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Three Essays on Corporate Finance: A Multilevel Inspection of Target Capital Structure & Convertible Debt Issuance and Market Valuations of Innovative Ability

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Dedication

To my daughter, Evelynn "Evey" Simone Poindexter, who illuminates my world. *"The light of God surrounds you, the love of God enfolds you, the power of God protects you, and the presence of God watches over you. Wherever you are, God is."*

&

To my mother, Flavia Lynn Richardson Eldemire, Ph.D. Know that anything I should ever accomplish or achieve is the direct fruit of your trailblazing life and endless encouragement.

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I sincerely wish it were possible to include my awesome community of family and friends as formal collaborators. In addition to co-authors Jamie Weathers and Adam Usman, the following pages also reflect the endurance and grace of my husband, Reginald Poindexter, my better half, Alicia Bouchier, and my extended family and dearest friends. I am indebted to them all for every hour of work, every hour of childcare, every meal, and all of their positive energy.

Abstract

This dissertation presents empirical analysis of the capital structure, security issuance, value creation, and valuation concepts of corporate finance. Two analysis examine connections between firm capital structure and the use of convertible debt securities, which have mixed debt and equity attributes. The third analysis examines the valuation of implicit and explicit signals of firm quality.

Chapter 1, Convertible Debt & Target Leverage Adjustments, examines how does convertible debt affects advances toward target capital structure. Convertibles may improve leverage adjustments by providing capital that is less costly to issue and less expensive to service. However, convertibles can be risky liabilities with uncertainty around the achievement and timing of conversion events. I find that issuers - both above and below respective target ratios - experience faster leverage adjustments during the issuance window and throughout the active outstanding offer period. Issuers realize faster adjustments by exercising call options and redemption exchanges. Robust to concurrent capital structure changes, the results suggest convertible debt can be an effective tool for target leverage adjustments.

Chapter 2, Target Leverage Deviations & Convertible Debt Design, examines whether the terms and provisions of convertible bond offers are distinctly related to the issuers' ex-ante target capital structure needs? Accounting for market-wide equity volatility and cumulative returns, aggregate investor demand, macroeconomic conditions and firm-specific equity and growth characteristics, I find that drifts (deviations) from target capital structure have a positive and significant effect on convertible bond issuance. Yet, the magnitude and direction of target deviations

have varying effects on the sensitivity of conversion terms, principal offer amounts, and the inclusion of call, put, and redemption provisions.

Chapter 3, Does the Market Value Innovative Ability? Evidence from M&A, co-authored with Adam Usman and Jamie Weathers, analyzes M&A announcement return effects when the acquirer displays a superior capability to convert investments in innovation into tangible valued output. We find a positive relation between acquirer innovation conversion (IC) ability and abnormal returns around M&A announcements. Further, we use distinct measures of IC ability to compare internal and external innovation investments. We find larger returns for the external measure (Intangible Assets) relative to the internal measure (R&D), which is the typical proxy for innovation investments. The results suggest IC ability type matters; market perception of the value impact of an acquisition differ across the acquirers' capability to capitalize external innovation.

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Chapter 1

Convertible Debt & Target Leverage Adjustments[1]

1.1 Introduction

Is the use of convertible debt consistent behavior for firms targeting an optimal leverage ratio? If so, how does the hybrid debt-equity structure of convertible bonds impact target leverage adjustments? I analyze these questions by studying the target leverage and partial adjustment activity of firms that issue convertible debt. By design convertible bonds provide immediate capital and the potential for new equity, but convertibles may also be a tool to mitigate the cost of target leverage adjustments. The relative ease of offering convertible debt may reduce a firm's sensitivity to the cost of accessing capital markets, a primary component of leverage adjustment costs. Convertible bonds are debt securities with an embedded equity option. If and when a predetermined strike price is met, bond-holders may convert the debt into common stock. Compared to equity, convertibles can be a less costly form of external financing as convertible bonds have lower issuance cost and less extreme underpricing.[2] Compared to straight debt, convertibles may mitigate concerns about firm risk and reduce the cost of debt financing (Brennan and Kraus

[1]Eldemire-Poindexter, A. To be submitted.

[2]It is a stylized fact that convertible offers have less negative abnormal returns around the announcement and issuance windows than those of equity offers (Dann and Mikkelson (1984) , Mikkelson and Partch (1986), Lewis, Rogalski, and Seward (1999), Dutordoir and Van de Gucht (2007), Henderson and Tookes (2012)).

(1987), Brennan and Schwartz (1988)). If convertible issuance sufficiently lowers the barriers to external financing, a firm could pay less to access capital markets and simultaneously resolve its financing needs and target leverage deviation.

Issuing convertible debt, however, does not guarantee that a firm will immediately reduce its leverage deviation. Since convertibles originate on the balance sheet as liabilities, issuance inherently increases short-term book leverage and may, all else equal, expand the deviation between an over-levered firm's current and optimal book leverage. Further, a convertible bond may take several years to convert into equity, if at all. Volatility in the issuer's stock price should encourage rational bond-holders to abstain from pursuing conversion while the equity option on the convertible continues to appreciate.[3] Such behavior by bond-holders highlights the potential for slow conversion events. The unknown time-to-conversion may skew interim leverage levels and subsequently slow adjustment efforts (Tsyplakov (2008)). Delayed conversion would extend the bond's debt service and could force the firm to revise other capital structure decisions (e.g. issuance of substitute or supplementary capital). For example, consider an over-levered firm issuing a convertible bond with the intent of quickly achieving conversion and making a large adjustment toward its target leverage. The cost of seeking new capital, the risk of tripping preexisting covenants, and the need to redirect cash are all possible risks if the stock price fails to reach the conversion price.

In addition to the size and direction of target deviations, cash flow needs also influence target leverage adjustments (Faulkender, Flannery, Hankins, and Smith (2012)). Changes in leverage due to internal (passive) shifts in net income have an independent and significant impact on overall leverage adjustment speeds. Convertible bond-holders are typically willing to accept a lower coupon payment in

[3] Henderson and Zhao (2014) report a mean stock price volatility of 4.15% over the two hundred trading days preceding issuance for a sample of convertibles offered between 2000-2010.

exchange for the bond's equity option (Brennan and Kraus (1987)). Accordingly, convertibles tend to have a reduced interest expense proportional to the value of their equity component. For this reason, outstanding convertibles may lower the firm's debt service burden and preserve cash holdings. If firms make faster target adjustments when internally generated cash is available, the reduced interest expense on convertible debt may increase net income and improve the issuer's target adjustments through this passive channel.

Due to the options embedded in convertible bonds, the principal of a convertible offer can undergo several changes between issuance and maturity. Figure 1.1 presents a diagram of the potential outcomes for convertible bonds. Call and/or put provisions are often included in convertible offers. When an issuer exercises a call provision bond-holders are typically forced to convert their debt into common stock. In contrast, put provisions grant bond-holders the right to be refunded before maturity if the issuer's stock under-performs. Calling convertible debt can reduce the issuers' liabilities but honoring putable bonds may deplete cash balances. It's unclear how changes in convertible debt, which can simultaneously effect debt and equity balances, impact target leverage adjustments.

To shed light on the relations between the use of convertible debt and capital structure, I construct a sample of convertible bond issuers from the Compustat universe from 1990-2014. The sample includes 842 firms that issued 1,386 convertible bonds. When issued, these bonds have a sizable impact on the firm's overall capital structure. At the means (medians) the convertibles constitute 76% (60%) of book leverage and 24% (19%) of total assets at issuance. Convertible bonds tend to contain provisions conducive to equity conversion. Roughly 65% of the bonds include call provisions and a quarter of the offers include put provisions.

I account for offer-level calls, puts, and open market redemptions from issuance through maturity to track changes to the principal of outstanding convertible bonds.

Within the sample, redemption, call, and put events can affect a third to a half of a convertible bond's outstanding principal before maturity. Consistent with existing literature, call and put events are not concentrated around the offer date but typically occur three to four years after issuance. King and Mauer (2014) show that call events are most likely to occur when the issuers' stock price has consistently exceeded the conversion price and the issuer has significant cash flow needs. Chemmanur and Simonyan (2010) find that, relative to other issuers, larger, less-risky firms primarily use put options. The stability of these firm's preempt and delay the likelihood of put events. Given that convertible offers make up a large proportion of cumulative debt, the time gaps between issuance and a major call, put, or redemption event highlight the importance of considering the entire duration of the bond.

To understand the impact of convertible debt on capital structure, I calculate target leverage as in Flannery and Hankins (2013), and estimate standard adjustments for book and market leverage as well as active adjustments for book leverage as in Faulkender et al. (2012). Shifts in aggregate leverage levels (standard adjustments) are decomposed relative to the source of the actions affecting capital structure. Active adjustments capture leverage corrections made in excess of the firm's internal changes in net income (passive adjustments). Estimates across all extant models of the determinants of target leverage are consistent with the expectations of targeting behavior and verify that convertible issuers do target an optimal leverage ratio.[4] Compared to non-issuers, firms issuing convertible debt have higher observed and target leverage ratios and wider target leverage deviations in the time preceding issuance.

Across the entire sample, the average firm has a standard book (market)

[4] Proxies for the determinants of target leverage have been identified and used to estimate optimal leverage ratios by simple ols, least squares dependent variable (LSDV), and generalized method of moments (Hovakimian, Opler, and Titman (2001), Hovakimian and Titman (2006), Korajczyk and Levy (2003), Flannery and Rangan (2006), Faulkender et al. (2012)).

adjustment speed of roughly 30% (37%) and an active book adjustment speeds of 62%. In other words, the average firm closes a third of the gap between its observed and desired book (market) leverage levels irrespective of the sources of capital. After incorporating internal shifts in net income and adjusting observed leverage, the average firm closes two-thirds of the remaining gap between its observed and desired leverage ratio with capital acquired externally. Despite spiking debt levels with a new offer, convertible bond issuers subsequently experience faster leverage adjustments than non-issuers. Across the three year window around a new convertible offer, issuers close 24% (14%) more of their standard book (market) leverage deviations and 11% more of their active book deviations.

Since partial adjustments are estimated as annual changes in aggregate leverage, the effects of an individual convertible offer may be lost in, or overpowered by, other activities that occur throughout the year. de Jong, Dutordoir, and Verwijmeren (2011) and Henderson and Zhao (2014) document a recent but widespread pattern of concurrent stock repurchase and seasoned equity issuance events alongside convertible bond issuance. To isolate the influence of convertible offers I exclude firms with concurrent offer-year changes to capital structure such as equity issuances, stock repurchases, or non-convertible debt calls, puts, or redemptions. The offer-year adjustment speed results are robust to controls for concurrent shifts in capital structure.

Considering the entire time during which convertible debt is a part of the firm's capital structure, the average issuer closes 9% (14%) more of its book (market) leverage deviations than non-issuers. However, active book adjustments trail those of non-issuers by 4%. From the univariate data it is clear that calls, puts, and redemptions can begin to affect a large portion of convertible offers years after issuance. Although firms have to engage with capital markets to execute calls and redemptions, these actions impact convertibles that are already a part of the firms balance sheet. In the decomposed setting of active and passive adjustments, these reductions in outstanding convertibles are likely captured as passive adjustments if net income is used to fund calls and redemptions. All else equal, larger passive adjustments will reduce the need for and magnitude of active adjustments. Overall, the results suggest that convertible debt helps improve the issuer's target leverage adjustments at issuance and throughout maturity.

1.2 Analytical Framework

In a frictionless static tradeoff theory world, firms have known target leverage ratios and will immediately correct any deviations from the target (Modigliani and Miller (1958)). In an imperfect world, optimal leverage varies as the balance between the costs and benefits of debt changes over time. Yet, there is strong empirical evidence that firms have long run target debt ratios. Several leverage studies have examined historic and current debt ratios, earnings, expected growth, and access to external financing to test and demonstrate targeting behavior (Hovakimian et al. (2001), Fama and French (2002), Hovakimian and Titman (2006)). This literature primarily examines the behavior of the universe of publicly traded firms. The generally observed targeting and adjustment trends may not apply to convertible issuers, who are a small sub-sample of all firms.

Consistent with a pecking order theory world, convertible issuers are often described as opaque firms with high leverage and limited financial market access (Mayers (1998)). In managerial surveys by Dong, Dutordoir, and Veld (2011) managers characterized their decision to issue a convertible as their only option or last resort to access external financing. Before scrutinizing convertible issuers adjustment speeds, a necessary first step is to establish whether issuers strive for a long run optimal leverage ratio.

To affirm whether convertible issuers have a long run optimal leverage, this paper's first tests are for consistency within the determinants of target leverage. Following the extant debt ratio literature, optimal leverage depends on a set of observable firm characteristics:

$$\mathrm{L}^*_{i,t} = \beta X_{i,t-1} + \tilde{\epsilon}_{i,t} \tag{1.1}$$

where $L^*_{i,t}$ is target leverage, $\mathbf{X_{i,t-1}}$ is a vector of lagged firm characteristics, and β is a cross-sectional coefficient vector.

The primary characteristics in the vector $\mathbf{X_{i,t-1}}$ are lagged book (market) leverage, earnings before interest and taxes as a proportion of total assets (EBIT/TA), market to book ratio of assets (MB), and the log of real total assets (LnTA).[5] Higher profitability (EBIT/TA) may mechanically reduce leverage and high MB firms may prefer to protect valuable growth opportunities by limiting or closely monitoring leverage (Rajan and Zingales (1995), Hovakimian et al. (2001)). Size may imply higher leverage as size is closely related to transparency, asset volatility, and access to public debt markets (Faulkender and Petersen (2006)). When considering convertible bond issuers, the determinants of target leverage, particularly profitability and market-to-book, may deviate from expectations. Convertible debt issuers have been characterized as opaque, low-medium quality firms with positive prospects (Stein (1992)). Empirical studies find that issuers tend to have higher leverage than industry peers and are often considered over-levered given their asset set and growth opportunities (Mayers (1998), Lewis et al. (1999)). High leverage and growth potential are conflicting attributes in the target leverage literature. Thus, convertible issuers may be a unique subset of firms with different target adjustment behavior or no target leverage altogether.

If convertible issuer β estimates for the determinants of optimal leverage are

[5] A full list of firm characteristics is provided in Appendix A.

consistent with theoretical expectations, we can infer that convertible issuers have a target leverage. Specifically, $\beta_{Convertible-Issuers}$ should follow directional expectations and be statistically significant.

Hypothesis 1| $H_0 : \boldsymbol{\beta}_{Non-Issuers} \neq \boldsymbol{\beta}_{Convertible-Issuers}$

Hypothesis 1A| $H_0 : \boldsymbol{\beta}_{Convertible-Issuers} = 0$

Convertible debt is not typically a part of a firm's capital structure every year it operates, therefore the primary analysis focuses on two definitions of convertible issuer firm-years to capture periods relevant to, and impacted by convertible debt. The first definition sets ($CBIssuer_{OfferYear}$=*1*) for a three year window around the year in which a convertible bond is issued. The second definition sets ($CBIssuer_{CD>0} = 1$) from the year preceding the issuance of a convertible through the year following its maturity. Figure 1.2 illustrates a time-line of firm-years for a typical convertible bond issuer. A more detailed discussion of the identification strategy for convertible issuer firm-years is presented after the discussion of target estimation and partial adjustment estimates.

Estimating Partial Adjustment Speeds

Unlike the setting with frictionless transaction costs and instantaneous corrections, firms have to minimize the real transaction costs of leverage changes. Since adjustments become more costly as debt ratios move farther away from the target, the specification in (2.9) is extended into a model of target leverage that accounts for partial adjustments, removes the constraint that optimal leverage is equivalent to observed leverage and incorporates firm fixed effects. Under the assumption that $L^*_{i,t} = \beta X_{i,t-1}$, Leary and Roberts (2005) and Flannery and Rangan (2006) develop a standard model of partial leverage adjustments with the form:

$$L_{i,t} - L_{i,t-1} = \lambda(L^*_{i,t} - L_{i,t-1}) + \tilde{\epsilon}_{i,t} \tag{1.2}$$

where $L_{i,t}$ and $L_{i,t-1}$ are time t and lagged leverage, and $L^*_{i,t}$ is the estimated target leverage. The speed of adjustment, λ, is the percentage of a typical firm's target deviation closed over a year (Δt). Rearranging (8) and substituting (2.9) yields the estimable model:

$$L_{i,t} = (\lambda)(\beta X_{i,t-1}) + (1 - \lambda)(L_{i,t-1}) + \tilde{\epsilon}_{i,t} \tag{1.3}$$

The coefficient vectors $\boldsymbol{\beta}$ and $\boldsymbol{\lambda}$ are estimated concurrently by the Blundell and Bond (1998) system GMM for dynamic panel models (Flannery and Hankins (2013)). Assuming target leverage is truly a function of observable and unobservable firm characteristics such that $L^*_i = \beta X_i + F_i$, the short panel bias model of target leverage takes the form:

$$L_{i,t} = \lambda(\beta X_{i,t-1}) + \lambda(F_i) + (1 - \lambda)(L_{i,t-1}) + \tilde{\delta}_{i,t} \tag{1.4}$$

Following Flannery and Hankins (2013), GMM estimated targets are adjusted by firm level target leverage fixed effects to capture unobserved but inter-temporally constant effects on a firm's target leverage ratio. Firm fixed effects for target leverage are calculated as the mean residual of the short panel bias model in (2.10). With yearly target leverage estimates the standard partial adjustment model in (8) is estimated by an ordinary least squares regression.

With yearly target leverage estimates the standard partial adjustment model in (8) is estimated by an ordinary least squares regression.

Active & Passive Leverage Adjustments

The standard partial adjustment model in (8) captures changes in leverage due to broad changes in debt and equity but can underestimate the impact of internally generated cashflows (Byoun (2008)). To differentiate between mechanical adjustments due to changes in operating income (net income) and active adjustments due to capital markets access, Faulkender et al. (2012) decompose leverage changes into active and passive components. Passive book leverage (1.5) accounts for internally financed adjustments:

$$L^P_{i,t-1} = \frac{D_{i,t-1}}{A_{i,t-1} + NI_{i,t}} \tag{1.5}$$

where, $NI_{i,t}$ is net income for year t. Active adjustments capture changes in leverage that result from external, open market activities. The standard adjustment model is revised to reflect active adjustments (1.6) as book leverage at time t less passive leverage:

$$L_{i,t} - L^P_{i,t-1} = \gamma(L^*_{i,t} - L^P_{i,t-1}) + \tilde{\epsilon}_{i,t} \tag{1.6}$$

Decomposing leverage deviations and adjustment into active and passive components is necessary to examine the potential of convertible debt's interest expense savings. Interest savings will materialize on the balance sheet as increased net income and retained earnings. If the savings are large enough to be meaningful, the need for active leverage adjustments should be mitigated.

Partial Adjustments & Convertible Issuers

Partial adjustment speeds are driven by the cost-benefit trade-offs of undertaking actions that affect leverage and the convex nature of adjustment cost (Leary and Roberts (2005), Flannery and Rangan (2006), Huang and Ritter (2009)). As such, adjustment speeds vary asymmetrically across firms and the direction of the target deviation has been shown to greatly impact estimated adjustment speeds (DeAngelo, DeAngelo, and Whited (2011)). Firms operating above their optimal leverage, i.e. over-levered firms, make larger adjustments than under-levered firms operating below their target (Hovakimian and Titman (2006), Faulkender et al. (2012)). All else equal, over-levered firms are perceived to gain more from reducing leverage and lowering distress risk than under-levered firms gain from increasing leverage and raising their tax shelter.

The hybrid debt-equity nature and low issuance cost of convertible bonds may make the security particularly appealing to over-levered firms trying to stay within reach of target book and market leverage ratios. Over-levered firms can move toward their target book-leverage by increasing profitability or issuing equity to retire debt. However, it is difficult to improve profitability and equity issuance is the most expensive form of external financing (Myers and Majluf (1984)). Further, volatility in the firm's stock price or prospects following an equity-offer may negatively impact market-leverage adjustments. Over-levered firms that ultimately want to raise equity may be attracted to the ability to determine the stock price that prompts conversion, the conversion ratio, the conversion commodity, any call provisions, and the offer size (Lewis, Rogalski, and Seward (2003)). Firms may also be drawn to the relatively low transaction costs associated with convertible issues, which are consistently found to be less severe than those of equity issues (Dann and Mikkelson (1984), Mikkelson and Partch (1986), Lewis et al. (1999), Lewis et al. (2003)).

Under-levered firms, that can make target adjustments by repurchasing equity or issuing debt, may also be attracted to the terms or design flexibility of convertible bonds. While under-levered firms generally have lower debt financing costs, offering convertible debt with a moderate equity option could still provide a less expensive form of debt financing. Theory argues that firms issue convertibles as a mechanism to limit adverse selection (back-door-equity hypothesis, Stein (1992)), as a mechanism to mitigate managerial agency problems (sequential financing hypothesis, Mayers (1998)), or as a mechanism to mitigate debt-equity holder agency concerns (risk-shifting hypothesis, Brennan and Schwartz (1988)).[6] The underlying differentiator in the theories of issuance is the power of the bond's equity option. The equity option captures the likelihood of conversion and the upside potential of the bond; if converted the holder is entitled to shareholder returns like dividends and repurchases. The equity option is valued as a function of the bond's features (e.g. the spread between the stock price at issuance and the conversion strike price, coupon rate, conversion ratio, call/put provisions, etc.). Issuers can typically achieve lower coupon payments in exchange for offering valuable equity (conversion) options (Lewis et al. (1999)).[7]

The partial adjustment models in (8) and (1.6) are extended to include an interaction term for convertible issuers. Respectively, the coefficients η and δ capture the differences in standard and active partial adjustment speeds between convertible issuer firm-years and non-issuer firm years.

$$L_{i,t} - L_{i,t-1} = \lambda(L^*_{i,t} - L_{i,t-1}) + \eta(L^*_{i,t} - L_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t} \tag{1.7}$$

$$L_{i,t} - L^P_{i,t-1} = \gamma(L^*_{i,t} - L^P_{i,t-1}) + \delta(L^*_{i,t-1} - L^P_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t} \tag{1.8}$$

Relative to the firm's optimal leverage, both over and under-levered issuers should experience some shifts in market and book leverage when a convertible note is offered. Convertibles are typically offered when the firm's stock price has a positive trajectory. As such, market leverage is expected to decline prior to issuance. Decreases in market leverage levels should result in faster market leverage adjustments for firms above their

[6]These are the primary theories of convertible issuance. More discussion is available in Dutordoir, Lewis, Seward, and Veld (2014).

[7]If the value of the option is too low the subsequent coupon reduction may be negligible.

market target and slower adjustments for firms below their market target. Holding other capital structure activity constant, firms should have more book leverage upon issuing convertible debt. Increases in book leverage levels should result in slower book leverage adjustments for firms above their book target and faster adjustments for firms below their book target. The expected differences in partial adjustment speeds for under-levered and over-levered firms motivate Hypotheses 2 and 2A. Following the partial adjustment models in (1.7) and (1.8):

Hypothesis 2| $H_0 : \eta_{\mathbf{Under-levered}CBIssuer} = \eta_{\mathbf{Over-levered}CBIssuers}$

Hypothesis 2A| $H_0 : \delta_{\mathbf{Under-levered}CBIssuers} = \delta_{\mathbf{Over-levered}CBIssuers}$

where η and δ are the difference in standard and active partial adjustments for a typical convertible issuer firm-year.

Book adjustment speeds estimated during years when convertible debt is outstanding should be driven by interim activities that reduce the amount of outstanding convertible debt (e.g. calls, puts). All else equal, large declines in the amount of outstanding convertible debt should impact both debt and equity levels. Conversions that reduce leverage and increase equity should result in faster (slower) adjustments for over (under) levered firms. The impact is reduced for puts and bond redemption events that reduce both leverage and cash balances. Additionally, maintaining un-modified convertible debt levels may keep over (under) levered firms farther from (closer to) their book target but hold changes in leverage and subsequent leverage adjustments constant.

The expected differences in partial adjustment speeds around issuance of a convertible bond (*OfferYear*) and across years when convertible debt is outstanding (*CD>0*) motivate Hypotheses 3-3A. Following the partial adjustment models in (1.7) and (1.8):

Hypothesis 3| $H_0 : \eta_{CBIssuers-window} = 0$

Hypothesis 3A| $H_0 : \delta_{CBIssuers-window} = 0$

where η and δ are the difference in standard and active partial adjustments for a typical firm convertible issuer firm-year. *Window* is either ($CBIssuer_{OfferYear}$) or ($CBIssuer_{CD>0}$). Recall that $CBIssuer_{OfferYear}$ is a dummy variable equal to one for a three year window around the year in which a convertible bond is issued. Likewise, $CBIssuer_{CD>0}$ is a dummy variable equal to one from the year preceding issuance through the year following maturity (Figure 1.2).

The three year window around issuance is necessary for both target estimation and adjustment speed measures. Recall that target leverage in the year of issuance, t, is a function of the characteristics in *t-1.* In addition to the characteristics in $X_{i,t}$, the year preceding issuance, $t-1$, captures relevant conditions that influence the choice to offer convertible debt (e.g. stock price growth). Issuing new convertible debt will affect the characteristic vector of t and will subsequently impact the target for $t+1$, the year following issuance. Since offering convertible debt can impact leverage adjustments between $t-1$ and t as well as adjustments between t and $t+1$, observing a three year window around issuance more accurately captures the impact on capital structure when convertible debt is offered. The same logic motivates the second definition of convertible issuer firm-years. A window from the year preceding issuance through the year following maturity captures conditions relevant to the issue year target as well as the post-maturity target. Moreover, considering the entire time the convertible is outstanding captures the time when interest expense savings materialize as part of passive adjustments.

1.3 Data

The sample draws from several different data sources. Convertible bonds are available in the Mergent Fixed Income Securities Database (FISD). FISD provides details on debt issues and issuers for publicly offered U.S. corporate, agency and treasury bonds. Capital structure data is available through Compustat and historical stock prices are available in CRSP. Changes in capital structure are aggregated from corporate action announcements available in Bloomberg.

FISD provides complete coverage for bonds issued after January 1990. Screening FISD for conventional convertible bonds results in 3,138 convertibles issued between January 1990 and December 2014. FISD uses different issue identifiers (cusip8) to record convertible bonds originally offered in the R144a market and later re-issued as Exchange Traded Offers. To eliminate duplicate observations, I collapse offers with identical issuer id's (cusip6), offering amounts, coupon rates, conversion prices, conversion ratios, and maturities. This filtering process refines the number of convertible issues to 2,251. Additional offer details include indicators for covenants, call, put, and redemption provisions, as well as information about the underlying security, and the conversion commodity. Call provisions are not reported for 383 cases, I classify these bonds as non-callable.

The full sample consist of all Compustat firms with complete balance sheet data and coverage in CRSP. To estimate target leverages and active partial adjustments, firms must have at least two years of consecutive annual fundamentals and an industry classification. The sample period is limited to 1989-2014 to align with the available FISD sample of convertible bond offers. Regulated firms (SIC 4900-4999) and financial firms (SIC 6000-6999) are excluded. These data requirements yield a full sample of 10,929 firms spanning 106,618 firm-years and a sub-sample of 842 firms offering 1,386 convertible bonds.

Firms are classified as convertible bond issuers from the firm-year preceding a new convertible offer through the firm-year following scheduled maturity (Figure 1.2). The year preceding issuance captures relevant conditions that influence the choice to offer convertible debt and the year following maturity captures any impacts on capital structure that may not be observed until after the debt matures. This definition identifies 7,294 convertible issuer firm-years from the sample of 842 firms with one or more convertible bond offers.

Calls, repurchases, puts, and other activities that reduce the outstanding amount of a convertible bond are aggregated from the corporate action announcements (cact) data available in Bloomberg. FISD provides International Securities Identification Numbers (ISIN) for individual convertible offers. I use the issue level ISINs to link bonds to their issuer's Bloomberg ID and collect all corporate action announcements from 1/1/1990-12/31/2014. Open market debt repurchases, calls, and puts are the most frequent and sizable events amongst the announcements related to convertible bonds[8]. Corporate action announcements for open market debt repurchases, calls, and puts are aggregated quarterly and yearly per bond.

1.3.1 Sample Description

Convertible Bond Terms

Table 1.1 presents summary statistics for the sample of convertible bonds from FISD. The number of issues, offering amounts, and prevalence of provision terms are comparable to convertible bond samples of related literature (Henderson and Zhao (2014), King and Mauer (2014)). The average convertible issue has an important and sizable impact on overall capital structure. The mean (median) offer size of 376M (200M) constitutes 76% (60%) of book leverage and 24% (19%) of total assets at issuance. Offers have relatively low interest rates, the mean convertible coupon rate of 3.87% is less than half of the average coupon (yield at par) of high yield bonds and roughly 60% of the coupon rates on investment grade bonds issued during the sample period. Table 1.1 also reports conversion terms for the sample. The

[8]Although immaterial, conversion term refixes are also quite common events. Refixes are adjustments to the conversion strike price and/or conversion ratio and are most commonly due to dividend payouts, stock splits, and stock distributions.

mean conversion price is roughly equivalent to the firm's high stock price from the year preceding issuance, but is 38% higher than the high stock price for the month preceding issuance. These statistics suggest that the equity or conversion option on convertible bonds are likely to become in-the-money during the bonds' lifetime. Convertible bonds tend to contain provisions conducive to equity conversion. Roughly 65% of the bonds include call provisions intended to force bond-holders to convert their debt into common stock before maturity. Nonetheless, a quarter of the offers include put provisions that grant bond-holders the right to be refunded. Issuers tend to offer 2-3 convertibles throughout a mean sample lifespan of 16 firm-years. The average firm has operated within the sample for 9 years at the time of its first convertible offer.

Firm characteristics

Table 1.2 summarizes the target estimation variables for the sample of convertible issuers and a comparison sample of all Compustat firms exclusive of the excluded industries. Convertible issuers generally resemble non-issuers and both samples are consistent This sample of convertible issuers has mean book and market leverage ratios of 31.7% and 27.1% respectively. Issuer leverage ratios are higher than non-issuers book and market leverage ratios of 23.9% and 22.7%. Despite higher book and market leverage levels, issuers have similar market-to-book ratios and median profitability as non-issuers. Higher book leverage during firm-years with outstanding convertible debt likely reflects the increase in liabilities from convertible issuance.

1.4 Key Findings

1.4.1 Changes in outstanding convertible debt

Table 1.3 summarizes the relative amount of cact events as a proportion of the underlying bonds' original offering amounts, the frequency of cact events per bond, and the time between issuance and the first cact event. These univariate results suggest that convertible debt is strategically reduced. Consider call events where the issuer demands that all or part of the bond be converted into equity. At the means, a convertible bond will have at least one partial call event within 5 years of issuance for approximately 33% of the original offering amount. These call events could reduce $125M in outstanding debt and introduce more than 7M worth of new shares of common stock.[9] Similarly sized events occur for put events where bond-holders can demand to return the debt to the issuer. Amongst the convertibles that have put provisions, on average, bond-holders put 38% of the debt back to the issuer at least once and often within 4 years of issuance. The desire to avoid liability for $143M in refunds illustrates the characterization that put provisions are for more desperate issuers .

Open market repurchases, or bond redemptions, are the most common firm initiated corporate action that affect the amount of outstanding convertible debt. On average, issuers repurchase 45-60% of their convertible debt across three to four spaced out quarters with the redemptions beginning approximately 4 years after issuance. Conversion term refixes are modifications to the bond's conversion price or conversion ratio.

1.4.2 Determinants of target leverage for convertible bond issuers

Econometric techniques used to estimate β for the determinants of target leverage have evolved with the target leverage literature. Table A1 presents OLS coefficient estimates for the characteristics vector (Rajan and Zingales (1995), Hovakimian et al. (2001)). Table A2 presents two-stage least squares coefficient estimates for the vector of firm characteristics, lagged book (market) leverage, clustered standard errors, and time fixed-effects as in Flannery and Rangan (2006). Discussion of the determinant

[9] The average conversion ratio is 59 shares per bond (FV=$1000)

terms is focused on the BB-GMM estimates as this estimation method is the most comprehensive model of target leverage. Table 1.4 present Blundell-Bond (BB) GMM coefficient estimates for the vector of firm characteristics, lagged leverage, and time fixed-effects as in Flannery and Hankins (2013). Results for the full samples of non-issuers and issuers across each model of target determinants are consistent with previous findings.

Lemmon, Roberts, and Zender (2008) show that lagged leverage is a highly persistent and dominant determinant of future leverage. For both definitions of convertible issuer firm-years, lagged leverage is significant at the 1% level. Noteworthy results during the three year window around a new convertible offer are the decline in the coefficient on lagged leverage, the negative and significant coefficient on scaled fixed assets, and the positive and significant coefficient on scaled R&D. The drop in the coefficient for lagged leverage likely captures the effects of a large debt issue and resulting gap to leverage levels. The positive coefficient on R&D reflects an increase in R&D expenditures as well as upward pressure on optimal leverage. In line with the sequential financing hypothesis, the increased sized and significance of the coefficient on R&D is consistent with the use of convertibles debt to fund costly, positive NPV investment prospects. The negative coefficient on offer-year FA/TA likely captures the decline in the the relative proportion of FA/TA when convertible issuance increases the set of total assets.

Blundell-Bond (BB) GMM estimates can diminish the significance of independent variable coefficients as the panel length shortens (Flannery and Hankins (2013)). This effect is observable in the smaller and shorter subsamples of convertible issuer firm-years. Even though the BB estimates reduce the significance of some characteristics, the signs and magnitudes of the marginal effect terms are as expected for the full samples of issuers and non-issuers. The primary determinant, lagged leverage, and the marginal determinants of profitability, total assets, and scaled fixed assets, are statistically significant for both book and market measures of leverage across both non-issuer and issuer sample sets. Altogether, results across the extant models of the determinants of target leverage are consistent with the expectations of targeting behavior. Therefore, I reject the null hypothesis of Hypothesis-1 and Hypothesis-1A and affirm that convertible issuers strive for a long run optimal leverage.

1.4.3 Target leverage and deviations from target leverage

Table 1.5 reports target leverage and target deviation estimates for the samples of non-issuers and issuers respectively. Target estimates and calculated target deviations are consistent with other BB-GMM estimated ratios.[10] When convertible debt is outstanding both under-levered and over-levered issuer's have a higher target leverage ratio than non-issuers. Higher targets are consistent with the finding that convertible issuers generally operate with more debt.

Book and market target deviations are calculated as the difference between the estimated target and lagged leverage. On average, over-levered firms in the full sample exceeds their optimal book leverage by 4.71% and under-levered firms trail their target book leverage by 7.49%. When convertible debt is outstanding, issuers have smaller book and market deviations than the non-issuers, over-levered (under-levered) issuer's have deviation of 1.82% (5.52%). Smaller target deviations during firm years when convertible debt is outstanding provide univariate support that convertible debt has a positive influence on target leverage adjustments.

Active book deviations are the difference between firms' target leverage and passive leverage ratios. Recall that passive leverage is the ratio of lagged total debt to the sum of lagged total assets plus current net income. Over-levered non-issuers

[10]Target deviations are larger in extant studies that cover a sample spanning 1965-2007. These samples have higher levels of market leverage, book leverage, and profitability but lower MB measures, less total assets and fewer R&D expenditures relative to the sample spanning 1990-2014.

tend to have an active book deviation of 5.05% while over-levered issuers have a mean active book deviation of 2.70%. Active deviations exclude mechanical changes to leverage so, all else equal, a larger active deviation implies that the firm had less net income to apply to passive adjustment efforts.

1.5 Results & Discussion

1.5.1 The effects of convertible bonds on partial adjustments

Table 1.6 reports base partial adjustment estimates for the regression in model (1.3) using market value leverage. The typical firm closes 37% of the deviation between its market target leverage and its observed market leverage. Column 2 of Table 1.6 reports adjustment speeds for convertible issuers during firm-years when convertible debt is outstanding. While the bonds are outstanding issuers above and below their target market-leverages have faster partial adjustments than non-issuers; issuers above (below) their target adjust market leverage 29.3% (8.98%) faster. Column 3 of Table 1.6 reports market partial adjustment speeds across the three year window around the offer-year of a new convertible bond. Issuers above and below their target market leverage experience much faster partial adjustments around new convertible offers, firms above (below) their target close 51.6% (6.64%) more of their book target deviation than non-issuers. These results suggest that the market value of the issuer's equity improves more than the relative value of the debt.

Table 1.7 reports base partial adjustments for book value leverages. The typical firm closes 30% of the deviation between its book target leverage and its observed book leverage. Issuers above their target book-leverage have adjustment speeds approximately 35.2% faster than non-issuers. However, issuers below their book target do not have significantly different adjustment speeds. Around the offer year issuers both above and below their target book leverage experience faster partial adjustments; firms above (below) their target close 82.8% (10.2%) more of their book target deviation than non-issuers.

The base adjustment speeds are faster than previous literature covering a different sample period. Flannery and Rangan (2006) and Faulkender et al. (2012)) find partial adjustment speeds of 22% for a sample spanning from 1965-2006 with higher book and market leverages, more fixed assets, and less R&D expenditures. Accordingly, the earlier sample's book target leverage is slightly higher than the current sample. Operating at a lower leverage ratio and making larger corrections to maintain a lower target appears to be more prevalent over time.

Table 1.8 presents active partial adjustment speeds for the regression in model (1.6) using active book leverage. Active adjustments capture changes in leverage that result from external financing activities in excess of mechanical changes in leverage due to retained earnings. Issuers' active adjustments are faster than non-issuers' across the three year window around a new bond offer but lag non-issuers on average during the convertibles' lifespan. The typical firm closes 61.7% of the deviation between its active book target leverage and its calculated active-book leverage.

Issuers below their target book-leverages have partial adjustments 5.9% slower than non-issuers while convertible bonds are outstanding and do not make significantly different adjustments around the offer year. Issuers above their target exhibit the opposite behavior, they do not make significantly different adjustments during the going concern period but make adjustments 30% faster across the three year window around a new convertible offer. Recall that calls, puts, and redemptions begin to affect a large portion of convertible offers three to four year after issuance. These delayed reductions in outstanding convertible debt reduce the firms existing debt liabilities but are likely captured as passive adjustments. All else equal, larger passive adjustments reduce the need for and magnitude of active adjustments.

Considering the magnitudes of market, book, and active book adjustments, under-levered and over-levered issuers experience very different adjustment speeds around the issuance and throughout the lifespan of convertible debt. In unreported results, difference test for under-levered and over-levered firm's standard and active adjustments are significant at the 1% level respectively. These results reject the null hypothesis of Hypothesis-2 and Hypothesis-3 and provide evidence that when convertible debt is used over-levered and under-levered issuers experience different adjustment speeds.

This analysis adds to two ongoing discussions in the convertible debt and capital structure literature. The frequency and size of issuer elected call events support Stein's back-door equity hypothesis of convertible issuance. Additionally, the high proportion of under-levered firms issuing convertibles may be motivated by Brennan and Kraus's risk-shifting hypothesis, future work could address this trend could provide more explicit support. Within the broader capital structure literature, this paper supports the notion that leverage adjustments and adjustment transaction cost are a function of the firm's distance from its target leverage as well as its concurrent cash flow needs.

1.5.2 Robustness

The adjustment speed results are robust to several changes in capital structure that occur within the same year of a convertible offer. Partial adjustment speeds are estimated annually. As such, it is necessary to consider a number of open market activities that could also occur throughout a given year. I account for firms that issue equity or buy-back stock. I also control for firms that call, put, or redeem portions of their convertible offers or portions of other non-convertible, straight debt. These actions have different directional impacts on leverage, for clarity I will first discuss the events that can increase assets, then discuss the events that require an outflow of capital or increase in liabilities.

Concurrent equity issuance can counter the leverage effects of convertible debt and have a positive net effect on capital structure. The subset of firms issuing both equity and convertible debt may drive the large adjustment speeds observed during offer years. Columns 1-2 of Table 1.10 presents results for offer-year partial adjustments for the sub-sample of convertible issuers without concurrent equity issuance. The sub-sample excludes 172 unique firms, roughly 20% of the pool of issuers, that had at least one year with concurrent convertible and seasoned equity offerings. Partial adjustment speeds for this equity controlled subsample are very similar to the original sample. Concurrent equity issuance does not appear to dominate the high offer year adjustment speeds.

With similar effects on leverage as an equity offer, a successful convertible call is effectively a forced conversion events. Firms with a convertible call events, or forced equity inflow, can increase assets within the offer year may disproportionately drive-up adjustment speed estimates. Convertible bond call events are identified throughout the bonds maturity. While I find that roughly 42% of the convertible bonds in the sample experience at least one call event before maturity, less than 1% of the sample of convertibles undergo a call event within the offer year. It is unlikely that bond-level calls significantly impact offer year adjustment speeds.

Open market redemptions of convertible and straight debt both require an outflow of capital. Likewise, firms will lose capital to honor put provisions on convertible and straight debt. Unlike convertible debt, straight debt call provisions give the issuer the right recall and settle, not convert, outstanding straight bonds. With the exception of puts, redemptions and non-convertible calls can be a useful and meaningful way for firms to refinance expensive debt. If the proceeds from convertible offers are used to fund the open market redemptions and calls of straight debt, then offer year partial adjustments may be driven by the net shifts in debt levels and retained earnings.

Likewise, firms may use the proceed from a convertible offer to balance or fund stock repurchases. Issuers who simultaneously repurchase stock and issue equity may bias the partial adjustment speeds observed during the offer year. Columns 3-4 of Table 1.10 presents results for offer-year partial adjustments for the sample of convertible issuers without concurrent repurchase events. 162 firms, roughly 19% of the sample, with at least one year of convertible issuance and stock repurchase events are excluded from the regression. Given small differences in adjustment speeds, stock repurchases do not appear to dominate the high offer year adjustment speeds.

While only 4% of the sample of convertible bonds are repurchased in the bonds' offer year, 17% of the sample of issuers repurchase portions of their non-convertible debt during the year of a convertible offer. Additionally, 15% of the sample of issuers call some portion of their non-convertible debt during the year of a new convertible offer. Columns 1-2 of Table 1.9 presents results for offer-year partial adjustments for the sample of convertible issuers without concurrent calls on straight debt. Columns 3-4 of Table 1.9 presents results for offer-year partial adjustments for the sample of convertible issuers without concurrent repurchases of straight debt. Concurrent shifts in debt capital structure do not greatly diminish the offer-year adjustment speeds. These tests suggest that offer year partial adjustments are not driven by external activities that shift the firm's equity and debt levels.

1.6 Summary

If tradeoff theory holds and firms target an optimal leverage ratio, firms should only undertake capital structure decisions that help maintain or achieve target leverage. Securities issuance and leverage adjustments are important corporate decisions and are closely related. Although convertible bonds are widely used and are a critical component of securities issuance and capital market access, little is known about these bond's effect on capital structure and leverage adjustments. This paper fills the gap in the literature by examining the relationship between convertible bonds and firm leverage- both the observed and modeled target leverage ratios.

Specifically, I examine how convertible debt securities help or hurt the issuing firm's effort to operate at its target leverage. Unlike other securities that only effect one side of the balance sheet as pure debt or equity, convertible bonds consist of both debt and equity components. This hybrid status complicates natural inferences on how convertible bonds should impact leverage ratios and target leverage adjustments. I find that the use of convertible debt is consistent with target leverage behavior and, given the situational use of specific bond features, convertibles can be very effective tools to limit adjustment cost without limiting adjustment speeds.

In line with recent capital structure literature, I use the Blundell-Bond GMM to estimate target leverage ratios and ordinary least squares regressions to estimate partial adjustment speeds. Compared to firms that do not offer convertible debt, I find that convertible issuers undergo faster partial adjustments when a new convertible bond is offered. These results hold when firms are split according to the direction of their target leverage deviation, i.e. separated as being above or below their leverage target.

The persistent result of positive adjustment speeds around issuance, despite increased debt levels, is intriguing. Target leverage adjustments are a function of annual changes in aggregate capital structure, and it is difficult to capture the impact of an individual convertible bond on overall firm leverage. To isolate the influence of convertible debt I control for other changes to the issuers' capital structure such as new equity issuance, stock repurchases, and calls, puts, and redemptions of traditional and convertible debt. After excluding firms that undertake concurrent capital structure shifts, the magnitude and statistical significance of the partial adjustment speeds for convertible issuers are consistent with the main results.

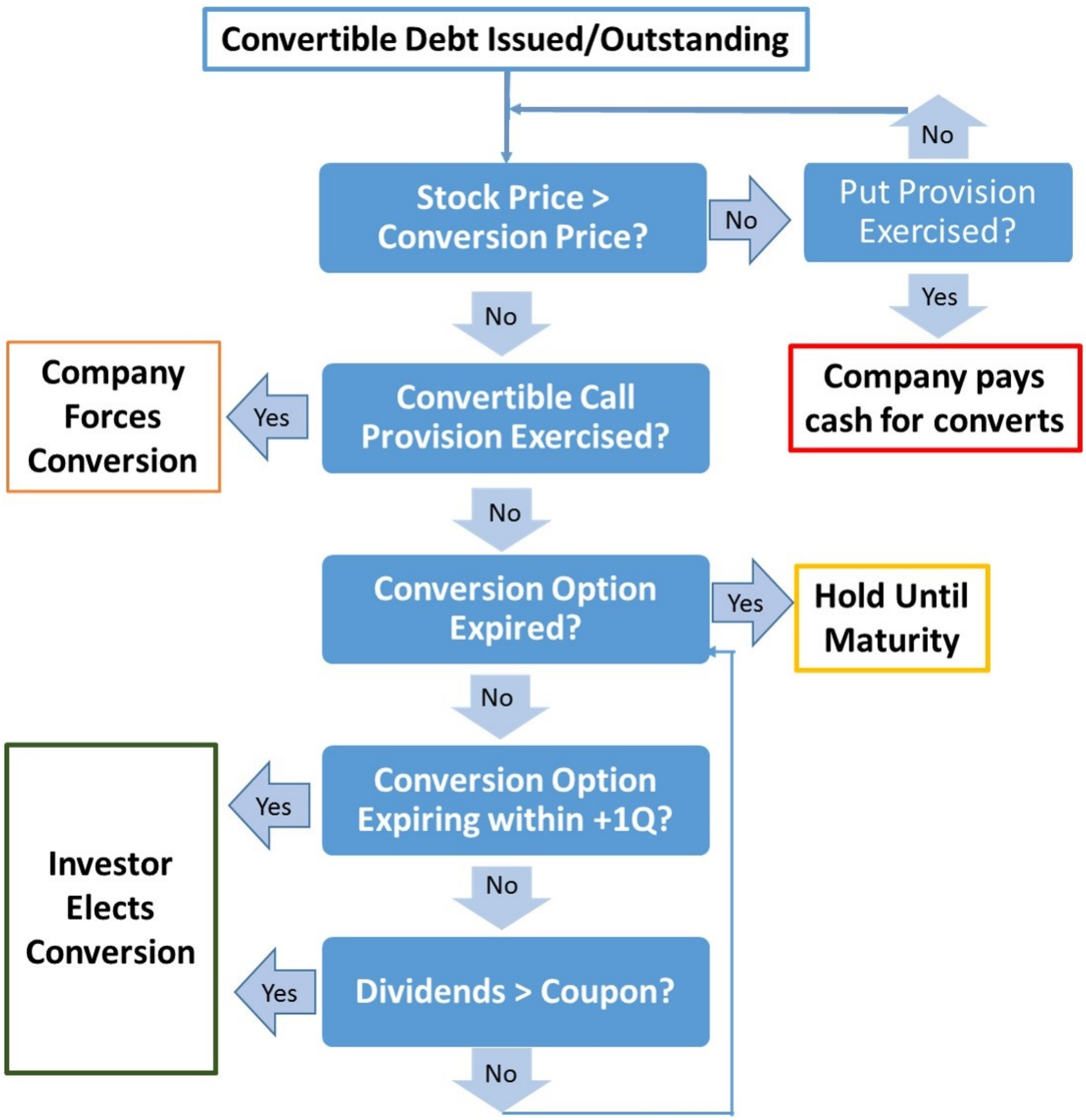

Figure 1.1: Convertible Bond Outcomes

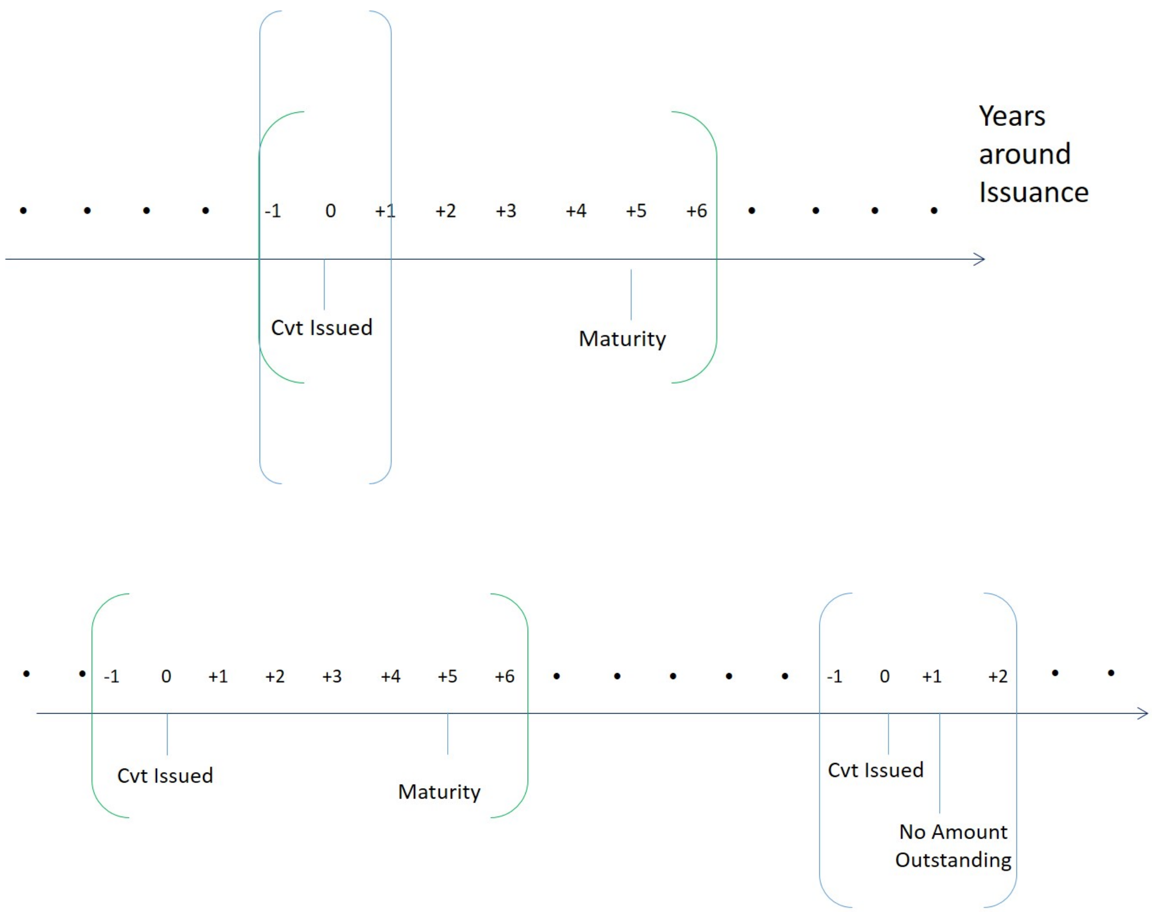

Figure 1.2: Convertible Issuer Firm-years

Table 1.1: Summary Statistics: Convertible Bond Terms at Issuance

Table 1.1 presents summary statistics for the sample of convertible bonds from Mergent's Fixed Income Securities Database (FISD) with at least two years of complete fundamentals in Compustat and coverage in CRSP. The sample consist of corporate convertible bonds issued between 1/1/1990-12/31/2014 by unregulated, non-financial firms. Bond terms include the offering amount, offering amount proportional to total assets during the issuing year, offering amount proportional to the sum of long term debt and current liabilities (total debt) during the issuing year, coupon rates, and years to maturity. Per issuer bond terms include the number of bonds issued per firm, time elapsed between consecutive convertible offers, firm age at time of the first convertible offer, and total firm age. Conversion terms include the quantity of the conversion commodity bond-holders receive upon conversion (conversion ratio) and the stock price required for the bond to be eligible for conversion (conversion price) relative to the end month and annual high stock prices preceding issuance. Conversion terms are winsorized at the 1% level. Provision terms indicate whether the issuing firm granted bond-holders the right to return the bond (putable) or reserved the right to make conversion forcing ultimatums (callable).

Offer Terms	mean	median	sd
Offering Amount (M)	376.0	200	516.8
Offer Amount/Total Assets	0.24	0.19	0.22
Offer Amount/Total Debt	0.76	0.60	0.91
Maturity (Yrs)	11.4	7	8.16
Coupon Rate	3.87	3.77	2.48
Conversion Premium	36.4	26.0	47.8
Prevalence			
Num. Bonds Issued	2.43	2	1.73
Time Btwn Issues (Yrs)	3.49	2.76	2.97
Age-First Issue (Yrs)	8.60	8	5.29
Provisions	Yes	No	Not Reported
Callable	901	102	383
Putable	433	953	0
Observations	1386		

Table 1.2: Firm Characteristics Used in Target Leverage Estimations

Table 1.2 presents summary statistics for the firm characteristics used to estimate target leverage. The full sample consist of Compustat firms with at least two years of complete balance sheet data and coverage in CRSP. The sample period is limited to 1989-2014 to align with available data for convertible debt issuance. Regulated and financial firms are excluded. Issuers are firm-years where at least one convertible bond is outstanding. Firms operating below the optimal book leverage are classified as under-levered and firms operating above the optimal leverage are classified as over-levered. U.L and O.L. are the subsets of under-levered and over-levered firm years respectively. Book Leverage is total debt normalized by the book value of assets. Market leverage is the book value of short-term plus long-term debt relative to the market value of assets. EBIT/ TA is the income before extraordinary items plus interest expense plus income taxes all normalized by total assets. Market to book is the sum of book liabilities and the market value of equity normalized by total assets. Depreciation/TA is depreciation and amortization normalized by total assets. Log total assets is the natural log of total assets deflated by the consumer price index to 1983 dollars. Fixed Assets/ TA is net property, plant, and equipment normalized by total assets. R&D expense/TA is research and development expense normalized by total assets. R&D dummy is equal to 1 if research and development expense is greater than zero and zero otherwise. Industry Median Book Leverage is the Fama and French (1997) industry average book leverage. Further discussion of the characteristics vector is provided in Appendix A. Medians in parentheses, standard deviation in brackets.

	Full Sample			Issuers (CD>0)		
	-All-	-U.L.-	-O.L.-	-All	-U.L.-	-O.L.-
Book Leverage	0.239	0.212	0.274	0.317	0.280	0.362
	(0.196)	(0.165)	(0.243)	(0.287)	(0.247)	(0.326)
	[0.23]	[0.22]	[0.24]	[0.21]	[0.21]	[0.21]
Market Leverage	0.227	0.206	0.261	0.271	0.240	0.309
	(0.154)	(0.128)	(0.201)	(0.221)	(0.188)	(0.263)
	[0.24]	[0.23]	[0.24]	[0.21]	[0.21]	[0.21]
EBIT/TA	-0.0219	-0.0150	-0.0191	0.0301	0.0433	0.0173
	(0.0632)	(0.0678)	(0.0607)	(0.0661)	(0.0740)	(0.0580)
	[0.32]	[0.32]	[0.30]	[0.18]	[0.17]	[0.18]
Market to book	1.849	1.836	1.706	1.711	1.780	1.580
	(1.215)	(1.226)	(1.149)	(1.278)	(1.319)	(1.211)
	[1.96]	[1.93]	[1.77]	[1.48]	[1.55]	[1.31]
Market to book	1.849	1.836	1.706	1.711	1.780	1.580

Table 1.2 – continued: Firm Characteristics Used in Target Leverage Estimations

	Full Sample			Issuers (CD>0)		
	-All-	-U.L.-	-O.L.-	-All	-U.L.-	-O.L.-
	(1.215)	(1.226)	(1.149)	(1.278)	(1.319)	(1.211)
	[1.96]	[1.93]	[1.77]	[1.48]	[1.55]	[1.31]
Depreciation/TA	0.0490	0.0500	0.0492	0.0440	0.0440	0.0445
	(0.0403)	(0.0414)	(0.0405)	(0.0367)	(0.0369)	(0.0369)
	[0.04]	[0.04]	[0.04]	[0.03]	[0.03]	[0.03]
Ln(Total Assets)	19.18	19.30	19.34	21.22	21.20	21.29
	(19.13)	(19.28)	(19.29)	(21.15)	(21.15)	(21.22)
	[2.29]	[2.29]	[2.25]	[1.53]	[1.54]	[1.49]
Fixed Assets/TA	0.320	0.329	0.313	0.273	0.277	0.271
	(0.244)	(0.250)	(0.243)	(0.189)	(0.186)	(0.196)
	[0.26]	[0.27]	[0.25]	[0.23]	[0.24]	[0.23]
R&D expense/TA	0.0461	0.0457	0.0452	0.0484	0.0503	0.0450
	(0)	(0)	(0)	(0.00773)	(0.00512)	(0.00970)
	[0.10]	[0.10]	[0.10]	[0.09]	[0.09]	[0.08]
R&D dummy	0.443	0.430	0.462	0.538	0.524	0.552
	(0)	(0)	(0)	(1)	(1)	(1)
	[0.50]	[0.50]	[0.50]	[0.50]	[0.50]	[0.50]
Industry Median	0.193	0.195	0.191	0.180	0.182	0.178
Book Leverage	(0.201)	(0.204)	(0.198)	(0.180)	(0.185)	(0.178)
	[0.10]	[0.10]	[0.10]	[0.10]	[0.10]	[0.10]
Observations	106618	49550	44284	7294	3755	3377

Table 1.3: Bond Level Changes in Outstanding Convertible Debt

Table 1.3 presents summary statistics for call, put, and redemption corporate action announcement (cact) events that effect the outstanding amount of an individual convertible bond. Amongst bonds that experience a particular cact, Relative Amounts report quarterly and yearly aggregated call, put, and redemption events as a proportion of the underlying principal offering amount. Frequency per Bond reports the number of call, put, and redemption events per quarter throughout the bond's life. Time After Issuance reports the number of months between issuance and the first call, put, or redemption. Calls are firm initiated conversion ultimatums, called amounts are the amount of the bond successfully called (converted). Puts are bondholder initiated refunds. Redemptions are firm initiated tender offers or open market repurchases.

Bond Changes	mean	p50	sd
Relative Amounts			
Called/Offer_Amt, Q	0.33	0.10	0.40
Called/Offer_Amt, Y	0.34	0.11	0.40
Put/Offer_Amt, Q	0.38	0.26	0.39
Put/Offer_Amt, Y	0.38	0.26	0.39
Redeemed /Offer_Amt, Q	0.15	0.042	0.22
Redeemed /Offer_Amt, Y	0.24	0.10	0.30
Observations	1145		

Frequency per bond	mean	median	max
Call events	1.10	1	4
Put events	1.16	1	2
Redemptions	3.57	3	18
Observations	1602		

Time after issuance	mean	median	sd
Time to Call	56.7	54.9	24.6
Time to Put	49.4	54.8	23.4
Time to OM-Repurch.	46.3	44.9	24.6
Observations	1600		

Table 1.4: Estimating Target Leverage (GMM)

With the restriction that $L_{i,t}* = \beta X_{i,t-1}$, this table presents Blundel-Bond coefficient estimates for the partial adjustment model: $L_{i,t+1} = (\gamma\beta)(X_{i,t}) - (1-\gamma)(L_{i,t}) + \tilde{\epsilon}_{i,t}$ where, the coefficient vectors $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are estimated concurrently by Blundell and Bond (1998) system GMM for dynamic panel models. $\mathbf{X_{i,t-1}}$ is the vector of firm characteristics summarized in Table 1.1. Columns 1-3 report book-leverage estimates and columns 4-6 report market-leverage estimates for the full sample (1,4), firm-years where at least one convertible bond is contractually outstanding (2,5), and the firm-year of a new convertible offer (3,6). Standard errors are reported in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
Book Leverage	0.748***	0.623***	0.322***			
	(0.011)	(0.037)	(0.084)			
Market Leverage				0.725***	0.670***	0.262*
				(0.008)	(0.030)	(0.104)
EBIT/TA	-0.028***	-0.121***	0.092	-0.019***	-0.069**	0.023
	(0.007)	(0.034)	(0.088)	(0.005)	(0.026)	(0.085)
Market to book	-0.002*	-0.006	-0.006	-0.001	-0.011**	-0.019*
	(0.001)	(0.006)	(0.012)	(0.001)	(0.003)	(0.009)
Depreciation/TA	-0.106	-0.406	-0.243	-0.218***	-0.407	-0.004
	(0.054)	(0.328)	(0.548)	(0.045)	(0.248)	(0.556)
Log total assets	-0.004	-0.106***	0.009	0.010***	-0.056***	0.048**
	(0.003)	(0.016)	(0.023)	(0.002)	(0.010)	(0.018)

Table 1.4 – continued: Estimating Target Leverage (GMM)

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
Fixed assets/TA	0.069***	0.083	-0.307*	0.138***	0.119	-0.116
	(0.015)	(0.099)	(0.146)	(0.012)	(0.068)	(0.163)
R&D expense/TA	-0.049	-0.234	0.599*	-0.059**	-0.378**	0.684*
	(0.029)	(0.191)	(0.292)	(0.019)	(0.116)	(0.287)
R&D dummy	-0.019**	0.047	-0.071	-0.015*	-0.071	-0.075
	(0.007)	(0.054)	(0.075)	(0.007)	(0.038)	(0.083)
Industry Median Book Leverage	0.075*	-0.684**	0.379			
	(0.035)	(0.258)	(0.443)			
Industry Median Market Leverage				0.100***	-0.090	0.542
				(0.023)	(0.100)	(0.347)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	93,872	6,412	1,436	93,872	6,412	1,436

Table 1.5: Target Deviation Variables

Table 1.5 presents summary statistics for the mean and median estimated target leverage ratios and target leverage deviations. Columns 1-3 details estimates for the full sample, columns 4-6 report estimates for the sample of convertible issuers during years when no convertible debt is outstanding, and columns 7-9 report estimates for the sample of convertible issuers during years when at least one convertible bond is outstanding. U.L and O.L. are the subsets of under-levered and over-levered firm years respectively. *Book Dev* is the book target less the book leverage from the previous year. *Book Active Dev* is the book target less the book leverage adjustment which is defined as the previous period's total debt divided by the sum of the previous period's book assets plus net income for the current period. *Market Dev* is the market target less the market leverage from the previous year. Medians in brackets.

	Full Sample			Issuers(CD>0)			Issuers(CD>0), Offer Year		
	All	U.L.	O.L.	All	U.L.	O.L.	All	U.L.	O.L.
Book Target	0.254	0.318	0.183	0.257	0.253	0.264	0.327	0.371	0.277
	[0.211]	[0.257]	[0.160]	[0.232]	[0.220]	[0.251]	[0.285]	[0.320]	[0.249]
Book Dev	0.0173	0.0749	-0.0471	0.0281	0.0552	-0.0182	0.0173	0.0510	-0.0201
	[0.00203]	[0.0301]	[-0.0264]	[0.0199]	[0.0394]	[-0.0138]	[0.00378]	[0.0210]	[-0.0181]
Book Active Dev	0.0130	0.0697	-0.0505	0.0264	0.0576	-0.0270	0.00838	0.0465	-0.0340
	[0.00615]	[0.0363]	[-0.0261]	[0.0262]	[0.0447]	[-0.0139]	[0.00880]	[0.0293]	[-0.0185]
Market Target	0.250	0.293	0.202	0.234	0.221	0.256	0.280	0.305	0.251
	[0.185]	[0.218]	[0.148]	[0.186]	[0.169]	[0.215]	[0.232]	[0.250]	[0.212]
Market Dev	0.0247	0.0662	-0.0217	0.0185	0.0361	-0.0119	0.0135	0.0351	-0.0105
	[0.00570]	[0.0295]	[-0.0187]	[0.0188]	[0.0314]	[-0.0104]	[0.00414]	[0.0163]	[-0.0113]
Observations	93,872	49,550	44,284	5,546	3,503	2,043	7,132	3,755	3,377

Table 1.6: Partial Adjustment Speeds- Market Deviations

Panels A-C report coefficients for the base partial adjustment model:
$L_{i,t} - L_{i,t-1} = \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}} = \lambda(L^*_{i,t} - L_{i,t-1}) + \eta(L^*_{i,t} - L_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t}$
ΔMarket Lev is difference between current and lagged market leverage. Column 1 reports estimates for the full sample, Column 2 reports estimates for the full sample with interaction terms for convertible issuers during years when at least one convertible bond is outstanding, and Column 3 reports estimates for the full sample with interaction terms for convertible issuers during the three year window around a new convertible offer. Standard errors in parentheses, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$.

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Δ Market Lev	Δ Market Lev	Δ Market Lev
Panel A: All Firms			
Market Dev	0.372***	0.367***	0.371***
	(0.00252)	(0.00257)	(0.00254)
MkDev_CD		0.143***	
		(0.0132)	
MkDev_OfferY			0.129***
			(0.0212)
Adjusted R^2	0.189	0.190	0.189
Observations	93872	93872	93872
Panel B: Under-levered Firms			
Market Dev	0.329***	0.325***	0.328***
	(0.00286)	(0.00292)	(0.00288)
MkDev_CD		0.0898***	
		(0.0151)	
MkDev_OfferY			0.0664**
			(0.0229)
Adjusted R^2	0.206	0.206	0.206
Observations	50874	50874	50874
Panel C: Over-levered Firms			
Market Dev	0.500***	0.489***	0.495***
	(0.00505)	(0.00514)	(0.00507)
MkDev_CD		0.293***	
		(0.0264)	
MkDev_OfferY			0.516***
			(0.0519)
Adjusted R^2	0.186	0.188	0.188
Observations	42,970	42,970	42,970

Table 1.7: Partial Adjustment Speeds- Book Deviations

Panels A-C present coefficients for the base partial adjustment model:
$L_{i,t} - L_{i,t-1} = \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}} = \lambda(L^*_{i,t} - L_{i,t-1}) + \eta(L^*_{i,t} - L_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t}$
ΔBook Lev is the difference between current and lagged book leverage. Column 1 reports estimates for the full sample, Column 2 reports estimates for the full sample with interaction terms for convertible issuers during years when at least one convertible bond is outstanding, and Column 3 reports estimates for the full sample with interaction terms for convertible issuers during the three year window around a new convertible offer. Standard errors in parentheses,$^{*} p < 0.05, ^{**} p < 0.01, ^{***} p < 0.001$.

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Δ Book Lev	Δ Book Lev	Δ Book Lev
Panel A: All Firms			
Book Dev	0.303***	0.299***	0.299***
	(0.00217)	(0.00221)	(0.00218)
BkDev_CD		0.0902***	
		(0.0114)	
BkDev_OfferY			0.238***
			(0.0178)
Adjusted R^2	0.172	0.173	0.174
Observations	93872	93872	93872
Panel B: Under-levered Firms			
Book Dev	0.279***	0.278***	0.277***
	(0.00258)	(0.00264)	(0.00260)
BkDev_CD		0.0178	
		(0.0128)	
BkDev_OfferY			0.102***
			(0.0195)
Adjusted R^2	0.191	0.191	0.191
Observations	49550	49550	49550
Panel C: Over-levered Firms			
Book Dev	0.352***	0.342***	0.344***
	(0.00388)	(0.00392)	(0.00388)
BkDev_CD		0.352***	
		(0.0239)	
BkDev_OfferY			0.828***
			(0.0406)
Adjusted R^2	0.157	0.161	0.165
Observations	44,284	44,284	44,284

Table 1.8: Partial Adjustment Speeds- Active Book Deviations

Panels A-C present coefficients for the active partial adjustment model:
$L_{i,t} - L^{P}_{i,t-1} = \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}+NI_{i,t}} = \gamma(L^{*}_{i,t-1} - L^{P}_{i,t-1}) + \delta(L^{*}_{i,t-1} - L^{P}_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t}$
ΔActive Book Dev is the difference between book leverage and the passive leverage adjustment which is defined as lagged total debt divided by the sum of lagged total assets and the current period's net income. Column 1 reports estimates for the full sample, Column 2 reports estimates for the full sample with interaction terms for convertible issuers during years when at least one convertible bond is outstanding, and Column 3 reports estimates for the full sample with interaction terms for convertible issuers during the three year window around a new convertible offer.Standard errors in parentheses, $^{*}p < 0.05,^{**} p < 0.01,^{***} p < 0.001$.

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Δ Active BkLev	Δ Active BkLev	Δ Active BkLev
Panel A: All Firms			
Active Bk Dev	0.617***	0.619***	0.616***
	(0.00275)	(0.00281)	(0.00276)
ActBkDev_CD		-0.0399**	
		(0.0129)	
ActBkDev_OfferY			0.108***
			(0.0231)
Adjusted R^2	0.350	0.350	0.350
Observations	93871	93871	93871
Panel B: Under-levered Firms			
Active Bk Dev	0.566***	0.569***	0.566***
	(0.00361)	(0.00370)	(0.00364)
ActBkDev_CD		-0.0594***	
		(0.0171)	
ActBkDev_OfferY			-0.00335
			(0.0302)
Adjusted R^2	0.331	0.331	0.331
Observations	49549	49549	49549
Panel C: Over-levered Firms			
Active Bk Dev	0.693***	0.694***	0.689***
	(0.00423)	(0.00434)	(0.00426)
ActBkDev_CD		-0.00950	
		(0.0195)	
ActBkDev_OfferY			0.300***
			(0.0360)
Adjusted R^2	0.377	0.377	0.378
Observations	44,284	44,284	44,284

Table 1.9: Partial Adjustment Speeds- Excluding Concurrent Straight Debt Calls, Redemptions

Table1.9 presents coefficients for the active partial adjustment model: $L_{i,t} - L^p_{i,t-1} = \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}+NI_{i,t}} = \gamma(L^*_{i,t-1} - L^p_{i,t-1}) + \delta(L^*_{i,t-1} - L^P_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t}$ ΔBook Lev is the difference between current and lagged book leverage. ΔActive Book Dev is the difference between current book and passive leverage adjustments. Columns 1-2 present offer-year partial adjustment estimates for the full sample with interaction terms for the sub-sample of convertible issuers without concurrent straight-debt calls (SDC=0). This sub-sample excludes roughly 17% of the sample of convertible issuers with concurrent straight-debt calls that could bias adjustment speed estimates. Columns 3-4 present offer-year partial adjustments for the full sample with interaction terms for the sub-sample of convertible issuers without concurrent straight debt redemptions (SDR=0). This sub-sample excludes roughly 15% of the sample of convertible issuers with concurrent straight debt redemptions that could bias adjustment speed estimates.Standard errors in parentheses,$^{*}p < 0.05$,$^{**}p < 0.01$,$^{***}p < 0.001$.

	Issuers(CD>0) Offer Year, SDC=0		Issuers(CD>0) Offer Year, SDR=0	
	Δ Book Lev	Δ Active BkLev	Δ Book Lev	Δ Active BkLev
Panel A: All Firms				
Book Dev	0.299***		0.299***	
	(0.00219)		(0.00219)	
BkDev_{OfferY}	0.225***		0.224***	
	(0.0184)		(0.0187)	
Active Bk Dev		0.616***		0.616***
		(0.00279)		(0.00279)
ActBkDev_{OfferY}		0.0833***		0.0853***
		(0.0252)		(0.0256)
Adjusted R^2	0.174	0.350	0.175	0.350
Observations	92008	92007	91740	91739
Panel B: Under-levered Firms				
Book Dev	0.277***		0.277***	
	(0.00261)		(0.00262)	
BkDev_{OfferY}	0.0962***		0.0809***	
	(0.0200)		(0.0203)	
Active Bk Dev		0.566***		0.566***

Table 1.9 – continued: Partial Adjustment Speeds- Excluding Concurrent Straight Debt Calls, Redemptions

	Issuers(CD>0) Offer Year, SDC=0		Issuers(CD>0) Offer Year, SDR=0	
	Δ Book Lev	Δ Active BkLev	Δ Book Lev	Δ Active BkLev
		(0.00367)		(0.00367)
ActBkDev_{OfferY}		-0.0638*		-0.0635
		(0.0321)		(0.0328)
Adjusted R^2	0.193	0.331	0.193	0.332
Observations	48533	48532	48353	48352
Panel C: Over-levered Firms				
Book Dev	0.343***		0.343***	
	(0.00389)		(0.00389)	
BkDevs	0.849***		0.901***	
	(0.0437)		(0.0442)	
Active Bk Dev		0.690***		0.690***
		(0.00429)		(0.00430)
ActBkDev_{OfferY}		0.383***		0.379***
		(0.0409)		(0.0414)
Adjusted R^2	0.164	0.380	0.165	0.379
Observations	43,437	43,437	43,349	43,349

Table 1.10: Partial Adjustment Speeds-Excluding Concurrent Equity Actions

Table1.10 presents coefficients for the active partial adjustment model:
$L_{i,t} - L^{p}_{i,t-1} = \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}+NI_{i,t}} = \gamma(L^{*}_{i,t-1} - L^{p}_{i,t-1}) + \delta(L^{*}_{i,t-1} - L^{P}_{i,t-1}) * CBIssuer + \tilde{\epsilon}_{i,t}$ ΔBook Lev is the difference between current and lagged book leverage. ΔActive Book Dev is the difference between current book and passive leverage adjustments. Columns 1-2 present offer-year partial adjustment estimates for the full sample with interaction terms for the sub-sample of convertible issuers without concurrent equity issuance (SEO=0). This sub-sample excludes roughly 20% of the sample of convertible issuers with concurrent equity issuance that could bias adjustment speed estimates. Columns 3-4 present offer-year partial adjustments for the full sample with interaction terms for the sub-sample of convertible issuers without concurrent stock buy-backs (SBB=0). This sub-sample excludes roughly 19% of the sample of convertible issuers with concurrent stock buy-backs that could bias adjustment speed estimates. Standard errors in parentheses.$^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$).

	Issuers(CD>0) Offer Year, SEO=0		Issuers(CD>0) Offer Year, SBB=0	
	Δ Book Lev	Δ Active BkLev	Δ Book Lev	Δ Active BkLev
Panel A: All Firms				
Book Dev	0.299***		0.299***	
	(0.00219)		(0.00220)	
BkDev_{OfferY}	0.247***		0.227***	
	(0.0193)		(0.0183)	
Active Bk Dev		0.616***		0.615***
		(0.00279)		(0.00279)
ActBkDev_{OfferY}		0.0940***		0.0991***
		(0.0259)		(0.0241)
Adjusted R^2	0.175	0.351	0.175	0.351
Observations	91474	91473	91487	91486
Panel B: Under-levered Firms				
Book Dev	0.277***		0.277***	
	(0.00262)		(0.00262)	
BkDev_{OfferY}	0.102***		0.0983***	
	(0.0210)		(0.0199)	
Active Bk Dev		0.565***		0.565***
		(0.00367)		(0.00368)

Table 1.10 – continued: Partial Adjustment Speeds-Excluding Concurrent Equity Actions

	Issuers(CD>0) Offer Year, SEO=0		Issuers(CD>0) Offer Year, SBB=0	
	Δ Book Lev	Δ Active BkLev	Δ Book Lev	Δ Active BkLev
ActBkDev_{OfferY}		-0.0648		-0.00681
		(0.0338)		(0.0312)
Adjusted R^2	0.193	0.332	0.193	0.332
Observations	48166	48165	48189	48188
Panel C: Over-levered Firms				
Book Dev	0.342***		0.344***	
	(0.00389)		(0.00390)	
BkDev_{OfferY}	0.902***		0.848***	
	(0.0445)		(0.0433)	
Active Bk Dev		0.690***		0.690***
		(0.00430)		(0.00430)
ActBkDev$OfferY$		0.364***		0.295***
		(0.0403)		(0.0380)
Adjusted R^2	0.165	0.379	0.165	0.379
Observations	43,270	43,270	43,260	43,260

Chapter 2

Target Leverage Deviations & Convertible Debt Design [1]

2.1 Introduction

How do firms design convertible bonds? A large literature has theorized and empirically shown the effects of information asymmetries, real investment options, and demand market characteristics on the design of convertible bonds[2]. However, target leverage objectives, which capture a wide range of firm characteristics and financing needs, have not been examined as a determinant of convertible bond issuance and design. Prior work shows that firms quickly correct target leverage deviations following the issuance of convertible debt, often through reliance on the bond's equity features (Eldemire-Poindexter (2016)). This trend raises questions about manager's ex ante intentions to rely on conversion terms and provisions to address target leverage objectives.

Firms often drift away from the target capital structures that represent an optimal balance of the cost and benefits of debt financing [3]. The resulting target leverage deviations affect a number of firm activities, ranging from security issuance and

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[1] Eldemire-Poindexter, A. To be submitted.

[2] See Lewis et al. (1999), Lewis et al. (2003),Korkeamaki and Moore (2004), Krishnaswami and Yaman (2008), de Jong, Duca, and Dutordoir (2013), Grundy and Verwijmeren (2018)

[3] The existence of target leverage ratios is well documented, most notably by Rajan and Zingales (1995), Hovakimian et al. (2001), Flannery and Rangan (2006), DeAngelo et al. (2011). Leary and Roberts (2005) and Boone, Casares Field, Karpoff, and Raheja (2007) highlight patterns of target leverage deviations and suggest adverse selection cost may dominate capital structure decisions

repurchase decisions to merger and acquisition activities (Hovakimian et al. (2001), Warr, Elliott, Koëter-Kant, and Öztekin (2012), Uysal (2011), Harford, Klasa, and Walcott (2009)). Generally, adjustments to leverage are costly, so without an expectation of positive net benefits, managers will not pursue equity or debt offerings Leary and Roberts (2005). The fore-mentioned studies consistently find that over-levered firms are less likely to issue debt in form of straight bonds, noting the cost of financing- which include high solicitation and underwriting transaction costs, and concerns about negative reputation or performance signals.

In this paper, I examine how the design features in convertible bonds are related to a firm's need to move towards a more optimal capital structure. With evidence that target deviations directly influence managerial decisions on straight debt and equity issuance, we should also expect to observe a significant relationship between target leverage deviations and convertible bond issuance[4]. Moreover, for firms trying to maintain or reach an optimal capital structure, the leverage dynamics that motivate security issuance should also affect security design as a necessary step in the issuance process. That is, firms issuing convertible bonds to close the gap between target and current leverage would be expected to carefully choose the features of the offer. These features include the conversion price (premium), conversion option delta, provisions for call, put, and redemption options, and maturity.

Univariate results show significant differences between the target capital structures and leverage deviations of firms that do and do not seek external financing. Three groups of firms (firm-year panels) are evident throughout the sample period of

[4]Chapter 1 tests for consistency across the determinants of target leverage verify that convertible issuers do target optimal leverage ratios. Replicating established literature, proxy determinants of target leverage were used to estimate optimal leverage ratios by simple ols, least squares dependent variable (LSDV), and generalized method of moments as in (Hovakimian et al. (2001), Hovakimian, Hovakimian, and Tehranian (2004), Korajczyk and Levy (2003), Flannery and Rangan (2006), and Faulkender et al. (2012)). Estimates across all extant models are consistent with the expectations of targeting behavior. Compared to non-issuers, firms issuing convertible debt tend to have higher real and target leverage ratios, as well as wider target leverage deviations in the time preceding issuance.

1990-2015: firms that do not pursue any public security issuance, firms that publicly issue equity, and firms that publicly issue both equity and debt. Compared to inactive issuers, both firms raising equity only and firms raising debt capital have meaningfully higher target leverage ratios but only slightly larger target leverage deviations. However, relative to each other, active issuers of debt financing have higher targets and meaningfully larger target deviations. Logistic regression results confirm a positive relationship between larger target leverage deviations the decisions to pursue public security issuance. Moreover, amongst active issuers, firms with larger target deviations more likely to choose a convertible bond offer instead of issuing equity, straight debt, or abstaining from issuance.

To examine the relationship between capital structure objectives and convertible design I examine the cross-section of at-issuance terms and provisions of convertible bond offers. For each offer, I estimate the at-issuance sensitivity of the conversion option (delta), likelihood of achieving conversion, and the standalone conversion option value as in Black and Scholes (1973) and Lewis et al. (1999). Consistent with the security issuance literature, namely de Jong et al. (2013), Lewis and Verwijmeren (2011), and Grundy and Verwijmeren (2018), this analysis includes several market conditions and macroeconomic conditions known to affect issuance decisions.

In addition to contract provisions, structural differences in security registration methods can also provide managers the ability to affect outstanding bonds. Convertible bonds often originate in the Rule-144a (R144a) market and are re-issued as Exchange Traded offers at a later date. Re-issued public bonds typically retain the original R144a offer terms (e.g. maturity, coupon, provisions), but the conversion terms and principal offer amount may be adjusted to reflect current conditions. Moreover, in both the R114a and public markets, following well received offers, firm's may pursue expansion offers containing identical bond and conversion terms but differing principal amounts (e.g. Series A, Series B). Likewise for Rule-415 offers, the half-life of shelf registered convertible bonds may allow issuers to delay formal issuance for more favorable timing, for instance, a time when the stock price is within close range of the conversion price.

I find that issuance strategies tend to vary with both the size and direction of the target leverage deviations. Over-levered firms issuing in the R144A market tend to have longer maturity periods and include put provisions, but do not face higher coupon expenses or reduced principal amounts than under-levered R144A issuers. Alternatively, under-levered firms issuing convertibles in exchange traded markets offer more callable bonds and tend to sell at a sizable discount (29%).

The following discussion summarizes the theoretical motivations and empirical studies surrounding the topics of optimal capital structure, convertible debt, and utility maximizing security choice. Sample data, summary statistics, and regression analysis are reported in the Data, Key Findings, and Results sections, respectively.

2.2 Analytical Framework

2.2.1 Convertible Design

It is a stylized fact that managers influence several design aspects of convertible bond offers (Lewis and Verwijmeren (2011), Dutordoir et al. (2014))[5]. Managers directly impact the conversion exercise price (premium) and maturity period to mimic straight debt or common equity (Brennan and Kraus (1987), Brennan and Schwartz (1988), Lewis et al. (1999), Lewis et al. (2003)) Moreover, there is strong evidence that the inclusion of provisions such as dilution protections, calls, and puts are related to asymmetric information barriers and financing constraints, (Mayers (1998), Korkeamaki and Moore (2004), Chemmanur and Simonyan (2010)).

[5]The primary theories of convertible issuance suggests that well positioned firms use convertibles as a mechanism to overcome adverse selection barriers (back-door-equity hypothesis, Stein (1992), or as a mechanism to mitigate managerial agency problems (sequential financing hypothesis, Mayers (1998).

Another line of literature examining the external drivers of convertible issuance highlights macroeconomic and market fluctuations which are highly correlated with convertible issuance (Krishnaswami and Yaman (2008), Dutordoir and Van de Gucht (2007), Mann, Moore, and Ramanlal (1999)) stream also highlights particular periods and conditions when counter-party purchasers have had a dominant influence over issuance trends Choi, Getmansky, Henderson, and Tookes (2010), de Jong et al. (2013), Grundy and Verwijmeren (2018). To capture the impact of target leverage deviations on the convertible bond design features, I account for market wide equity volatility and cumulative returns, aggregate investor demand, macroeconomic conditions and firm-specific equity and growth characteristics. These controls help distinguish the connections between a firms need to move towards target leverage and the delta, post-conversion equity, maturity, and provision design features of convertible bonds.

A combination of explicit and implicit features shape the design characteristics of convertible bonds. Explicit terms, like the conversion premium and maturity date, become determining factors of implied conversion (equity) option features. As such, individual components either provide too little information for relevant comparisons, or provide biased information when considered without the context of the additional components. Building on the insights and methodologies from the highlighted literature, my proxies for convertible design include the implied Delta measure as well as the explicit maturity, conversion ratio (new equity), and call protection period terms.

Delta

Examining the chosen conversion strike price, conversion ratio, and bond provisions can reveal how much alignment exist between convertible bond offers and broader capital structure objectives Mayers (1998). The firm's choice of strike price and conversion ratio determines the conversion-option delta value, a measure of the sensitivity of the conversion option to the underlying commodity (common stock). These terms also directly influence the value of the conversion-option (equity-option) as well as the likelihood of achieving conversion at the time of issuance [6]. I examine the following proposition using the Black-Scholes option pricing model, detailed in Appendix A, for measures of at-issuance conversion option deltas, conversion likelihoods, and conversion option values:

Proposition 1. *If capital structure objectives are a determinant of at-issuance conversion option value,*

i. Over-levered firms concerned with levering down will be more prone to offer in-the-money (ITM) or at-the-money (ATM) convertible bond

ii. Under-levered firms concerned with levering-up will be more prone to issuing out-of-the-money (OTM) bonds

New Equity, Maturity, Call Protections

The standard B.S. model, which best fits non-callable options, can yield noisy estimates of the implied delta and conversion likelihood measures for callable convertible bonds Lewis and Verwijmeren (2011). As in Lewis et al. (1999) and de Jong et al. (2013), I use a simultaneous equations framework with two-stage least squares to examine the amount of post-conversion (new) equity, maturity, and call protection period design features. I extend the model and the set of instrumental

[6] Poindexter (2014) provides a detailed literature review.

variables used throughout the system to incorporate the target deviation measure:

$$NewEquity = a_0 + a_1 LogBookDev + a_2 Maturity + a_3 CallPP + a_4 FC + a5OC + a_6 MP + a_7 MD + a_8 MC \quad (2.1)$$

$$Maturity = b_0 + b_1 LogBookDev + b_2 NewEquity + b_3 CallPP + b_4 FC + b_5 OC + b_6 MP + b_7 MD + b_8 MC \quad (2.2)$$

$$CallProtection = c_0 + c_1 LogBookDev + c_2 NewEquity + c_3 Maturity + c_4 FC + c_5 OC + c_6 MP + c_7 MD + c_8 MC \quad (2.3)$$

with the instrumental variables,

$$LogB\hat{o}okDev = \pi_{00} + \pi_{01} Pr(NoPublicOffer) + \pi_{02} CAPXAT + \Pi_0 X + v_1 \quad (2.4)$$

$$New\hat{E}quity = \pi_{10} + \pi_{11} ConvPremium + \Pi_1 X + v_2 \quad (2.5)$$

$$Mat\hat{u}rity = \pi_{20} + \pi_{21} TermSpread + \pi_{32} DebtMaturity + \Pi_2 X + v_2 \quad (2.6)$$

$$Cal\hat{l}PP = \pi_{30} + \pi_{31} EPSgrowth + \Pi_3 X + v_3 \quad (2.7)$$

NewEquity is calculated as the natural log of number of new shares issued to convertible bondholders under full conversion normalized by the total shares outstanding on the month-end prior to issuance.*Maturity* is years to maturity measured at issuance, *CallProtection* is calculated as the length of the call protection period divided by maturity. *CallProtection* is equal to one for non-callable convertibles. The instrument *Pr(NoPublicOffer)* is the one minus the probability of seeking public financing estimated in equation 2.11 of the following discussion.

The market performance variables, *MP*, include measures of market wide equity run-ups, volatility, and sentiment. Following Korajczyk and Levy (2003) and Lowry (2003) market runup (MarketRunup), calculated as the return on the S&P 500 index over the quarter preceding the offer, accounts for general market conditions. Annualized return volatility from daily returns on the S&P 500 index (MarketVolatility) over the quarter preceding an offer captures uncertainty about market returns as in de Jong et al. (2013). Following Lowry (2003) and Helwege and Liang (2004), to capture general investor sentiments that effect issuance decisions I use a measure of the VIXindex, calculated as the annual averages of the daily S&P 500 volatility index for year preceding issuance.

The market demand variables, *MD*, include measures of aggregate interest in equity, straight debt, and convertible securities. Aggregate capital inflows to mutual funds proxy market demand (supply of capital), as in Choi et al. (2010) and de Jong et al. (2013), to distinguish between issuance decisions that are motivated by internal willingness or desire to raise capital and decisions motivated by external shocks to the availability of time-sensitive capital. Aggregate flows to funds with majority holdings of equity, straight debt, and convertible debt are specified as:

$$MFF = Percentage\ Flow_t = \frac{\sum_{i=1}^{N} Dollar\ Flow_{it}}{\sum_{i=1}^{N} Assets_{i,t-1}} \tag{2.8}$$

$$Dollar\ Flow_{i,t} = Assets_{i,t} - Assets_{i,t-1}(1 + r_{i,t})$$

The macroeconomic variables, *MC*, include the real interest rate (InterestRate) and term speard (TermSpread). Following Krishnaswami and Yaman (2008), the real interest rate (InterestRate) serves as a proxy for bankruptcy risk. Interest rates are calculated as the difference between the yield on 10-year U.S. Treasury Bonds and the inflation rate from the continuously compounded annual change in the U.S. consumer price index. Term spread(TermSpread), which is defined as the difference between yields on 10-year U.S. Treasury Bonds and 3-month U.S. Treasury Bills, accounts for business conditions and expected investment opportunities, as in Korajczyk and Levy (2003) and Erel, Julio, Kim, and Weisbach (2012).

Proposition 2. *If capital structure objectives are a determinant of convertible bond* *design,*

i. *A positive relationship exist between deviation size and the amount of potential new equity*

ii. *A positive relationship exist between both of the size and direction deviations and maturity length*

ii. *A negative relationship exist between both of the size and direction deviations and call protection periods*

Call Provisions

Amongst the additional features of convertible bonds, call options are the most noted provision as callability can affect every aspect of the offering and also impact the equity and capital structure of the issuer. While bond call options grant issuers the right to enter early settlement with bondholders, convertible bond call options are distinct because the settlement request is effectively an ultimatum on equity conversion [7]. Cash flow concerns and back-door equity motivations dominate the likelihood of including call provisions (King and Mauer (2014), Bechmann, Lunde, and Zebedee (2014)). Moreover, firms with in-the-money convertible issues typically take little delay to call outstanding bonds (Grundy and Verwijmeren (2018)). Accordingly, over-levered firms with capital structure objectives to reduce leverage may be most inclined to include call option provisions.

However, including call option provisions can be costly for issuers as bondholders typically require higher coupons to compensate for uncertainty around call events. Since the mid 1990s, the use of call provisions has steadily declined, especially

[7] When called, convertible bondholders can choose between settlement in the form of new equity, with shares proportional to the conversion rate, or a cash refund of the initial purchase (offering) price, which is typically below par value.

amongst firms relying on issuance under Rule-144A (Grundy and Verwijmeren (2018), Grundy and Verwijmeren (2016)). Amongst convertible bond issuers that do include call provisions, firms with short horizon investment opportunities are less likely to include call provisions than firms with longer investment horizons (Korkeamaki and Moore (2004), Mayers (1998)). Issuers with relatively small target leverage deviations, due to intermediate/mature capital expenditures or other interim activities, may have less demand for an explicit call option provision.

Proposition 3. *If the potential benefits of convertible bond call provisions are related to the firms target leverage objectives,*

i. *A positive relationship exist between deviation size and the likelihood of call option provisions*

ii. *A negative relationship exist between deviation direction (from under to over) and the likelihood of call option provisions*

iii. *A negative relationship exist between negotiated offers, particularly Rule-144A offers, and the likelihood of call option provisions*

Focusing on the connections between the design features of convertible bonds and a firms need to move towards target leverage, analysis ultimately begins with a model of firm-level target leverage ratios and target leverage deviations. Next, to disentangle the relationship between convertible bond design and target leverage deviations, the effects of target leverage deviations are examined across three key stages of security issuance: security choice, security design, and market choice (issuance strategy).

2.2.2 Target Leverage Ratios and Deviations

Consistent with Flannery and Hankins (2013), optimal leverage, $L^*_{i,t}$, is a function of observable and unobservable firm characteristics with the form:

$$L^*_i = \beta \text{ X}_i + F_i \tag{2.9}$$

where X_i is a vector of firm characteristics and F_i is a firm level fixed effect. Firm fixed effects capture unobserved but inter-temporally constant effects on a firm's leverage ratio and target capital structure. To empirically estimate $L^*_{i,t}$ and incorporate firm fixed effects, the specification in (2.9) is extended to account for partial leverage adjustments and short panel bias [8]. Target leverage is estimated under the model:

$$L_{i,t+1} = \lambda(\beta \text{ X}_{i,t}) + \lambda(\text{F}_i) + (1-\lambda)(\text{L}_{i,t}) + \delta_{i,t} \tag{2.10}$$

The coefficient vectors $\boldsymbol{\beta}$ and $\boldsymbol{\lambda}$ are estimated concurrently by the Blundell and Bond (1998) system GMM for dynamic panel models. GMM estimated target ratios are adjusted with firm fixed effects, which are calculated as the mean residual of the short panel bias model in (2.10).

Following Flannery and Rangan (2006) the characteristics vector includes lagged book (market) leverage, earnings before interest and taxes as a proportion of total assets (EBIT/TA), market to book ratio of assets (MB), and the log of real total assets (LnTA).[9] Higher profitability (EBIT/TA) may mechanically reduce leverage and high

[8] Leary and Roberts (2005) and Flannery and Rangan (2006) develop a standard model of partial leverage adjustments with the form
$L_{i,t} - L_{i,t-1} = \lambda(L^*_{i,t} - L_{i,t-1}) + \tilde{\epsilon}_{i,t}$; where $L_{i,t}$ and $L_{i,t-1}$ are time t and lagged leverage, and the speed of adjustment, λ, is the percentage of a typical firm's target deviation closed over a year (δ t).

[9] A full list of firm characteristics is provided in Appendix A.

MB firms may prefer to protect valuable growth opportunities by limiting or closely monitoring leverage (Rajan and Zingales (1995), Hovakimian et al. (2001)). Size may imply higher leverage as size is closely related to transparency, asset volatility, and access to public debt markets (Faulkender et al. (2012)). When considering convertible bond issuers, the determinants of target leverage, particularly profitability and market-to-book, may deviate from expectations. Convertible debt issuers have been characterized as opaque, low-medium quality firms with positive prospects (Stein (1992)). Empirical studies find that issuers tend to have higher leverage than industry peers and are often considered over-levered given their asset set and growth opportunities (Mayers (1998), Lewis et al. (1999)). High leverage and growth potential are conflicting attributes in the target leverage literature.

2.2.3 Target Deviations and Security Issuance, Security Choice

Firm characteristics, security attributes, market conditions, or overlaps across and within these factors may influence security issuance decisions. Standard in the issuance literature, binomial logit regressions model initial public financing decisions across firms. I use quarterly and annual measures of demand for each security to incorporate the different circumstances tied to each option. Time specific demand for each security differentiates each alternative security option and also reflects variation in external factors surrounding the individual decision events within a firm.

Public Financing

In general, firms have access to several capital markets. In addition to public exchanges, managers can often rely on quicker and less costly financing methods such as private placements or bank lending. Since alternatives for external capital exist, the choice to engage in expensive public offerings may reflect key information about the underlying capital structure needs and objectives of the issuing firm. If so, what is the shape of the relationship between target deviation levels and the decisions to seek public financing? Is there anything inconsistent or special about the capital structure of firms that do not regularly offer public securities?

Model 2.11 presents a multi-level logistic regression model of annual target leverage deviations on public issuance events:

$$Pr(PubIssue_{ijk} = 1) = \beta_0 + \delta_{ijk} * |Dev|_{ijk} + \beta \text{ FC}_{ijk} + \alpha^{*}\text{MC}_i + u_{jk} + v_k \quad (2.11)$$

for k=1,..., L independent industry clusters with j=1,...,m_k nested firm clusters that contain i=1,...,n_{jk} yearly observations. *PubIssue* is the binary outcome equal to one if the firm publicly issued equity, straight debt, or convertible debt. $|Dev|$, FC, and MC are fixed effects covariates for deviation size, firm-specific characteristics, as well as market and macroeconomic conditions. In conditioning on two sets of random effects across industry clusters, v_j, and firm clusters, u_{jk}, the multi-level model accounts for endogeneity concerns in the issuance decision and modeled deviation measure through firm-level random effects.

Security Choice

In-line with the multinomial security choice analysis of Erel et al. (2012), discrete alternative-specific multinomial logit regressions (McFadden's Choice) model the security selection decision between equity, straight debt, convertible debt, or non-issuance. Under the standard multinomial logistic model, selecting between equity, straight debt, or convertible debt does not satisfy the assumptions of independent and irrelevant alternatives (i.i.a) for the sample of firms with observable capital structure determinants and stock price histories[10]. The alternative-specific

[10] Although i.i.a. assumptions are weakly violated, security choice is also modeled under a variation of McFadden's Choice, the alternative specific conditional logit model:

$$Pr(y_{ij} = 1) = X_i\beta + (z_iA)' \quad (2.12)$$

McFadden's Choice model incorporates attributes of each alternative option and accounts for correlations across selected outcomes to relax the i.i.a. assumptions. In this discrete model each observed security issuance event is expanded to explicitly capture the contemporaneous characteristics of the alternative securities. Within this analysis, firm-years without observable equity, debt, or convertible debt offerings are classified as a *No Issuance* alternative. Subsequently, every firm-year has a minimum of one issuance event spanning the four discrete alternatives with identical contemporaneous firm characteristics, market conditions, and macroeconomic conditions, excluding security-specific market demand.

Since conditions surrounding and within the firm remain fixed throughout each discrete decision event, selection and rejection outcomes reveal information about the determinant factors of the utility maximizing choice. The utility function for optimal security issuance is modeled as:

$$\begin{aligned} U_{ia} &= \beta_i x_{ia} + \alpha \ \mathrm{w}_{ia} + \delta_a z_i + \epsilon_{ia} \\ &= \beta_i MD(CapitalSupply)_{ia} + \alpha \ \mathrm{SecurityOption}_{ia} + \delta_a [FC_i, MP_i, MC_i] + \epsilon_{ia} \end{aligned} \tag{2.13}$$

for i-firms and a=*1,2,3,4* alternative outcomes.β_i case-specific random coefficients and α fixed coefficients load on the alternative-specific (security-specific) variable vectors x_{ia} and w_{ia} respectively. $delta_a$ security-specific fixed coefficients load on the vector of case-specific (firm-specific) variables z_i. This mixed multinomial logit model is approximated by maximum simulated likelihood; the process first estimates the density function $f(\beta)$ and then determines choice probabilities under the standard

For i-firms and j=*1,2,3,4* alternative outcomes, $y_{ij} = 1$ when security j is chosen and $y_{ij} = 0$ otherwise. Results for the alternative specific conditional model, reported in Appendix D.1, show similar factor loadings (direction and significance) of deviation size on security choice.

logistic probability function:

$$P_{ia}(\beta) = \frac{e^{(x_{ia}\beta_i + w_{ia}\alpha + z_i\delta_a)}}{\sum_{\alpha=1}^{A} e^{x_{ia}\beta_i + w_{ia}\alpha +_i \delta_a}} \tag{2.14}$$

Since the design features of a convertible bond give the offer more debt-like or equity-like attributes, the discrete choice setting is particularly useful to distinguish the selection of a convertible bond over a straight bond or equity offering.

Proposition 4. *If capital structure objectives are a determinant of convertible issuance,*

i. A positive relationship exist between deviation size and the likelihood of issuing convertible debt

ii. A positive relationship exist between deviation direction (from under to over) and the likelihood of issuing convertible debt

2.3 Data

I examine the features of all corporate convertible bond offers (CCOV) between 1990-2015 with known coupon rates and maturities as recorded and available in Mergent's Fixed Income Securities Database (FISD). FISD maintains details on debt issues and issuers of U.S. corporate, agency, and treasury bonds. The sample excludes non-conventional convertibles such as Medium Term Notes (MTN) and Contingent Convertibles (CoCo). I draw from several additional data sources to incorporate equity and straight debt offerings, estimate capital structure ratios, and account for the firm-specific characteristics, market conditions, and macroeconomic factors known to effect issuance activity.

Screening for securities from U.S. corporates, Thompson Reuters-SDC provided equity offerings of common stock (Common Shares, Ord/Common Shs.), and FISD provided data for straight bond issues (CDEB). To construct target capital structure estimates, firms must have at least two years of consecutive annual fundamental financial data in Compustat as well as an industry classification. Given the scope of FISD's bond coverage, sample firms require annual financials between 1989-2015. The sample excludes regulated firms (SIC 4900-4999) and financial firms (SIC 6000-6999).

CRSP provided daily stock prices and S&P 500 returns to calculate market and firm-specific equity volatilities[11]. The CRSP-Survivorship-Bias Free Mutual Fund Database provided monthly fund flow data used to proxy market demand for equity and debt securities. Aggregated fund flows between 1989-2015 include corporate convertible bond mutual funds with a 50% convertible bond basis or Strategic Index (SI)/Lipper Objective (LO) codes *CVR* and *CV*. As well as corporate straight bond mutual funds with a 50% straight bond basis or SI/LO codes *CHQ, CMQ, CSM, CIM, CHY, CGN, CPR, A, BBB, CPB*, and equity mutual funds with a 50% equity basis or SI/LO codes *AGG, GRO, GRI, BAL, G, GI, B, I.* Federal Reserve Bank Reports (WRDS) provided interest rate and treasury yield data.

The full sample of firms with sufficient financial and stock price data include 10,373 firms spanning 95,851 firm-years. Within the full firm sample, no publicly issued equity or debt is observed for 50,500 firm-years, and 20,230 firm-years report public issuance of equity securities only. 3,679 unique firms spanning 45,351 firm-years report at least one public issuance of debt or equity securities throughout the sample period. The sample of new and unique security offerings includes 3,145 common equity offers, 3,895 straight bond offers, and 1,219 convertible bond offers.

[11]To appropriately value most convertible bond features, CRSP's daily stock prices must map to several dates within sample period. The specific dates of interest include the offer date, delivery date, any conversion term adjustment dates, the conversion option's expiration date, and the maturity date.Conversion term adjustments primarily result from stock splits or changes to the underlying commodity due to merger and acquisition activities.

2.3.1 Sample Description: Firm Characteristics

Table 2.1 presents summary statistics and univariate analysis of target leverage ratios, target deviations, and the vector of firm characteristics ($X_{i,t-1}$) used to estimate target leverage ratios. Within the *Summary Statistics* panel, column one includes the full sample of firm-years and column two contains the panel years of firms with no security issuance events during the sample period. The full samples is consistent with the Compustat universe samples presented in Flannery and Rangan (2006) and Faulkender et al. (2012). Column three contains the panel years of firms with at least one common equity, straight bond, or convertible bond issue, column four contains the panel years of firms with only common equity issues, and column five contains the panel years of firms issuing either straight or convertible bonds. The sample of active debt and equity issuers is consistent with the subsample of convertible issuers discussed in Chapter 1.

The sample statistics are consistent with prior literature modeling the optimal capital structure of the Compustat universe of publicly traded firms. The sample's firm characteristics most closely resemble Danis, Rettl, and Whited (2014), who examine a similar time period (1984-2011) and similar sample of non-regulated, non-financial firms[12]. Firms with debt financing generate most of the variation across the univariate analysis of target leverage determinants (firm characteristics). Profitability and R&D, both scaled by total assets, are notable differences in the respective t-test between inactive firms, firms actively issuing debt and equity securities, and firms issuing common equity. Proportional to both inactive and equity only firms, firms with debt financing are at least twice as profitable and spend three times less on R&D expenditures. At the 1% significance level, firms with public debt financing have larger target leverage deviations and are 40% more levered relative to

[12] Danis et al. (2014) report quarterly mean (median) book leverage ratios of 23.3% (19.6%). For a sample spanning 1965-2006 Faulkender et al. (2012) report annual book leverage ratios of 25.3% (22.8%) and book deviations of 3.3% (1.6%).

firms that are inactive in the public capital markets and firms that only raise equity publicly. These differences persist when inactive firms are excluded from comparison.

2.4 Key Findings

Convertible Bond Offer series, Market Strategy

Convertible bonds often originate in the Rule-144a (R144a) market and then later re-issued as Exchange Traded offers. Re-issued public offers typically retain the original R144a-bond's terms (e.g. maturity, coupon, provisions) but the conversion terms and principal offer amount may be adjusted to reflect current conditions. In both the R114a and public markets, following well received offers, firm's may pursue expansion offers containing identical bond and conversion terms but different principal amounts (e.g. Series A, Series B). Further, tender offers and rollovers can impact an existing issue's outstanding principal, conversion terms, or bond terms. As such, it is important to identify and distinguish the original issue when firms can use re-issuance, expansion series, or tender offers to modify a bond's conversion terms and conversion likelihood.

I consider convertible bonds with equivalent maturities, coupon rates, and sequential offer descriptions (prospectus) to be separate series of one bond chain[13]. Sequencing the full sample yields 1,852 convertible bond chains with 1,219 unique offer chains(series) and a range of 1-4 issue series per chain. Across the sample period 786 firms issue an average of 2 separate convertible bond series. A large portion of convertible bond chains originate on the R144a market (762), and more than 75% of these chains become registered publicly issues. The remaining convertible bond chains originate on exchange traded (public) markets, private markets, or as Rule-415 shelf-registrations.

[13] For a small set of bonds reissued with different coupon rates I exclusively rely on maturity dates and prospectus details.

2.5 Results & Discussion

Table 2.2 presents summary statistics and univariate analysis for the offer details, conversion options terms, bond features, and provisions of convertible bonds issued between 1990-2015. This is the first combined analysis for convertible bond terms relative to target capital structure magnitudes. Univariate test of design terms across the different issuer attributes highlight an important aspect of the deviation measure. Target deviations contain two components, first is the relative direction around the optimal level which distinguish under-levered and over-levered firms. Second is the relative distance from the optimal level which differentiates a firms dealing with large and small gaps between the current and optimal capital structure. Absolute values of the size and an indicator variable for direction are both used through the analysis to reflect the magnitude of target leverage deviations. The log transformed target leverage deviation measure is also used throughout the analysis to succinctly capture both the size and direction components.

Managers issuing convertible debt specify the offering amount, maturity, and conversion premium- the difference between the strike price and the issue day stock price. These bond features relay different information about the firm's objectives. All else equal, offering amounts reflect the amount of new equity the firm could realize, and the conversion premium reflects the firm's eagerness to be within range of realizing the new equity. Likewise, the maturity periods reflect the window of opportunity for conversion. Conversion premiums and maturity periods directly influence the value of the conversion (equity) option as well as the likelihood of achieving conversion at the time of issuance since. Using details from the initial (original) offers discussed in Section 2.4, Column 7 of Table 2.2 details univariate test across the top and bottom quartiles of book deviation size. Firms with larger deviations issue smaller (-91.8M) more expensive convertible bonds (coupons +59bps), but those offers contain more potential new equity (factor of 1.89) , have shorter maturities (-2.7years), and higher conversion probabilities (+3.4%).

Table 2.3 reports design feature summary statistics for Rule-144A private placements, Rule-415 shelf-registrations, other private negotiations, and public exchange market offers. For each market, means and proportions are reported across market participation and within the market participation by the direction of the firms leverage deviation. From the univariate test, over-levered firms issuing in the R144A market tend to have longer maturity periods and include put provisions, but do not face higher coupon expenses or reduced principal amounts than under-levered R144A issuers. Alternatively, under-levered firms issuing convertibles in exchange traded markets offer more callable bonds and tend to sell at a sizable discount (29%). Further analysis of the differences between these markets follows in Table 2.8.

Table 2.5 reports binomial logit regression results for the security issuance choice model in equation (2.11). Separate regressions model the determinants of pursuing security issuance for all firms in the sample and firms classified as *Active Issuers*; firms with at least one public offering of equity, straight debt, or convertible debt during the 1990-2015 sample period. Consistent with prior security issuance studies, the fully constrained model shows firm-specific characteristics, market demand, market performance, and macroeconomic conditions are significant determinants of public financing. Comparing regression results and summary statistics, reported in columns 1-2 of Table 2.1 and Table 2.4, the inclusion of inactive issuers greatly magnifies(diminishes) the influence of almost every covariate. These trends suggest the models are appropriately capturing the higher(lower) bounds of internal and external circumstances surrounding the decision to raise external financing. Accordingly, the probability of public issuance, which serves as an instrument for target leverage deviations, is predicted using the regression coefficients from the full sample of inactive and active issuers.

The remainder of the analysis excludes all inactive issuers. The security choice and design questions examined in Tables 2.6 - 2.8 require at least one positive response away from the base level. With no public offerings during the 25 year sample period, inactive firms lack any observations selecting an alternative security to non-issuance, and thus reveal no usable information in the positive response setting. The following discussions are based on the active sample of firms that participate in observable capital markets.

Table 2.6 reports regression results for McFadden's mixed multinomial logit model of security choice. Recalling equations (2.13) and (2.14), McFadden's model uses fixed characteristics and random attributes, factors which vary across decision events and between alternative securities, to model correlated choices across equity, debt, and convertible debt securities. Instead of restricting the model to uncorrelated choices or ignoring these effects altogether, each choice is evaluated as discrete observations of utility maximizing decisions. To construct the discrete setting for *McFadden's Choice*, each observed security offering is duplicated four times to incorporate the three alternative securities the firm could have issued but rejected instead. As required in the model, all event-specific issue and issuer covariates are duplicated for each rejected alternative in the event set. The dependent variable (*Security Selected*) has a base value of 0 for each option and a single non-zero value (1) for the security the firm chose to issue. Firm-years without an observable public equity, debt, or convertible debt offers are categorized as selecting *No Issuance*. All regressions accounts for the market performance, market demand, and macroeconomic conditions used throughout the analysis.

Aggregate flows into mutual funds which have concentrated holdings of equity, straight debt, and convertible debt, respectively, are the random alternative-specific characteristics in the mixed multinomial model. Time-specific market demands for a particular security can shift issuance preferences for all options. In the first model of Table 2.6, the positive and significant coefficient for security specific market demand

(MFF_i=*CD,SD,CD*) is evidence that higher demand for a security increases the likelihood it is chosen. The standard deviation coefficient captures variation in the ways that firms respond to demand for a specific security. The coefficient on the standard deviation of average market demand effects is significant at the 1% level, indicating strong heterogeneity in the influence of market demand on security choice. However, market demands alone have little impact on issuance when non-issuance outcomes are excluded from the choice set in the second model. Taken together, the models suggest that changing market demands do not independently influence security choice once firms have decided to raise capital.

Considering the magnitude of target leverage deviations, firms with wider deviations and over-levered firms are more likely to choose convertible debt relative to non-issuance, straight debt, or equity. Significance on the squared deviation term indicates a diminishing preference for both straight debt and convertible debt as deviation gaps widen. This trend is consistent with the limited debt capacity and lower credit quality associated with highly levered firms. The over/under directional measure of target leverage deviations is negative and significant for the full choice set in model 1 and insignificant for the reduced choice set in model 2. Yet, deviation direction coefficients are significant for common equity, which suggest that over-levered firms are more likely to choose equity than any form of debt, all else equal.

Table 2.7 reports regression results for the system of equations in (2.1)-(2.3) modeling the endogenous design terms maturity, new equity, and call protection period. Using a two-stage least squares (2SLS) framework, models 1-3 report second-stage coefficient results and first-stage fit statistics using the instrumental variables in 2.4-2.7. The natural logarithmic measure of target leverage deviations,*Log(BookDev)*, is excluded from model-1, treated as an exogenous variable in model-2, and instrumented as an endogenous variable in model-3. Repeating this structure for each design term's independent 2SLS regression, Appendix D.2 reports endogeneity test statistics for the instrumental variables. Consistent with Lewis and Verwijmeren (2011) and Dutordoir et al. (2014), the instruments conversion premium (new equity), term spread and debt maturity (maturity), and natural log of growth in earnings per share (call protection period) are valid and exogenous in full form equations. Within the simultaneous estimation results, coefficients on maturity, call protection periods, overallotment allowances, and equity volatility are also consistent with the findings in (Lewis and Verwijmeren (2011) and Dutordoir et al. (2014)). Log scaled target leverage deviations do not significantly effect the new equity, maturity, or call protection periods bond terms.

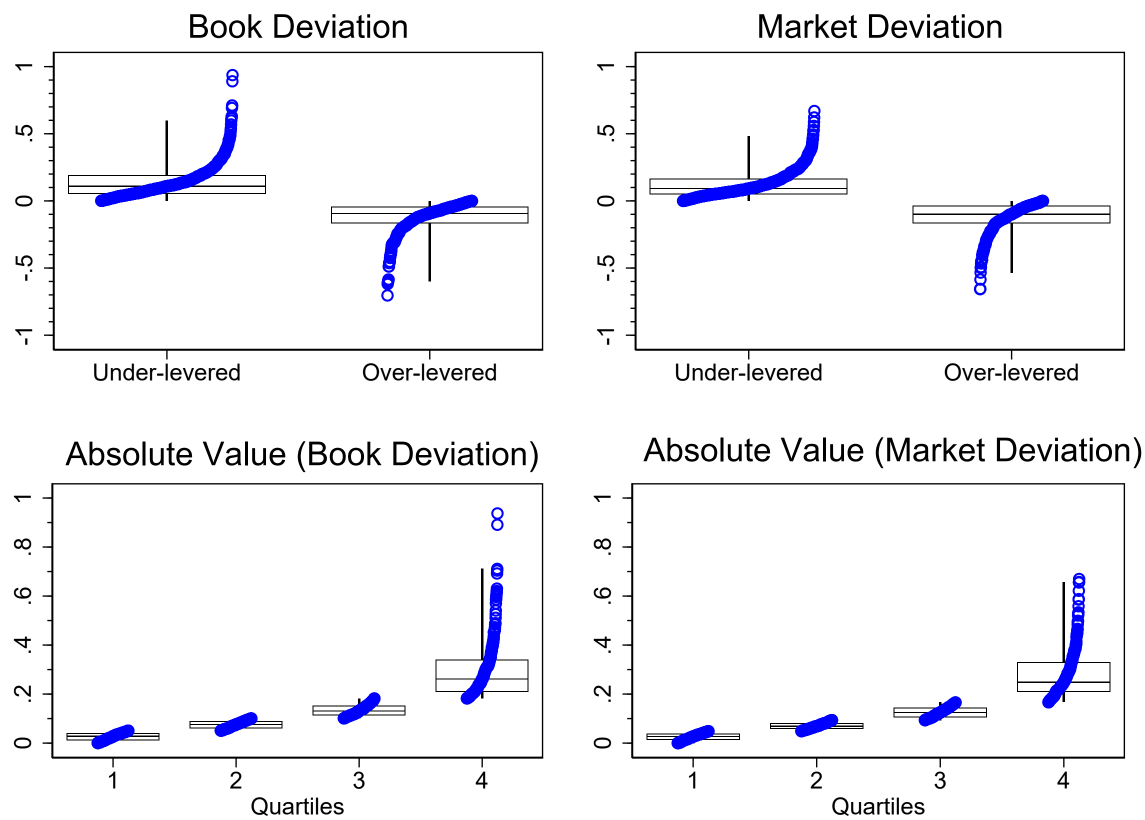
Both natural log and absolute value-directional indicator measure of target leverage deviations are used to model the probabilities of including call, put, and redemption options. Table 2.8 reports multinomial logit results for three types of call options; non-callable, callable but not enforcible for three or more years, or callable and enforcible within three years. Columns 5-6 and columns 7-8 report binomial logit results for put and redemption options respectively. Consistent with Grundy and Verwijmeren (2018), Rule-144A offers significant reduce the probability of issuing a convertible bond callable within three years. The coefficients across *IssueMarket*, a categorical ranking of exchange offers, other/private negotiated offers, rule-415 offers, and rule-144A offers, respectively, suggests shelf registrations and negotiated offers have call protection periods in general. Consistent with Chemmanur and Simonyan (2010), longer maturity bonds from firms with better credit quality are more likely to have put provisions. Covariate effects for redemption provisions, which allow for to early repurchases and retirement, follow a similar trend as short call protected offers. All else equal, firms with larger target leverage deviations are less likely to offer callable bonds with short protection periods and over-levered firms are more likely to extend put provisions.

Considering the univariate test and multivariate regression results altogether, target leverage deviations are a significant determinant in the decision to issue convertible debt and a modest determinant of the subsequent design features. These findings are robust to controls for market wide equity volatility and cumulative returns, aggregate investor demand, macroeconomic conditions and firm-specific equity and growth characteristics.

2.6 Summary

This analysis sits in the cross-sections of theoretical and empirical studies on the existence and determinants of optimal capital structure, external financing, convertible bond issuance, and convertible bond design. Within this setting, I examine how the terms and provisions of convertible bond offers are related to the target capital structure needs of the issuing firm. Modeling firm-level target leverage ratios and target leverage deviations, the analysis focus on three key capital structure decisions to disentangle the relations between target leverage objectives and convertible design. Using frameworks motivated in the literature, security issuance models test the likelihood of the first decision to undertake any public security offerings, and the following decision to offer common equity, straight debt, or convertible debt. The third decision(s) on security design address the influence of existing annual target leverage deviations on the conversion terms, provisions, and primary features (e.g. amount of potential new equity, maturity) written into new convertible bond issues.

Accounting for market wide equity volatility and cumulative returns, aggregate investor demand, macroeconomic conditions and firm-specific equity and growth characteristics, I find that drifts (deviations) from target capital structure have a positive and significant effect on convertible bond issuance. Yet, the magnitude and direction of target deviations have varying effects on the sensitivity of conversion terms, principal offer amounts, and the inclusion of call, put, and redemption provisions. Altogether, target leverage deviations are a significant determinant in decisions to raise external financing through convertible debt and a modest determinant of the subsequent design features.



Note: Book (Market) Dev is the book (market) target less prior year book (market) leverage.

Figure 2.1: Distribution of Target Leverage Deviations

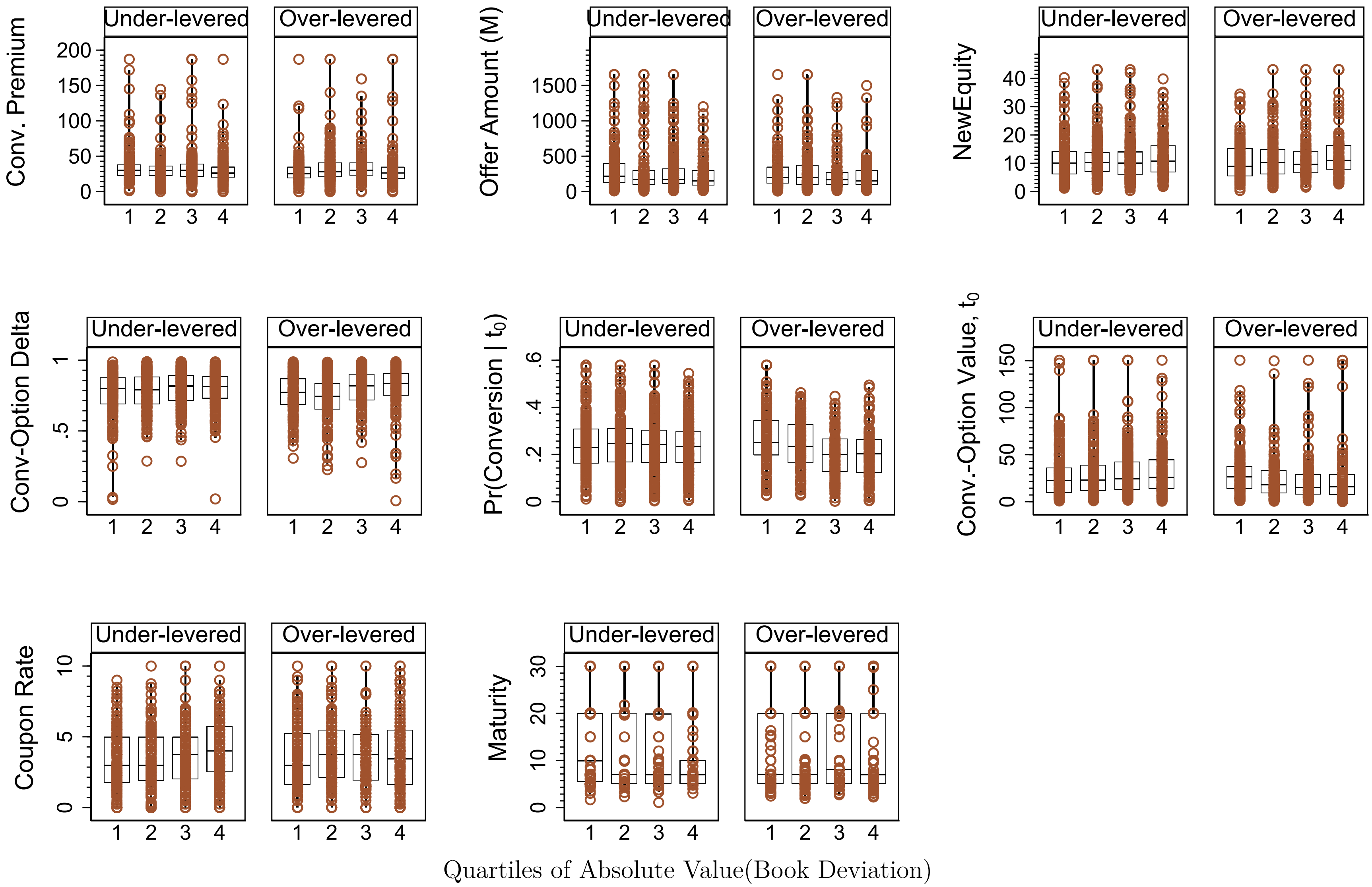


Figure 2.2: Distribution of Continuous Design Terms

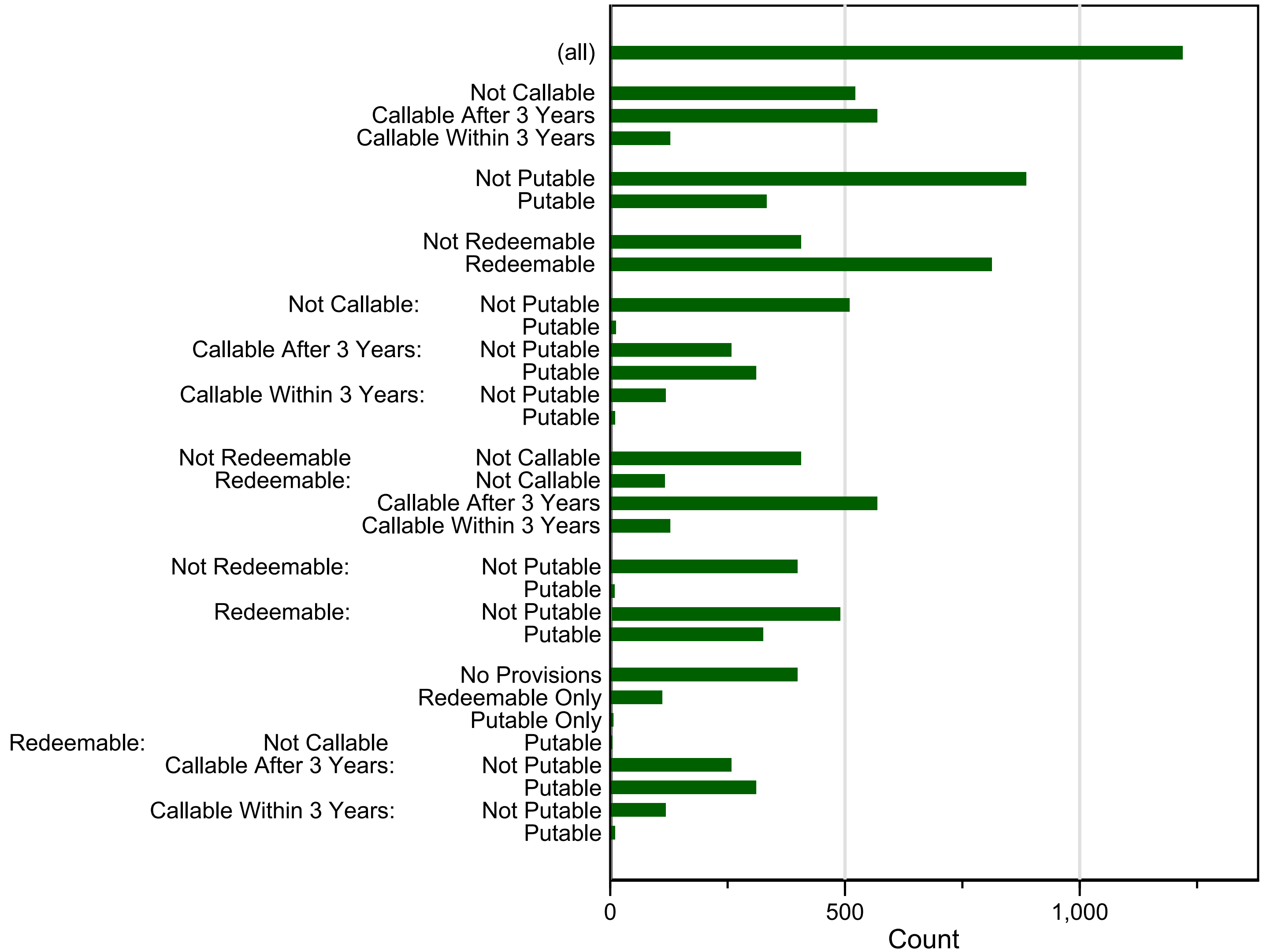


Figure 2.3: Distribution of Discrete Bond Provisions

Log(Book Dev)																
-0.006 0.839	Equity MFFs															
-0.036 0.238	0.327 0.000	S Bond MFFs														
-0.068 0.026	-0.015 0.632	-0.048 0.113	Conv. Premium													
-0.124 0.000	0.190 0.000	0.073 0.017	-0.117 0.000	New Equity												
-0.046 0.126	0.069 0.023	-0.048 0.114	0.006 0.832	-0.117 0.000	Maturity											
-0.060 0.049	-0.019 0.526	0.045 0.135	-0.018 0.544	0.084 0.006	0.030 0.314	TermSpread										
0.005 0.861	0.179 0.000	0.103 0.001	0.006 0.852	0.065 0.031	0.065 0.032	-0.051 0.095	Call Protection Period									
0.053 0.078	0.019 0.528	-0.015 0.622	-0.032 0.284	-0.021 0.479	-0.018 0.550	-0.050 0.098	-0.050 0.102	EPSgrowth								
0.016 0.589	-0.139 0.000	-0.013 0.667	0.028 0.358	-0.207 0.000	0.170 0.000	-0.077 0.011	-0.113 0.000	-0.000 0.999	Offer Amount							
0.052 0.084	0.088 0.004	0.035 0.246	-0.162 0.000	0.075 0.013	0.370 0.000	0.066 0.028	0.213 0.000	-0.004 0.897	-0.134 0.000	Delta						
0.044 0.147	0.155 0.000	0.024 0.426	-0.089 0.003	0.228 0.000	-0.206 0.000	0.062 0.042	0.053 0.082	0.013 0.670	-0.345 0.000	0.130 0.000	Alternate Security					
0.105 0.001	0.230 0.000	0.089 0.003	-0.252 0.000	-0.020 0.503	0.051 0.091	-0.277 0.000	0.015 0.630	0.025 0.407	0.080 0.008	-0.208 0.000	-0.142 0.000	Pr(Conv;ND2)				
-0.017 0.575	0.090 0.003	0.164 0.000	0.102 0.001	0.364 0.000	-0.306 0.000	0.005 0.866	0.231 0.000	0.018 0.557	-0.319 0.000	0.045 0.140	0.122 0.000	-0.084 0.006	Coupon Rate			
0.058 0.058	-0.141 0.000	-0.176 0.000	-0.110 0.000	-0.151 0.000	0.144 0.000	0.123 0.000	-0.131 0.000	0.015 0.630	0.067 0.026	0.036 0.233	-0.028 0.352	-0.075 0.013	-0.361 0.000	Overallotment Issued		
0.116 0.000	-0.106 0.000	-0.139 0.000	-0.020 0.509	-0.042 0.163	-0.158 0.000	0.023 0.455	-0.119 0.000	0.011 0.725	-0.089 0.003	0.027 0.377	0.516 0.000	-0.151 0.000	-0.146 0.000	0.115 0.000	Pr(Not Offering CD)	
0.116 0.000	0.111 0.000	-0.009 0.764	-0.101 0.001	0.198 0.000	-0.022 0.463	-0.096 0.002	0.071 0.019	0.017 0.585	-0.264 0.000	0.003 0.915	0.487 0.000	0.070 0.022	0.080 0.009	-0.057 0.059	0.307 0.000	Pr(No Offering)

Figure 2.4: Pearson's Correlations: Design Terms, Instrumental Variables

Table 2.1: Summary Statistics and Univariate Analysis- Firm Characteristics

Summary statistics and univariate analysis for target leverage ratios, target deviations, and the vector of firm characteristics $(X_{i,t-1})$ used to estimate target leverage ratios. With the restriction that $L_i^* = \beta X_i + F_i$, annual target leverage ratios are modeled as: $L_{i,t+1} = (\lambda\beta)(X_{i,t}) - (1-\lambda)(L_{i,t}) + F_i + \tilde{\epsilon}_{i,t}$ where, the coefficient vectors $\boldsymbol{\beta}$ and $\boldsymbol{\lambda}$ are estimated concurrently by Blundell and Bond (1998) system-GMM for dynamic panel models. Following Flannery and Hankins (2013), firm fixed effects F_i are equivalent to the mean within panel residuals. The full sample consist of all Compustat firms with at least two years of complete balance sheet data and coverage in CRSP. Regulated and financial firms are excluded. The sample period is 1989-2016 to align with available data for bond issuances in Mergent's Fixed Income Securities Database (FISD). Thompson Reuters-SDC provided common equity issues. Within the *Summary Statistics* panel: column one includes the full sample of firm-years, column two contains the panel years of firms with no security issuance events during the sample period, column three contains the panel years of firms with at least one common equity, straight bond, or convertible bond issue, column four contains the panel years of firms with only common equity issues, and column five contains the panel years of firms issuing either straight or convertible bonds. Within the *Univariate Analysis* panel: columns 1-3 present mean t-test between inactive firms and all active firms, firms issuing common equity only, and firms issuing debt, respectively. Column four presents mean t-test between firms issuing common equity only and firms issuing debt. Appendix A details variable descriptions. Medians in brackets, standard errors in parentheses, $*p < 0.1, **p < 0.05, ***p < 0.01$.

	Summary Statistics					Univariate Analysis			
	Full Sample	Inactive	Active	CE only	CE&D	Inact-Active	Inact-CE	Inact-CE&D	CE-CE&D
L^*_{BDR}	0.228	0.214	0.244	0.171	0.326	-0.030***	0.042***	-0.112***	0.129***
	[0.19]	[0.17]	[0.22]	[0.13]	[0.29]	(0.001)	(0.002)	(0.002)	(0.002)
$\lvert Dev_{BDR} \rvert$	0.091	0.087	0.096	0.083	0.095	-0.009***	0.003***	-0.008***	0.022***
	[0.06]	[0.06]	[0.07]	[0.05]	[0.07]	(0.001)	(0.001)	(0.001)	(0.001)
L^*_{MDR}	0.230	0.230	0.230	0.166	0.315	0.000	0.064***	-0.085***	0.114***
	[0.18]	[0.17]	[0.19]	[0.11]	[0.28]	(0.001)	(0.002)	(0.002)	(0.002)

Table 2.1 – continued: Summary Statistics and Univariate Analysis- Firm Characteristics

	Summary Statistics					Univariate Analysis			
	Full Sample	Inactive	Active	CE only	CE&D	Inact-Active	Inact-CE	Inact-CE&D	CE-CE&D
$\lvert Dev_{MDR} \rvert$	0.101	0.102	0.100	0.086	0.112	0.002**	0.016***	-0.010***	0.025***
	[0.07]	[0.07]	[0.07]	[0.05]	[0.08]	(0.001)	(0.001)	(0.001)	(0.001)
$\mathbf{X}_{it}$:									
L_{BDR}	0.226	0.213	0.242	0.171	0.327	-0.029***	0.041***	-0.115***	0.127***
	[0.18]	[0.15]	[0.21]	[0.10]	[0.31]	(0.001)	(0.002)	(0.002)	(0.002)
L_{MDR}	0.219	0.218	0.220	0.156	0.311	-0.002	0.063***	-0.093***	0.117***
	[0.14]	[0.12]	[0.15]	[0.06]	[0.26]	(0.002)	(0.002)	(0.002)	(0.002)
PROF/TA	0.039	0.023	0.057	-0.002	0.134	-0.034***	0.025***	-0.111***	0.106***
	[0.10]	[0.09]	[0.11]	[0.09]	[0.13]	(0.002)	(0.002)	(0.001)	(0.002)
MB	1.821	1.749	1.901	2.129	1.494	-0.152***	-0.380***	0.255***	-0.412***
	[1.23]	[1.14]	[1.32]	[1.44]	[1.16]	(0.011)	(0.016)	(0.012)	(0.017)
DEP/TA	0.048	0.050	0.047	0.046	0.048	0.003***	0.004***	0.001***	0.002***
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]	(0.000)	(0.000)	(0.000)	(0.000)
LnTA	5.171	4.423	6.005	4.848	7.386	-1.581***	-0.425***	-2.963***	2.088***
	[5.09]	[4.32]	[5.98]	[4.85]	[7.41]	(0.012)	(0.014)	(0.015)	(0.015)
FA/TA	0.267	0.258	0.276	0.236	0.352	-0.018***	0.022***	-0.093***	0.073***
	[0.19]	[0.19]	[0.20]	[0.16]	[0.29]	(0.002)	(0.002)	(0.002)	(0.002)
R&D Ex/TA	0.058	0.055	0.062	0.087	0.018	-0.008***	-0.032***	0.037***	-0.045***
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	(0.001)	(0.001)	(0.001)	(0.001)
R&D	0.486	0.460	0.514	0.554	0.392	-0.054***	-0.094***	0.069***	-0.072***

Table 2.1 – continued: Summary Statistics and Univariate Analysis- Firm Characteristics

	Summary Statistics					Univariate Analysis			
	Full Sample	Inactive	Active	CE only	CE&D	Inact-Active	Inact-CE	Inact-CE&D	CE-CE&D
	[0.00]	[0.00]	[1.00]	[1.00]	[0.00]	(0.003)	(0.004)	(0.004)	(0.005)
IndMedL$_{BDR}$	0.185	0.186	0.184	0.163	0.227	0.002***	0.023***	-0.041***	0.037***
	[0.20]	[0.20]	[0.19]	[0.15]	[0.24]	(0.001)	(0.001)	(0.001)	(0.001)
IndMedL$_{MDR}$	0.167	0.168	0.165	0.141	0.213	0.003***	0.027***	-0.045***	0.043***
	[0.16]	[0.17]	[0.16]	[0.12]	[0.21]	(0.001)	(0.001)	(0.001)	(0.001)
Observations	95851	50500	45351	20230	17529	95851	70730	68029	45351

Table 2.2: Summary Statistics and Univariate Analysis- Convertible Bond Design Terms

Summary statistics and univariate analysis for the offer details, conversion options terms, bond features, and provisions of convertible bonds issued between 1990-2015.S_{t-5} is market price of the underlying stock 5 trading days before issuance, $X_C P$ is the conversion price at issuance, and conversion Premium is the percentage difference between the conversion price and the issuers' stock price. *Offering Amount* the total par value (in millions) of debt initially issued. *NewEquity* is the natural logarithm of the number of shares issued to convertible bondholders under full conversion normalized by the total shares outstanding on the month-end prior to issuance. Following Black-Scholes (1973), *Delta* is a measure of the sensitivity of the conversion option to the underlying commodity (common stock). *Pr(Conversion* | t_0*)* is the cumulative probability of reaching the conversion strike price under the standard normal distribution, and $Cv - OptValue_{t_0}$ is the value of the conversion option, priced as a call on equity; Appendix A details the B.S. equations used. *Coupon Rate* is the current applicable annual interest rate. *Maturity* is the number of year between the initial offer date and maturity date. *Offer Price* is the price as a percentage of par at which the issue was originally sold to investors. *Callable, Putable, Redeemable* are indicator variables respectively equal to 1 if the issue is callable, putable, or redeemable and 0 otherwise. *Exchange Offer* is an indicator variable equal to 1 if the issue was sold on a public exchange and equal to 0 if the issue was sold in private negotiations. *Rule-144A Offer, Rule-415 Offer* are indicator variables respectively equal to 1 if the bond was issued pursuant to Rule-144a or Rule-415 and 0 otherwise. Parenthesis report standard errors, $*p < 0.1, **p < 0.05, ***p < 0.01$.

	Full Sample			Book Dev:		Under : Over	$\|q1\| : \|q4\|$	Market Dev:		Under : Over	$\|q1\| : \|q4\|$
	mean	median	s.d.	mean	mean	d_{mean}	d_{mean}	mean	mean	d_{mean}	d_{mean}
S_{t-5}	32.273	23.102	57.244	34.705	28.431	6.274*	5.268	38.338	19.425	18.912***	6.899***
	(1.646)					(3.072)	(4.041)			(2.502)	(1.959)
$X_{CP_{t0}}$	43.355	29.771	87.729	47.103	37.435	9.668*	9.164	51.603	25.883	25.721***	8.610**
	(2.522)					(4.580)	(5.996)			(3.796)	(2.703)
Conv Prem	34.072	27.523	37.379	32.952	35.840	-2.888	-2.091	31.537	39.442	-7.905**	-3.428
	(1.075)					(2.409)	(3.316)			(2.961)	(3.054)

Table 2.2 – continued: Summary Statistics and Univariate Analysis- Convertible Bond Design Terms

	Full Sample			Book Dev:	Under : Over		$\lvert q1\rvert : \lvert q4\rvert$	Market Dev:	Under : Over		$\lvert q1\rvert : \lvert q4\rvert$
	mean	median	s.d.	mean	mean	d_{mean}	d_{mean}	mean	mean	d_{mean}	d_{mean}
Offer Amount	279.475	175.000	348.717	286.213	268.827	17.386	91.804***	281.560	275.056	6.505	96.057***
	(10.025)					(20.553)	(27.268)			(23.244)	(26.618)
NewEquity	11.941	10.254	8.488	11.663	12.381	-0.717	-1.892**	11.313	13.273	-1.960***	-5.264***
	(0.244)					(0.528)	(0.667)			(0.579)	(0.713)
Conversion Terms:											
Delta	0.780	0.802	0.147	0.787	0.769	0.018*	-0.032**	0.783	0.772	0.011	-0.029*
	(0.004)					(0.009)	(0.012)			(0.010)	(0.012)
Pr(Conv| t_0)	0.238	0.232	0.118	0.242	0.233	0.010	0.034***	0.251	0.213	0.038***	0.040***
	(0.003)					(0.007)	(0.010)			(0.007)	(0.010)
Cv Opt Val_{t_0}	31.294	22.406	49.624	33.617	27.624	5.992*	3.513	37.256	18.665	18.591***	5.860**
	(1.427)					(2.746)	(3.663)			(2.189)	(1.921)
Bond Terms:											
Coupon Rate	3.723	3.500	2.424	3.686	3.781	-0.095	-0.595**	3.584	4.018	-0.434**	-1.429***
	(0.070)					(0.147)	(0.198)			(0.163)	(0.201)
Maturity	11.313	7.030	7.929	10.956	11.877	-0.921	2.736***	11.087	11.792	-0.705	2.512***
	(0.228)					(0.477)	(0.644)			(0.496)	(0.638)
Offer Price	97.014	100.000	12.076	97.105	96.863	0.242	-3.003**	97.010	97.023	-0.013	-1.187
	(0.371)					(0.773)	(0.999)			(0.818)	(1.033)
Binary Indicators:											
Callable	0.570	1.000	0.495	0.565	0.578	-0.012	0.104*	0.574	0.562	0.012	-0.002

Table 2.2 – continued: Summary Statistics and Univariate Analysis- Convertible Bond Design Terms

	Full Sample			Book Dev:	Under : Over		$\|q1\| : \|q4\|$	Market Dev:	Under : Over		$\|q1\| : \|q4\|$
	mean	median	s.d.	mean	mean	d_{mean}	d_{mean}	mean	mean	d_{mean}	d_{mean}
	(0.014)					(0.029)	(0.040)			(0.031)	(0.041)
Putable	0.272	0.000	0.445	0.242	0.320	-0.078**	0.134***	0.253	0.312	-0.059*	0.116**
	(0.013)					(0.027)	(0.036)			(0.028)	(0.036)
Redeemable	0.666	1.000	0.472	0.664	0.670	-0.006	0.087*	0.672	0.655	0.017	0.021
	(0.014)					(0.028)	(0.039)			(0.029)	(0.038)
Exch. Offer	0.114	0.000	0.318	0.088	0.156	-0.068***	-0.057*	0.092	0.160	-0.067**	-0.064*
	(0.009)					(0.020)	(0.025)			(0.021)	(0.026)
R-144A Offer	0.627	1.000	0.484	0.652	0.588	0.063*	0.003	0.653	0.572	0.081**	0.132***
	(0.014)					(0.029)	(0.040)			(0.030)	(0.040)
R-415 Offer	0.177	0.000	0.382	0.157	0.209	-0.052*	0.027	0.153	0.227	-0.074**	-0.037
	(0.011)					(0.023)	(0.030)			(0.025)	(0.032)
Observations	1210			741	469	1210	598	822	388	1210	599

Table 2.3: Summary Statistics and Univariate Analysis- Convertible Bond Design Across Markets

Summary statistics and univariate analysis of convertible bond offer features across the Rule-144A private placement, Rule-415 shelf-registration, other private negotiation (Panel B), and public exchange markets (Panel B). *Across Market* columns summarize all issues outside and inside the respective market. *Within* columns summarize issues in the respective market that are offered by under-levered and over-levered firms. Appendix A details variable descriptions. $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

	Rule-144A Offers						Rule-415 Offers					
	Across Markets			Within, by DevDir			Across Markets			Within, by DevDir		
	mean_{out}	mean_{in}	d_{mean}	mean_{UL}	mean_{OL}	d_{mean}	mean_{out}	mean_{in}	d_{mean}	mean_{UL}	meanOL	d_{mean}
Conv Premium	36.428	32.659	3.768	32.153	33.466	-1.314	34.324	32.910	1.414	33.902	31.798	2.104
Offer Amount	264.283	287.465	-23.182	291.919	281.292	10.627	278.440	280.318	-1.878	306.192	248.120	58.073
NewEquity	13.659	10.929	2.730***	10.708	11.280	-0.572	11.926	12.076	-0.151	10.851	13.617	-2.766**
Delta	0.771	0.786	-0.015*	0.790	0.778	0.012	0.786	0.752	0.035***	0.748	0.753	-0.005
$\Pr(\text{Conv} \mid t_0)$	0.253	0.229	0.024***	0.231	0.226	0.005	0.240	0.228	0.013	0.236	0.222	0.013
Cv Opt Value_{t_0}	27.483	33.476	-5.992**	35.129	30.725	4.404	32.138	27.032	5.106**	31.952	21.268	10.684***
Coupon Rate	4.705	3.148	1.558***	3.114	3.198	-0.084	3.645	4.135	-0.490***	4.175	4.063	0.111
Maturity	10.077	12.143	-2.066***	11.617	13.032	-1.416**	11.670	9.976	1.694***	8.781	10.823	-2.042*
Offer Price	95.528	97.767	-2.239**	97.746	97.778	-0.032	97.034	97.049	-0.015	98.699	94.882	3.818*
Overallotment	0.545	0.786	-0.241***	0.795	0.772	0.023	0.689	0.728	-0.039	0.767	0.673	0.094
Options:	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P
Callable	0.676	0.509	0.167***	0.484	0.551	-0.066*	0.586	0.507	0.079**	0.500	0.510	-0.010
Callable in 3Y	0.379	0.034	0.345***	0.043	0.020	0.023	0.167	0.291	-0.124***	0.310	0.280	0.030
Putable	0.182	0.328	-0.146***	0.284	0.402	-0.119***	0.286	0.212	0.074**	0.155	0.276	-0.120**

Table 2.3 – continued: Summary Statistics and Univariate Analysis- Convertible Bond Design Across Markets

	Rule-144A Offers						Rule-415 Offers					
	Across Markets			Within, by DevDir			Across Markets			Within, by DevDir		
	mean_{out}	mean_{in}	d_{mean}	mean_{UL}	mean_{OL}	d_{mean}	mean_{out}	mean_{in}	d_{mean}	mean_{UL}	meanOL	d_{mean}
Redeemable	0.766	0.608	0.158***	0.592	0.634	-0.042	0.675	0.631	0.043	0.621	0.643	-0.022
Observations	457	762	1219	483	276	759	1002	217	1219	116	98	214

Panel B: Summary Statistics and Univariate Analysis- Convertible Bond Design Across Markets

Conv Premium	34.899	28.437	6.462***	25.710	33.562	-7.852*	31.604	53.251	-21.647***	56.597	50.321	6.276
Offer Amount	286.192	228.229	57.963**	226.800	236.511	-9.710	284.630	233.274	51.357	261.645	209.711	51.934
NewEquity	11.291	16.462	-5.171***	17.239	14.874	2.366	11.766	13.405	-1.639	11.938	14.785	-2.847
Delta	0.777	0.801	-0.024**	0.816	0.773	0.043**	0.782	0.761	0.021	0.770	0.752	0.018
Pr(Conv | t_0)	0.230	0.292	-0.061***	0.293	0.286	0.007	0.238	0.241	-0.003	0.252	0.233	0.019
Cv Opt Value_{t0}	31.745	27.716	4.029	29.512	24.713	4.800	32.263	23.192	9.072***	26.929	19.865	7.064**
Coupon Rate	3.514	5.214	-1.700***	5.249	5.109	0.140	3.512	5.442	-1.931***	5.383	5.501	-0.117
Maturity	11.488	10.551	0.937*	11.130	9.529	1.601	11.696	8.827	2.869***	8.240	9.208	-0.968
Offer Price	97.355	95.144	2.210*	94.826	95.542	-0.716	97.245	83.308	13.937**	68.446	98.169	-29.723**
Overallotment	0.713	0.577	0.136***	0.596	0.564	0.032	0.782	0.022	0.761***	0.031	0.014	0.017
Options:	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P
Callable	0.532	0.846	-0.315***	0.899	0.745	0.154**	0.546	0.770	-0.223***	0.877	0.671	0.206***
Callable in 3Y	0.166	0.273	-0.106***	0.326	0.146	0.180**	0.090	0.720	-0.630***	0.807	0.633	0.174**
Putable	0.291	0.154	0.137***	0.172	0.127	0.044	0.288	0.158	0.130***	0.123	0.178	-0.055

Table 2.3 Panel B – continued: Summary Statistics and Univariate Analysis- Convertible Bond Design Across Markets

	Other Negotiated Offers						Exchange Offers					
	Across Markets			Within, by DevDir			Across Markets			Within, by DevDir		
Options:	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P	P_{out}	P_{in}	d_P	P_{UL}	P_{OL}	d_P
Redeemable	0.634	0.891	-0.257***	0.949	0.782	0.168***	0.641	0.871	-0.230***	0.923	0.822	0.101*
Observations	1063	156	1219	99	55	154	1080	139	1219	65	73	138

Table 2.4: Summary Statics- Variables used in Security Choice Models

Summary statistics for the firm, market, and macroeconomic variables used throughout the analysis. *Binomial Logit* summarizes the annual measures included in logit model of public security issuance reported Table 2.5, and *McFadden's Choice Logit* summarizes the annual measures included the discrete alternative-specific multinomial logit, *McFadden's Choice model*, reported in Table 2.6 and Appendix B.2. The construction of each variable is described in Appendix B.

	Binomial Logit		McFadden's Choice Logit			
	Base: No Issuance		Base: No Issuance		Base: Straight Bond	
	mean	sd	mean	sd	mean	sd
Public Offering	0.095	0.294				
Security Choice			0.250	0.433	0.333	0.471
$\lvert Dev \rvert_{BDR}$	0.085	0.089	0.090	0.090	0.096	0.094
Dev^2_{BDR}	0.015	0.037	0.016	0.039	0.018	0.043
Overlevered_{BDR}	0.424	0.494	0.428	0.495	0.494	0.500
EquityVolatility			0.557	0.292	0.502	0.280
EquityRunup			0.187	0.705	0.377	1.129
CashFlow	-0.039	0.231	-0.028	0.217	-0.038	0.240
DebtMaturity	0.968	3.178	0.831	2.986	0.404	1.596
RatedFirm	0.202	0.402	0.389	0.488	0.646	0.478
AvgBDR_{3Y}	0.214	0.200	0.231	0.201	0.304	0.204
LnTA	5.329	2.029	6.098	1.955	7.080	2.140
MB	1.775	1.708	1.834	1.661	1.820	1.649
PROF/TA	0.055	0.231	0.072	0.211	0.085	0.206
MarketRunup	0.032	0.120	0.028	0.051	0.152	0.067
MarketVolatility	0.164	0.108	0.145	0.052	0.036	0.069
Sentiment	19.747	5.770				
MFF_{CD}	0.007	0.051	0.009	0.037	0.010	0.046
MFF_{SD}	0.012	0.031	0.016	0.023	0.019	0.031
MFF_{CE}	0.016	0.016	0.018	0.014	0.017	0.017
InterestRate	4.378	1.746	4.007	1.592	3.873	1.731
TermSpread	1.823	1.109	1.954	1.108	2.005	1.082

Table 2.5: Target Deviations and Pubic Financing

Mixed effects logit regression model of annual leverage deviation levels on the likelihood of issuing public securities. $Pr(PubIssue_{ijk} = 1) = \beta_0 + \delta_{ijk} * |Dev|_{ijk} + \beta FC_{ijk} + \alpha * MC_i + u_{jk} + v_k$ for $k = 1, ..., L$ independent industry clusters with $j = 1, ..., m_k$ nested firm clusters spanning i=1,...,n_{jk} yearly observations. *Public Offering* is the binary outcome equal to one if the firm publicly issued equity, straight debt, or convertible debt and 0 otherwise. $|Dev|$, FC, and MC are fixed effects covariates for deviation size, firm-specific characteristics, as well as market and macroeconomic conditions. Conditioning on two sets of random effects across industry clusters, v_j, and firm clusters, u_{jk}, the multi-level model accounts for endogeneity concerns in the issuance decision and the modeled deviation measure through firm-level random effects. *All Firms* includes the full sample of Compustat firms with complete information for the covariates. Coefficients from the full model in *All Firms* predict the probability of issuance measure which serves as an instrument for target leverage deviations. *Active Issuers* includes all firms with at least one public security offering during the 1990-2015 sample period. Table 2.1 and Table 2.4 detail summary statistics for the all covariates. Appendix B.1 details variable descriptions. Parentheses contain t-statistics, $*p < 0.1, **p < 0.05, ***p < 0.01$. respectively.

Public Offer	All Firms				Active Issuers			
$\lvert Dev\rvert_{BDR}$	2.234***	2.234***	2.086***	2.097***	1.312***	1.312***	1.232***	1.234***
	(7.89)	(7.89)	(6.81)	(6.94)	(6.36)	(6.36)	(5.87)	(6.05)
Dev^2_{BDR}	-3.013***	-3.013***	-2.870***	-2.885***	-2.202***	-2.202***	-2.188***	-2.183***
	(-7.26)	(-7.26)	(-6.42)	(-6.38)	(-6.16)	(-6.16)	(-6.33)	(-6.08)
Overlevered_{BDR}	0.129***	0.129***	0.114***	0.109***	0.0932***	0.0932***	0.0807***	0.0776***
	(5.34)	(5.34)	(5.77)	(5.70)	(4.83)	(4.83)	(4.68)	(4.69)
CashFlow	-0.0587	-0.0587	-0.169	-0.151	-0.286	-0.286	-0.345	-0.351
	(-0.13)	(-0.13)	(-0.39)	(-0.34)	(-0.81)	(-0.81)	(-0.92)	(-0.93)
DebtMaturity	-0.0533***	-0.0533***	-0.0535***	-0.0532***	-0.0511***	-0.0511***	-0.0512***	-0.0509***
	(-5.15)	(-5.15)	(-5.15)	(-5.04)	(-5.24)	(-5.24)	(-5.28)	(-5.14)

Table 2.5 – continued: Target Deviations and Pubic Financing

Public Offer	All Firms				Active Issuers			
RatedFirm	1.681***	1.681***	1.663***	1.676***	0.512***	0.512***	0.529***	0.527***
	(12.60)	(12.60)	(12.25)	(12.41)	(8.26)	(8.26)	(9.04)	(8.66)
$AvgBDR_{3Y}$	0.590***	0.590***	0.568***	0.558**	0.897***	0.897***	0.879***	0.869***
	(2.59)	(2.59)	(2.65)	(2.55)	(6.89)	(6.89)	(7.11)	(6.97)
LnTA	0.228***	0.228***	0.224***	0.219***	0.149***	0.149***	0.132***	0.134***
	(9.80)	(9.80)	(13.70)	(10.80)	(4.73)	(4.73)	(6.03)	(4.90)
MB	0.191***	0.191***	0.182***	0.185***	0.158***	0.158***	0.150***	0.153***
	(9.66)	(9.66)	(9.82)	(9.25)	(7.25)	(7.25)	(7.65)	(7.23)
PROF/TA	-0.799***	-0.799***	-0.689***	-0.676***	-0.794***	-0.794***	-0.664**	-0.656**
	(-5.51)	(-5.51)	(-3.04)	(-2.99)	(-4.57)	(-4.57)	(-2.54)	(-2.58)
MarketRunup		6.431***	2.205***	2.074***		6.367***	2.062***	2.001***
		(5.45)	(20.43)	(12.69)		(5.63)	(24.58)	(13.30)
MarketVolatility		-199.5***	0.551**	0.231		-190.1***	0.474**	0.0915
		(-6.72)	(2.28)	(0.88)		(-6.55)	(2.33)	(0.40)
Sentiment		4.329***	-0.0364***	-0.0312***		4.130***	-0.0308***	-0.0283***
		(6.74)	(-4.15)	(-2.87)		(6.58)	(-3.72)	(-2.71)
MFF_{CD}			4.703***	3.786***			4.126***	3.355***
			(9.93)	(7.04)			(8.53)	(5.99)
MFF_{SD}			1.467	1.310			1.710	1.522
			(1.22)	(1.20)			(1.41)	(1.37)
MFF_{CE}			-15.34***	-14.19***			-11.31***	-11.81***
			(-8.86)	(-4.68)			(-6.08)	(-3.74)

Table 2.5 – continued: Target Deviations and Pubic Financing

Public Offer	All Firms				Active Issuers			
InterestRate				-0.0136				0.00907
				(-0.62)				(0.41)
TermSpread				0.0865***				0.0918***
				(3.58)				(3.46)
Constant	-7.293***	-43.00***	-4.385***	-4.520***	-5.358***	-39.47***	-2.571***	-2.761***
	(-22.22)	(-7.76)	(-18.34)	(-17.57)	(-14.18)	(-7.27)	(-10.20)	(-9.33)
$VAR_{Industry}$	0.102***	0.102***	0.0975***	0.0964***	0.0266**	0.0266**	0.0235**	0.0236**
	(3.35)	(3.35)	(3.34)	(3.34)	(2.30)	(2.30)	(2.50)	(2.44)
VAR_{Firm}	0.964***	0.964***	0.927***	0.933***	0.283***	0.283***	0.272***	0.273***
	(15.60)	(15.60)	(16.67)	(17.20)	(12.45)	(12.45)	(12.03)	(11.83)
Year F.E.	Yes	Yes	No	No	Yes	Yes	No	No
Observations	74874	74874	74874	74874	37775	37775	37775	37775
Ind. Clusters	10	10	10	10	10	10	10	10
$ICC_{Industry}$	0.0235	0.0235	0.0226		0.00739	0.00739	0.00655	0.00657
ICC_{Firm}	0.245	0.245	0.238	0.238	0.0861	0.0861	0.0824	0.0827

Table 2.6: Target Deviations and Security Choice

McFadden's Choice model, alternative specific logit regression of target leverage deviations on security choice. The dependent variable (*Security Selected*) is equal to one when a firm is observed issuing equity, straight debt, convertible debt, or having no issuance activity, and 0 otherwise. The security option *No Issuance* captures firm-years without public equity, debt, or convertible debt offers. In the discrete choice setting, every observable issuance events is expanded to reflect all of the alternative options the firm did not choose, this process requires mapping duplicate firm-year firm characteristics, market conditions, and macroeconomic conditions. As such every firm-year includes at least one issuance event spanning the four alternative securities, with identical contemporaneous firm characteristics, market conditions, and macroeconomic conditions, excluding security-specific market demand,(MFF_i=*CD,SD,CD*). Under the utility function for optimal security issuance, modeled as: $U_{ia} = \beta_i MD(CapitalSupply)_{ia} + \alpha SecurityOption_{ia} + \delta_a[FC_i, MP_i, MC_i] + \epsilon_{ia}$ for *i*-firms and *a=1,2,3,4* alternative outcomes. β_i case-specific random coefficients and α fixed coefficients load on the alternative-specific (security-specific) variable vectors x_{ia} and w_{ia} respectively. $delta_a$ security-specific fixed coefficients load on the vector of case-specific (firm-specific) variables z_i. Under maximum simulated likelihood, the estimated density function $f(\beta)$ is used to determine choice probabilities under the standard logistic probability function: $P_{ia}(\beta) = e^{(}x_{ia}\beta_i + w_{ia}\alpha + z_i\delta_a)/\sum_{\alpha=1}^{A} e(x_{ia}\beta_i + w_{ia}\alpha +_i \delta_a)$ In panel 1 *No Issuance* is the base choice. In panel 2 the choice set excludes *No Issuance*, straight debt is the base choice. Appendix A details variable descriptions. t statistics in parentheses. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

	1				2		
Security Selected	Security-Specific Characteristics	SD	CD	CE	Security-Specific Characteristics	CD	CE
MFF_i	3.643**				-0.343		
	(2.125)				(-0.487)		
$\sim N(.)$,							
$std.de\hat{v}.MFF_i$	14.73***				4.18e-08		
	(3.291)				(0.170)		
$\|Dev\|_{BDR}$		1.014*	6.600***	0.174		5.648***	-1.162

Table 2.6 – continued: Target Deviations and Security Choice

Security Selected	Security-Specific Characteristics	SD	CD	CE	Security-Specific Characteristics	CD	CE
		(1.676)	(5.595)	(0.204)		(4.624)	(-0.887)
Dev^2_{BDR}		-1.617	-8.937***	-0.738		-8.285***	0.319
		(-0.931)	(-3.756)	(-0.421)		(-2.810)	(0.094)
Overlevered_{BDR}		-0.254***	-0.246**	0.307***		0.0326	0.605***
		(-4.039)	(-2.481)	(3.799)		(0.269)	(5.177)
EquityVolatility		0.0137	1.232***	0.00433		1.722***	1.121***
		(0.061)	(5.545)	(0.008)		(5.598)	(3.710)
EquityRunup		0.179*	0.392***	0.725***		0.290***	0.545***
		(1.743)	(3.482)	(4.901)		(3.148)	(5.972)
CashFlow		-0.598*	0.699**	-0.596*		1.643***	0.786*
		(-1.935)	(2.324)	(-1.700)		(3.991)	(1.812)
DebtMaturity		-1.275***	-0.719***	-0.0132		0.221	0.559*
		(-7.154)	(-2.833)	(-1.442)		(0.787)	(1.904)
RatedFirm		2.483***	-0.826***	-0.117		-3.321***	-2.723***
		(8.601)	(-6.294)	(-1.119)		(-19.784)	(-18.640)
AvgBDR_{3Y}		2.464***	0.777***	0.874***		-1.659***	-1.484***
		(11.792)	(3.673)	(2.765)		(-4.073)	(-4.478)
LnTA		0.577***	0.399***	-0.137**		-0.157***	-0.778***
		(14.936)	(13.784)	(-2.371)		(-3.000)	(-16.218)
MB		-0.0331	0.0719***	-0.0346		0.0953**	-0.0263
		(-0.970)	(3.039)	(-1.118)		(2.189)	(-0.581)

Table 2.6 – continued: Target Deviations and Security Choice

Security Selected	Security-Specific Characteristics	SD	CD	CE	Security-Specific Characteristics	CD	CE
PROF/TA		0.453	-1.010***	-0.665***		-1.916***	-1.700***
		(0.926)	(-3.758)	(-2.629)		(-2.958)	(-2.587)
MarketVolatility		-0.274	-2.519*	-3.611***		1.361	0.172
		(-0.233)	(-1.788)	(-3.152)		(1.414)	(0.161)
MarketRunup		2.628**	2.175	3.202*		-1.766**	-1.741**
		(2.233)	(0.844)	(1.716)		(-2.247)	(-2.181)
InterestRate		-0.0529	-0.0957	0.132**		-0.0206	0.189***
		(-1.529)	(-1.302)	(2.176)		(-0.560)	(5.183)
TermSpread		0.124*	0.0252	0.212**		-0.0699	0.0882**
		(1.820)	(0.241)	(2.365)		(-1.418)	(2.028)
Sentiment						-0.0360***	-0.0232*
						(-2.626)	(-1.702)
Constant		-8.171***	-5.438***	-2.701***		2.507***	5.774***
		(-19.834)	(-10.358)	(-4.721)		(4.958)	(12.370)
Observations	138456				19842		

Table 2.7: Convertible Bond Design: New Equity, Maturity, Call Protections

Table 2.7 reports regression results for the simultaneous-equations, estimated in a 2SLS framework, for convertible bond design terms: *New Equity, Maturity*, and *Call Protection Period*. Models 1-3 report second-stage results and first-stage fit statistics for three applications of the I.V. equation framework:

$Log\hat{BookDev} = \pi_{00} + \pi_{01}Pr(NoPublicOffer) + \pi_{02}CAPXAT + \Pi_0 X + v_1$

$New\hat{E}quity = \pi_{10} + \pi_{11}ConvPremium + \Pi_1 X + v_2$

$Mat\hat{u}rity = \pi_{20} + \Pi_{21}TermSpread + \Pi_{32}DebtMaturity + \Pi_2 X + v_2$

$Cal\hat{l}PP = \pi_{30} + \pi_{31}EPSgrowth + \Pi_3 X + v_3$

$NewEquity = \beta_{10} + \boldsymbol{\beta}_{11}Y_1 + \boldsymbol{\beta}_{12}X + u_1 \quad Maturity = \beta_{20} + \boldsymbol{\beta}_{21}Y_2 + \boldsymbol{\beta}_{22}X + u_2 \quad CallPP = \beta_{30} + \boldsymbol{\beta}_{31}Y_3 + \boldsymbol{\beta}_{32}X + u_3$

where $\mathbf{Y}_i$ is the vector of instrumented endogenous variables, relative to each design feature. $\mathbf{X}_i$ is the vector of firm characteristics,market performance, market demand, and macroeconomic conditions used throughout the analysis excluding (*TermSpread* and *DebtMaturity*). The measure of target leverage deviation,*Log(BookDev)*, is excluded from Model 1, treated as an exogenous variable in Model 2, and included in $\mathbf{Y}_i$ in Model 3. The bottom panel reports fit statistics for the instrumental variables used in the first-stage regressions. Appendix A details variable descriptions. Heteroscedasticity-consistent standard errors are clustered by year. t statistics in parentheses.$^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

	1			2			3		
	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP
Log(BookDev)				-14.80	-1.552	-0.113	-53.73	-6.569	-0.432
				(-0.81)	(-1.19)	(-1.07)	(-1.13)	(-0.73)	(-0.71)
NewEquity		-0.0830	-0.00627		-0.0861	-0.00632		-0.0964	-0.00637
		(-0.69)	(-0.69)		(-0.71)	(-0.70)		(-0.72)	(-0.72)
Maturity	-8.624		-0.0753***	-9.078		-0.0733***	-5.627		-0.0658***
	(-0.82)		(-3.15)	(-0.80)		(-3.20)	(-0.95)		(-4.51)
Call PP	-112.6	-13.02***		-122.4	-13.46***		-84.16	-14.88***	

Table 2.7 – continued: Convertible Bond Design: New Equity, Maturity, Call Protections

	1			2			3		
	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP
	(-0.80)	(-3.11)		(-0.78)	(-3.17)		(-0.94)	(-4.45)	
Overallotment	13.63	1.606***	0.121**	14.52	1.618***	0.118**	9.067	1.654***	0.109***
	(0.76)	(3.96)	(2.38)	(0.75)	(4.01)	(2.41)	(0.88)	(4.09)	(2.92)
EquityVolatility	-29.31	-3.586***	-0.267*	-29.90	-3.424***	-0.248	-17.77	-3.438***	-0.222**
	(-0.67)	(-2.84)	(-1.66)	(-0.66)	(-2.66)	(-1.60)	(-0.77)	(-2.88)	(-1.97)
EquityRunup	3.238	0.415*	0.0312	3.225	0.384	0.0281	1.704	0.392	0.0257
	(0.57)	(1.67)	(1.46)	(0.56)	(1.55)	(1.36)	(0.54)	(1.56)	(1.44)
CashFlow	-8.907	-0.934	-0.0731	-11.18	-1.150	-0.0861	-15.11	-2.051	-0.138
	(-0.66)	(-0.68)	(-0.76)	(-0.72)	(-0.83)	(-0.92)	(-1.25)	(-1.07)	(-1.12)
RatedFirm	2.746	0.299	0.0210	3.844	0.405	0.0286	4.098	0.530	0.0333
	(0.52)	(0.56)	(0.47)	(0.63)	(0.75)	(0.63)	(1.03)	(0.76)	(0.68)
$AvgBDR_{3Y}$	18.30	1.925*	0.146	11.14	1.124	0.0829	-12.99	-1.292	-0.0842
	(1.09)	(1.76)	(1.61)	(0.87)	(0.97)	(0.97)	(-0.57)	(-0.30)	(-0.30)
LnTA	4.589	0.632	0.0480	4.832	0.606	0.0447	1.292	0.519	0.0345
	(0.48)	(1.57)	(1.54)	(0.48)	(1.47)	(1.46)	(0.25)	(1.01)	(1.02)
MB	-1.690*	-0.150	-0.0111	-1.366	-0.117	-0.00843	-1.139*	-0.102	-0.00647
	(-1.69)	(-0.76)	(-0.69)	(-1.35)	(-0.59)	(-0.54)	(-1.78)	(-0.52)	(-0.48)
PROF/TA	22.10	2.477	0.185	24.93	2.677*	0.195	19.55	3.030*	0.198
	(0.80)	(1.56)	(1.30)	(0.81)	(1.68)	(1.39)	(1.11)	(1.68)	(1.52)
Rule-144A	17.35	2.051***	0.154**	18.55	2.071***	0.152**	11.08	2.045***	0.134***

Table 2.7 – continued: Convertible Bond Design: New Equity, Maturity, Call Protections

	1			2			3		
	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP	New Equity	Maturity	Call PP
	(0.75)	(4.90)	(2.53)	(0.75)	(4.98)	(2.58)	(0.86)	(4.90)	(3.15)
MarketVolatility	54.71	6.194*	0.476**	60.82	6.592*	0.490**	42.45	7.113**	0.478**
	(0.80)	(1.73)	(2.18)	(0.79)	(1.83)	(2.31)	(0.98)	(2.10)	(2.45)
MarketRunup	-11.14	-1.170	-0.0948	-11.57	-1.193	-0.0921	-11.22	-1.819	-0.128
	(-0.46)	(-0.44)	(-0.51)	(-0.45)	(-0.45)	(-0.51)	(-0.64)	(-0.71)	(-0.81)
Sentiment	-0.998	-0.107	-0.00828*	-1.090	-0.114	-0.00850**	-0.779	-0.121*	-0.00817**
	(-0.94)	(-1.50)	(-1.89)	(-0.91)	(-1.58)	(-2.00)	(-1.13)	(-1.81)	(-2.15)
MFF_{CD}	82.09	9.168*	0.706**	87.98	9.442*	0.703**	63.23	10.46**	0.705**
	(0.83)	(1.68)	(2.16)	(0.fccv ‘81)	(1.74)	(2.22)	(1.00)	(2.06)	(2.46)
InterestRate	-5.939	-0.690**	-0.0533***	-6.390	-0.706**	-0.0527***	-4.109	-0.760***	-0.0514***
	(-0.76)	(-2.25)	(-4.95)	(-0.75)	(-2.27)	(-4.95)	(-0.83)	(-2.80)	(-4.73)
Constant	175.9	19.18***	1.460***	187.8	19.79***	1.461***	144.5	22.21***	1.479***
	(1.02)	(3.40)	(3.68)	(0.99)	(3.47)	(3.67)	(1.33)	(3.41)	(3.57)
Observations	1123			1122			1116		
F New Equity	0.764			0.665			1.622		
F Maturity	20.52			19.64			19.96		
F CallPP	8.720			8.781			11.13		
R^2	-32.13			-35.23			-13.59		
R^2_{adj}	0.516			0.521			0.522		

Table 2.8: Convertible Bond Design: Call, Put,and Redemption Options

Multinomial and binomial logit regressions of target leverage deviations on the use of call, put, and redemption options $Pr(Option_i >= j) = \beta_0 + \beta_1 * Log(BookDev) + \boldsymbol{\beta} IssueMarket + \boldsymbol{\beta} X + \epsilon, for j = 1, 2$ Columns 1-4 report multinomial logit results for three types of call options; non-callable, callable but not enforcible for three or more years, or callable and enforcible within three years. Columns 5-6 and columns 7-8 report binomial logit results for put and redemption options respectively. *IssueMarket* is a categorical ranking the most frequently used market; equaling 1-4 respectively for Exchange offers, Other/Private negotiated offers, Rule-415 offers, and Rule-144A offers. $\mathbf{X}_i$ is the vector of firm characteristics,market performance, market demand, and macroeconomic conditions used throughout the analysis. Appendix A details variable descriptions. Heteroscedasticity-consistent standard errors are clustered by year. t statistics in parentheses. $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

	Call Level				Putable		Redeemable	
	Callable After 3Y	Callable Within 3Y	Callable After 3Y	Callable Within 3Y	Putable	Putable	Redeemable	Redeemable
Log(BookDev)			-0.748*	1.334		-1.365		-0.683
			(-1.97)	(1.04)		(-1.44)		(-1.07)
$\lvert Dev \rvert_{BDR}$	-0.463	0.356			0.664		-1.180	
	(-0.42)	(0.14)			(0.70)		(-1.65)	
Overlevered_{BDR}	-0.109	-0.528			0.647*		-0.383	
	(-0.46)	(-1.17)			(2.04)		(-1.20)	
$\lvert Dev \rvert_{BDR}$ x Overlevered_{BDR}	1.733	-1.233			-0.0674		2.856	
	(1.47)	(-0.34)			(-0.03)		(1.85)	
IssueMarket	Rule-144A	0.0304	-4.592***	0.0397	-4.552***	0.289	0.240	-1.625***
-1.606***								

Table 2.8 – continued: Convertible Bond Design: Call, Put, and Redemption Options

	Call Level				Putable		Redeemable	
	Callable After 3Y	Callable Within 3Y	Callable After 3Y	Callable Within 3Y	Putable	Putable	Redeemable	Redeemable
	(0.09)	(-8.62)	(0.11)	(-8.87)	(0.94)	(0.76)	(-4.88)	(-4.47)
Rule-415		0.372	-2.680***	0.373	-2.668***	0.520	0.559*	-0.905***
-0.899**								
	(0.86)	(-5.93)	(0.89)	(-5.99)	(1.72)	(1.96)	(-3.30)	(-3.09)
OPnegotiated		1.824***	-1.167*	1.821***	-1.174*	-0.453	-0.499	0.731*
0.722*								
	(3.99)	(-2.07)	(3.99)	(-2.11)	(-1.02)	(-1.15)	(2.14)	(2.02)
Log(OfferAmt)	-0.450*	-0.415	-0.436*	-0.380	0.0455	0.00987	-0.658***	-0.636***
	(-2.02)	(-0.96)	(-2.14)	(-0.91)	(0.29)	(0.06)	(-5.00)	(-4.94)
Maturity	0.226***	0.130**	0.225***	0.131**	0.340***	0.338***	0.225***	0.224***
	(11.49)	(3.04)	(11.59)	(3.10)	(8.19)	(8.36)	(8.05)	(8.17)
EquityVolatility	-0.0662	0.425	-0.0459	0.546	-0.537	-0.595	-0.00691	0.0309
	(-0.13)	(0.64)	(-0.09)	(0.86)	(-0.75)	(-0.86)	(-0.01)	(0.06)
EquityRunup	-0.188	-0.156	-0.187	-0.167	-0.0945	-0.0969	-0.111	-0.112
	(-1.66)	(-0.95)	(-1.63)	(-0.99)	(-0.79)	(-0.78)	(-1.28)	(-1.29)
CashFlow	0.700	1.119	0.685	1.061	1.308	1.341	-0.212	-0.208
	(1.15)	(1.27)	(1.16)	(1.23)	(1.43)	(1.52)	(-0.44)	(-0.44)
RatedFirm	0.477*	0.0994	0.484*	0.114	0.763**	0.771***	0.465	0.463
	(2.32)	(0.28)	(2.38)	(0.35)	(3.16)	(3.41)	(1.90)	(1.88)
$AvgBDR_{3Y}$	-1.013*	0.0880	-1.074*	-0.0457	-0.674	-0.487	-1.185**	-1.265***

Table 2.8 – continued: Convertible Bond Design: Call, Put, and Redemption Options

	Call Level				Putable		Redeemable	
	Callable After 3Y	Callable Within 3Y	Callable After 3Y	Callable Within 3Y	Putable	Putable	Redeemable	Redeemable
	(-2.08)	(0.10)	(-2.18)	(-0.05)	(-1.00)	(-0.76)	(-3.22)	(-4.85)
LnTA	0.0409	-0.219	0.0261	-0.249	-0.200	-0.178	0.0432	0.0211
	(0.33)	(-0.67)	(0.24)	(-0.83)	(-1.29)	(-1.09)	(0.49)	(0.27)
MB	-0.0173	-0.0384	-0.0167	-0.0363	-0.0382	-0.0359	0.0433	0.0423
	(-0.31)	(-0.33)	(-0.29)	(-0.31)	(-0.32)	(-0.29)	(0.73)	(0.69)
PROF/TA	-0.765	-1.632	-0.752	-1.414	-1.064	-1.315	-0.234	-0.120
	(-1.06)	(-0.86)	(-1.06)	(-0.77)	(-1.03)	(-1.31)	(-0.36)	(-0.17)
MarketVolatility	-10.83***	-13.54**	-10.72***	-13.08***	-5.035**	-5.164**	-9.449***	-9.225***
	(-3.64)	(-3.12)	(-3.62)	(-3.52)	(-2.62)	(-2.76)	(-10.16)	(-9.25)
Market Runup	-3.144	-2.922	-3.135	-2.845	-2.239	-2.302	-0.0190	0.0306
	(-1.07)	(-0.98)	(-1.07)	(-0.98)	(-1.65)	(-1.78)	(-0.02)	(0.03)
Sentiment	0.305***	0.338***	0.304***	0.330***	0.130*	0.135**	0.259***	0.256***
	(5.35)	(3.34)	(5.32)	(3.57)	(2.51)	(2.72)	(10.68)	(10.77)
MFF_{CD}	-19.34***	-22.04**	-19.34***	-22.00**	-11.26*	-11.36*	-15.90***	-15.85***
	(-3.59)	(-2.71)	(-3.54)	(-2.75)	(-2.53)	(-2.48)	(-7.06)	(-6.84)
MFF_{SD}	-15.79	-18.77	-15.68	-18.43	-10.72*	-10.29*	-11.09**	-11.13**
	(-1.47)	(-1.30)	(-1.46)	(-1.34)	(-2.16)	(-2.07)	(-3.08)	(-3.07)
MFF_{CE}	73.74***	91.13**	73.92***	92.14**	40.31***	40.69**	34.54***	34.69***
	(3.47)	(2.76)	(3.47)	(2.84)	(3.30)	(3.27)	(4.84)	(4.97)
InterestRate	0.436*	0.939***	0.434*	0.944***	0.0374	0.0334	0.295***	0.288***

Table 2.8 – continued: Convertible Bond Design: Call, Put, and Redemption Options

	Call Level				Putable		Redeemable	
	Callable After 3Y	Callable Within 3Y	Callable After 3Y	Callable Within 3Y	Putable	Putable	Redeemable	Redeemable
	(2.57)	(3.68)	(2.57)	(3.80)	(0.42)	(0.37)	(6.04)	(6.00)
Constant	-6.714***	-6.138*	-6.685***	-6.412**	-6.997***	-6.606***	-1.770*	-1.854*
	(-5.36)	(-2.50)	(-5.34)	(-2.83)	(-5.87)	(-5.69)	(-2.20)	(-2.03)
Observations	1122		1122		1122	1122	1122	1122
R^2	0.485		0.485		0.608	0.606	0.403	0.402

Chapter 3

Does the Market Value Innovative Ability? Evidence from M&A [1]

3.1 Introduction

Is the ability to convert innovation investments into a tangible valued output (e.g. sales) a determinant of synergy value? Recent empirical evidence indicates that although M&A is a value-destroying activity for acquirers on average, firms motivated by the acquisition of innovation experience greater abnormal announcement and long-run returns (Bernstein (2015) , Bena and Li (2014), Phillips and Zhdanov (2013)). Yet, prior work has mainly focused on the characteristics and innovative qualities of target firms. Our study focuses on the attributes of the firms acquiring new asset management responsibilities. We examine how an acquirer's ex-ante ability to convert internal and external innovation investments contributes to cross-sectional variations in M&A announcement returns. Our analysis illustrate three considerations around innovation which help explain M&A announcement reactions: we (1) highlight a new and pertinent measure for innovative ability, (2) show the importance of distinguishing between investment types and outcomes when determining innovation "success", and (3) provide evidence of an additional factor impacting abnormal short-run returns.

A firm's ability to stay innovative is notoriously difficult to measure and thus often misvalued by the market (Cohen, Diether, and Malloy (2013), Hirshleifer,

[1] Eldemire-Poindexter, A., Usman, A., and Weathers, J. To be submitted.

Hsu, and Li (2013)). Market valuation of firm innovative success has historically focused on the conversion of Research and Development expenditures (R&D) into legal outputs such as patents. However, a "successful" innovation, generally defined as a patentable output, does not routinely translate into relatively superior firm sales and/or profitability; thereby innovations are clearly not created equally (Cohen et al. (2013)). Firms must have the knowledge, skill set, and resources to transform patentable innovation into commercial marketability and profit for a true indication of success in terms of return on investment. Within human capital dependent firm structures where innovation is a key component to maintain a competitive advantage, understanding the impact of firm "innovativeness" on shareholder wealth denotes evident economic importance.

In addition to internal innovation development, firms may also pursue innovation externally through acquisitions. This increased focus on the abundance and relevance of innovation-driven acquisition has prompted our examination of firm ability to convert investment in innovation into a tangible measure of profit[2]. There are at least two important considerations in determining the success of an innovation-driven acquisition: the strength (or quality) of the innovation purchase and the strength (or ability) of the acquirer to convert innovation into tangible profit. This analysis focuses on the impact of the latter on the announcement returns to acquirers.

Existing neoclassical merger and agency theories explain the popularity of mergers in spite of value-destroying evidence in the empirical literature, which typically shows announcement returns being close to zero on average for acquiring firms [3]. Therefore, the motive behind merger and acquisition (M&A) transactions, especially

[2]Bena and Li (2014) indicate two thirds of completed mergers during the period of 1984 to 2006 were motivated by pursuit of technological innovation.

[3]On average, the combined firm value post M&A rises 1% to 3%, whereas the target enjoys a positive abnormal return as high as 15% to 30%, while the acquirer barely breaks even with an average announcement return close to zero (Fuller, Netter, and Stegemoller (2002), Moeller, Schlingemann, and Stulz (2007)).

for acquirers, is a popular debate in corporate finance. However, recent studies reveal that sourcing innovation is not only a strong motive for M&A activity e.g., Phillips and Zhdanov (2013); Sevilir and Tian (2011), but also results in positive returns to both the target and the acquirer. Sevilir and Tian (2011) show an average positive acquirer return (both short- and long-run) to firms using M&A as a means for acquiring innovation; acquirers of innovative target firms enjoy greater announcement and 5-year post-acquisition returns than those of non-innovative targets. Additionally, Bena and Li (2014) find innovation-driven acquisition provides a positive shock to patent portfolios of the newly merged firms, especially when there is a technological overlap between the acquirer and the target.

M&A transactions therefore provide a feasible channel for firms to increase tangible profitability through the purchase of innovative human capital and/or patentable innovation from other firms with or close to patentable innovation. This is an optimal action for well-established, large firms as they have less flexibility to innovate internally due to internal competition for firm resources (Brusco and Panunzi (2005)). Bernstein (2015) identifies that once a firm goes public, the quality of internal innovation declines causing a shift in strategy from innovation creation to innovation acquisition. Yet, firms do continue to do one, the other or both and an important unexplored distinction remains in the ability of the acquirer to convert these investments in innovation, either internally or externally, to tangible profits. Therefore, our research aims to understand how the market values a firms ability to capitalize innovation investments.

We investigate this question using measures of acquirer innovation conversion ability. In the M&A setting innovation conversion (IC), or perceived IC, is subject to asymmetric information. As such, observable measures of IC serve as a differentiating signal of firm performance. The proxy for IC ability must capture both a firm's internal and external investments in innovation, as we cannot know for certain when and how these strategies shift or combine. In this effort, we use the standard innovation input measure, R&D expenditure, for a proxy of internal investment in innovation. The accounting measure, Intangible Assets, proxies for external investment in innovation. While internal efforts towards innovation must be expensed as R&D costs, external efforts such as the procurement of patents, inventors, or innovative target firms are capitalized as intangible assets (FASB ASC Topic 350-Intangibles Goodwill and Other)[4].

As a result of our findings, acquirers with higher IC ability as determined by external investment conversion experience greater M&A announcement returns. Additionally, our results not only indicate the market does not value internal investment conversion positively, but also illustrates a nonlinear relationship between internal-IC ability and short-run returns; despite the evidence that R&D investment is positively related to sales growth. Findings from our study contribute to both the value implications of mergers and acquisitions and to our collective understanding of the importance of measuring both innovation investment via multiple channels and firm ability to convert respective investment to profit. Our results also introduce an additional barrier to entry consideration for firms intending on shifting to an innovation growth strategy via acquisition and thus merits future exploration.

3.2 Analytical Framework

In this section, we review relevant literature surrounding firm innovation processes and the links between innovation procurement and M&A motives. We also discuss our measures of innovation conversion ability, and review the characteristic considerations relevant for M&A event studies. Throughout, we develop predictions on the effect of ex-ante acquirer IC ability on announcement returns.

[4] Intangible assets are often identified as the excess cost of an acquired firm that cannot be valued as physical assets such as land, machinery, inventory, etc. (Canibano, Garcia-Ayuso, and Sanchez (2000)).

Innovation Processes & Mergers and Acquisitions

Measures of innovation investments

Innovation is vital for national economic growth (Solow (1957)) and to a firm's long-term competitive advantage (Zingales (2000)), but with the speed of technological advancement increasing exponentially over time, firms must be open to alternative pursuits of innovative success. Historically companies accustomed to R&D expenditures as the best available innovation investment measure, as this proxy has a proven positive correlation with future firm value (Hall, Jaffe, and Trajtenberg (2001),Hall, Jaffe, and Trajtenberg (2005)). However, innovation is a lengthy process inherently riddled with false starts and failures, so with the option to acquire innovation further along in the incubation process, R&D should no longer serve as the main measure of innovation investment, but that R&D may be correlated with other determinants of synergy value.

Firm innovation strategies now vary from in-house creation, corporate venture capital, open innovation (e.g. crowdsourcing), direct patent purchase to whole- and partial-firm acquisitions. Although there is general agreement of the positive impact of R&D expenditure on firm value in the literature, there are also implications of a negative R&D/acquisition strategy relationship within the M&A context. Some empirical evidence indicates predictable and optimal firm positioning as acquirers or targets through levels of R&D expenditure where firms with large patent portfolios and low R&D expenses are more likely to be acquirers and firms with high R&D expenses and small patent portfolios are more likely to be targets (Bena and Li (2014) and Phillips and Zhdanov (2013)). Additionally, Bernstein (2015) finds a decreasing effect on R&D investment paired with an increasing effect on external innovation pursuits via acquisition upon IPO filings of firms. Firm innovation strategy appears to shift throughout time, which is an additional indication that we must consider both internal and external investment in innovation in order to fully understand firm innovation capacity.

Measurement of external investment in innovation has not historically demanded attention in the finance literature. We have identified Goodwill as a feasible proxy. Goodwill captures purchased intangible assets such as values for patents, proprietary technology, brand recognition, reputation, etc. In the M&A context, it is the difference between the net value of purchased assets, liabilities, and the price paid for a target firm. Goodwill is the quantification of an acquirer's willingness to pay for the intangible value of the target; which includes, but is not limited to, innovation potential and output. It is recorded as an intangible asset on an acquiring firm's balance sheet and allows us to exclude the values of tangible assets and liabilities included in the transaction values of M&A deals.

U.S. GAAP requires immediate expensing of internally generated intangible assets (e.g. intellectual property) due to the inherent uncertainty and information asymmetry surrounding these types of activities. However, there is no such requirement for externally acquired intangible assets. In fact, U.S. GAAP allows intangible assets to be included on the balance sheet when those assets are acquired and if there is an identifiable value that can be amortized. This means that firms have an accounting choice when making acquisitions and we surmise that firms choose to capitalize purchased "innovativeness" vs. expense it due to the short term benefit of earnings management (Burgstahler and Dichev (1997)).

Innovation Conversion Ability and M&As

According to the literature, firms investing heavily in R&D tend to be smaller in size and their innovative capability more opaque relative to their counterparts acquiring innovation. Thus, firms pursuing internal innovation are more likely, and possibly expected, to position themselves as potential targets. M&A serves other motives beyond the development of innovative output, such as impeding potential competition. An acquirer motivated by a "blocking" strategy has no ex-ante discerning qualities from a similar firm purchasing innovation as a growth strategy. The latter firm faces the potential of negative synergy through their effort towards conversion to profit, whereas the former firm makes no effort in this direction, as their objective is innovation suppression. Seru (2014) investigates the effect of firm boundaries on innovation activity and finds that firms acquired in diversifying mergers produced both less innovation output and less novel innovation. This effect proved greater in mergers where acquiring firms exhibited an active internal capital market and was largely driven by inventors becoming less productive. Further, as diversity in resources and opportunities increase, firms can experience value distortion through inefficient resource allocation (Rajan, Servaes, and Zingales (2000)). As a result, the future expected cash flows of a high IC ability firm could initially suffer more than a low IC ability firm with less innovative diversity and competition for internal resources.

Bidding alone may also indicate poor opportunities for internal investment (e.g. Jovanovic and Braguinsky (2004)), thus new information of an M&A announcement would be considered "bad news". Again, given the opacity of the success of investment in innovation, the market is unable to determine if acquisition by an innovative acquirer is motivated by a growth strategy or a failed research pipeline with no new promising opportunities. Further, Margsiri, Mello, and Ruckes (2008) provide a theoretical model showing acquiring firms with higher integration costs firms with internal growth opportunities predict lower announcement returns. On the other hand, a merger with an innovation procurement motive provides a positive shock to the patent portfolio of the acquiring firm. Therefore, in an efficient market and ceteris paribus, stock markets should respond positively to the acquisitions of innovation, under the fundamental assumption that innovation enhances firm value.

There are two parties in a merger transaction and previous literature has focused on the potential of patentable innovations (output), R&D expenditures (input), and synergies provided by targets, however acquirers should also provide variation in value through their ability to transform innovation into tangible profits. A firm's ability, in general, to produce patentable innovation, quality innovation (cited patents), and profitable innovation (sales growth or profitability resulting from patents) adds value to the firm (e.g. Hall et al. (2001), Hall et al. (2005); Cohen et al. (2013)). The extensive innovation process from investment to output to sales is positively correlated with firm value. Hirshleifer et al. (2013) find that innovative efficiency-patents or citations scaled by R&D expense-is a positive predictor of future returns and Cohen et al. (2013) uses a unique measurement of firm ability to convert innovation input (R&D) to a valued outcome (sales or profitability) to find superior portfolio returns by firms with greater ability. Hirshleifer et al. (2013) focuses on a measure of output as an innovation success, whereas Cohen et al. (2013) extends it further to tangible profit, which is inarguably the real definition of "success" for the firm and appears to be valued by the market in the context of portfolio returns over time.

Yet, it is still unclear if IC ability is recognized in the context of M&A? If innovative targets add value, shouldn't acquirers with superior IC ability also add value? Further, if acquirer IC ability is valued, will we see positive returns irrespective of investment type? We explore these questions by distinguishing acquirers based on IC ability and propose the following hypotheses:

Proposition 5. *Merger announcement returns may be related to two dimensions of IC ability:*

1. *The level of an acquirers' demonstrated ability to realize revenue from innovation investments*

   Hypothesis 1: Acquirers with the best (better) IC abilities should experience greater announcement returns.

2. *The type of innovation conversion an acquirer has demonstrated a high capacity for; while both measures capture a history of successful IC, internal and external ability measures reflect different signals about performance and prospects*

   Hypothesis 2: Announcement returns will differ between the internal and external measures of IC ability

Measures of Innovation Conversion Ability

We construct two measures of innovation conversion (IC) ability; internal-IC and external-IC, to capture how well firms translate innovation investments into a tangible and valued performance measure (i.e. sales growth). Standard in the finance literature, R&D expenditure serve as our proxy for internal innovation investments. Identifying a new measurement approach, intangible assets proxy for external innovation investments. To standardize each measure, we use the natural logarithm of annual R&D expense scaled by sales and the natural logarithm of annual intangible assets scaled by total assets[5]. It is important to measure internal and external innovation ability separately as R&D and intangible assets capture different innovation strategies. The level of R&D expenses, as observed on the income statement, directly reflect investment flows to internal innovation production. However, the level of intangibles, a market based measure observed on the balance sheet, can reflect changes in the quantity of underlying assets or changes in the valuation of the underlying assets. As such, the level of intangible assets alone may not reveal complete information about new investment activities. Thus, for robustness and to more accurately capture external innovation investment, we also employ a growth measure of intangible assets. Following the foundational methodology provided in Cohen et al. (2013), we conduct separate firm-by-firm rolling time-series regressions of sales growth on the proxies for internal and external

[5] We find similar results using a measure of R&D expenses scaled by assets, ln(R&D/Assets).

innovation investment respectively, as:

$$ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \gamma_0 + \gamma_j ln\left(1 + \frac{R\&D_{i,t-j}}{Sales_{i,t-j}}\right) + \epsilon_{i,t} \tag{3.1}$$

$$ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \theta_0 + \theta_j ln\left(1 + \frac{Intangibles_{i,t-j}}{Assets_{i,t-j}}\right) + \epsilon_{i,t} \tag{3.2}$$

$$ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \mu_0 + \mu_j ln\left(1 + \frac{Intangibles_{i,t}/Assets_{i,t}}{Intangibles_{i,t-j}/Assets_{i,t-j}}\right) + \epsilon_{_{i,t}} \tag{3.3}$$

where i indexes firm, t indexes fiscal year, and j=1,2,3,4,5 lag periods. Annual internal and external ability measures are respectively computed as the average value of the coefficients on γ_j,θ_j, and μ_j from each individual lag j regression. By design, the values of both of the IC ability measures quantify a firms' historic and persistent success in converting internal or external innovation investments into sales. As such, to identify firms with high internal (external) IC abilities each ability measure is split into quintiles. Acquirers in the top quintiles of each measure are defined as high IC ability firms. Relative to the 80% of the sample of peer firms, High_Ability_R&D denotes acquirers with the most success in converting internal innovation investments into sales and High_Ability_Intan denotes acquirers with the most success converting external innovation investments into sales.

CARs and M&A Characteristics

We measure cumulative abnormal returns (CARs) over three time intervals: [0], [-1,+1], and [-2,+2], where announcement date is on day 0. The CARs are computed using the market model, $AR_t = R_{s,t} + R_{m,t}$, estimated over 250 trading days ending 46 trading days prior to the announcement event with at least 100 non-missing trading days.

Consistent with existing innovation literature, control variables include: Firm size, Total Assets (Size), measured by the natural logarithm of total assets; profitability, ROA, measured by operating income before depreciation scaled by total assets; leverage, Leverage, measured by total debt to total assets ratio; capital expenditure, CapEx/Assets, measured by capital expenditures scaled by total assets; asset tangibility, PPE/Assets, measured by plant, property and equipment scaled by total assets; growth opportunity, Tobin's Q, measured by market value to book value ratio; industry competition intensity, Herfindahl, measured by the Herfindahl-Hirschman Index as indicated by annual sales; and firm age, Firm Age, measured by the natural logarithm of number of list years in Compustat plus one. Again, following the innovation literature, we also include the square of the Herfindahl - Hirschman Index, Herfindahl's q, to mitigate probable non-linear relation between industry competition and firm innovation.

The extent M&A literature has established control variables for investigating acquirer announcement returns around M&A. In addition to acquirer size, profitability, leverage, Tobin's Q, and age we control for specific deal variables: Tar private, equal to one if the target reports as a private firm in SDC, and zero otherwise; Deal Size, measured by deal value divided by acquirer's market value of equity; equal to one if the deal is classified as a merger of equals in SDC, and zero otherwise; Stock Payment, equal to one if the deal is financed partially or fully with stock, and zero otherwise; Merger of Equals, equal to one if the deal is classified as a merger of equals in SDC, and zero otherwise; Diversity, equal to one if the acquirer and the target firm operate in different two-digit SIC industries, and zero otherwise; and Hostile, equal to one if the deal is classified as a hostile takeover in SDC, and zero otherwise. A summary of variable descriptions is provided in Appendix B

3.3 Data

The sample is filtered from all M&A deals by public U.S. acquirers announced between January 1, 1984 to December 31, 2015 covered in the Mergers and Acquisitions database of Thomson Financial-SDC Databases. Given the multiple types of M&As, we only include deals coded as "merger", "acquisition of assets", or "acquisition of majority interest" in order to exclude smaller deals. No preference is specified to the location of the target; however, the transaction currency must be in U.S. dollars. Further, since we examine announcement events, no preference is specified for the completed status of the deal. All M&A data is merged with acquirer financial and accounting data obtained from Compustat and stock return data obtained from The Center for Research in Security Prices (CRSP).

3.3.1 Sample Descriptive statistics

Table 3.1, Panel A presents summary statistics of the main variables used for verification of a positive relationship between sales growth and internal and external innovation investment. This initial analysis uses the entire sample of Compustat U.S. firms from 1984 to 2016. There are 8,843 unique public firms with 84,841 firm-year observations. The mean (median) firm in this sample invests about 44.8% (3.4%) of total sales in R&D and experiences 0.7% (0.0%) growth in intangible assets (scaled by assets) over a one-year period . Sample firms have a mean (median) ROA of 1.6% (9.3%), leverage of 21.9% (16.3%), Tobin's Q of 2.27 (1.52), and first appeared in the Compustat database 15.5 (12) years ago.

Table 3.2 reports average results of the rolling firm-by-firm regressions for our innovation conversion proxy measures. Columns 1-5 report rolling window average proxy measures estimated over the 1-5 year windows respectively. Row segments 1 and 2 report results for equations (1), the R&D to Sales proxy, and (2), the Intangibles to Assets proxy. Segments 3 reports results for equation (3), the Intangibles Growth to Assets proxy at a three year growth period.

Table 3.1, Panel B highlights summary statistics of M&A event variables by innovation investment type quintiles. The sample sizes for internal and external-IC abilities differ due to missing values in respective ability measures. The internal-IC ability sample represents 11,547 firm-event observations with 3,304 unique acquirers. The external-IC ability sample represents 11,613 firm-event observations with 3,342 unique acquirers. Events are defined as the first announcement of a merger and acquisition.

Table 3.1, Panel C shows the distribution of M&A events by innovation investments type across the sample period. As expected, there are fewer events in the earlier years (1986-1987) and an increase or wave of mergers in the late 90s (1995-1999) (Andrade, Mitchell, and Stafford (2001)).

3.4 Results & Discussion

Innovation Conversion Ability and M&A Announcement Returns

In this section, we examine the acquirers' cumulative abnormal returns on and around merger announcement dates to determine whether a distinction between acquirers with high IC ability exist, and explore how that distinction varies between internal and external innovation investment. In Table 3.3, we report the mean values and univariate test of cumulative abnormal returns of acquirers with high internal and external innovation conversion ability around M&A announcement dates[6]. High ability firms are in the top quintile of the sample per respective ability measure. Table 3.4 presents multivariate regressions where High_Ability_R&D

[6]Harrington and Shrider (2007) highlight how the short-horizon event study setting can induce biased cross-sectional CAR effects if pre-existing cross-sectional variations in the sample are not fully controlled. Accordingly, we account for several characteristics that vary across firms throughout our analysis, and our results are robust to using heteroskedacity consistent standard errors. Consistent with Harrington and Shrider (2007), we observe standard errors shifts in the 10^{-3} order of magnitude but do not observe significantly different coefficient estimates.

(High_Ability_Intan) is a dummy variable that equals one for acquirers with the respective ability measure in the top quintile of the sample, and zero otherwise.

The univariate results in Table 3.3 demonstrates that IC ability does have an impact on the immediate returns to announcements. However, the impact differs depending on the investment dimension being examined. While firms in the top quintile for internal-IC ability (measured by R&D) do not generate significantly higher CARs on the announcement of M&A activity, firms with high external-IC ability (measured by intangible assets) tend to over perform.

Looking at a [0] event window, high internal-IC ability acquirers produce CARs that are 8.9 basis points higher than all other acquirers. This performance difference, however is not statistically different from zero. Conversely, high external-IC ability acquirers generate CARs that are, on average, a statistically significant 45.9 basis points larger than all other firms. These findings are consistent across all event windows.

These results illustrate that a firm's ability to transform investment in external innovation into a tangible benefit may capture a different feature of the innovation process than that of internal investment conversion. These distinctive features are observed and valued by market participants. In Table 3.4, we examine the effect of IC ability on M&A announcement returns while controlling for factors than have previously been shown to affect announcement performance. The dependent variable in each regression is M&A announcement CAR defined over the event windows [0], [-1,+1], and [-2,+2]. High_Ability_R&D (High_Ability_Intan) is a dummy variable that equals one for acquirers with the respective ability measure in the top quintile of the sample, and zero otherwise. Each model accounts for contemporaneous time and industry fixed effects.

Regressions (1)-(3) show that across all specifications, the ability to convert R&D investment into sales growth is not valued by the market. The coefficients on

High_Ability_R&D are statistically insignificant, indicating that high internal-IC ability acquirers do not generate superior announcement returns relative to other firms. Regressions (4) - (6) illustrate that the ability to convert investment in intangible assets does matter to investors. The CARs to acquirers with high external-IC ability are significantly larger than those of all other firms. High_Ability_Intan firms generate CARs between 53 to 81 basis points greater.

Alternative Measure and Analysis of External Innovation

Next, we define external-IC ability as the capacity to convert growth in intangible assets into sales growth. We use the changes in intangible assets for years t-n to t to define ability (where, n= 1,2,3,4,5), rather than the level of intangible assets. This subtle distinction captures the flow dimension of intangible asset investment. The change in intangible assets between years t-n to t represents the investment the firm has made in that window of time in new intangible assets. Therefore, a firm with a high external-IC ability measure, as defined by intangible asset growth, will have demonstrated adeptness in converting new investment in intangible assets into sales growth.

In Table 3.5, we use five different windows to examine the persistence of external-IC ability and its relation to post-announcement returns to the acquirer. Firms with a high capacity to convert near-term investments in intangible assets into sales growth, tend to produce higher announcement CARs than all other firms. Using intangible growth over a one year period to compute external-IC ability, we see that firms with high ability have announcement day returns 49 basis points greater than other firms. This finding is consistent when intangible asset growth is measured over a two, three, and four-year window of time, with announcement day CARs of 50, 70, and 66 basis points, respectively.

The effect of external-IC ability increases when the measurement of intangible asset growth is stretched over a 2-4 year time windows. Suggesting high ability firms with longer incubation periods for intangible asset growth produce announcement day CARs that are significantly different than all other firms. However, the effect is diminished when intangible asset growth is measured over a 5-year window.

3.5 Summary

We examine how an acquirer's ex-ante ability to convert internal and external innovation investment into a tangible valued output (e.g. sales) contributes to cross-sectional variations in acquirer returns around M&A announcements. Our analysis illustrates three key considerations in the exploration of market valuation of innovation: (1) recognition of a new and pertinent measure for innovation investment, (2) the importance of defined investment types and outcomes when determining innovation "success", and that (3) within the M&A context, acquirers have an additional manageable variable which impacts short-run returns. Further, given the dynamics of firm innovation strategies and the inability to measure the shifting firm strategies directly, it is imperative to examine the innovation process beyond internal investment and opportunities.

Table 3.1: Summary Statistics: Firm Characteristics, M&A Events

Table 3.1-Panel A reports the summary statistics for variables constructed for the universe of Compustat firms during the years 1984 to 2015. Panel B reports the summary statistics for M&A event variables. Panel C illustrates M&A announcement counts per year by IC ability quantile. High IC Ability quintiles are determined by ranking γ_j , θ_j estimates from the respective regressions of innovation conversion proxy measures on sales growth: $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \gamma_0 + \gamma_j ln\left(1 + \frac{R\&D_{i,t-j}}{Sales_{i,t-j}}\right) + \epsilon_{i,t}$, and $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \theta_0 + \theta_j ln\left(1 + \frac{Intangibles_{i,t-j}}{Assets_{i,t-j}}\right) + \epsilon_{i,t}$. Appendix B list variable descriptions.

Panel A: Summary statistics of all variables

	N	Mean	S.D.	P25	Median	P75
Internal Ability (beta)	84,841	3.422	26.31	-0.365	0.016	3.196
External Ability (beta)	75,219	0.496	13.86	-0.895	0.000	0.875
RD/Sales	83,506	0.448	2.298	0.003	0.034	0.128
Intan Growth	73,633	0.007	0.063	-0.006	0.000	0.004
Sales Growth	84,841	0.199	2.436	-0.033	0.080	0.231
Total Assets (Size)	84,841	3,431	19,426	34.73	158.2	913.7
ROA	84,841	0.016	0.571	0.000	0.093	0.159
Leverage	84,841	0.219	0.309	0.015	0.163	0.334
CapEx/Assets	84,841	0.051	0.059	0.015	0.034	0.066
PPE/Assets	84,841	0.216	0.190	0.071	0.166	0.309
Tobin's Q	84,841	2.271	3.406	1.115	1.521	2.397
Herfindahl	84,841	0.078	0.083	0.039	0.050	0.085
Herfindahl Sq	84,841	0.013	0.043	0.002	0.003	0.007
Firm Age	84,841	15.51	12.32	6.000	12.00	21.00

Table 3.1 – continued: Summary Statistics: Firm Characteristics, M&A Events

Panel B: Summary statistics of M&A event variables

	Internal-IC ability (R&D)					External-IC ability (Intangibles)				
Qtile	1	2	3	4	5	1	2	3	4	5
N	2,621	3,546	907	2,227	2,246	2,183	2,853	2,158	2,484	1,935
Acq Size	8,768	2,264	3,862	5,105	6,849	4,997	5,345	3,361	6,690	5,851
Acq ROA	0.120	0.061	-0.049	0.065	0.129	0.081	0.095	0.051	0.089	0.093
Acq Leverage	0.195	0.308	0.141	0.164	0.225	0.259	0.201	0.264	0.222	0.246
Acq Tobin's Q	2.468	2.064	3.163	2.681	2.034	2.066	2.543	2.293	2.119	1.964
Acq Age	20.03	12.45	11.34	16.03	24.01	18.30	15.95	14.23	19.44	21.65
Private Target	0.509	0.569	0.609	0.546	0.443	0.482	0.553	0.574	0.514	0.472
Relative deal size	0.299	0.584	0.225	0.171	0.215	0.420	0.194	0.791	0.183	0.243
Stock Payment	0.291	0.244	0.401	0.334	0.221	0.248	0.307	0.234	0.246	0.271
Merger of Equals	0.000	0.001	0.002	0.000	0.001	0.001	0.000	0.000	0.002	0.002
Diversity	.461	0.551	0.366	0.413	0.498	0.484	0.428	0.527	0.451	0.491
Hostile	0.008	0.004	0.000	0.007	0.014	0.008	0.008	0.005	0.008	0.008

Table 3.1 – continued: Summary Statistics: Firm Characteristics, M&A Events

Panel C: Event count by year										
	Internal-IC ability (R&D)					External-IC ability (Intangibles)				
Year; Qtile	1	2	3	4	5	1	2	3	4	5
1984	5	2	2	6	5	7	3	3	3	6
1985	23	20	6	12	24	22	20	13	18	19
1986	25	30	4	35	39	43	37	15	25	26
1987	23	21	6	23	22	25	27	11	21	17
1988	26	38	7	25	39	37	33	24	36	28
1989	45	31	16	33	33	39	44	18	26	29
1990	34	37	8	40	35	31	57	20	22	28
1991	27	56	17	29	26	32	47	32	28	29
1992	33	60	25	59	47	41	59	43	39	39
1993	70	89	16	55	55	66	68	53	51	47
1994	89	129	16	72	72	72	82	85	63	68
1995	99	176	15	82	100	94	84	80	81	89
1996	115	245	25	92	108	103	118	115	105	88
1997	172	374	23	105	116	144	168	178	129	133
1998	167	438	37	100	139	178	182	200	131	117
1999	173	218	47	131	131	110	137	111	133	102
2000	164	151	68	151	116	104	175	85	95	84
2001	96	77	39	104	115	66	107	62	82	67
2002	102	87	42	88	92	82	105	84	87	69
2003	110	103	47	83	81	91	90	110	88	80
2004	129	83	56	109	72	88	114	69	138	84
2005	128	118	40	95	89	93	116	94	137	73
2006	123	130	45	82	99	70	133	104	124	85
2007	98	120	40	78	84	70	131	71	127	85
2008	67	97	39	70	66	50	107	71	96	61
2009	51	61	24	60	66	45	79	45	73	37
2010	66	67	35	74	59	62	76	57	71	65
2011	82	72	34	67	65	62	85	65	84	52
2012	71	72	43	81	61	61	91	62	92	53
2013	49	95	35	69	49	51	93	60	80	39

Table 3.1 – continued: Summary Statistics: Firm Characteristics, M&A Events

Panel C: M&A Event count by year										
	Internal-IC ability (R&D)					External-IC ability (Intangibles)				
Year; Qtile	1	2	3	4	5	1	2	3	4	5
2014	75	121	30	60	84	72	89	65	96	82
2015	84	128	20	57	57	72	96	53	103	54
Total	2,621	3,546	907	2,227	2,246	2,183	2,853	2,158	2,484	1,935

Table 3.2: Estimating Innovation Conversion Ability

Table 3.2 reports average results of rolling firm-by-firm regressions of innovation conversion proxy measures on sales growth. Columns 1-5 report rolling window average proxy measures calculated over 1-5 year windows respectively. Row segments 1 and 2 report results for equations (1) and (2), and segments 3-5 report results for equation (3) across alternate growth periods: $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \gamma_0 + \gamma_j ln\left(1 + \frac{R\&D_{i,t-j}}{Sales_{i,t-j}}\right) + \epsilon_{i,t}$ (1) , $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \theta_0 + \theta_j ln\left(1 + \frac{Intangibles_{i,t-j}}{Assets_{i,t-j}}\right) + \epsilon_{i,t}$ (2) $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \mu_0 + \mu_j ln\left(1 + \frac{Intangibles_{i,t}/Assets_{i,t}}{Intangibles_{i,t-j}/Assets_{i,t-j}}\right) + \epsilon_{i,t}$ (3) . Appendix B list variable descriptions.

	5 Yr-Rolling Window		4 Yr-Rolling Window		3 Yr-Rolling Window		2 Yr-Rolling Window		1 Yr-Lag	
	mean	median	mean	median	mean	median	mean	median	mean	median
R&D/Sales (Internal Measure)										
beta$_{RDS}$	4.925	0.000	6.051	0.000	7.346	0.000	8.029	0.000	1.724	0.000
constant	-0.055	0.029	-0.077	0.025	-0.097	0.020	-0.114	0.017	0.017	0.063
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.69	16.00
R^2	0.195	0.091	0.232	0.118	0.294	0.175	0.416	0.348	0.137	0.038
Adjusted R^2	0.043	0.000	0.043	0.000	0.044	0.000	0.041	0.000	0.044	0.000
Intan/Assets (External Measure)										
beta$_{INAT}$	1.585	0.000	0.874	0.000	2.209	0.000	2.836	0.000	0.957	0.000
constant	0.057	0.069	0.051	0.070	0.044	0.071	0.023	0.073	0.180	0.085
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.59	16.00
R^2	0.177	0.056	0.207	0.068	0.256	0.092	0.351	0.173	0.130	0.037

Table 3.2 – continued: Decomposed Estimates of Innovation Conversion Ability

	5 Yr-Rolling Window		4 Yr-Rolling Window		3 Yr-Rolling Window		2 Yr-Rolling Window		1 Yr-Lag	
	mean	median	mean	median	mean	median	mean	median	mean	median
Adjusted R^2	0.044	0.000	0.045	0.000	0.044	0.000	0.042	0.000	0.047	0.000
1Y-Intan Growth (External Measure)										
$\text{beta}_{INATGROW1}$	-4.880	0.000	-5.147	0.000	-13.135	0.000	-9.616	0.000	-11.542	0.048
constant	0.067	0.062	0.068	0.063	0.068	0.063	0.068	0.065	0.078	0.067
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.600	16.000
R^2	0.165	0.047	0.193	0.057	0.241	0.081	0.342	0.162	0.114	0.027
Adjusted R^2	0.026	0.000	0.022	0.000	0.016	0.000	0.008	0.000	0.027	0.000
2Y-Intan Growth										
$\text{beta}_{INATGROW2}$	-0.062	0.000	-0.329	0.000	-1.351	0.000	-16.356	0.000	-3.567	0.000
constant	0.066	0.061	0.066	0.062	0.067	0.064	0.066	0.066	0.061	0.065
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.680	16.000
R^2	0.166	0.055	0.198	0.069	0.251	0.099	0.355	0.195	0.114	0.029
Adjusted R^2	0.027	0.000	0.027	0.000	0.026	0.000	0.024	0.000	0.026	0.000
3Y-Intan Growth										
$\text{beta}_{INATGROW3}$	1.649	0.000	2.303	0.000	3.015	0.000	-4.307	0.000	-12.114	0.000
constant	0.065	0.061	0.066	0.062	0.067	0.063	0.064	0.063	0.065	0.063
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.774	16.000
R^2	0.169	0.058	0.203	0.074	0.258	0.106	0.365	0.212	0.113	0.028

Table 3.2 – continued: Decomposed Estimates of Innovation Conversion Ability

	5 Yr-Rolling Window		4 Yr-Rolling Window		3 Yr-Rolling Window		2 Yr-Rolling Window		1 Yr-Lag	
	mean	median	mean	median	mean	median	mean	median	mean	median
Adjusted R^2	0.029	0.000	0.030	0.000	0.032	0.000	0.032	0.000	0.025	0.000
4Y-Intan Growth										
$beta_{INATGROW4}$	-4.735	0.000	-4.531	0.000	0.054	0.000	9.794	0.000	-9.432	0.000
constant	0.064	0.059	0.065	0.061	0.060	0.061	0.059	0.062	0.060	0.061
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.803	16.000
R^2	0.174	0.061	0.209	0.078	0.265	0.115	0.372	0.233	0.114	0.029
Adjusted R^2	0.033	0.000	0.036	0.000	0.037	0.000	0.036	0.000	0.027	0.000
5Y-Intan Growth										
$beta_{INATGROW5}$	-5.776	0.000	-4.811	0.000	1.618	0.000	3.073	0.000	-13.265	0.000
constant	0.062	0.057	0.060	0.058	0.053	0.059	0.042	0.060	0.055	0.059
Observations	6.000	6.000	5.000	5.000	4.000	4.000	3.000	3.000	17.793	16.000
R^2	0.177	0.064	0.212	0.082	0.268	0.122	0.376	0.243	0.116	0.032
Adjusted R^2	0.036	0.000	0.037	0.000	0.038	0.000	0.033	0.000	0.027	0.000

Table 3.3: Univariate Analysis-Innovation Conversion Ability and M&A Announcement Returns

Table 3.3 reports mean cumulative abnormal returns (CARs) for acquirers around M&A announcements. Acquirers are ranked by innovation conversion (IC) ability levels, where high IC Ability is defined by the 5th quintile of beta estimates from equations (1) and (2), respectively. Univariate results are presented for the CARs of high vs. not-high innovative ability acquirers. Cumulative abnormal returns are computed using the standard market model, $AR_t = R_{s,t} + R_{m,t}$, and an equally-weighted CRSP index for event windows [0], [-1,+1], and [-2,+2]; announcement is on day 0. The market model is estimated over 250 trading days, ending 46 trading days prior to the event with at least 100 non-missing daily returns. Appendix B list variable descriptions. P-values, based on robust standard errors, are reported in parentheses. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

	Internal-IC Ability (R&D)			External-IC Ability (Intangibles)		
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
Quintile Rank						
1st Quintile	0.594	1.000	1.091	0.600	0.929	1.083
2nd Quintile	0.396	0.632	0.710	0.307	0.590	0.533
3rd Quintile	0.335	0.447	0.377	0.189	0.353	0.432
4th Quintile	0.396	0.745	0.685	0.645	1.199	1.274
5th Quintile **High Ability**	0.596	1.020	1.184	0.914	1.516	1.581
(1st-4th Quintile) Not High Ability	0.507	0.918	0.908	0.454	0.834	0.843
Difference: High Ability						
d_{mean}	0.089	0.102	0.275	0.459	0.682	0.738
t-stat	0.627	0.494	1.127	3.193***	3.252***	2.978***

Table 3.4: Multivariate Analysis- Innovation Conversion Ability and M&A Announcement Returns

Table 3.4 reports multivariate regression results of acquirer innovation conversion ability on cumulative abnormal returns around M&A announcements. Synonymous with High IC Ability, High_Ability_Intan is an indicator variable, with a base value 0, that is equal to 1 if the acquirer is in the 5th quintile of γ_j , θ_j estimates from the respective regressions:
$ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \gamma_0 + \gamma_j ln\left(1 + \frac{R\&D_{i,t-j}}{Sales_{i,t-j}}\right) + \epsilon_{i,t}$ and $\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \theta_0 + \theta_j ln\left(1 + \frac{Intangibles_{i,t-j}}{Assets_{i,t-j}}\right) + \epsilon_{i,t}$. The dependent variables are acquirer cumulative abnormal returns (CARs) for event windows [0], [-1 ,+1], and [-2,+2]; announcement is on day 0. CARs are computed using the market model, $AR_t = R_{s,t} + R_{m,t}$, and an equally-weighted CRSP index. The market model is estimated over 250 trading days ending 46 trading days prior to the event with at least 100 non-missing daily returns. Year fixed effects, Year t, and industry fixed effects, Industry j, are included in all multivariate regressions. Appendix B defines all other variables. P-values, based on robust standard errors, are reported in parentheses.$^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

	Internal-IC Ability (R&D)			External-IC Ability (Intangibles)		
	(1)	(2)	(3)	(4)	(5)	(6)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
High_Ability R&D	0.126	0.067	0.224			
	(0.419)	(0.767)	(0.404)			
High_Ability Intan				0.531***	0.756***	0.819***
				(0.001)	(0.001)	(0.003)
Acq size	-0.326***	-0.542***	-0.616***	-0.325***	-0.543***	-0.614***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acq roa	-0.057	0.155	0.592	-0.054	0.149	0.599
	(0.839)	(0.701)	(0.215)	(0.845)	(0.712)	(0.210)
Acq lev	1.265***	2.470***	3.048***	1.251***	2.452***	3.027***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acq tq	0.020	0.043	0.042	0.022	0.047	0.046
	(0.395)	(0.201)	(0.289)	(0.340)	(0.162)	(0.251)
Private target	0.259**	0.086	0.188	0.267**	0.099	0.199
	(0.026)	(0.613)	(0.348)	(0.022)	(0.558)	(0.319)
Relative deal size	-0.002	-0.006	-0.001	-0.002	-0.006	-0.001

Table 3.4 – continued: Multivariate Analysis- Innovation Conversion Ability and M&A Announcement Returns

	Internal-IC Ability (R&D)			External-IC Ability (Intangibles)		
	(1)	(2)	(3)	(4)	(5)	(6)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
	(0.688)	(0.484)	(0.898)	(0.697)	(0.491)	(0.907)
Stock deal	-0.529***	-0.654***	-0.965***	-0.541***	-0.667***	-0.983***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Merger of equals	-3.156*	-2.487	-2.279	-3.176*	-2.522	-2.307
	(0.066)	(0.319)	(0.440)	(0.065)	(0.312)	(0.435)
Diversify	0.055	0.254	0.290	0.053	0.248	0.289
	(0.641)	(0.138)	(0.151)	(0.652)	(0.147)	(0.153)
Hostile	-0.775	-1.870**	-1.919*	-0.759	-1.859**	-1.893*
	(0.232)	(0.047)	(0.085)	(0.241)	(0.048)	(0.089)
Constant	1.184	2.425	1.411	1.090	2.277	1.270
	(0.365)	(0.201)	(0.530)	(0.404)	(0.230)	(0.572)
Yr & Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,675	13,675	13,670	13,675	13,675	13,670
Adjusted R^2	0.015	0.019	0.019	0.016	0.020	0.019

Table 3.5: Intangible Growth Measures of Innovation Conversion Ability and M&A Announcement Returns

Table 3.5 reports multivariate regression results of acquirer innovation conversion ability on cumulative abnormal returns around M&A announcements. Synonymous with High IC Ability, High_Ability_Intan is an indicator variable, with a base value 0, that is equal to 1 if the acquirer is in the 5th quintile of μ_j estimates from the regression: $ln\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) = \mu_0 + \mu_j ln\left(1 + \frac{Intangibles_{i,t}/Assets_{i,t}}{Intangibles_{i,t-j}/Assets_{i,t-j}}\right) + \epsilon_{i,t}$ Columns 1-5 report the results of IC ability measures with growth rates calculated over 1-5 year periods respectively. The dependent variables are acquirer cumulative abnormal returns (CARs) for event windows [0], [-1,+1], and [-2,+2]; announcement is on day 0. CARs are computed using the market model, $AR_t = R_{s,t} + R_{m,t}$, and an equally-weighted CRSP index. The market model is estimated over 250 trading days ending 46 trading days prior to the event with at least 100 non-missing daily returns. Year fixed effects and Industry fixed effects are included in all multivariate regressions. Appendix A defines all other variables. P-values, based on robust standard errors, are in parentheses.$*p < 0.1, **p < 0.05, ***p < 0.01$.

	Growth over 1 Year			Growth over 2 Years			Growth over 3 Years			Growth over 4 Years			Growth over 5 Years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
High Ability Intan	0.496***	0.202	0.181	0.500***	0.517**	0.636**	0.708***	0.886***	0.891***	0.661***	1.089***	1.040***	0.213	0.426	0.471
	(0.002)	(0.390)	(0.516)	(0.003)	(0.037)	(0.030)	(0.000)	(0.001)	(0.004)	(0.000)	(0.000)	(0.001)	(0.264)	(0.125)	(0.151)
Acq size	-0.327***	-0.543***	-0.614***	-0.326***	-0.543***	-0.615***	-0.327***	-0.544***	-0.616***	-0.328***	-0.547***	-0.619***	-0.326***	-0.544***	-0.616***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acq roa	-0.041	0.163	0.613	-0.057	0.150	0.598	-0.048	0.158	0.609	-0.050	0.154	0.605	-0.049	0.155	0.604
	(0.883)	(0.687)	(0.200)	(0.838)	(0.711)	(0.211)	(0.863)	(0.695)	(0.202)	(0.857)	(0.702)	(0.205)	(0.860)	(0.702)	(0.206)
Acq lev	1.250***	2.464***	3.041***	1.247***	2.452***	3.025***	1.234***	2.432***	3.009***	1.250***	2.446***	3.024***	1.261***	2.463***	3.039***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Acq tq	0.022	0.044	0.042	0.021	0.045	0.044	0.022	0.047	0.045	0.022	0.048	0.046	0.020	0.045	0.043
	(0.350)	(0.193)	(0.292)	(0.361)	(0.182)	(0.273)	(0.344)	(0.169)	(0.262)	(0.346)	(0.159)	(0.254)	(0.390)	(0.186)	(0.281)
Private target	0.263**	0.087	0.186	0.266**	0.094	0.195	0.269**	0.099	0.199	0.266**	0.100	0.198	0.259**	0.090	0.190

Table 3.5 – continued: Intangible Growth Measures of Innovation Conversion Ability and M&A Announcement Returns

	Growth over 1 Year			Growth over 2 Years			Growth over 3 Years			Growth over 4 Years			Growth over 5 Years		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
	(0.024)	(0.607)	(0.353)	(0.022)	(0.579)	(0.329)	(0.021)	(0.556)	(0.320)	(0.022)	(0.555)	(0.321)	(0.026)	(0.594)	(0.342)
Relative deal size	-0.003	-0.007	-0.002	-0.003	-0.007	-0.002	-0.002	-0.006	-0.001	-0.002	-0.006	-0.001	-0.002	-0.006	-0.001
	(0.634)	(0.471)	(0.887)	(0.646)	(0.458)	(0.865)	(0.698)	(0.491)	(0.907)	(0.691)	(0.486)	(0.902)	(0.690)	(0.486)	(0.901)
Stock deal	-0.532***	-0.656***	-0.971***	-0.530***	-0.653***	-0.967***	-0.537***	-0.662***	-0.977***	-0.538***	-0.664***	-0.979***	-0.533***	-0.657***	-0.972***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Merger of equals	-3.212*	-2.509	-2.288	-3.261*	-2.599	-2.408	-3.159*	-2.496	-2.278	-3.159*	-2.500	-2.281	-3.156*	-2.499	-2.282
	(0.062)	(0.315)	(0.438)	(0.058)	(0.298)	(0.415)	(0.066)	(0.317)	(0.440)	(0.066)	(0.317)	(0.440)	(0.066)	(0.317)	(0.440)
Diversify	0.055	0.254	0.296	0.056	0.253	0.294	0.050	0.245	0.287	0.051	0.244	0.286	0.057	0.252	0.294
	(0.642)	(0.137)	(0.143)	(0.635)	(0.139)	(0.146)	(0.668)	(0.151)	(0.155)	(0.661)	(0.153)	(0.157)	(0.627)	(0.140)	(0.146)
Hostile	-0.747	-1.857**	-1.892*	-0.772	-1.873**	-1.909*	-0.743	-1.838*	-1.873*	-0.737	-1.820*	-1.857*	-0.753	-1.845*	-1.877*
	(0.249)	(0.049)	(0.089)	(0.234)	(0.047)	(0.086)	(0.252)	(0.051)	(0.093)	(0.256)	(0.053)	(0.095)	(0.245)	(0.050)	(0.092)
Constant	1.035	2.366	1.379	1.073	2.302	1.277	1.018	2.206	1.210	1.056	2.196	1.212	1.177	2.386	1.387
	(0.428)	(0.213)	(0.539)	(0.411)	(0.225)	(0.569)	(0.436)	(0.245)	(0.590)	(0.419)	(0.247)	(0.589)	(0.368)	(0.209)	(0.537)
Yr & Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	13,675	13,675	13,670	13,675	13,675	13,670	13,675	13,675	13,670	13,675	13,675	13,670	13,675	13,675	13,670
Adj. $R\hat{2}$	0.016	0.019	0.019	0.015	0.020	0.019	0.016	0.020	0.019	0.016	0.020	0.019	0.015	0.019	0.019

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Appendix A
Variable Descriptions: Multilevel Inspection of Target Capital Structure & Convertible Debt

Compustat provided annual financials, Mergent's Fixed Income Securities Database (FISD) provided bond issues, Thompson Reuters-SDC provided common equity issues, and Federal Reserve Bank Reports (WRDS) provided treasury data. CRSP provided daily stock prices and S&P 500 returns, as well as monthly fund data from the CRSP-Survivorship-Bias Free Mutual Fund Database. Excluding annual financials and target estimates, and unless otherwise stated, all variables are average values of the three months (one quarter) preceding an issue date. Extent literature discuss variable definitions, namely Faulkender et al. (2012), de Jong et al. (2013), Choi et al. (2010), Lewis et al. (1999) and Erel et al. (2012).

Panel I: Firm Characteristics	
L^*_{BDR}, L^*_{MDR}	Book (Market) target leverage ratio estimated using the methodology discussed in the analytical framework
$\lvert Dev\rvert_{BDR}$, $\lvert Dev\rvert_{MDR}$	Absolute value of book (market) target leverage less the book (market) leverage ratio of the preceding year
overlevered	Binary indicator equal to 1 if L* is greater than lagged leverage and 0 otherwise
L_{BDR}	Book leverage as total debt (dltt +dlc) normalized by the book value of assets (at)
L_{MDR}	Market leverage as the book value of short-term plus long-term debt relative to the market value of assets $(dltt + dlc)/(dltt + dlc + (\lvert prc\rvert * shrout/1000))$
$PROF/TA$	Profitability, income before depreciation (oibdp) normalized by total assets
MB	Market-to-Book, sum of book liabilities and market value of equity normalized by total assets
DEP/TA	Depreciation and amortization (dp) normalized by total assets
$LnTA$	Log total assets as the natural log of total assets deflated by the consumer price

Table A.1– continued: Variable Descriptions- Multilevel Inspection of Target Capital Structure & Convertible Debt

FA/TA	Net property, plant, and equipment (ppent) normalized by total assets
R&D Exp/TA	Research and development expense (xrd) normalized by total assets
R&D	Binary indicator equal to 1 if research and development expense is greater than zero
$IndMedL_{BDR}$	Industry Median Book Leverage, Fama and French (1997) industry median book leverage
$IndMedL_{MDR}$	Industry Median Market Leverage, Fama and French (1997) industry median market leverage
CashFlow	$CF = \frac{oibdp_{i,t} - txt_{i,t} - xint_{i,t}}{at_{i,t-1}} - IndCapEx_t$. $IndCapEx_t$, Fama-French industry yearly average capital expenditures normalized by book assets of the preceding year
DebtMaturity	long-term debt maturing in less than three years (dd1+ dd2 + dd3) normalized by total long-term debt
EPSgrowth	percentage growth in Earnings per Share (epspx) between year t-2 to t-1
Discrete Indicators	
Active	Active Issuer, = 1 if firm-panel includes at least one common equity, straight bond, or convertible bond issue
CE Only	Issued Common Equity Only, = 1 if firm-panel includes common equity issues only
CE&D	Issued Common Equity and Debt, = 1 if firm-panel includes at least one straight or convertible bond issue
SD Only	Issued Straight Debt Only, = 1 if firm-panel includes common equity and straight bond issues
SD&CD	Issued Straight and Convertible Debt, = 1 if firm-panel includes common equity, straight and convertible bond issues
Panel II: Convertible Bond Features	
delta, Δ	$= e^{-qT}N(d_1)$
Pr(Conv| t_0)	$= N(d_2)$
C-Option Value	$= Se^{-qT}N(d_1) - Xe^{-rt}N(d_2)$

Table A.1– continued: Variable Descriptions- Multilevel Inspection of Target Capital Structure & Convertible Debt

with, s	$d_1 = \left\{ \frac{ln(\frac{S}{X_{CP}}) + (r - q + \frac{\sigma^2}{2})T}{\sigma\sqrt{T}} \right\}$ *and*
	$d_2 = \left\{ \frac{ln(\frac{S}{X_{CP}}) + (r - q - \frac{\sigma^2}{2})T}{\sigma\sqrt{T}} \right\}$
	N(.), the cumulative probability under a standard normal distribution
	q, continuously compounded dividend yield as ordinary dividends (dvc) relative to market value in the year preceding issuance
	S, market price of the underlying stock -5 trading days before issuance
	r, yield on a ten-year US Treasury Bond measured at issuance
	X_{CP}, conversion price at issuance
	$\sigma = EquityVolatility_{i,t}$
	T = *Maturity*
Maturity	years to maturity measured at issuance (instrumented with *TermSpread* and *DebtMaturity*)
ConversionPrem	at issuance percentage difference between X_{CP} and S (instrumented with *NewEquity*)
NewEquity	*Log(* number of shares issued to convertible bondholders under full conversion normalized by the total shares outstanding on the month-end prior to issuance)
Call PP	Call protection period length divided by maturity. CallProtection is equal to one for noncallable convertibles
Discrete Indicators	
Callable	= 1 if the bond has a call provision
Putable	= 1 if the bond has a put provision
Redeemable	= 1 if the bond has a redemption provision
Rule-144A	= 1 if the bond originated as a Rule-144A restricted offering
Rule-415	= 1 if the bond originated as a Rule-415 shelf offering
OPnegotiated	= 1 if the bond originated as a private (other) negotiated offering

Table A.1– continued: Variable Descriptions- Multilevel Inspection of Target Capital Structure & Convertible Debt

Exchg	= 1 if the bond originated as an exchange traded offering
Panel III: Issue, Market, and Macroeconomic Characteristics	
EquityRunup	Stock return over -240 to -40 trading days prior to an issue date
EquityVolatility	Annualized stock return volatility, estimated using daily returns over -240 to -40 trading days prior to issuance
MarketRunup	Total return of the S&P 500 Index across the three months preceding issuance
MarketVolatility	Annualized return volatility of the S&P 500 Index over the three months preceding issuance, using daily returns
Mutual Fund Flows	$MFF = Percentage\,Flow_t = \frac{\sum_{i=1}^{N} Dollar\,Flow_{it}}{\sum_{i=1}^{N} Assets_{i,t-1}}$; $Dollar\,Flow_{i,t} = Assets_{i,t} - Assets_{i,t-1}(1 + r_{i,t})$
MFF_{CD}	Quarterly flows into corporate convertible bond mutual funds with >50% convertible bond basis or Strategic Index (SI)/ Lipper Objective (LO) codes: *CVR CV*
MFF_{SD}	Quarterly flows into corporate straight bond mutual funds with >50% straight bond basis or SI/LO codes: *CHQ CMQ CSM CIM CHY CGN CPR A BBB CPB*
MFF_{CE}	Quarterly flows into equity mutual funds with >50% equity basis or SI/LO codes: *AGG GRO GRI BAL G GI B I*
TermSpread	Term premium, yield difference between ten-year Treasury Bonds and three-month Treasury Bills
InterestRate	Real interest rate, ten-year Treasury Bond yield less concurrent Consumer Price Index inflation

Appendix B
Variable Descriptions: Market Valuation of Innovative Ability

Panel I: Dependent and independent variables	
[0][-1,+1][-2,+2] CARs	Cumulative abnormal return around the M&A announcement. Daily abnormal returns are computed using the market model for equally-weighted CRSP index. Market model parameters are estimated over 250 trading days ending 50 trading days before announcement with at least 100 non-missing daily returns in the estimation period.
beta_RDS	Rolling window average coefficients calculated over 1-5 lag year windows using regression results of R&D expenditures scaled by sales on sales growth. At least 2 data points required for inclusion.
High_Ability_R&D	Equal to one if internal ability beta (R&D) measure is in the top quintile of the full Compustat sample, and zero otherwise.
beta_INAT *beta_INATGROWTH*	Rolling window average coefficients calculated over 1-5 lag year windows using regression results of intangible assets scaled by total assets (or intangible asset growth) on sales growth. Intangible asset growth measures are calculated for multiple growth periods from t-n to t, where n=1,2,3,4,5. At least 2 data points required for inclusion.
High_Ability_Intan	Equal to one if external ability beta (intangible assets) measure is in the top quintile of the full Compustat sample, and zero otherwise.

Table B.1– continued: Variable Descriptions- Market Valuation of Innovative Ability

Sales Growth	Natural logarithm of $sales_{i,t}/sales_{i,t-1} - 1$
Panel II: Deal and financial variables	
CapEx/Assets	Capital expenditure/total assets
Diversify	Equal to one if the acquirer and the target firm operate in different two-digit SIC industries, and zero otherwise.
Firm Age	Number of years since the firm appeared in Compustat
Hostile	Equal to one if the deal is classified as hostile by SDC, and zero otherwise.
Herfindahl *Herfindahlsq*	Herfindahl index based on all Compustat firms within the sample years, where industries are defined by 2 digit SIC codes
Leverage (Acq)	Total debt/total assets
Merger of equals	Equal to one if the deal is classified as merger of equals by SDC, and zero otherwise.
PPE/Assets	Property, plant, & equipment/total assets
Private Target	Equal to one if target classified as a private firm in SDC, and zero otherwise.
ROA (Acq)	Operating income before depreciation/total assets
RD/Sales	R&D expenditures/sales
Relative deal size	Deal value divided by acquirerŠs market value of equity.
Total Assets	
Size (Acq Size)	Natural logarithm of total assets
Stock deal	Equal to one if the deal is financed partially or fully with stock, and zero otherwise.
Tobin's Q (Acq)	Tobin's Q (Total assets - common ordinary equity + (common shares outstanding * annual fiscal price close))/total assets

Appendix C
Characteristics of Target Leverage

Table C.1: Estimating Target Leverage (OLS)

Table C.1 presents coefficient estimates for the reduced form model of target leverage: $L_{i,t} = \beta X_{i,t-1} + \tilde{\epsilon}_{i,t}$ where, $X_{i,t-1}$, includes earnings before interest and taxes as a proportion of total assets, the market-to-book ratio of firm assets, depreciation expense as a proportion of total assets, natural log of total assets,fixed assets as a proportion of total assets, a dummy variable indicating that the firm did not report R&D expenses, R&D expenses as a proportion of total assets, and the industry median leverage ratio. The coefficient vector $\boldsymbol{\beta}$ is estimated by an OLS regression. Columns 1-3 report book-leverage estimates and columns 4-6 report market-leverage estimates for the full sample (1,4), firm-years where at least one convertible bond is contractually outstanding (2,5), and the firm-year of a new convertible offer (3,6). Standard errors are reported in parentheses.

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
EBIT/TA	-0.147***	-0.307***	-0.211***	-0.144‘	-0.303***	-0.234***
	(0.003)	(0.017)	(0.032)	(0.003)	(0.016)	(0.028)
Market to book	-0.001***	0.018***	0.019***	-0.028***	-0.032***	-0.029***
	(0.000)	(0.002)	(0.003)	(0.000)	(0.002)	(0.003)

Table C.1 – continued: Characteristics of Target Leverage

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
Depreciation/TA	0.280***	-0.013	-0.013	0.059**	-0.049	-0.205
	(0.020)	(0.086)	(0.168)	(0.020)	(0.081)	(0.144)
Log total assets	0.006***	0.008***	0.012***	0.010***	0.013***	0.015***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Fixed assets/TA	0.056***	0.096***	0.057*	0.056***	0.091***	0.080***
	(0.003)	(0.013)	(0.027)	(0.003)	(0.012)	(0.023)
R&D expense/TA	-0.121***	0.244***	0.269***	-0.174***	-0.133***	-0.077
	(0.010)	(0.042)	(0.078)	(0.010)	(0.040)	(0.067)
R&D dummy	-0.023***	-0.024***	-0.030*	-0.030***	-0.041***	-0.037**
	(0.002)	(0.007)	(0.014)	(0.002)	(0.006)	(0.012)
Industry Median Book Leverage	0.579***	0.586***	0.460***			
	(0.008)	(0.031)	(0.062)			
Industry Median Market Leverage				0.529***	0.393***	0.332***
				(0.007)	(0.024)	(0.046)
Fixed Effects	No	No	No	No	No	No
R^2	0.592	0.745	0.805	0.608	0.726	0.776
Observations	93,872	6,412	1,436	93,872	6,412	1,436

Table C.2: Estimating Target Leverage (LSDV)

With the restriction that $L_{i,t}* = \beta X_{i,t-1}$, Table C.2 presents coefficient estimates for the two-stage least squares dependent variable partial adjustment model: $L_{i,t+1} = (\lambda\beta)(X_{i,t}) - (1-\lambda)(L_{i,t}) + \nu_i + \tilde{\epsilon}_{i,t}$ where, the coefficient vector $\boldsymbol{\beta}$ is estimated with time fixed-effects and firm-level clustered standard errors (Petersen, 2009). $X_{i,t-1}$ is the vector of firm characteristics summarized in Table 1.2. Columns 1-3 report book-leverage estimates and columns 4-6 report market-leverage estimates for the full sample (1,4), firm-years where at least one convertible bond is contractually outstanding (2,5), and the firm-year of a new convertible offer (3,6). Standard errors are reported in parentheses.

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
Book Leverage	0.821***	0.772***	0.612***			
	(0.004)	(0.013)	(0.029)			
Market Leverage				0.826***	0.793***	0.648***
				(0.003)	(0.012)	(0.027)
EBIT/TA	-0.038***	-0.084***	-0.089*	-0.022***	-0.042**	-0.064*
	(0.004)	(0.021)	(0.039)	(0.002)	(0.014)	(0.027)
Market to book	-0.001**	0.007**	0.015***	-0.001***	-0.000	-0.008***
	(0.000)	(0.002)	(0.003)	(0.000)	(0.001)	(0.002)
Depreciation/TA	-0.045*	-0.127	-0.303*	-0.108***	-0.130	-0.328**
	(0.019)	(0.084)	(0.137)	(0.015)	(0.068)	(0.107)
Log total assets	0.002***	-0.009***	-0.022***	0.003***	-0.004**	-0.010**
	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.003)
Fixed assets/TA	0.014***	0.027*	0.033	0.022***	0.026*	0.040

Table C.2 – continued: Estimating Target Leverage (LSDV)

	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year	Full Sample	Issuers (CD>0)	Issuers(CD>0) Offer Year
	Book Leverage,t+1	Book Leverage,t+1	Book Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1	Market Leverage,t+1
	(0.002)	(0.011)	(0.020)	(0.002)	(0.011)	(0.021)
R&D expense/TA	-0.023*	0.051	0.231**	-0.041***	-0.061*	0.045
	(0.010)	(0.045)	(0.087)	(0.006)	(0.028)	(0.050)
R&D dummy	-0.007***	-0.009*	-0.008	-0.012***	-0.019***	-0.019*
	(0.001)	(0.005)	(0.010)	(0.001)	(0.004)	(0.009)
Industry Median Book Leverage	0.089***	0.132***	0.204***			
	(0.006)	(0.025)	(0.051)			
Industry Median Market Leverage				0.066***	0.029	0.076*
				(0.005)	(0.018)	(0.038)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.698	0.675	0.553	0.729	0.703	0.645
Observations	93,872	6,412	1,436	93,872	6,412	1,436

Appendix D
Target Leverage Deviations & Convertible Debt Design

Table D.1: Target Deviations and Security Choice-Robust Specification

A variation of *McFadden's Choice model*, alternative specific conditional logit regression of target leverage deviations on discrete security choice between common equity, straight debt,convertible debt, or no security issuance: $Pr(y_{ij} = 1) = X_i\beta + (z_i A)'$ for i-firms and *j=1,2,3,4* alternative outcomes. $y_{ij} = 1$ when security j is chosen and $y_{ij} = 0$ otherwise. In panel 1, columns 1-2, the choice sets exclude the *No Issuance* option, straight debt is the base choice. In panel 2, columns 3-5, *No Issuance* is the base choice. Both models account for annual market performance, market demand, and macroeconomic conditions controls used throughout the analysis. Appendix A details variable descriptions. t statistics in parentheses. $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

	1		2		
	Convertible Debt	Common Equity	Convertible Debt	Common Equity	Straight Debt
$\lvert Dev\rvert_{BDR}$	5.725***	-1.170	6.636***	0.0900	0.937
	(4.64)	(-0.90)	(7.11)	(0.12)	(1.08)
Dev^2_{BDR}	-8.214***	0.510	-8.825***	-0.444	-0.762
	(-2.78)	(0.15)	(-4.27)	(-0.26)	(-0.33)
Overlevered$_{BDR}$	0.0266	0.610***	-0.273***	0.278***	-0.255***
	(0.22)	(5.24)	(-2.74)	(3.63)	(-3.59)
EquityVolatility	1.582***	1.014***	0.341*	-0.588***	-0.985***

Table D.1 – continued: Target Deviations and Security Choice-Robust Specification

	1		2		
	Convertible Debt	Common Equity	Convertible Debt	Common Equity	Straight Debt
	(5.79)	(3.69)	(1.76)	(-3.36)	(-6.01)
EquityRunup	0.270***	0.549***	0.468***	0.764***	0.317***
	(2.99)	(6.19)	(7.95)	(13.48)	(5.54)
CashFlow	1.457***	0.516	0.382	-0.850***	-0.865***
	(3.54)	(1.20)	(1.25)	(-3.83)	(-3.28)
DebtMaturity	0.221	0.552*	-0.696***	-0.00610	-1.220***
	(0.77)	(1.86)	(-3.05)	(-0.54)	(-7.37)
RatedFirm	-3.348***	-2.757***	-0.939***	-0.229***	2.362***
	(-19.86)	(-18.70)	(-7.28)	(-3.08)	(15.44)
$AvgBDR_{3Y}$	-1.658***	-1.554***	0.848***	0.863***	2.483***
	(-4.02)	(-4.63)	(2.73)	(4.44)	(11.37)
LnTA	-0.151***	-0.762***	0.358***	-0.164***	0.519***
	(-2.88)	(-15.88)	(8.78)	(-5.34)	(13.83)
MB	0.0915**	-0.0162	0.0469**	-0.0532***	-0.0443
	(2.05)	(-0.35)	(2.01)	(-2.74)	(-1.17)
PROF/TA	-1.906***	-1.632**	-1.018***	-0.617***	0.0654
	(-2.93)	(-2.53)	(-3.89)	(-2.66)	(0.16)
MarketVolatility	0.504	-0.373	8.965***	5.907***	8.792***
	(0.58)	(-0.35)	(8.70)	(5.02)	(15.01)
MarketRunup	-2.420***	-2.271***	5.810***	5.379***	6.296***

Table D.1 – continued: Target Deviations and Security Choice-Robust Specification

	1		2		
	Convertible Debt	Common Equity	Convertible Debt	Common Equity	Straight Debt
	(-3.20)	(-2.89)	(6.51)	(5.85)	(10.59)
MFF_{CD}	0.542	-1.272	-1.428	-1.606	-2.453***
	(0.51)	(-1.06)	(-1.30)	(-1.31)	(-3.26)
MFF_{SD}	-3.184*	1.084	1.976	7.351***	6.931***
	(-1.81)	(0.67)	(0.93)	(4.46)	(7.65)
MFF_{CE}	11.23**	14.63***	11.79*	17.03***	0.0770
	(2.56)	(3.05)	(1.93)	(3.27)	(0.02)
InterestRate	-0.0503	0.138***	-0.150***	0.0265	-0.0887***
	(-1.15)	(3.01)	(-2.66)	(0.53)	(-2.92)
TermSpread	-0.0592	0.101**	-0.0172	0.108***	0.0431*
	(-1.20)	(2.10)	(-0.35)	(2.78)	(1.65)
Constant	1.962***	5.271***	-6.390***	-3.322***	-8.446***
	(3.76)	(11.01)	(-15.55)	(-10.22)	(-21.25)
Observations	19842		138456		

Table D.2: Convertible Bond Design: New Equity, Maturity, Call Protections- Decomposed System of Equations

Standalone 2SLS regressions used in the full system of simultaneous-equations for convertible bond design terms: *New Equity, Maturity*, and Call Protection Period. Models 1-3 report second-stage results and first-stage fit statistics for three applications of the I.V. equation framework:

$Log\hat{BookDev} = \pi_{00} + \pi_{01}Pr(NoPublicOffer) + \pi_{02}CAPXAT + \Pi_0 X + v_1$

$New\hat{E}quity = \pi_{10} + \pi_{11}ConvPremium + \Pi_1 X + v_2$

$Mat\hat{u}rity = \pi_{20} + \Pi_{21}TermSpread + \Pi_{32}DebtMaturity + \Pi_2 X + v_2$

$Cal\hat{l}PP = \pi_{30} + \pi_{31}EPSgrowth + \Pi_3 X + v_3$

$NewEquity = \beta_{10} + \boldsymbol{\beta}_{11}Y_1 + \boldsymbol{\beta}_{12}X + u_1 \quad Maturity = \beta_{20} + \boldsymbol{\beta}_{21}Y_2 + \boldsymbol{\beta}_{22}X + u_2 \quad CallPP = \beta_{30} + \boldsymbol{\beta}_{31}Y_3 + \boldsymbol{\beta}_{32}X + u_3$

where $\mathbf{Y}_i$ is the vector of instrumented endogenous variables, relative to each design feature. $\mathbf{X}_i$ is the vector of firm characteristics,market performance, market demand, and macroeconomic conditions used throughout the analysis (excluding *TermSpread* and *DebtMaturity*). The measure of target leverage deviation, *Log(BookDev)*, is excluded from Model(s) 1, treated as an exogenous variable in Model(s) 2, and included in $\mathbf{Y}_i$ in Model(s) 3. The bottom panel reports fit statistics for the instrumental variables used in the first-stage regressions. Appendix A details variable descriptions. Heteroscedasticity-consistent standard errors are clustered by year. t statistics in parentheses. $^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

	NewEquity			Maturity		Call Protection Period			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(BookDev)		-11.79	-36.89**		-1.701	-5.830		-0.112	-0.606
		(-0.21)	(-2.16)		(-1.38)	(-0.56)		(-0.88)	(-0.94)
NewEquity				-0.111	-0.117	-0.0914	-0.00624	-0.00612	-0.00706
				(-0.81)	(-0.81)	(-0.70)	(-0.64)	(-0.63)	(-0.73)
Maturity	38.67	-6.752	-1.110				-0.0752	-0.0727*	-0.0651***
	(0.05)	(-0.17)	(-0.44)				(-1.59)	(-1.66)	(-3.09)
Call PP	464.9	-92.98	-21.10	-13.59	-12.19	-15.55**			

Table D.2– continued: Convertible Bond Design: New Equity, Maturity, Call Protections- Decomposed System of Equations

	NewEquity			Maturity		Call Protection Period			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(0.05)	(-0.19)	(-0.56)	(-1.19)	(-1.02)	(-2.29)			
EquityVolatility	168.2	-20.54	0.122	-3.332*	-3.497*	-3.300**	-0.266	-0.246	-0.224*
	(0.06)	(-0.12)	(0.01)	(-1.88)	(-1.78)	(-2.11)	(-1.05)	(-1.04)	(-1.92)
EquityRunup	-21.12	2.089	-0.557	0.380*	0.351	0.394*	0.0312	0.0280	0.0249
	(-0.06)	(0.11)	(-0.43)	(1.77)	(1.61)	(1.76)	(1.50)	(1.45)	(1.43)
CashFlow	19.05	-9.398	-9.321*	-1.093	-1.087	-2.030	-0.0731	-0.0859	-0.164
	(0.05)	(-0.30)	(-1.93)	(-0.57)	(-0.56)	(-1.03)	(-0.85)	(-0.96)	(-1.18)
RatedFirm	-11.66	2.927	2.340*	0.273	0.528	0.440	0.0209	0.0277	0.0416
	(-0.05)	(0.15)	(1.75)	(0.27)	(0.51)	(0.49)	(0.25)	(0.33)	(0.69)
$AvgBDR_{3Y}$	-48.75	9.445	-10.98*	2.104*	1.210	-0.938	0.145	0.0819	-0.169
	(-0.05)	(0.37)	(-1.73)	(1.65)	(1.05)	(-0.19)	(1.39)	(1.13)	(-0.58)
LnTA	-36.52	2.840	-2.482	0.558	0.484	0.558	0.0480	0.0450	0.0296
	(-0.06)	(0.08)	(-1.10)	(0.85)	(0.70)	(0.93)	(1.52)	(1.49)	(0.73)
MB	0.398	-1.345	-1.176***	-0.183	-0.177	-0.0889	-0.0111	-0.00805	-0.00655
	(0.01)	(-1.19)	(-5.45)	(-0.60)	(-0.53)	(-0.43)	(-0.50)	(-0.39)	(-0.44)
PROF/TA	-87.12	19.17	7.776	2.514	2.850	2.920	0.185	0.193	0.211
	(-0.05)	(0.19)	(1.17)	(1.19)	(1.29)	(1.37)	(0.96)	(1.01)	(1.46)
MarketVolatility	-204.1	47.25	14.30	6.591	6.076	7.395	0.476	0.490	0.488
	(-0.05)	(0.21)	(0.77)	(1.03)	(0.91)	(1.37)	(1.36)	(1.43)	(1.56)
MarketRunup	18.52	-10.07	-5.431	-1.459	-0.859	-2.081	-0.0950	-0.0935	-0.123

Table D.2– continued: Convertible Bond Design: New Equity, Maturity, Call Protections- Decomposed System of Equations

	NewEquity			Maturity		Call Protection Period			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(0.04)	(-0.21)	(-0.77)	(-0.21)	(-0.12)	(-0.36)	(-0.23)	(-0.24)	(-0.37)
Sentiment	2.741	-0.892	-0.365	-0.120	-0.109	-0.127	-0.00827	-0.00847	-0.00821
	(0.05)	(-0.25)	(-1.23)	(-0.77)	(-0.68)	(-0.99)	(-1.05)	(-1.12)	(-1.20)
MFF_{CD}	-284.2	69.42	23.09	9.891	8.755	10.94	0.706	0.702	0.710
	(-0.05)	(0.23)	(0.86)	(1.04)	(0.93)	(1.08)	(1.20)	(1.23)	(1.33)
Overallotment	-65.61	10.59	1.312	1.581***	1.603**	1.648***	0.121	0.118	0.108**
	(-0.05)	(0.15)	(0.30)	(2.63)	(2.57)	(2.65)	(1.36)	(1.39)	(2.15)
Rule-144A	-84.69	13.48	1.362	2.012***	2.047***	2.038***	0.154*	0.151**	0.133***
	(-0.06)	(0.16)	(0.25)	(2.77)	(2.79)	(2.67)	(1.89)	(1.98)	(2.72)
InterestRate	24.77	-4.840	-0.785	-0.725	-0.617	-0.812	-0.0533**	-0.0528**	-0.0500***
	(0.05)	(-0.19)	(-0.39)	(-0.98)	(-0.80)	(-1.53)	(-2.26)	(-2.29)	(-2.66)
Constant	-560.8	150.5	65.09	20.64**	19.94**	22.44***	1.459**	1.450**	1.527***
	(-0.05)	(0.24)	(1.41)	(2.55)	(2.40)	(3.18)	(2.31)	(2.30)	(2.90)
Observations	1123	1122	1116	1123	1122	1116	1123	1122	1116
Overall p-Fstat	0.134	0.105	0.115	0.738	0.747	0.936	0.202	0.209	0.0290
Overall Fstat	2.189	2.484	2.192	0.308	0.296	0.139	1.713	1.672	3.566
F $New\hat{E}quity$				23.70	23.94	16.02	15.29	14.99	11.41
F $Mat\hat{u}rity$	0.487	0.497	2.997				0.561	0.587	3.589
F $Cal\hat{l}PP$	2.354	2.160	5.810	1.294	1.392	4.236			

Table D.2– continued: Convertible Bond Design: New Equity, Maturity, Call Protections- Decomposed System of Equations

	NewEquity			Maturity		Call Protection Period			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
F $LogB\hat{o}okDev$	.	.	7.914	.	.	8.455	.	.	4.562

Appendix E

Decomposed Estimates of Innovation Conversion Ability

Table E.1: Shocks to Intangible Growth Accounting - Innovation Conversion Ability and M&A Announcement Returns

	1984-2001			2002-2007			2008-2016		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
High_Ability Intan	0.483**	0.807**	0.909**	0.140	0.436	0.617	0.998***	0.971**	0.897*
	(0.211)	(0.322)	(0.402)	(0.250)	(0.404)	(0.453)	(0.367)	(0.464)	(0.498)
Acq size	-0.390***	-0.632***	-0.728***	-0.306***	-0.518***	-0.537***	-0.217***	-0.414***	-0.495***
	(0.042)	(0.065)	(0.081)	(0.052)	(0.084)	(0.095)	(0.077)	(0.097)	(0.104)
Acq roa	-0.018	0.370	0.691	-0.793	-1.684**	-0.384	1.169	1.701	1.733
	(0.324)	(0.495)	(0.618)	(0.503)	(0.811)	(0.910)	(0.889)	(1.126)	(1.207)
Acq lev	1.096***	1.909***	2.753***	0.376	1.980**	3.226***	1.119	2.886***	3.124***
	(0.389)	(0.594)	(0.742)	(0.503)	(0.811)	(0.911)	(0.727)	(0.920)	(0.987)
Acq tq	0.020	0.032	0.033	-0.006	0.098	0.061	0.021	0.093	0.054
	(0.024)	(0.037)	(0.046)	(0.065)	(0.105)	(0.117)	(0.107)	(0.135)	(0.145)

Table E.1 – continued: Shocks to Intangible Growth Accounting - Innovation Conversion Ability and M&A Announcement Returns

	1984-2001			2002-2007			2008-2016		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]	[0]	[-1,+1]	[-2,+2]
Private target	0.270*	0.160	0.419	0.327*	0.307	0.400	0.358	0.005	-0.326
	(0.151)	(0.231)	(0.288)	(0.187)	(0.301)	(0.338)	(0.277)	(0.351)	(0.376)
Relative deal size	-0.005	-0.008	-0.003	-0.467***	-0.349	0.027	1.096***	0.816***	0.320
	(0.006)	(0.009)	(0.011)	(0.138)	(0.223)	(0.250)	(0.196)	(0.248)	(0.266)
Stock deal	-0.537***	-0.740***	-1.093***	-1.000***	-0.941***	-1.149***	0.011	-0.134	-0.341
	(0.157)	(0.240)	(0.300)	(0.224)	(0.362)	(0.406)	(0.374)	(0.473)	(0.507)
Merger of equals	-0.018	-1.734	-2.538	-4.568**	-3.645	-4.019	-4.438	0.420	4.348
	(2.770)	(4.226)	(5.277)	(2.005)	(3.236)	(3.633)	(5.410)	(6.848)	(7.342)
Diversify	0.130	0.229	0.196	0.077	0.188	0.301	0.061	0.480	0.637
	(0.150)	(0.228)	(0.285)	(0.189)	(0.305)	(0.342)	(0.291)	(0.368)	(0.395)
Hostile	-0.830	-1.802*	-1.726	1.038	-0.881	-0.468	-0.668	-1.953	-2.807
	(0.679)	(1.036)	(1.294)	(2.003)	(3.233)	(3.630)	(2.558)	(3.238)	(3.471)
Constant	1.512	2.947	1.882	3.127***	4.104***	4.087***	1.247	3.023**	4.122***
	(1.297)	(1.978)	(2.470)	(0.695)	(1.122)	(1.260)	(0.963)	(1.219)	(1.307)
Yr & Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,770	7,770	7,765	3,503	3,503	3,503	3,380	3,380	3,380
Adjusted R^2	0.019	0.024	0.023	0.020	0.017	0.012	0.017	0.016	0.014