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Self-selection and stock returns around corporate security offering announcements

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Marie Dutordoir (Manchester Business School)
Laurie Hodrick (Columbia Business School)

Motivation

- Documented stock returns around announcement (Eckbo et al., Handbook of Corporate Finance: Empirical Corporate Finance Chapter 6, 2007)
  - Straight debt issue: no significant returns
  - Convertible debt issue: negative returns of approximately −1.5% on average
  - Seasoned equity issue: negative returns of approximately −2% on average

- An important caveat to observed security offering announcement effects is that they are conditional on firms self-selecting into a particular security offering

  "*If a corporate event is voluntary and investors are rational, cross-sectional regressions that seek to explain the event's stock price effect should explicitly account for the self-selection of firms…*" Eckbo et al. (RFS, 1990)

Main contribution

- To our knowledge, we are the first to incorporate the endogenous nature of security offering choices into an analysis of their stock price effects

- We analyze the determinants of security choices and associated stock price effects in an integrated framework

- This approach enables us to calculate estimates of counterfactual announcement returns that would be expected were firms instead to choose different security offerings: we find that firms choose the offering with the least negative expected announcement returns when offering straight debt, convertible debt, or common equity

Data

- We retrieve security offerings made by U.S. firms between 1999 and 2008 from the Security Data Company (SDC)

- Our search algorithm excludes
  - Mortgage- or asset-backed bonds
  - IPOs and secondary equity offerings
  - Offerings made by utilities and financials
  - Privately-placed non-Rule 144 A offerings
  - SEC Rule 415 shelf offerings

- We further require
  - Balance sheet and income statement data are available from Compustat
  - Stock price-related data are available from CRSP
  - Deal-specific information is available from SDC

- We thus obtain a data set of 1,142 straight debt, 659 convertible debt, and 371 equity offerings

Data: Measurement of determinants

- Descriptive statistics of determinants widely used in the literature as components of vectors X and Z in self-selection and announcement return equations (measured fiscal year-end prior to announcement) highlight how firm characteristics differ significantly across offering types

Variables	Mean			*t*-statistics for difference in means		
	Straight debt	Convertible	Equity	Convertible vs. Straight	Equity vs. Convertible	Equity vs. Straight
Leverage	24.38%	37.42%	18.11%	11.55^{***}	-4.32^{***}	-14.67^{***}
Volatility	2.92%	3.54%	4.66%	7.20^{***}	7.89^{***}	13.97^{***}
EBIT	13.52%	6.25%	−7.87%	-9.37^{***}	-7.13^{***}	-11.50^{***}
PPE	35.64%	25.00%	24.87%	-12.53^{***}	−0.09	-10.15^{***}
Taxes	2.41%	2.15%	1.37%	-1.80^{*}	-4.80^{***}	-7.38^{***}
TB Yield	2.99%	2.82%	3.56%	-2.01^{**}	6.69^{***}	5.59^{***}
Slack	6.48%	23.92%	29.75%	17.97^{***}	3.24^{***}	14.88^{***}
Stock Run-up	−0.05%	0.03%	0.24%	4.34^{***}	7.89^{***}	11.31^{***}
Leading Indicator	0.00%	0.35%	0.39%	5.22^{***}	0.57	4.88^{***}
Relative Proceeds	23.98%	20.35%	27.28%	-3.94^{***}	5.52^{***}	2.48^{***}
Total Assets ($ Million)	7,768	2,656	1,259	-8.10^{***}	-2.72^{***}	-8.57^{***}
MB	4.51	6.24	5.98	1.41	−1.29	1.55

Methodology

- Our research consists of the following steps
  - Traditional event study analysis of security offering announcement returns
  - Switching regression analysis of security choice and announcement return determinants
  - Counterfactual analysis of expected announcement returns under alternative offering choices

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Methodology: Event study analysis

- Standard event study methodology as in Brown and Warner (JFE, 1985)
- Event study results consistent with literature

Event day(s)	Straight debt (N = 1,004)		
	Mean AR	% Negative AR	Patell Z-statistic
−1	0.04%	50.82%	−0.12
0	0.11%	50.27%	2.15**
1	0.07%	47.46%	1.00
(2,10)	−0.13%	51.18%	−0.29
Event day(s)	**Convertible debt (N = 638)**		
	Mean AR	% Negative AR	Patell Z-statistic
−1	−0.79%	55.54%**	−5.93***
0	−3.02%	73.44%***	−23.02***
1	−0.24%	54.02%	−0.61
(2,10)	1.06%	46.43%*	2.45**
Event day(s)	**Seasoned equity (N = 343)**		
	Mean AR	% Negative AR	Patell Z-statistic
−1	0.10%	51.92%	1.13
0	−1.76%	65.55%**	−12.44***
1	0.06%	50.43%	0.40
(2,10)	−0.64%	53.04%	−1.35

Methodology: Switching regression model

- Self-selection equation estimated as an ordered probit model with maximum likelihood method

$$Y^* = Z'\gamma + \varepsilon \qquad (1)$$
$$Y^* \le \mu_1 \rightarrow straight\ debt$$
$$\mu_1 < Y^* \le \mu_2 \rightarrow convertible\ debt$$
$$\mu_2 < Y^* \rightarrow equity$$

- Announcement return equations

$$AR_0 = X_0\beta_0 + u_0 \quad (2a)$$
$$AR_1 = X_1\beta_1 + u_1 \quad (2b)$$
$$AR_2 = X_2\beta_2 + u_2 \quad (2c)$$

- Endogeneity of security choice is modelled by allowing residuals u_j to correlate with residual ε: Use estimates for parameters μ and γ to calculate generalized residuals, to augment the announcement return equations

$$\lambda_0 = \frac{-f(\hat{\mu}_1 - Z'\hat{\gamma})}{F(\hat{\mu}_1 - Z'\hat{\gamma})} \quad for\ straight\ debt \quad (3a)$$
$$\lambda_1 = \frac{f(\hat{\mu}_1 - Z'\hat{\gamma}) - f(\hat{\mu}_2 - Z'\hat{\gamma})}{F(\hat{\mu}_2 - Z'\hat{\gamma}) - F(\hat{\mu}_1 - Z'\hat{\gamma})} \quad for\ convertible\ debt \quad (3b)$$
$$\lambda_2 = \frac{f(\hat{\mu}_2 - Z'\hat{\gamma})}{1 - F(\hat{\mu}_2 - Z'\hat{\gamma})} \quad for\ equity \quad (3c)$$

Methodology: Counterfactual analysis

- For a security issuer with particular characteristics, what would have been the announcement return if that firm had, instead, announced another offering type?

- To infer the abnormal stock return a straight debt issuer *i* would have obtained if it had instead announced convertible debt or equity, we compute the following counterfactuals

  $$E(AR_{1i} | Y_i = 0) \qquad (4a)$$
  $$E(AR_{2i} | Y_i = 0) \qquad (4b)$$

  The counterfactual returns in these equations can be calculated by evaluating the straight debt issuer's attributes using the parameter estimates obtained for the relevant announcement return equation

- Counterfactual outcomes for convertible debt and equity issuers are computed in the same manner

Empirical results

- Determinants of the choice of offering largely consistent with literature and univariate results, robust to multiple offerings within year and to continuous variable specification

Variables	Parameter values (*z*-statistic)		
	(1)	(2)	(3)
Intercept 1	−3.981*** (−16.05)	−4.351*** (−13.57)	0.768*** (31.73)
Intercept 2	−2.498*** (−10.46)	−2.795*** (−9.17)	NA
Leverage	−0.855*** (−6.22)	−0.825*** (−5.11)	−0.658*** (−6.21)
Volatility	12.476*** (7.04)	12.107*** (4.21)	9.960*** (5.35)
EBIT	−0.556** (−2.24)	−0.494** (−2.00)	−0.299* (−1.92)
PPE	−0.385*** (−2.95)	−0.412*** (−2.64)	−0.335*** (−3.29)
Taxes	−3.205*** (−2.60)	−3.419*** (−2.79)	−2.187*** (−2.66)
TB Yield	1.794 (0.96)	2.738 (1.28)	−3.373 (−0.26)
Slack	−0.291 (−1.50)	−0.271 (−1.42)	−0.033 (−0.27)
Stock Run-up	71.395*** (8.00)	76.641*** (5.58)	51.065*** (5.81)
Leading Indicator	14.212*** (4.90)	12.451*** (3.55)	10.389*** (4.62)
Relative Proceeds	−2.114*** (−11.30)	−2.172*** (−9.93)	−1.622*** (−10.81)
LN(Total Assets)	−1.070*** (−17.29)	−1.191*** (−14.54)	−0.732*** (−14.21)
MB	−0.002 (−0.01)	0.020 (0.54)	0.010 (0.34)
Debt Maturing in One Year	−1.238* (−1.72)	−1.124* (−1.72)	−0.806* (−1.70)
Pseudo R^2	29.86%	33.73%	28.58%
Likelihood ratio statistic	1,196.94***	1,187.79***	1,466.12***
N	1,982	1,875	1,982

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Empirical results

- Determinants of straight debt offering announcement returns show significant ‘positive selection’ and effect of residual variable on other coefficients

Variables	Parameter values (*z*-statistic)		
	(1)	(2)	(3)
Intercept	−0.085 (−1.63)	0.010 (0.83)	−0.083 (−1.61)
Residual	−0.037* (−1.95)		−0.036* (−1.93)
Confounding			−0.004 (−0.73)
Leverage	0.018* (1.67)	0.001 (0.16)	0.018* (1.67)
Volatility	−0.311** (−2.05)	−0.063 (−0.59)	−0.308** (−2.04)
EBIT	0.014 (0.43)	0.004 (0.13)	0.014 (0.43)
PPE	0.016*** (2.47)	0.010* (1.89)	0.016*** (2.44)
Taxes	0.004 (0.04)	−0.067 (−0.68)	0.002 (0.02)
TB Yield	−0.181** (−2.08)	−0.155* (−1.89)	−0.185** (−2.11)
Slack	0.035** (2.01)	0.033* (1.92)	0.034* (1.98)
Stock Run-up	−2.333** (−2.45)	−1.231** (−2.50)	−1.490** (−2.34)
Leading Indicator	−0.345 (−1.72*)	−0.068 (−0.49)	−0.344 (−1.72*)
Relative Proceeds	0.029 (1.43)	−0.008 (−0.97)	0.029 (1.42)
LN(Total Assets)	0.016* (1.64)	−0.001 (−0.49)	0.016 (1.62)
MB	−0.058*** (−3.01)	−0.057*** (−2.85)	−0.055*** (−2.79)
R^2	3.46%	3.15%	3.55%
Adjusted R^2	2.10%	1.91%	2.09%

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Empirical results

- Determinants of convertible debt offering announcement returns show effect of residual variable on other coefficients

Variables	Parameter values (*z*-statistic)		
	(1)	(2)	(3)
Intercept	−0.441** (−2.09)	−0.105*** (−2.78)	−0.402* (−1.84)
Residual	−0.122 (−1.58)		−0.103 (−1.29)
Confounding			0.017** (2.00)
Leverage	0.080 (1.49)	−0.004 (−0.22)	0.070 (1.26)
Volatility	−1.531 (−1.57)	−0.278 (−1.11)	−1.259 (−1.40)
EBIT	0.036 (0.74)	−0.017 (−0.53)	0.021 (0.43)
PPE	0.068* (1.96)	0.028 (1.27)	0.065* (1.85)
Taxes	0.208 (0.64)	−0.121 (−0.75)	0.174 (0.53)
TB Yield	0.600** (2.02)	0.745*** (2.65)	0.632** (2.14)
Slack	0.055* (1.72)	0.024 (0.94)	0.052 (1.62)
Stock Run-up	−6.700 (−1.32)	0.693 (0.53)	−5.348 (−1.02)
Leading Indicator	−0.555 (−0.56)	0.823* (1.81)	−0.311 (−0.30)
Relative Proceeds	0.154 (1.06)	−0.062 (−1.76)	0.118 (0.78)
MB	0.027** (2.24)	0.027** (1.96)	0.027** (2.04)
LN(Total Assets)	0.127* (1.84)	0.018* (1.78)	0.111 (1.55)
R^2	4.53%	4.18%	5.08%
Adjusted R^2	2.40%	2.22%	2.80%

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Empirical results

- Determinants of equity offering announcement returns show significant 'positive selection,' effect of residual on other coefficients, and substantial differences across security offerings

Variables	Parameter values (z-statistic)		
	(1)	(2)	(3)
Intercept	0.036 (0.95)	−0.005 (−0.18)	0.035 (0.93)
Residual	0.043* (1.71)		0.043* (1.71)
Confounding			−0.022* (−1.77)
Leverage	−0.048* (−1.72)	−0.022 (−1.03)	−0.050* (−1.80)
Volatility	−0.192 (−0.75)	−0.484* (−1.91)	−0.185 (−0.73)
EBIT	0.019 (0.95)	0.024 (1.22)	0.016 (0.86)
PPE	−0.008 (−1.05)	0.004 (0.27)	−0.008 (−0.46)
Taxes	−0.024 (−0.15)	0.090 (0.66)	−0.012(−0.07)
TB Yield	−0.036 (−0.16)	−0.052 (−0.23)	−0.030 (−0.13)
Slack	0.014 (0.73)	0.024 (1.26)	0.012 (0.65)
Stock Run-up	2.987** (2.06)	1.577* (1.63)	3.011** (2.07)
Leading Indicator	0.221 (0.56)	−0.161 (−0.48)	0.221 (0.56)
Relative Proceeds	−0.047 (−1.05)	0.006 (0.27)	−0.049 (−1.10)
MB	−0.131 (−0.22)	0.235 (0.40)	−0.132 (−0.22)
LN(Total Assets)	−0.032* (−1.67)	−0.001 (−1.16)	−0.030 (−1.57)
R^2	5.30%	4.82%	6.43%
Adjusted R^2	1.19%	1.06%	2.08%

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Empirical results

- Analysis of actual versus counterfactual announcement effects: firms select offering with least negative expected announcement return, results robust

Security issuer type	Straight debt (1)	Convertible debt (2)	Seasoned equity (3)
		Security type	
Straight debt issuer (a)	0.11% (I)	*−8.60%*	*−11.02%*
		t-stat. for difference with (II): -7.66^{***}	*t*-stat. for difference with (III): -27.55^{***}
		t-stat. for difference with (I): -54.81^{***}	*t*-stat. for difference with (I): -84.77^{***}
Convertible debt issuer (b)	*−3.25%*	−2.75% (II)	*−4.57%*
	t-stat. for difference with (I): -21.18^{***}		*t*-stat. for difference with (III): -18.11^{***}
	t-stat. for difference with (II): -2.78^{***}		*t*-stat. for difference with (II): -10.13^{***}
Seasoned equity issuer (c)	*−5.24%*	*−1.61%*	−1.76% (III)
	t-stat. for difference with (I): -32.17^{***}	*t*-stat. for difference with (II): 4.24^{***}	
	t-stat. for difference with (III): -4.52^{***}	*t*-stat. for difference with (III): 0.31	

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Conclusions

- To our knowledge, our study is the first to incorporate the non-random nature of security choices into an analysis of security offering announcement returns
- Our results suggest that firms choose the security offering with the least negative expected announcement effect
  - Straight debt and convertible debt issuers would have encountered significantly more negative announcement returns had they instead issued equity
  - Returns even more negative than those observed for actual equity issuers (six times as negative and twice as negative as equity issuers, respectively)
- Equity and convertible debt issuers would have encountered significantly more negative announcement returns had they instead issued straight debt
- As a consequence, the negativity of security offering announcement returns is truncated by firms' self-selection into particular security offerings, as the reaction would have been worse had they issued something else
- Does anticipation of the announcement effects drive the offering choice?
  - Testing whether expected announcement returns influence security choice by estimating structural self-selection model
  - Preliminary results suggest that expected announcement returns do have an impact on security choices incremental to other security choice determinants