Liquidity Risk, Firm Risk, and Issue Risk Premium Effects on the Abnormal Returns to New Issues of Convertible Bonds

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ABSTRACT

This paper provides new evidence on the effects of the risk profiles of firms on the returns to convertible bond issues. Liquidity risk, firm risk, and issue risk premium factors are examined as determinants of abnormal returns around the convertible bond issue dates. The market responds favorably to the issuance of convertible bonds by issuers with mild levels of firm volatility risk. Liquidity risk (issue size) and issue risk premium factors (convertible Vega) have significantly negative effects on abnormal returns around the issue date. The findings are robust to different grouping criteria and estimation methods.

JEL Classification: *G12, G14, G30, G32*

Keywords: *Convertible bonds; Liquidity; Firm risk; Vega*

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I. INTRODUCTION

A large body of empirical evidence demonstrates that the issuance of new CB's is associated with negative abnormal returns of the underlying shares[1]. This is puzzling since: (1) the market normally reacts positively to the straight corporate bond issuance; (2) CB's have payoff structures entail a straight bond component and an equity option component; and (3) in spite of the negative equity market reaction to CB issuance, the market for CB's has grown rapidly over time[2]. One possible resolution of the puzzle that has been adduced is that due to *dilution effects*, investors perceive CB's as equity from the outset, rather than debt[3]. In this vein, according to the pecking order theory, the market reaction should be negative. However, the evidence that we provide in this paper demonstrates that *dilution effects are negligible.* What then explains the abnormal equity performance of firms that issue CBs?

This paper serves to provide new evidence on this score. In particular, we examine the underlying firm characteristics that serve as drivers of the abnormal returns when CB's are issued. The focus is on the relationship between the short-term wealth effect[4] around the issuance of CBs and the characteristics of issuer firms and the features embodied in the issues themselves. In particular, we examine the impact of three factors suggested in Liu and Switzer (2009): liquidity risk (logarithm of issue size), issue risk (Vega, which measures the sensitivity of CB value to the volatility of underlying stocks), and firm volatility risk (standard deviation of beta[5]) on the abnormal returns to convertible bond issues.

We find that all of these three risk factors serve as significant drivers for the abnormal returns around the CB issue date. The market responds favourably to the issuance of convertible bonds by issuers with mild level of firm volatility risk. However, liquidity risk and issue risk are significantly negatively related to performance. The latter two risk components serve to offset the risk management benefits of convertibles for firms. These findings are robust to different grouping criteria and estimation methods.

The remainder of this paper is organized as follows. Section II describes the data used in this paper. Section III explains the methodology and proxies employed in this study. Results are reported in Section IV. The paper concludes with a summary in Section V.

II. DATA DESCRIPTION

The sample consists of all CB offerings from January 1, 1986 to December 31, 2005 for which the underlying shares are traded on the New York Stock Exchange (NYSE), the American Exchange (AMEX), or the over-the-counter (NASDAQ) market from the SDC Platinum database. The basic CB data, including conversion price, coupon rate, expiry date, issue date, ratings, and issue size are obtained from SDC. Missing observations from SDC are replaced with data from the Convertible Bond Database that was provided to us from Morgan Stanley.

The underlying stock prices of the above identified firms are from CRSP. During the observation period, stock prices are adjusted for stock dividends or splits. The market index returns are also from CRSP. We employ three market proxies in our tests: returns on the value-weighted market portfolio, returns on an equally-weighted market portfolio, and returns on the level of the Standard & Poor's 500 Composite Index.

Company financial data are obtained from the Standard & Poor's Compustat database. Firms are included in the analyses if they have complete data on cash flow, working capital, investment in fixed assets, the real tax rate, growth rates in assets and sales, and various size and risk measures.

Market expectations for CB issuers are proxied by analysts' opinions, as reported in IBES, which includes the estimation of earnings per share, cash flow per share, sales, or operating profit, and the Buy/Hold/Sell recommendations. The divergence of opinion across analysts is proxied by the IBES estimate of standard deviation of the analyst forecasts. Analysts' estimates are updated on the Thursday before the third Friday of every month.

Table 1

Distribution of the convertible bonds issuance by the year

This table reports the yearly characteristics of convertible bonds issues used in the study. The time period is from 1986 to 2005. There are total 732 observations in the sample.

Year	**Number of Issues**	**Coupon (%)**		**Principal Amount (Million USD)**		**Conversion Premium (%)**	
		Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
1986	172	7.39	7.25	52.67	35.00	22.66	23.16
1987	129	7.01	7.00	70.15	45.00	22.79	23.94
1988	22	5.92	7.00	101.80	75.00	23.56	22.03
1989	47	N/A	N/A	161.89	60.00	21.11	21.97
1990	23	N/A	N/A	297.48	100.00	17.83	18.03
1991	40	N/A	N/A	322.85	130.00	18.48	18.19
1992	48	6.28	6.50	123.25	82.50	21.35	21.72
1993	62	5.30	5.75	146.75	65.00	21.60	22.28
1994	17	6.14	6.63	106.06	75.00	20.22	20.49
1995	12	6.40	6.69	124.21	101.75	22.31	21.01
1996	34	5.85	6.00	150.66	100.00	22.51	23.14
1997	30	6.10	6.25	171.93	115.00	30.46	23.51
1998	9	4.38	4.50	349.99	343.50	24.84	23.29
1999	7	3.07	1.50	627.51	260.00	18.42	20.01
2000	18	3.65	3.88	702.45	300.00	26.50	25.00
2001	32	2.28	1.75	598.35	502.50	29.10	28.40
2002	6	5.50	5.50	1025.80	705.00	26.47	32.25
2003	13	3.90	3.31	571.25	200.00	42.76	38.00
2004	4	4.84	5.13	146.25	150.00	39.25	37.50
2005	7	4.05	3.25	395.71	150.00	25.32	25.00
Total	732						

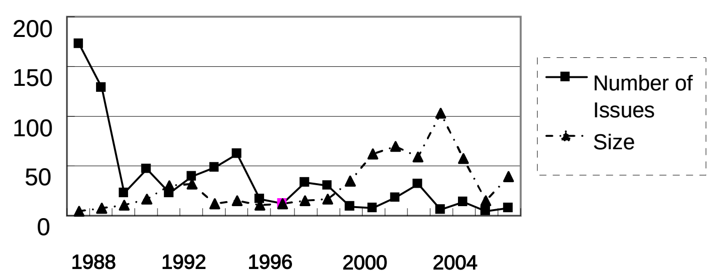
Note: The coupon rates in 1989, 1990, and 1991 in this sample are floating interest rate.

Benchmark interest rates such as Treasury bills/ bonds of different maturities and corporate bonds with different ratings are obtained from Datastream. The four factor data (the returns of market portfolio, size portfolio, book-to-market (BM) portfolio, and momentum portfolio) for Carhart-Fama-French approach are downloaded from Kenneth R. French's Data Library.

The sample for calculating market reactions consists of 732 CBs issuances over the period January 1, 1986 to December 31, 2005. A breakdown of the sample by year of issuance is shown in Table 1. The study period includes both bullish and bearish equity market periods. The average principal amount is highest in 2002, and reaches the second highest level in 2000. The conversion premia are higher after 2001 (including) compared with those in earlier years. In this sense, we infer that since 2001 CBs have become increasingly debt-like.

Figure 1 shows the time series of convertible bond issues over the period studied in this paper.

Figure 1
Convertible bond issuance, 1986-2006



III. METHODOLOGY

A. Methodology

In order to analyze the wealth effects and underlying driving factors around the issuance of CBs, we first calculate abnormal returns using standard event study methodologies, as in Brown and Warner (1985). The computed abnormal returns are then used as grouping variables, as well as dependent variables in regressions that are designed to capture the effects of the various risk factors on firm performance.

1. Abnormal Returns

Abnormal returns are calculated based on filing dates and issue dates. The Issue Date in this paper is defined as the first trading date of the underlying stocks on or after the issue date specified in SDC. The Filing Date is the date when an issuer officially transmits its CBs application or provides notice to the SEC for the issuance of CBs. We study the filing date because: 1) in an efficient market, prices should react to relevant information on the firms when it becomes public, which in many cases occurs on the Filing Date; 2) Information about the issuance of CBs shown in other resources such as newspaper reports or comments from senior officers of a listed company at the time before the filing date may be contaminated with other events, such as disclosure of other financing and investment activities.

Theoretically the information effect of CB financing on the stock price is ambiguous. The issuance of CBs could be good news for shareholders since the firm is issuing more debt with much lower financing cost compared with that of normal bonds, and the issuance of CBs might be a good signal for the future performance of the issuer. However, the issuance may be adverse, if dilution and liquidity effects are considerable.

Market returns are calculated using an estimation period that has 250 trading days (approximately one calendar year) in length. The estimation period is the same for both the filing date and issue date event studies and ends 40 days before the event. The results we report use the Equally Weighted Index from the CRSP database as the benchmark. This index is relevant for our purpose because the dataset includes firms from different industries listed on NYSE, AMEX or NASDAQ[6]. To test the robustness of the findings in abnormal returns, we use Carhart-Fama-French approach, which states that the abnormal return of securities is explained by the market portfolio and three factors designed to mimic risk variables related to size, book-to-market (BM) and momentum.

2. Comparison of Mean Abnormal Returns across Sub-Samples

In order to detect whether firm and issue characteristics are significantly different across sub-samples, we employ the mean comparison method. Sub-samples are divided into two groups based on the abnormal returns: observations with positive/negative abnormal returns. We explore several alternative time intervals and classify observations into three groups: positive/negative and almost zero abnormal returns.

B. Alternative Proxy Variables

The proxies are divided into three groups: a) based on issuer fundamental characteristics; b) characteristics of the issue (size, CB features; and c) the prevailing interest rate.

1. Proxies related to the issuer

We choose to test a comprehensive set of proxies related to the issuer in cash flows, growth, and risks, as well as other factors that the extant literature has proposed as determinants of the wealth effect.

a. Cash flow

Cash flow is important for issuers in the sense that it serves as a constraint to the firm's financing and investment activities. Three types of cash flows are examined in this study: (1) Cash Flow from Operations, which measures the returns to the firm's fundamental activities; (2) Free Cash Flow to the Firm (FCFF), calculated as net income plus non-cash charges-minus working capital investment plus the product of interest and one minus tax rate, and minus capital expenditures; this variable captures cash available to both equity holders and debt holders; and (3) Free Cash flow to equity (FCFE), which is the cash available to common shareholders after funding capital requirements, working capital needs, and debt financing requirements. It is calculated as FCFF minus the product of the interest rate and one minus the tax rate, plus net borrowing. By studying FCFF and FCFE simultaneously, we can disentangle the divergent interests of shareholders vs. bond holders. Aside from looking at absolute values of the cash flow variables, we also examine them as a proportion of total assets or total sales.

b. Growth and profitability

EPS (Earning per share) growth is a straightforward proxy of the historical growth of an issuer. We compute the growth of both the diluted EPS and basic EPS including extraordinary items in the three years preceding the issuance of CBs. Capital expenditure and R&D expenditures are good proxies for the future growth potential of issuers. Tobin's Q is another proxy for the growth of a firm. As per Chung and Pruitt (1994), Tobin's Q is defined as the sum of the book value of debt, market value of equity and the liquidating value of preferred stock, divided by the book value of total assets. Tobin’s Q is calculated at the fiscal year end preceding the issue date of CBs.

We choose the ratios of operating income over sales and over total assets at the fiscal year end preceding the issue date of CBs as proxies for the profitability of an issuer.

c. Risk

Risks are measured both from the perspective of firms (performance uncertainty of the business operation) and investors. We differentiate between three categories of risk: business risk, financial risk, and market risk.

Business risk is the uncertainty associated with the variability of operating income, as a consequence of fluctuating sales and production costs. Three measures of the business risk of the issuer are examined: (1) the coefficient of variation of the firm’s EBIT over a five year horizon; (2) the standard deviation of the firm’s sales over a five year period; and (3) the firm’s operating leverage, computed as the average of the absolute value of the percentage change in the firm’s operating income divided by the percentage changes in sales over a five year period. The impact of a change in sales on the firm’s operating income will be more pronounced if it has higher fixed costs.

Financial risk is the additional risk a shareholder bears when a firm uses debt financing. Four proxies are used: (1) the firm’s long term debt ratio, calculated as the book value of long-term debt to the total capital of the firm; (2) the firm’s short term debt maturity structure, calculated as the ratio of short-term debt to the total debt of the firm; (3) the firm’s interest coverage, estimated as the ratio of the cash flow from the firm’s operations to interest expense before the CB issuance; (4) the long-term debt coverage ratio, estimated as the ratio of the firm’s cash flow from operations to long-term debt before the CB issuance.

Market risk is measured using Carhart-Fama-French-type factors including: (1) the firm’s beta and unlevered beta, calculated as the beta during the period one year and

40 days before the issue date; (2) the firm's size to proxy for the Fama French size risk factor; (3) a proxy for the Fama French book to market factor: calculated as the absolute value of one minus the ratio of market value and book value of the equity of an issuer; (4) a (Carhart) one year momentum factor, calculated is the total rate of return on the underlying common stock during the fiscal year preceding the issuance of CBs; (5) the standard deviation of the firm's beta calculated in the five years before the CB issuance. We also include the historical volatility of firm's stock returns as well as higher moments of the returns (skewness and kurtosis) to capture non-normalities in the distribution of returns. Finally, Brennan and Schwartz (1982) argue that firms issue convertible debt precisely when uncertainty concerning the underlying risk of a firm's investment projects is greatest. To proxy for the uncertainty with respect to the expectation of issuer's future performance, we use the standard Deviation of the EPS estimation and percentage of down estimates from analysts before the issuance of CBs. These variables are retrieved from IBES.

d. Other factors

There are some other factors that could influence the valuation of a firm after the issuance of CBs. The first is the firm's tax-rate, which measures the potential tax shields available to an issuer. The higher the marginal tax rates, the more issuers can take advantage of direct tax benefits of additional interest obligations associated with CBs financing. Issuers with lower profitability will derive fewer direct tax benefits from the CB's. There are different proxies to measure the tax shield a firm can utilize. Similar to Houston and Houston (1990), we use the average tax rate, which provides a summary measure of the ability of issuers to take advantage of direct tax benefits associated with additional debt financing.

Additionally, we use the firm's depreciation rate, measured as the ratio of the firm's depreciation charges over total PPE (Physical property, plant, and equipment) to measure non-debt tax shield. This ratio can also be deemed as the rate at which the physical plant is written off, which could be related to the guaranty of CBs. This ratio can also be related to the risk of the current fixed assets of a firm. For completeness, we also include the firm's change in working capital as per Essig (1992), the number of industries (4-digit SIC codes an issuer has in SDC database) in which the firm operates to capture potential diversification benefits or real options as per Lee and Figlewicz (1999), and the ratio of net fixed asset (net PPE) to total assets as per Titman and Wessels (1988).

2. Issue Specific Factors

The issue specific factors that we consider are: size, conversion premium and the CBs option risk parameters.

a. Issue size

Issue size can influence the price of CBs and underlying stock prices through dilution effects and liquidity effects, both of which are positively correlated with the number of CBs issued. The absolute issue size should be negatively related to the valuation because of liquidity effect. On the other hand however, if we deem CBs can act to reduce the agency costs associated with debt/equity financing, the issuance of CBs, especially for small but rapidly growing firms, can be an effective way to alter the risks of their total assets. So the relative size could be positively related to the valuation.

Similar to Dann and Mikkelson (1984), we employ proxies for both absolute and relative issue size. The logarithm of the total dollar amount of proceeds is chosen to proxy the absolute issue size. The relative change of the liabilities due to CB issuance is measured by the total dollar amount raised divided by the book value of total liabilities of the firm. The potential impact on equity market as a result of the CBs issue is estimated as the total dollar amount raised divided by the market value of common stock. Dilution effects are proxied by the number of shares issued upon conversion divided by the number of shares outstanding.

b. Debt structure

Since CBs are part of the debt burden of the firm before their conversion, it is worthwhile to study the relative debt structure for the valuation effect. The ratio of long-term debt before the offering divided by the market value of common stock one day before the issuance of CBs is used to measure previous long-term debt utilization. The ratio of total liabilities before the offering divided by market value of common stock one day before the issuance is employed to measure debt financing capacity and total debt utilization[7]. Finally, we use the debt ratio[8] after issuance divided by debt ratio before issuance to study the change of debt ratio that is a consequence of the CB issuance.

c. Proxies related to the features of CBs

Lewis, Rogalski, and Seward (2003) find that the market reacts differently to the debt-like vs. equity-like orientation of the CBs issuance. The more equity-like of the CBs, the more negative is the price response of the market, which is consistent with the pecking order theory of Myers (1984). Debt-like CB's differ from equity-like CB's in several interrelated dimensions including: conversion ratios, maturity dates, coupon rates, call periods, and the time to first call. Debt-like CBs have higher conversion premia, shorter maturities, and shorter call periods. In this study, we use three proxies to differentiate the debt and equity components. The first is the conversion premium, which is calculated as dividing the conversion price by stock price minus one. From this value, we can study how quickly the management of the issuer wants CBs to be converted into shares after their issuance. The second proxy is the conversion probability specified in the Merton (1973) model, which extend the Black and Scholes (1973) model by incorporating dividend rates. The higher the conversion probability, the more equity-like of the. The third proxy is CB's delta, defined as the sensitivity of the CB value to its underlying stock. The higher delta, the more equity component CBs have.

Two other proxies that measure the sensitivity of CBs are used: (1) Gamma, which measures the sensitivity of delta to the price of the underlying stock. (2) Vega, which measures the sensitivity of CBs value to the volatility of underlying stock.

3. Interest Rate, Term Structure, and Default Risk Measures

The ten year T-bond yield is used as a proxy for the macroeconomic discounting factor. Term structure risk is calculated as the difference between the return on the 3-month Treasury bill and 6-month Treasury bill. Default/credit risk is measured as the difference between the Moody's Aaa rating corporate bond and the Moody's Baa rating corporate bond.

IV. RESULTS

In this section, we first look at the abnormal returns around filing/issue dates of CBs for our sample. We then proceed to analyze the underlying drivers of the abnormal returns first using a firm grouping approach and then using a regression models approach that is motivated by the theoretical model.

A. Abnormal Returns

Table 2 reports the abnormal returns for the event study conducted using the filing date of the CB issuance as the event date. The first column shows the event window. Day 0 is the filing date, while day 1 is one day after the filing date etc. The dates in the windows are trading days. The second and third column show the Cumulative Abnormal returns (CAR) and Cumulative Average Abnormal returns (CAAR) respectively. The market returns used to calculate abnormal returns in this table is the CRSP equal-weighted market return series. The fourth to seventh column show the number of positive abnormal returns, of negative abnormal returns, the ratio of positive to negative returns, and the number of observations in the estimation. Z–statistics are reported in the eighth column, while the significance level is shown in the ninth column. In the last column, a, b, and c denote statistical significance at the 10%, 5% and 1% levels of a two-tails test respectively.

From Table 2, we find that the abnormal returns in all the different event windows are significantly negative at the 1% level. The significance level is higher when the window is nearer to the SEC filing date. The abnormal return on the filing date is -0.72% with a Z statistic of -7.60; for the (-1, 1) window it is -1.39%, with a z-statistic of -8.10%. Evidently, the filing of CB issuance is not perceived as good news, consistent with previous studies. The number of positive abnormal return observations is smaller than that of negative ones; however, a large portion of observations do have positive abnormal returns: the lowest and highest ratios of the number of positive to negative abnormal returns are 0.57 and 0.72 respectively[9].

B. The Drivers of Abnormal Returns

Table 3 reports the determinants of cumulative abnormal returns (AR) for various windows around the issue dates of CBs.[10] The columns of this exhibit represent different event windows. On the upper-left (upper right) superscript shows the significance level calculated from the White method by assuming $\mathrm{diag}\left(\hat{u}_t^2/(1-h_t)^2\right)$ (OLS method) as the covariance matrix. For each window, two models are employed. Model I include three regressors: liquidity risk (logarithm of issue size), issue risk

(Vega), and firm volatility risk. Model II uses these three regressors as well as free cash flows (FCFE) to equity divided by sales as a robustness test.

On the whole, the models are significant, based on the computed F-statistics. We find that the influence of issue size on abnormal returns is significant. The market impact is negatively correlated with issue size on or before the issue date. This may due to the fact that some investors short sell the underlying stocks to set up a hedging portfolio.[11] Vega has a significantly negative effect. Firm risks have positive effects on abnormal returns, but are significant in only a few cases. FCFE/Sale is not significant.

Table 2

Abnormal returns around the filing dates of CBs

This table reports the abnormal returns for the event study conducted using the filing date of the CB issuance as the event date. The first column shows the event window. Day 0 is the filing date, while day 1 is one day after the filing date etc. The dates in the windows are trading days. The second and third column show the Cumulative Abnormal returns (CAR) and Cumulative Average Abnormal returns (CAAR) respectively. The market returns used to calculate abnormal returns in this table is the CRSP equal-weighted market return series. The fourth to seventh column show the number of positive abnormal returns, of negative abnormal returns, the ratio of positive to negative returns, and the number of observations in the estimation. Z–statistics are reported in the eighth column, while the significance level is shown in the ninth column.

Windows	CAR	CAAR	Number of Returns		Ratio +/-	Total number	Z-Values	Significance level
			Positive	negative				
(-10,0)	-1.46%	-0.13%	305	425	0.72	730	-4.63	c
(-10,1)	-1.92%	-0.16%	294	436	0.67	730	-5.88	c
(-10,2)	-1.97%	-0.15%	302	428	0.71	730	-5.77	c
(-10,5)	-2.16%	-0.14%	295	435	0.68	730	-5.63	c
(-5,0)	-1.50%	-0.25%	279	451	0.62	730	-6.05	c
(-5,1)	-1.96%	-0.28%	275	455	0.60	730	-7.49	c
(-5,2)	-2.01%	-0.25%	269	461	0.58	730	-7.16	c
(-5,5)	-2.20%	-0.20%	283	447	0.63	730	-6.63	c
(-2,0)	-1.13%	-0.38%	287	443	0.65	730	-6.22	c
(-2,1)	-1.59%	-0.40%	278	452	0.62	730	-7.89	c
(-2,2)	-1.64%	-0.33%	272	458	0.59	730	-7.25	c
(-1,0)	-0.93%	-0.47%	295	435	0.68	730	-6.39	c
(0,1)	-1.18%	-0.59%	264	466	0.57	730	-8.91	c
(-1,1)	-1.39%	-0.46%	277	453	0.61	730	-8.10	c
0	-0.72%	-0.72%	284	446	0.64	730	-7.60	c

Note: This table uses the Market Pricing Model. The abnormal returns using Carhart-Fama-French approach are similar.

Table 3

Cumulative abnormal returns determinants around issue dates of CBs

This table reports the determinants of cumulative abnormal returns (CAR) around the issue dates of CBs. AR is calculated with equal weight market returns. FCFE is the free cash flows to equity holders divided by sales, Vega is calculated by Black-Scholes-Merton model, Ln (Size) is the logarithm of issue size, std (Beta) is standard deviation of beta. The columns of this exhibit represent different event windows. 0 is the issue date, and 1 is one trading day after the issue date etc. On the upper-left (upper right) superscript shows the significance level calculated from the White method by assuming $\mathrm{diag}\left(\hat{u}_t^2/(1-h_t)^2\right)$ (OLS method) as the covariance matrix.

Items	(-2, 0)		(-2, 1)		(-2, 2)		(-1, 0)		(-1, 1)	
	I	II	I	II	I	II	I	II	I	II
Intercept	[c] 0.0386 [c]	[c] 0.0345 [c]	[c] 0.0376 [c]	[b] 0.0298 [c]	[c] 0.0410 [c]	[b] 0.0333 [c]	[a] 0.0196 [b]	[a] 0.0178 [b]	0.0186 [b]	0.0131
FCFE	--	-0.0037	--	-0.0025	--	-0.0035	--	0.0008	--	0.0019
Vega	[b] -0.0390 [c]	[b] -0.0580 [c]	[c] -0.0614 [c]	[c] -0.0805 [c]	[c] -0.0690 [c]	[c] -0.0849 [c]	-0.0181 [b]	[a] -0.0578 [c]	[b] -0.0406 [c]	[c] -0.0803 [c]
Ln(Size)	[c] -0.0106 [c]	[c] -0.0083 [c]	[c] -0.0095 [c]	[b] -0.0067 [c]	[c] -0.0091 [c]	[b] -0.0065 [c]	[c] -0.0066 [c]	-0.0040 [b]	[b] -0.0055 [c]	-0.0024
std(Beta)	0.0160	0.0266 [b]	0.0277 [b]	0.0420 [c]	0.0250 [a]	0.0373 [b]	0.0015	0.0259 [b]	0.0132	[a] 0.0413 [c]
R^2	7.84%	8.64%	7.16%	[b] 9.07%	7.05%	8.97%	4.12%	7.27%	3.77%	8.56%
F-test	12.48 [c]	10.73 [c]	11.31 [c]	11.32 [c]	11.12 [c]	11.18 [c]	6.31 [c]	8.89 [c]	5.74 [c]	10.62 [c]

a, b, and c denote statistical significance at the 10%, 5% and 1% levels respectively.

From the above, we may say the key drivers of abnormal returns around the issue date are: market liquidity impact (issue size), risks to CBs' prices (Vega), and risks to the firm (std(Beta)). The first two of these drivers are particularly noteworthy. We find CBs can help firm to deal with firm's risk, but the additional risks brought by the CB issuance induce negative valuation effects around issuance. These risks can explain abnormal returns near the issuance event. After CB issuance, the negative returns should maintain until the decrease in the firm's risk overweight the increase of additional risks brought by CB issuance when CB issuer demonstrate themselves about the prospect of the new projects financed by CBs.

C. Robustness Tests

In order to test the robustness of the results, we perform the analyses with several alternative specifications/variable proxies.[12] On the whole, the findings are quite robust.

V. CONCLUSION

This paper examines the empirical relationship between the characteristics of issuers/issue and the abnormal returns of firms that issue CB's. We confirm that there are significant negative abnormal returns around the filing date of the notice or application to SEC and the issue date at a significance level of 1%. The abnormal return on the filing date and issue date is -0.72% and -0.81% respectively. The significance statistics is higher when the window is nearer to event date, and the significance statistics is larger for issuance date effects, which supports the view that selling pressures exist around the issuance date of CBs.

Consistent with Liu and Switzer (2009) the market responds favorably to the issuance of convertible bonds by issuers with mild levels of firm volatility risk. Liquidity risk (issue size) and issue risk premium factors (convertible Vega) have significantly negative effects on abnormal returns around the issue date. The findings are robust to different grouping criteria and estimation methods.

ENDNOTES

1. See e.g., Dann and Mikkelson (1984), Eckbo (1986), Davidson III, Glascock and Schwartz (1995), Kim (1990), Arshanapalli, Fabozzi, Switzer, and Gosselin (2005), and Loncarski, Horst, and Veld (2006).
2. See Smith (1986), and Davidson et al. (1995).
3. See Asquith and Mullins (1986).
4. Fabozzi, Liu, and Switzer (2009) demonstrate that a naked long position of CBs from issue date can generate good returns at the end of two or three years after issuance, especially for CBs with low ratings and large issue size.
5. If we deem stock price include the market reactions to all information, the standard deviation of beta could be a very good proxy for the firm's general risk.
6. We also use the CRSP value-weighted portfolio as well as the S&P 500 as alternative market portfolio proxies to test for robustness. The results, which are

available on request, are unaffected by the use of alternative market proxies and robust to these alternative measures.

7. Several capital-structure related measures here can also be deemed as issuer specific proxies. We list here for convenience.
8. Total debt divided by total assets.
9. The results are similar when we use the value-weighted market returns and the S&P index returns as the market proxies. When we use CB issue date as the event date we find the abnormal returns typically exceed those of Panel A. In addition, most of the abnormal returns are highly significant. These results are not reported here in order to conserve space, but are available on request.
10. A similar test conducted around the filing date is not meaningful because at filing date since: 1) terms of CBs may not have been determined, which means that the value of the CB cannot be determined, 2) the actual issue date is still unknown, which means that hedged position of CBs cannot be set up yet; and 3) according to the database of Bloomberg, normally there does not have abnormal variations of the accumulated short interests around the filing date of CBs; however an increase of accumulated short interest is obvious around the issue date.
11. Short interest for CB issuing companies rises around the issuance: the mean and median ratio of short interest after CB issuance to that before issuance are 228.08% and 46.29% respectively.
12. Specifically, we use the CRSP value weighted index as well as the S&P 500 as alternative market proxies. In addition, we perform the analyses using real returns, rather than abnormal returns, around the issue date to run the regressions. We also perform the regressions using both FGLS and Error-components Model with fixed effects, and using CARs based on the Carhart-Fama-French approach. Finally, we use a dilution adjusted estimate of Vega to capture volatility risk (Liu and Switzer (2009)). The results are very similar to those reported in Table 3. The rating of CB issuance firms could be another proxy for the firm volatility risk, since it should incorporate comprehensive information about the performance of a firm. Due to lack of data, we use ratings of CB issuance instead. We find that the firm volatility risk is still positively related to the abnormal returns of CBs, although the influence of the CB issuance ratings is not significant. To conserve space, we do not include these results herein. They are available on request.

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