consists of 199 calls. However, we report results for a consistent sample of 165 calls throughout the paper; results are similar for the larger sample. Our sample is similar in size and composition to that in Mayers (1998) and Alderson, Betker, and Stock (2006).

We follow Lewis, Rogalski, and Seward (2002) to generate a sample of control firms matched to each of the calling firms in terms of industry affiliation, size, and operating performance. Specifically, the matching procedure selects the non-calling firm in the same industry (two-digit SIC code) with total assets from the fiscal year prior to the year of the call between 20% and 150% of the calling firm that has the closest ratio of operating

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[2] Although it is not the focus of our study, we find no evidence of risk changes around 40 out-of-the-money calls. Specifically, equity beta decreases from 0.84 to 0.74 the year of the call, but the 0.11 average decrease is not statistically different from zero (*t*-stat = -1.35). We also find no changes in asset beta.

income before depreciation divided by total assets (EBITDA/Assets) to that of the calling firm as of the year prior to the call.

3.2. Methods

We use the following market model to estimate the systematic risk of equity before and after the call announcement:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}, \tag{1}$$

where t represents the trading day, j represents a stock, and R_{mt} is the return on the CRSP value-weighted NYSE-Amex-Nasdaq Index. Day 0 is defined as the day that the call is first reported in the press. The market model is estimated for the year before and the three years after the convertible call. A year is defined as 250 contiguous trading days (i.e., year 1 begins on day 91 and year -1 ends on day -91). The (-90, 90) period around the call announcement day is excluded because abnormal trading activity can lead to biased beta estimates. A conversion-forcing call is necessarily preceded by a stock price run-up (Cowan, Nayar, and Singh, 1990) and appears to be followed by unusual selling pressure (Mazzeo and Moore, 1992). To control for measurement error and price-adjustment delays, we estimate equity beta following Fowler and Rorke (1983). Throughout the paper, we report beta estimates using two lead and two lag index returns, but we obtain similar results with no adjustment, and with five, ten, or 15 lead-lag adjustments.

Following Lewis, Rogalski, and Seward (2002), asset betas are estimated by unlevering the equity beta using the debt-to-asset ratio under the assumption that the debt beta is zero. The debt-to-asset ratio is equal to long-term debt divided by the sum of long-term debt plus the book value of equity. Our results do not change if we use the market value of equity to compute financial leverage, and thus asset betas.

4. Evidence on systematic risk changes

4.1. Evidence on changes in systematic risk: Full sample

In Table 1, we report equity beta (Panel A) and asset beta estimates (Panel B). Calling firms do not exhibit increases in systematic equity risk following the call. While the mean (median) equity beta estimate increases from 1.24 (1.15) in year -1 to 1.27 (1.19) in year 1, these changes are not statistically significant. There is no evidence of changes in systematic risk two and three years following the call. Additionally, there is no evidence of changes in systematic risk for the control sample.

In contrast, calling firms experience an average (median) increase in asset beta of 0.21 (0.20) from year -1 to year 1. Both mean and median changes are significantly different from zero at the 1% level. The average (median) asset beta increases from 0.65 (0.58) in year -1 to 0.87 (0.79) in year 1. There are no significant changes in the asset beta of the control firms.

Our finding that there is no change in equity beta around calls of convertible bonds contrasts with that of Cowan, Nayar, and Singh (1990), who report significant decreases in equity beta using methods similar to ours. Their sample covers an earlier period, however. Their results are similar to what we find in the next section for the subsample of firms that significantly reduce their financial leverage following the call.

To summarize, calling firms experience an increase in systematic operating risk following the call. The increase in operating risk offsets the decrease in financial risk associated with bond conversion and, as a result, there is no significant change in the systematic equity risk of the calling firms. The result does not support Stein's theory but is consistent with the predictions of Mayers' model and with increases in operating leverage following the exercise of investment options.

4.2. Evidence on changes in systematic risk:. Subsamples based on financial leverage

Expected costs of financial distress play a significant role in both the backdoor equity theory and the sequential financing theory. In Stein's theory, offering convertible bonds to signal quality is costly because of expected costs of financial distress, which are particularly high for highly levered firms with abundant investment opportunities. Therefore, the model applies best to firms with high financial leverage at the time of the call. In Mayers' theory, a convertible bond offering minimizes issuing and overinvestment costs and helps control underinvestment incentives. Thus, it seems reasonable to expect that calling firms that are highly levered at the time of the call will be the ones investing the most subsequent to the call.[3]

In this section, we examine subsamples based on the level of financial leverage before and after the call. High expected financial distress costs are likely to be associated with high financial leverage and so we pay particular attention to the group of firms that are highly levered around the year of the call.[4]

Specifically, we form two groups based on whether a calling firm's financial leverage prior to the call is higher or lower than the industry median; and, independently of this classification, we form two other groups based on whether a calling firm's financial leverage subsequent to the call is higher or lower than the industry median. Thus, we divide the full sample into four mutually exclusive groups: High-to-Low, High-to-High, Low-to-High, and Low-to-Low. For example, the High-to-Low group includes calling firms for

[3] Alderson, Betker, and Stock (2006) argue similarly. They find no association between capital expenditures and post-call debt issuance in a sample of both in-the-money and out-of-the money calls.

[4] Firms with high expected costs of financial distress (i.e., highly levered) are not necessarily financially distressed. As a robustness check, including or excluding the 18 financially distressed firms in our sample, as defined by Jin, Merton, and Bodie (2006), does not affect the results.

which the debt-to-asset ratio is greater than the industry median the year prior to, but lower than the industry median the year of the call.

In Table 2, we report leverage and beta estimates around the year of the call for the full sample and for three groups of firms. Because there is only one firm in the Low-to-High group, we omit this group.

Although there is no evidence of changes in systematic equity risk for the full sample, there is evidence of decreases in equity beta for the High-to-Low group of firms. Specifically, the average (median) equity beta decreases from 1.35 (1.29) the year prior to the call to 1.23 (1.16) the year following the call. Cowan, Nayar, and Singh (1990) report changes of similar magnitude that are significantly different from zero; in our case, however, these changes are not significantly different from zero.

In Table 2, we also report asset betas, which can explain why firms in the High-to-Low group do not exhibit statistically significant decreases in equity beta despite the large decrease in financial leverage (the average decrease is 36%, as shown in Table 2). Firms in the High-to-Low group exhibit significant increases in asset beta, from an average (median) of 0.66 (0.70) the year prior to the call to 1.06 (1.03) the year following the call. Therefore, firms for which the backdoor equity theory should be most suitable exhibit significant increases in operating risk around the call. This finding does not support the backdoor equity theory.

We also report equity and asset beta estimates for firms in the Low-to-Low and High-to-High groups. Firms that are less financially leveraged than industry peers exhibit no significant change in either equity or asset beta. In contrast, firms that are more leveraged than industry peers exhibit an increase in both equity and asset beta around the call.

4.3. Evidence on changes in capital expenditures

In this section, we relate the changes in asset beta reported in the previous section to the increases in investment activity around the call. Following Mayers (1998), we measure changes in business spending in year 0 as the difference between capital expenditures in year 0 minus capital expenditures in year -1 divided by total assets in year -1. Mayers (1998) reports that calling firms increase their investment activity significantly more than industry medians for two years following the call. To save space, we report in Table 2 changes in capital expenditures from year -1 to year 1.

The average (median) growth in capital spending is 7.0% (2.0%) for the full sample, 6.0% (2.0%) for firms in the Low Leverage group, 14.0% (9.0%) for those in the High-to-Low group, and 4.0% (2.0%) for those in the High-to-High group. Growth rates are significantly different from zero at the 5% level with one exception. Firms in the Low group do not increase their investment activity around the call; as reported, these firms do not experience changes in asset beta.

When we regress changes in asset beta on changes in capital expenditures (normalized by assets the year prior to the call), we find that the coefficient estimate is 0.92 (*t*-stat is 3.26) for the full sample, 2.70 (1.78) for firms in the Low group, 0.66 (1.71) for firms in the High-to-Low group, and 1.56 (2.72) for firms in the High-to-High group. Thus, there is evidence of a positive association between changes in operating risk and investment activity.

To summarize, we find that firms that are highly levered prior to the call exhibit increases in investment activity and operating risk around the call. These findings suggest that calling firms exercise investment options around the time of the call. However, we also find that firms that reduce their leverage in the year of the call increase their investment spending significantly more than the control sample, which seems to contradict the predictions on the sequential financing theory (Alderson, Betker, and Stock, 2006). These firms do not increase the systematic risk of their common stock around the call, perhaps trading off increases in operating risk and decreases in financial risk. In contrast, calling firms that remain highly levered following the call exhibit increases in systematic risk.

5. Stock price reaction analysis

5.1 Abnormal returns at call announcement

To explain the observed negative stock-price reaction to calls of convertible bonds (e.g., Mikkelson, 1981), previous studies have examined stock-price and earnings performance around the call, with mixed results. Although firm insiders as well as analysts appear optimistic about the calling firms' future cash flows (Byrd and Moore, 1996; Ederington and Goh, 2001), earnings growth rates and long-run returns appear to deteriorate following calls of in-the-money convertible bonds (Campbell, Ederington, and Vankudre, 1991; Datta, Iskandar-Datta, and Raman, 2003).

The literature, however, typically has not considered unexpected increases in the systematic risk of the calling firms. In this section, we examine abnormal stock returns across subsamples, building on the evidence reported earlier that risk changes are different across sub-groups.

To compute abnormal returns, we follow Biktimirov, Cowan, and Jordan (2004) and estimate the following cross-sectional regression on each day in the event time with day 0 representing the call announcement day:

$$R_{it} - R_{ft} = \alpha_t + \beta_t\left(R_{mt} - R_{ft}\right) + s_t SMB_t + h_t HML_t + \varepsilon_{it}. \tag{2}$$

The daily return on security *i*, the CRSP value-weighted index return, and the risk-free asset (i.e., the one-month Treasury-bill rate) are denoted by R_{it}, R_{mt}, and R_{ft}, respectively. The daily rate of return on the size and book-to-market factor in day *t* is denoted by SMB_t and HML_t, respectively. The estimate of intercept α_t represents the average abnormal return for day *t*.

This approach has the advantage of not requiring a separate estimation period, thereby lowering the effect of any run-up bias or risk-change bias. In addition, the approach controls for size and book-to-market effects and allows for a larger sample size compared to other estimation methods (Biktimirov, Cowan, and Jordan, 2004).

We present the results in Table 3. We focus on abnormal returns over the period (0, 1) because our sample of call announcement dates comes from news wires. The calls can be announced after the stock market has closed, thus resulting in a possible effect the following day. For the full sample, the average abnormal return over the two-day period (0, 1) is -1.42%, which is significantly different from zero at the 1% level. Consistent with previous studies (i.e., Mazzeo and Moore, 1992), the negative announcement stock price reaction appears to be temporary.

Examination of abnormal returns by financial leverage groups reveals interesting patterns. First, there is no statistically significant negative stock price reaction to the call for firms in the High-to-Low group. The abnormal return over window (0, 1) is -1.10%, which is not statistically significantly different from zero. Earlier, we find that firms in the High-to-Low group experience no change in equity beta around the call. Second, firms in the High-to-High group experience an abnormal return of -1.40% over days (0, 1), which is significant at the 1% level and which appears to be permanent. The negative abnormal return is consistent with the increase in equity beta experienced by these firms surrounding the call. Third, firms with low financial leverage before and after the call experience an abnormal return of -1.41% over days (0,1), which is significant at the 10% level. However, the small sample size (23 firms) makes the results for this group unreliable.

5.2 Regression analysis

In this section, we use regression analysis to relate abnormal returns at call announcements with proxies for growth option exercise and risk changes. More specifically, the dependent variable is the two-day (0,1) cumulative abnormal return, computed as the market-adjusted return using the CRSP value-weighted index. The independent variables are as follows:

ΔRISK: Following Healy and Palepu (1990), this variable measures the percentage decline in stock price given a change in equity beta and is defined as the (negative) percentage decline in stock price given a change in equity beta, ceteris paribus. That is,

$$\Delta RISK = \Delta\beta_e\left(E\left(R_m\right) - R_f\right)/R_f + \beta_{ep}\left(E\left(Rm\right) - R_f\right), \tag{3}$$

where $\Delta\beta_e$ is the change in equity beta and β_{ep} is the post-call beta. The risk-free rate (R_f) and the expected return on the market (R_m) are evaluated at the average of the one-month Treasury bill return and the average of the CRSP value-weighted index daily return over the period 1986-2001. We expect the sign of the Δ*RISK* coefficient estimate to be negative.

ΔINVESTMENT:. To measure "funding requirements" associated with exercise of investment options (Jen, Choi, and Lee, 1997), this variable is computed as capital expenditures in year 1 minus capital expenditures in year -1 divided by total assets in year -1; to adjust for industry effects, we subtract the corresponding value of the ratio for the control firm.

ΔROA(0):. We measure current profitability at the time of the call as a proxy for expected future profitability (Campbell, Ederington, and Vankudre, 1991). Current profitability is defined as the change in EBITDA from year -1 to year 0 divided by total book assets in year -1. To control for industry effects, we subtract the change in operating income for the control match from the change for the calling firm.[5]

To control for size, our regressions include the log of the market value of equity the fiscal year prior to that of the call. Including the log of total book assets instead does not affect reported results.

We present the results in Table 4. Reported *t*-statistics are based on White's heteroskedasticity-consistent standard errors. In the full sample, and consistent with financial theory, stock returns are negatively associated with unexpected increases in risk and positively associated with exercise of investment options or growth financing needs. The coefficient estimate for ΔRISK is -2.11%, which is statistically significant at the 1% level; and the coefficient estimate for ΔINVESTMENT is 4.10%, which is significant at the 1% level.

For consistency, we report estimates for the subsamples for the same specifications used for the full sample. There is no significant association between risk changes and abnormal returns for firms in the High-to-Low group. In Section 4, firms in this group exhibit no change in equity beta around the call. There is, however, a significantly positive association between exercise of growth options and abnormal returns. In contrast, abnormal returns for firms in the High-to-High group are negatively associated with ΔRISK. The ΔRISK coefficient estimate is -1.82%, which is significantly different from zero at the 5% level.

[5] An alternative variable profitability measure, the control-firm-adjusted change in EBITDA from year 0 to year 3 divided by total book assets in year -1, is never significant in unreported regressions.

To summarize, we find that there is a significantly negative association between abnormal returns and risk changes for calling firms that experience an increase in equity beta around the call but not for firms that experience no change in equity beta. The findings link the risk changes associated with the exercise of investment options with the wealth effects of convertible bond call announcements.

6. Conclusions

We analyze systematic risk changes around conversion-forcing calls of convertible bonds. Calling firms experience increases in operating risk (asset betas) following the call. The increases in operating risk offset the reductions in financial risk associated with debt conversion and, as a result, there are no significant changes in the systematic equity risk (equity betas) of the calling firms. We argue that the finding contradicts the implications of Stein's (1992) backdoor equity financing theory because, according to the theory, calling firms should experience a decrease in equity beta and no change in asset beta following the call. In contrast, the finding is consistent with Mayers' (1998) sequential financing theory, particularly in combination with models that predict an increase in asset betas when firms exercise growth options or when firms trade off operating and financial risk. Additionally, we find that wealth effects at call announcement are significantly negative only for firms that exhibit an increase in equity beta around the call. The finding suggests that a call conveys information about the systematic risk of the calling firm.

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Table 1

Equity betas and asset betas around 165 conversion-forcing calls of convertible bonds from 1986 to 2001.

The market model with two leads and two lags is used to estimate equity betas the year before and the three years after the convertible call announcement. The market is the CRSP value-weighted NYSE-Amex-Nasdaq Index. A year is defined as 250 contiguous trading days (i.e., year 1 begins on day 91 and year -1 ends on day -91). Asset betas are estimated by unlevering the equity beta using the debt-to-asset ratio under the assumption that the debt beta is zero. The debt-to-asset ratio is equal to the book value of long-term debt divided by the sum of book value of long-term debt plus the book value of equity. The statistical significance of the risk changes is measured relative to year -1 using *t*-tests on the mean change and Wilcoxon signed-rank tests on the distributions.

	Year relative to call				
	-2	-1	+1	+2	+3
Panel A: Estimates of equity beta					
Calling firms					
Mean beta	1.19	1.24	1.27	1.16	1.09
Median beta	1.14	1.15	1.19	1.08	1.08
Mean change			0.03	-0.09	-0.16
t-stat			0.57	-1.31	-2.42
Median change			0.08	-0.16	-0.24
Z-stat			1.47	-1.72	-0.28
Control firms					
Mean beta	0.78	0.77	0.82	0.80	0.72
Median beta	0.66	0.75	0.85	0.65	0.61
Mean change in beta			0.04	0.02	-0.08
t-stat			0.34	0.21	-0.67
Median change			0.07	-0.05	-0.07
Z-stat			0.20	-0.70	-0.50
Panel B: Estimates of asset beta					
Calling firms	-2	-1	+1	+2	+3
Mean	0.51	0.65	0.87	0.79	0.74
Median	0.51	0.58	0.79	0.74	0.66
Mean change			0.21***	0.12**	0.06
t-stat			4.82	2.01	1.08
Median change			0.20***	0.07*	-0.06
Z-stat			4.70	1.75	-0.51
Control firms					
Mean	0.54	0.51	0.62	0.57	0.54
Median	0.40	0.46	0.53	0.37	0.38
Mean change			0.11	0.06	0.00
t-stat			1.36	0.68	0.01
Median change			0.09	-0.03	-0.04
Z-stat			1.58	-0.32	-0.77

***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 2

Changes in equity beta and asset beta around 165 conversion-forcing calls of convertible bonds: Analysis by subsamples based on financial leverage

Calling firms are divided into four mutually exclusive groups based on whether their financial leverage prior to the call is higher or lower than the industry median and on whether their financial leverage subsequent to the call is higher or lower than the industry median. Because there is only one firm in the Low-to-High group, we omit this group. Sample size is shown in brackets. Leverage is measured as the debt-to-asset ratio at the end of the fiscal year, either prior to the call (Before) or the year of the call (After). The estimation of equity and asset betas is explained in Table 1. Capexp/Asset is equal to capital expenditures the fiscal year prior to the call (Before) or the year following the call (After); divided by total assets the year before the call. The statistical significance of changes is evaluated using *t*-tests on the mean change and Wilcoxon signed-rank tests on the distributions.

		Full sample [165]		Low-to-low [23]		High-to-low [42]		High-to-high [100]	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A. Calling firms									
Leverage	Before	0.48	0.43	0.26	0.24	0.50	0.42	0.52	0.49
	After	0.33	0.31	0.22	0.24	0.14	0.10	0.43	0.36
	Difference	-0.16***	-0.12***	-0.04**	-0.03*	-0.36***	-0.30***	-0.10***	-0.09***
Equity beta	Before	1.24	1.15	1.21	1.14	1.35	1.29	1.17	1.06
	After	1.27	1.19	1.20	1.20	1.23	1.16	1.31	1.20
	Difference	0.03	0.08	-0.01	0.05	-0.11	-0.08	0.14**	0.18*
Asset beta	Before	0.65	0.59	0.94	0.86	0.66	0.70	0.58	0.50
	After	0.86	0.78	0.95	0.83	1.06	1.03	0.76	0.74
	Difference	0.21***	0.20***	0.01	0.06	0.40***	0.33***	0.18***	0.14***
Capexp/Asset	Before	0.08	0.07	0.10	0.08	0.08	0.07	0.08	0.06
	After	0.16	0.11	0.16	0.12	0.21	0.16	0.13	0.10
	Difference	0.07***	0.02***	0.06	0.02	0.14***	0.09***	0.04***	0.02***

***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively

Table 2 (*continued*)

Panel B. Control firms									
Leverage	Before	0.32	0.23	0.31	0.24	0.36	0.27	0.29	0.22
	After	0.24	0.24	0.31	0.27	0.17	0.28	0.26	0.19
	Difference	-0.07	0.00	0.00	0.00	-0.19	-0.01	-0.03	-0.01
Equity beta	Before	0.76	0.74	0.76	0.78	0.79	0.70	0.75	0.73
	After	0.80	0.82	0.86	0.73	0.77	0.76	0.80	0.87
	Difference	0.03	0.06	0.10	-0.05	-0.02	0.12	0.03	0.12
Asset beta	Before	0.51	0.45	0.44	0.48	0.61	0.32	0.49	0.46
	After	0.62	0.53	0.58	0.45	0.59	0.47	0.65	0.60
	Difference	0.11	0.09	0.14	-0.04	0.00	0.08	0.15*	0.12*
Capexp/Asset	Before	0.07	0.05	0.09	0.08	0.05	0.04	0.08	0.05
	After	0.12	0.08	0.19	0.08	0.10	0.11	0.11	0.08
	Difference	0.05***	0.09***	0.10	0.01	0.05***	0.02**	0.03**	0.02***

*** indicates significance at the 0.01 level
** indicates significance at the 0.05 level
* indicates significance at the 0.10 level

Table 3

Call announcement abnormal returns

We estimate the following cross-sectional regression on each day in event time with the day 0 representing the call announcement day: $R_{it} – R_{ft} = \alpha_t + \beta_t (R_{mt} – R_{ft}) + s_t SMB_t + h_t HML_t + \varepsilon_{it}$. The daily return on security i, the CRSP value-weighted index return, and the risk-free asset (i.e., the one-month T-bill rate) are denoted by R_{it}, R_{mt}, and R_{ft}, respectively. The daily rate of return on the size and book-to-market factor in day *t* is denoted by SMB_t and HML_t, respectively. The estimate of the intercept α_t represents the average abnormal return for day *t* in the RATS method.

Day relative to call	Full sample [165]		Low-to-low [23]		High-to-low [42]		High-to-high [100]	
Panel A. Abnormal returns based on RATS regressions								
	AR	Z(AR)	AR	Z(AR)	AR	Z(AR)	AR	Z(AR)
-5	0.11	0.61	0.12	0.27	0.04	0.11	0.13	0.54
-4	0.41	1.61	-0.18	-0.55	1.16	1.45	0.15	0.57
-3	0.26	1.56	0.53	1.06	-0.07	-0.24	0.30	1.31
-2	0.19	0.97	0.13	0.33	-0.14	-0.32	0.36	1.49
-1	-0.08	-0.46	0.09	0.19	-0.44	-1.59	0.08	0.34
0	-1.07***	-4.50	-1.30**	-2.33	-0.63	-0.83	-1.13***	-5.00
1	-0.35*	-1.80	-0.10	-0.23	-0.46	-1.07	-0.27	-1.07
2	-0.13	-0.58	-0.16	-0.31	-0.17	-0.38	-0.21	-0.73
3	-0.06	-0.35	-0.44	-0.80	-0.27	-0.68	0.05	0.22
4	-0.01	-0.06	-0.10	-0.18	-0.43	-1.17	0.17	0.74
5	0.20	1.03	-0.01	-0.02	0.18	0.39	0.18	0.74
[-90, -2]	21.06***	11.34	16.16***	3.37	24.39***	6.48	20.55***	8.38
[0, 1]	-1.42***	-4.63	-1.41*	-1.92	-1.10	-1.25	-1.40***	-4.16
[-1, 1]	-1.50***	-4.24	-1.33	-1.57	-1.53*	-1.67	-1.32***	-3.21
[2, 30]	2.70***	2.71	0.56	0.21	6.10***	2.82	1.27	1.00
[2, 60]	4.77***	3.34	1.16	0.31	6.95**	2.34	3.28*	1.78
[2, 90]	5.20***	2.85	3.23	0.66	5.75	1.56	3.31	1.39
Panel B. Market-adjusted abnormal returns								
[0, 1]	-1.39***	-4.84	-1.47**	-2.28	-1.14	-1.50	-1.47***	-4.80
[-1, 1]	-1.51***	-4.59	-1.59**	-2.29	-1.34	-1.16	-1.55***	-5.07

***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4

Regression analysis of call announcement abnormal returns on systematic risk changes

The dependent variable is the two-day market-adjusted cumulative abnormal return. Log MVE is the log of market value of equity the fiscal year prior to the call (year -1). ΔRISK measures the percentage decline in stock price given the change in the equity beta of the calling firms around the year of the call. It is computed following Healy and Palepu (1990) as the ratio of $\Delta\beta_e$ $(E(R_m) - R_f)$ divided by of $R_f + \beta_{ep} (E(R_m) - R_f)$, where $\Delta\beta_e$ is the change in equity beta and β_{ep} is the post-call beta and where the risk-free rate (R_f) and the expected return on the market (R_m) are equal to the average of the one-month Treasury-bill rate and the average of the CRSP value-weighted index daily return over the period 1986-2001. ΔROA(0) is the change in EBITDA from year -1 to year 0 divided by book assets in year -1 minus the corresponding change for the control firm. ΔINVESTMENT is equal to capital expenditures in year 1 minus capital expenditures in year -1 divided by total assets in year -1 for the calling firm, minus the corresponding value of the ratio for the control firm. Reported *t*-statistics (in parenthesis) are based on White's heteroskedasticity-consistent standard errors.

	Full sample		Low-to-low		High-to-low		High-to-high	
ΔRISK	-1.50*	-2.11%***	-0.56	-1.80	1.98%	2.06	-0.84	-1.82**
	(-1.72)	(-2.41)	(0.40)	(-0.87)	(0.96)	(1.15)	(-1.02)	(-2.18)
ΔROA(0)		0.23%		1.03		0.73		-0.32
		(0.92)		(1.68)		(1.36)		(-0.94)
ΔINVESTMENT		4.10%***		-1.37		6.85***		4.86***
		(2.45)		(0.94)		(9.23)		(2.48)
Log MVE	0.12%**	0.50%***	0.75**	0.92	0.98%	0.62	0.43**	0.47***
	(0.58)	(2.39)	(2.03)	(1.58)	(1.77)	(1.12)	(2.12)	(2.38)
Intercept	-2.00%	-4.55%***	-7.04%***	-9.26%***	-5.34%	-4.40%	-4.00%***	-4.50%***
	(-1.53)	(-3.59)	(-2.99)	(-2.64)	(-1.69)	(1.40)	(-3.03)	(3.57)
Adjusted R^2	0.0167	0.1954	0.0135	-0.0642	0.0138	0.3879	0.0466	0.1690
Regression *p*-val.	0.1118	0.0002	0.3427	0.5582	0.3451	0.0321	0.0872	0.0082

*** indicates significance at the 0.01 level

** indicates significance at the 0.05 level

* indicates significance at the 0.10 level