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Risk changes around convertible debt offerings

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Abstract

Firms issuing convertible debt experience poor long-run stock price and operating performance. We examine the possibility that this poor performance may be caused by an unexpected increase in the cost of capital. Our finding that the cost of capital decreases following a convertible debt offer (CDO) is inconsistent with this interpretation. We also provide evidence that idiosyncratic and total risk increases and that these increases are not related to corresponding changes in the issuer's industry. The results are consistent with an interpretation that idiosyncratic risk affects investment decisions following convertible debt offers, which in turn adversely impacts future operating performance. Our empirical evidence reinforces the notion suggested in earlier studies that the efficient investment decisions predicted by theory are not achieved by the actual design and issuance of convertible debt securities in practice.

Keywords: Risk changes; Convertible debt offerings; Cost of capital

1. Introduction

Firms issue securities to raise capital for investment in new growth opportunities or to refinance existing investment in its assets-in-place. Capital market investors form expectations about the likely use of the issue proceeds and incorporate their revised forecasts into security prices. Over time, as the issuer's actual investment decisions are observed, investors may reassess their initial expectations and stock prices change accordingly.

Forecast revisions by investors would be especially likely in situations where a firm faces a risky investment opportunity set. Several theories suggest that convertible debt

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financing is an optimal security choice in such investment environments. Thus, convertible debt offers (CDOs) provide a unique opportunity to simultaneously study how firms use contingent payment securities to manage their investment decisions and whether investor reactions to convertible debt security offer announcements in high-risk environments are related to subsequent changes in the risk-adjusted cost of capital.

Lewis et al. (in press) find that firms making CDOs experience poor long-run stock price and operating performance. They also show that equity research analysts are optimistic about the issuing firms' future operating performance.[1] Since analyst forecasts likely reflect the same information used by investors, it is tempting to conclude that the unexpectedly poor operating performance explains the long-run stock price performance. Before we reach this conclusion, however, it is important to consider the possibility that the poor post-issue stock price performance can be partially explained by updated investor assessments of increases in systematic risk and the firm's cost of capital.

In this paper, we document that the poor post-CDO stock price performance cannot be explained by an unexpected increase in cost of capital. In fact, we show that systematic asset risk *declines* for convertible debt issuers. Although there is a corresponding reduction in industry systematic risk during the sample period, the declines experienced by issuing firms are twice the size of industry changes. Interestingly, these declines are so large that systematic equity risk also declines, even though a CDO increases the issuer's financial leverage. Thus, the post-issue reduction in business risk more than offsets the increase in financial risk. All else equal, an unexpected decline in the issuer's systematic risk is consistent with a *positive* share price reaction to the offer announcement.

By contrast, unsystematic or idiosyncratic equity risk increases significantly in the period following a CDO. The change is at least partially attributable to trends in the idiosyncratic risk conditions in the issuer's industry. Total risk (measured by the variance of equity returns) also increases for issuing firms. This suggests that increases in idiosyncratic risk more than offset the decreases in systematic equity risk. Surprisingly, total risk declines at the industry level, indicating that the effect of the systematic risk reduction dominates the idiosyncratic risk increase.

The higher idiosyncratic and total risk levels following CDOs reinforce an alternative interpretation of convertible debt financing decisions first described by Lewis et al. (in press). They argue that rationing in the seasoned equity market forecloses some issuers from participation. Convertible debt allows "would-be" equity issuers to raise external capital in situations where heightened investor uncertainty about future operating performance closes the window of opportunity for a common equity offer.

In effect, high costs of adverse selection and capital structure considerations force some firms to raise investment capital outside the seasoned equity market. Issuers are not necessarily choosing convertible debt to signal information (see, e.g., Stein, 1992; Brennan and Schwartz, 1988), to eliminate risk-shifting problems (see, e.g., Green, 1984), or to reduce overinvestment incentives (see, e.g., Mayers, 1998). Instead, investors use the contingent equity issue market to screen issuers. Our results also hint that investor

[1] Analyst optimism persists after different types of security offers, including initial public offerings (Rajan and Servaes, 1997) and seasoned equity offerings (Healy and Palepu, 1990; Ali, 1997).

reactions to changes in idiosyncratic risk may be responsible for closing the window of opportunity for seasoned equity offers and initiating the onset of screening through the convertible debt market.

The remainder of the paper is organized as follows. Section 2 describes our data sources and sample selection procedure. Section 3 presents our analysis of changes in the systematic and unsystematic risk of issuers and comparison firms. Section 4 summarizes and concludes the paper.

2. Sample description and data sources

2.1. Convertible debt issuers

The sample consists of all domestic convertible debt offerings between 1979 and 1990. The initial sample of convertible debt issuers was obtained from the *Investment Dealers' Digest Domestic and International New Issues* database. Regulated utilities (SIC=481 and 491–494) and financial institutions and their holding companies (SIC=600–699) are excluded from the final sample.

We require issuing firms to meet several additional criteria. The sample is limited to issuers whose daily common stock returns are included in the Center for Research in Security Prices (CRSP) daily returns file. Since the study uses accounting-based measures of operating performance, we require that the issuing company appear on the Compustat Annual Research Tapes in the year of the convertible debt offering. Finally, some firms are multiple issuers of convertible debt. Because we examine changes over several years, we require the issuing firm to have had no other convertible debt offer in the 5 years prior to the issue date. This requirement is similar to the restrictions imposed by Healy and Palepu (1990) and Loughran and Ritter (1997) in their studies of operating performance following seasoned equity offers (SEOs). The final sample consists of 566 CDOs.

Summary information on the number of CDOs by issue year and issuer industry is provided in Table 1. The annual number of convertible debt offerings varies considerably during the sample period. In 1985–1987, there is a high level of issue activity, about 43% of the total number of offerings. Loughran and Ritter (1997) report that 1983 is the year of highest issue activity in their study of the operating performance of firms conducting SEOs. This suggests a lag effect in the relative use of equity-linked financing instruments, consistent with the aggregate issue volume data reported in Choe et al. (1993). High volumes of CDOs *following* periods of high SEO volume are also consistent with the interpretation that the window of opportunity for convertible debt offers occurs during periods of reduced SEOs.

Panel B of Table 1 provides two-digit SIC codes for the CDO sample. Issuers represent a broad cross-section of industries, indicating that convertible debt is a useful financing instrument in a variety of business conditions. The top six industries (in terms of the number of convertible debt offers) are the same top six seasoned equity offer industry affiliations reported in Loughran and Ritter (1997). Thus, CDOs occur during periods where the demand for equity investment capital is high. If the high degree of overlap in industry affiliation between SEO and CDO firms indicates similar demand-side motives

Table 1
Number of convertible debt offerings (CDOs) by year and industry
To be included in the sample, a CRSP-listed NASDAQ, Amex, or NYSE firm must not have issued a convertible during the 5 years prior to the issue date. The industries (defined by CRSP two-digit SIC codes) listed in Panel B have 10 or more CDOs. Regulated utilities (SIC 481 and 491–494) and financial institutions and their holding companies (SIC 600–699) are excluded.

Panel A: Number of CDOs by calendar year

Year	Number of offerings	Percentage of sample
1979	20	3.5
1980	60	10.6
1981	42	7.4
1982	35	6.2
1983	58	10.2
1984	35	6.2
1985	65	11.5
1986	105	18.6
1987	74	13.1
1988	19	3.4
1989	33	5.8
1990	20	3.5
Total	566	100.0

Panel B: Number of CDOs by industrial classification

Industry	SIC code	Number of offerings	Proportion of firms (%)
Office and computer equipment	35	56	16.3
Communication and electronic equipment	36	47	13.6
Computer and data processing services	73	35	10.4
Oil and gas	13	33	17.2
Engineering and scientific instruments	38	32	10.5
Chemicals and pharmaceuticals	28	25	7.5
Transportation equipment	37	24	21.6
Wholesale trade-durable goods	50	21	14.8
Transportation by air	45	20	46.5
Wholesale trade-nondurable goods	51	18	24.3
Eating and drinking places	58	17	22.7
Health services	80	17	15.6
Food and kindred products	20	13	10.7
Miscellaneous retail	59	13	15.5
Motion pictures	78	11	23.4
General merchandise stores	53	10	21.7
Fabricated metal products	34	10	10.5
Electric, gas and sanitary services	49	10	3.8
Other	–	154	–
		566	

for equity capital, then supply-side decisions by investors would be expected to play a very important role in security choice decisions. We also report the proportion of firms making CDOs relative to the number of firms in each two-digit SIC code.

2.2. Matched sample selection procedure

In our study, risk measure attributes are estimated for the issuer and its industry (as indicated by the issuer's two digit SIC code). Industry-adjusted results allow us to compare issuing firms with nonissuing firms matched on industry affiliation, firm size, and issue year operating performance. This approach allows us to detect how changes in risk attributes compare with concurrent changes in the risk characteristics of the issuer's industry.

To our knowledge, there is no general methodology to match firms on the basis of risk attributes alone. Therefore, to identify the industry-matched sample, we follow the procedure recommended by Barber and Lyon (1996) and implemented by Loughran and Ritter (1997) in their study of the operating performance of firms that issue seasoned equity. Specifically, we match each issuing firm with a comparison firm that has not issued convertible debt during the prior 5 years according to an algorithm as follows.

(1) If there is at least one nonissuer in the same two-digit industry with end-of-year assets within 25% to 200% of the issuing firm, the nonissuer with the closest OIBD/Assets ratio to that of the issuer is chosen as the matching firm.

(2) If no non-issuer meets this criterion, then all nonissuers with year 0 assets of 90% to 110% of the issuer are ranked, and the firm with the closest, but higher, OIBD/Assets ratio is selected as the matching firm.

This procedure is designed to select a comparison firm on the basis of industry affiliation, asset size, and normalized operating income similarities. Since firms in comparable industries should have similar systematic risk levels, our selection procedure indirectly controls for pre-issue systematic risk. Comparison firms must also appear on Compustat, and can be listed on the NYSE, the AMEX, or Nasdaq.

3. Risk information conveyed by convertible debt offers

This section considers the hypothesis that long-run stock performance following CDOs reflects updated investor assessments of changes in the issuer's systematic risk. Our investigation is motivated by Healy and Palepu (1990) who suggest that the stock price decline at seasoned equity offer announcements is due to an increase in business risk rather than deterioration in operating performance.

We provide evidence on two measures of issuer risk. First, we examine the change in the systematic risk of the firm and its common equity. This sheds light on whether stock price performance is related to unexpected changes in discount rates. Second, we examine changes in total equity risk around the convertible debt offer date. Although unsystematic risk changes should have no impact on the aggregate market value of the issuer, they may cause wealth transfers between creditors and equityholders. In addition, theory suggests that convertible debt financing decisions are likely to be observed during periods when firms have the opportunity to invest in high idiosyncratic risk investment projects (Green, 1984).

We measure equity risk using a standard two-parameter market model estimated for 1 year prior to and years 1 through 3 after the convertible debt issue date. The CRSP value-weighted NYSE/AMEX/Nasdaq index is used to calculate stock returns and equity betas.

We estimate betas and residual variances over the 250-trading day period surrounding the issue date, so that year −1 (+1) is the 250-trading days immediately preceding (following) the convertible debt issue date. Asset betas are estimated by unlevering the equity beta using the market-based debt-to-asset ratio under the assumption that the debt beta is zero. While this assumption clearly results in downward biased estimates of the firm's true asset beta, the assumption is commonly employed due to a lack of market price data for the outstanding debt.

To control for changes in systematic and unsystematic risk for the offer firms' industries, we also estimate systematic risk and residual variances for each industry-matched firm. For each firm, we compute *t*-statistics and *Z*-statistics to determine if changes in beta and residual variance are significantly different from zero. The *t*-statistic is computed to test whether the estimated mean beta changes are significantly different from zero, and the Wilcoxon signed-rank test is used to test whether the median changes are significantly different from zero.

3.1. Evidence on changes in financial leverage

Table 2 presents summary statistics for issuer and comparison firm leverage ratios in the years surrounding convertible debt offers. Panels A and B report debt-to-asset ratios based on market and book values of equity. The debt-to-asset ratio based on market value is calculated as the book value of long-term debt scaled by the sum of the book value of long-term debt and the market value of outstanding common equity at the end of the fiscal year. The debt-to-asset ratio based on book value is calculated as the book value of long-term debt scaled by the sum of the book value of long-term debt and the book value of common equity.

Not surprisingly, financial leverage increases dramatically following a convertible debt offer. All else equal, the higher debt-to-asset ratio increases the financial risk premium, and would increase the issuer's cost of equity. The mean debt asset ratio based on market value (Panel A) increases from 21.8% in the year prior to issue to 33.2% in the year following the offer. The mean change in financial leverage is −11.4% and has a *t*-statistic of −9.83. By contrast, the mean industry leverage ratio increases from 23.2% in the year prior to issue to 25.8% in the year after issue. The mean change in financial leverage of −2.6% is statistically significant with a *t*-statistic of −2.25. This suggests that industry conditions only explain 23.8% of the increase in issuer financial leverage. The differences between issuer and industry matched debt ratios for years +2 and +3 are similar in magnitude, suggesting that the leverage change is persistent for at least 3 years following issue.

Similar changes are noted for debt asset ratios based on book value (Panel B). The only difference is that changes in industry level measures of leverage are statistically insignificant.

3.2. Evidence on changes in systematic asset risk

Panel A of Table 3 presents summary statistics for issuer and comparison firm asset betas in the years surrounding convertible debt offers. The asset beta measures changes in business risk during the period surrounding a CDO. There are several interesting patterns.

Table 2
Financial leverage measures for CDO issuers and their matching firms
Panels A and B, respectively, report debt asset ratios based on market and book values based on fiscal year-end values on Compustat for issuer and matching firms. Matching firms are chosen by matching each issuing firm with a firm that has not issued a convertible bond during the prior 5 years using the algorithm: (i) If there is at least one nonissuer in the same two-digit industry with end-of-year 0 assets within 25% to 200% of the issuing firm, the nonissuer with the closest OIBD/assets is used; (ii) if no nonissuer meets this criterion, then all nonissuer with year 0 assets of 90% to 110% of the issuer are ranked, and the firm with the closest, but higher, OIBD/assets is used. The Compustat data items for the variables are debt asset ratio based on market value [Long-term debt (item #9/(Long-term debt (item #9)+total equity capital (item #216)] and debt asset ratio based on market value [Long-term debt (item #9/(Long-term debt (item #9)+total equity capital (item #25×item #199)].

	Year relative to issue			
	−1	+1	+2	+3
Panel A: Estimates of long-term debt asset ration based on market value				
Issuer				
Mean	0.218	0.332	0.334	0.349
Median	0.164	0.297	0.301	0.326
Mean change		−0.114	−0.116	−0.131
t-statistic		−9.83	−8.76	−8.28
Median change		−0.096	−0.097	−0.093
Z-statistic		−8.80	−7.85	−7.34
Matching firms				
Mean	0.232	0.258	0.260	0.262
Median	0.167	0.190	0.196	0.203
Mean change		−0.026	−0.027	−0.030
t-statistic		−2.25	−2.06	−2.46
Median change		−0.006	−0.009	−0.015
Z-statistic		−2.23	−2.41	−2.74
Panel B: Estimates of long-term debt asset ratio based on book value				
Issuers				
Mean	0.297	0.450	0.426	0.425
Median	0.271	0.429	0.408	0.415
Mean change		−0.153	−0.130	−0.129
t-statistic		−11.84	−9.26	−7.9
Median change		−0.123	−0.111	−0.098
Z-statistic		−9.80	−8.00	−6.95
Matching firms				
Mean	0.290	0.303	0.300	0.300
Median	0.267	0.272	0.290	0.287
Mean change		−0.013	−0.010	−0.010
t-statistic		−1.19	−1.33	−1.44
Median change		0.000	−0.003	−0.012
Z-statistic		−1.36	−1.42	−1.69

First, issuer firms have similar asset betas to the comparison firms in the periods before and after a convertible debt offer. This suggests that firms in the same industry have the same asset risk. Differences in business risk at the time of issue are unlikely to explain the decision to issue convertible debt.

Table 3
Asset betas and equity betas for CDO issuers and their matching firms
Panel A and B, respectively, report asset and equity betas for issuer and matching firms. Matching firms are chosen by matching each issuing firm with a firm that has not issued a convertible bond during the prior 5 years using the algorithm: (i) If there is at least one nonissuer in the same two-digit industry with end-of-year 0 assets within 25% to 200% of the issuing firm, the nonissuer with the closest OIBD/assets is used; (ii) if no nonissuer meets this criterion, then all nonissuer with year 0 assets of 90% to 110% of the issuer are ranked, and the firm with the closest, but higher, OIBD/assets is used. We estimate equity risks using a standard two-parameter market model estimated for 1 year prior to and years 1 through 3 after the convertible debt issue date. The CRSP value-weighted NYSE/AMEX/Nasdaq index is used to calculate stock returns and equity betas. We estimate betas over the 250-trading day period surrounding the issue date, so that year −1 (+1) is the 250-trading days immediately preceding (following) the convertible debt issue date. Asset betas are estimated by "unlevering" the equity beta using the market-based debt asset ratio under the maintained assumption that the debt beta is zero.

	Year relative to issue			
	−1	+1	+2	+3
Panel A: Estimates of asset beta (systematic risk)				
Issuer				
Mean	1.242	0.996	1.011	0.941
Median	1.109	0.891	0.947	0.866
Mean change		0.246	0.231	0.301
t-statistic		6.67	5.58	5.79
Median change		0.159	0.191	0.252
Z-statistic		6.25	5.17	5.99
Matching firms				
Mean	1.183	1.097	1.140	1.030
Median	1.077	1.029	1.058	0.941
Mean change		0.085	0.042	0.153
t-statistic		2.39	1.03	3.13
Median change		0.064	0.075	0.182
Z-statistic		2.59	1.43	3.90
Panel B: Estimates of equity beta (systematic risk)				
Issuers				
Mean	1.584	1.506	1.499	1.458
Median	1.533	1.476	1.434	1.405
Mean change		0.078	0.085	0.126
t-statistic		2.46	2.43	2.98
Median change		0.064	0.075	0.182
Z-statistic		2.64	2.18	3.16
Matching firms				
Mean	1.188	1.211	1.201	1.169
Median	1.170	1.164	1.152	1.105
Mean change		−0.023	−0.013	0.019
t-statistic		−0.71	−0.41	0.48
Median change		−0.006	−0.035	0.049
Z-statistic		−0.15	−0.52	1.05

Second, the systematic asset risk of issuers declines following the issue date. For example, the mean asset beta of CDO firms declines from 1.242 in the year prior to issue to 0.941 in the third year following issue. Issuer systematic risk is significantly lower in

each post-issue time period (relative to year −1) according to either *t*-statistics or *Z*-statistics.

Third, systematic asset risk also declines for the comparison firms, although the magnitude of the change is less pronounced. This suggests that, while industry effects explain part of the decline in systematic asset risk, approximately half of the decrease is issuer specific.

3.3. Evidence on changes in systematic equity risk

The systematic asset risk results are consistent with an investment decision where issue proceeds are allocated to projects that have less systematic risk than the assets in place at the time of the issue. The next step is to consider the effect that the interaction between higher financial leverage and lower asset risk have on the issuer's equity cost of capital. Panel B of Table 3 reports systematic equity risk for issuers and comparison firms. We make the following observations.

First, issuer firms have higher equity betas than the comparison firms in the periods before and after a convertible debt offer. Thus, convertible debt issuers are "risky" firms, at least from the perspective of systematic risk.

Second, the systematic equity risk of issuers declines after the issue date. For example, the mean equity beta of CDO firms declines from 1.58 in the year prior to issue to 1.46 in the third year following issue. Issuer systematic risk is significantly lower in each post-issue time period (relative to year −1) according to either *t*-statistics or *Z*-statistics.

Third, systematic equity risk does *not* significantly change over time for the comparison firms. This suggests that the observed decline in the post-issue systematic risk of issuer firms is largely firm-specific rather than industry-related. Consequently, since convertible debt issues increase financial risk by increasing leverage, issuing firms experience reductions in systematic business risk following the security offer. Moreover, the reduction in business risk is sufficiently large to offset the higher level of financial risk.

All else equal, an unexpected decline in systematic equity risk would cause the issuer's stock price to increase. To the extent that investors anticipate this change at the time of CDO announcement, poor long-run stock performance is possible only if the expected deterioration in post-issue operating performance more than offsets the reduction in post-issue systematic equity risk.

Results reported in Healy and Palepu (1990) for post-offer changes in the systematic risk of seasoned equity issuers provide an informative comparison. The systematic risk of equity issuers increases significantly in the period subsequent to their offers. Like convertible debt issuers, equity issuers also have higher betas than is typical for their industries in both the pre- and post-offer periods. Industry equity betas increase in the period following an SEO, suggesting that industry factors contribute to the higher business risk.

Healy and Palepu (1990) interpret their findings as evidence that managers issue equity and reduce financial leverage when they foresee an unexpected increase in their firms' systematic business risk. Our results suggest that managers issue convertible debt when they foresee a decline in operating profits that dominates a corresponding reduction in systematic business risk. While industry conditions appear to affect the business risk of

firms that issue seasoned equity, we find no evidence of a similar industry effect in the case of firms issuing convertible debt. Instead, firm-specific factors appear to be much more important in the CDO decision.

3.4. Evidence on changes in residual return variance and total equity risk

In order to investigate further the relationship between CDO decisions and issuer risk, we now consider how idiosyncratic risk changes during the period surrounding issue announcement. Although unsystematic risk does not have an impact on the issuer's cost of equity capital, it may nonetheless influence a firm's investment decisions (Green, 1984). Therefore, changes in idiosyncratic risk have a direct impact on post-issue performance through the firm's investment decisions and, therefore, post-issue operating performance.

Panel A of Table 4 provides summary statistics of the market model residual variances for issuer and comparison firms during the period surrounding CDO announcement. We find that the residual variances of issuers increase substantially in the post-issue period; in years +2 and +3 residual variances are significantly greater than in year −1. Thus, idiosyncratic risk following CDOs increases while systematic risk declines.

The change in issuer risk appears to be related at least partially to an increase in residual variance among the comparison firms. For comparison firms, idiosyncratic risk also increases significantly in years +2 and +3, although the change is less than for issuer firms. This suggests that industry factors cause at least some of the increase. Thus, industry-wide increases in the risk of investment opportunities appear to be a factor in the selection of convertible debt as a financing instrument.

One interpretation of these results is that convertible debt is issued prior to expected increases in unsystematic risk. While the higher risk level is related to increases in industry risk, the high industry-adjusted risk of issuers indicates that issuers are the riskier firms in these industries.

Since issuer systematic risk is decreasing while idiosyncratic risk is increasing, issuer total equity risk may increase or decrease in the period following the issue of convertible debt. Panel B of Table 4 provides evidence on the net impact. Total risk is higher after the offer, so the increase in residual risk outweighs the decrease in systematic risk. Nonissuer firms also exhibit an increase in total risk, although the effect is less pronounced in terms of median changes.

3.5. Trading activity and systematic risk estimates surrounding convertible debt offers

Corporate events often lead to a change in the trading activity of a firm's common stock. Changes in trading activity may, in turn, affect the accuracy of security return measurement and estimates of systematic risk. Denis and Kadlec (1994) show that the estimation biases caused by infrequent trading and price adjustment delay can affect inferences about changes in systematic risk following SEOs and share repurchases. Since convertible debt is a hybrid security with an equity component, it is plausible that our OLS estimates of systematic risk may be similarly biased.

To examine the robustness of our conclusions about changes in issuer systematic risk, we reestimate issuer and nonissuer systematic equity risk in the period surrounding the

Table 4
Residual variance and total equity risk for CDO issuers and their matching firms
Panel A and B, respectively, report asset and equity betas for issuer and matching firms. Matching firms are chosen by matching each issuing firm with a firm that has not issued a convertible bond during the prior 5 years using the algorithm: (i) If there is at least one nonissuer in the same two-digit industry with end-of-year 0 assets within 25% to 200% of the issuing firm, the nonissuer with the closest OIBD/assets is used; (ii) if no nonissuer meets this criterion, then all nonissuer with year 0 assets of 90% to 110% of the issuer are ranked, and the firm with the closest, but higher, OIBD/assets is used. We estimate equity risks using a standard two-parameter market model estimated for 1 year prior to and years 1 through 3 after the convertible debt issue date. The CRSP value-weighted NYSE/AMEX/Nasdaq index is used to calculate stock returns and equity betas. We estimate betas over the 250-trading day period surrounding the issue date, so that year −1 (+1) is the 250-trading days immediately preceding (following) the convertible debt issue date. Asset betas are estimated by "unlevering" the equity beta using the market-based debt asset ratio under the maintained assumption that the debt beta is zero.

	Year relative to issue			
	−1	+1	+2	+3
Panel C: Estimates of residual variance				
Issuer				
Mean	0.079	0.072	0.102	0.158
Median	0.057	0.059	0.068	0.066
Mean change		0.006	−0.023	−0.079
t-statistic		1.08	−2.12	−3.36
Median change		0.001	−0.002	−0.004
Z-statistic		0.23	−2.96	−4.53
Matching firms				
Mean	0.076	0.085	0.095	0.108
Median	0.054	0.055	0.057	0.053
Mean change		−0.010	−0.019	−0.033
t-statistic		−2.11	−3.09	−3.38
Median change		−0.002	−0.005	−0.001
Z-statistic		−1.81	−3.11	−2.11
Panel D: Estimates of variance (total risk)				
Issuers				
Mean	0.09	0.087	0.116	0.169
Median	0.064	0.07	0.079	0.073
Mean change		0.004	−0.025	−0.078
t-statistic		0.617	−2.25	−3.29
Median change		0.000	−0.001	−0.003
Z-statistic		−0.219	−2.553	−3.52
Matching firms				
Mean	0.083	0.096	0.105	0.116
Median	0.061	0.063	0.068	0.062
Mean change		−0.013	−0.022	−0.033
t-statistic		−2.64	−3.34	−3.33
Median change		−0.002	−0.006	−0.001
Z-statistic		−2.33	−3.29	−1.59

issue date using the aggregated coefficient method (Fowler and Rorke, 1983). If changes in the accuracy with which returns are measured or the speed of price adjustment to new information cause changes in systematic risk, the beta should change less as a result of the

corrective estimation procedure. The alternative hypothesis is that the changes in beta represent an economic change in the risk of the issuer firm. In this latter case, differences in the pre-issue and post-issue estimates would remain statistically significant even after the estimation bias is corrected.

We follow Denis and Kadlec (1994) and estimate betas with several different symmetric lead and lag intervals: lead and lag intervals of 5 days (2 lead and 2 lag), 11 days (5 lead and 5 lag), 21 days (10 lead and 10 lag), and 31 days (15 lead and 15 lag). To compare our results with the findings reported in Panel B of Table 3, we use a 250-trading day measurement interval for pre-issue and post-issue beta estimates. The results are reported in Table 5.

A comparison of the 5-day betas (2 lead and 2 lag) with our OLS betas suggests that the decline in the betas of issuer firms in the post-offer period is *not* sensitive to the potential estimation problems caused by infrequent trading and the speed of security price adjustments. Mean and median changes in beta remain significant at the 5% level. In addition, changes in systematic risk for the nonissuer firms remain statistically insignificant when the 5-day betas are estimated. Therefore, the change in systematic risk following convertible debt offerings does not appear to be caused by reductions in short-term price adjustment delays.

Table 5 also indicates that an increase in the number of leads and lags used to estimate beta generally produces a greater change in systematic risk for issuer firms. This suggests that nonsynchronous trading and price adjustment delays have some impact on the size (but not the significance or direction) of the estimated change in issuer betas surrounding convertible debt offers. This result is most likely due to the presence of smaller, less liquid, and less frequently traded companies in the sample of issuers.

Table 5
Alternative estimates of equity beta (systematic risk) for CDO issuers and their matching firms
Issue −1 and Match −1 betas are estimated over the 250-trading day period preceding the convertible issue, while Issue +1 and Match +1 are estimated over the 250 days following the convertible issue. Beta estimates involving lead and lagged coefficients are computed using the technique detailed in Fowler and Rorke (1983). Means are listed with medians below. Significance of changes in beta is measured using a standard *t*-test for means and Wilcoxon signed ranks test for medians.

	Issuer				Matching firms			
	Issue −1	Issue 1	Change	*t*-statistics, *z*-value	Match −1	Match 1	Change	*t*-statistics, *z*-value
OLS	1.584	1.506	0.078	2.46	1.188	1.211	−0.023	−0.71
	1.533	1.476	0.068	2.64	1.17	1.164	−0.006	−0.14
Daily	1.516	1.442	0.078	2.03	1.157	1.203	−0.047	−1.21
(2lead, 2 lag)	1.489	1.411	0.108	1.97	1.132	1.136	0.014	−0.54
Daily	1.469	1.332	0.137	3.08	1.106	1.17	−0.063	−1.37
(5lead, 5 lag)	1.358	1.281	0.144	2.97	1.119	1.096	0.003	−0.52
Daily	1.395	1.212	0.183	2.63	1.117	1.109	0.008	0.1
(10lead, 10 lag)	1.333	1.221	0.126	2.92	1.034	1.111	0.074	−0.05
Daily	1.478	1.225	0.253	2.78	1.081	1.119	−0.038	−0.48
(15lead, 15 lag)	1.317	1.188	0.244	3.03	1.033	1.069	0.001	−0.48

4. Conclusion

We document three new findings about risk changes around convertible debt issuers. First, convertible debt offers convey information about the issuer's systematic and unsystematic risk. Second, systematic asset and equity risk declines for issuers, and the decline consists of an issuer specific and an industry component. Surprisingly, there is a decline in equity risk despite a significant increase in financial leverage. Third, unsystematic risk increases significantly, and this increase is partially caused by industry factors.

The results extend our understanding of the relation between security choice decisions and post-issue operating and stock price performance. As is the case with SEOs, future operating performance is not fully impounded into market prices at the time of issue. That is, investors expect the positive pre-issue operating performance to continue in the future. Post-issue stock price performance then is poor as investors realize the poorer operating performance. Our findings suggest that this poor stock price performance is not related to unexpected increases in the equity cost of capital.

This finding reinforces an interpretation of convertible debt offers in which rationing in the seasoned equity market forecloses some issuers from participation. In contrast to credit market rationing, where issuers cannot raise more senior investment capital, convertible debt provides an opportunity for "would-be" equity issuers to raise external capital. In effect, high costs of adverse selection and capital structure considerations force some firms to raise investment capital outside the equity markets. Issuers are not necessarily choosing convertible debt to signal information, eliminate risk-shifting problems, or reduce over-investment incentives.

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