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What Can We Learn About Capital Structure from Bond Credit Spreads?

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ABSTRACT

Bond credit spreads have been shown to reflect the issuing firm's default probability. In an efficient market, spreads will reflect both the firm's current risk and investors' expectations about how that risk level might change in the future. Collin-Dufresne and Goldstein (2001) show analytically that the expected future behavior of a firm's leverage importantly influences the appropriate credit spread on long-term bonds. We implement this insight empirically, by using current information to proxy for investors' expectations about future leverage changes. We find that expected future leverage affects bond credit spreads, and that expectations formed under the trade-off and pecking order theories of capital structure both enjoy empirical support.

I. Introduction

As credit risk modeling has become more formalized, researchers have focused increasing attention on the information content of bond credit spreads. Financial theory indicates that any change in a firm's default risk should be reflected in the prices of its debt claims. Merton (1974) specifies bond credit spreads in terms of a firm's asset volatility, initial leverage, and term to maturity. Subsequent empirical studies have sought to explain credit spreads using (among other things) firm leverage and a variety of proxies for asset volatility (e.g. Collin-Dufresne *et al.* (2001), Krishnan *et al*. (2005), Avramov *et al.* (2005), Campbell and Taksler (2003)). Researchers agree that default risk accounts for at least part of a corporate bond rate's spread over Treasury. Some studies conclude that the spread is entirely caused by default risk (Longstaff *et al.* (2005)) while others assert that taxes (Elton *et al.* (2001)) and liquidity (Chen, Lesmond, and Wei (2005)) also contribute.

The Merton (1974) model generally implies implausibly small asset volatilities when taken to the data. Collin-Dufresne and Goldstein (2001) argue that one likely reason is the Merton model's failure to consider that a firm might change its debt level in the future. Merton (1974) assumes that a firm will maintain its current debt level until the debt matures. Because expected asset returns are positive, this implies an expected decline in leverage over time, which generates relatively low expected default losses. Collin-Dufresne and Goldstein (2001) (and others) recognize that a firm may change its outstanding debt over time, with potentially important effects on the riskiness of multi-period debt obligations. By modeling leverage as mean-reverting, CDG simulate credit spreads that conform much more closely to those observed in the market. They conclude that "the appropriate credit spread for a corporate bond [reflects]… both the firm's current liability structure, and its right to alter this structure in the future." (p.1930) In other words, bond prices (credit spreads) should reflect not only current information about a firm's condition, but also changes in investors' expectations about future, firm-specific information.

Credit spread changes thus present an opportunity to infer what market investors believe about theories of capital structure (leverage) determination. This opportunity is particularly attractive because directly modeling firm capital structures gives rise to serious econometric difficulties and uncertainties. Lemmon, Roberts and Zender (2006) contend that firms' capital structure decisions must include firm-specific effects and partial adjustment. But the combination of these two effects creates well-known biases in the application of traditional estimation techniques (Baltagi (2001, chapter 8)). The method employed to deal with these biases materially affects conclusions (Flannery and Rangan (2006), Table 2), but the literature has not yet identified a reliable method for correcting these biases. Studying credit spread changes thus provides a new (different) opportunity to gather market evidence about capital structure theories.

Previous empirical studies of credit spreads have not explicitly incorporated investors' expectations about a firm's subsequent condition, most likely because those expectations are unobservable. However, the various theories of a firm's capital structure permit us to infer expected future leverage changes and then incorporate these into an empirical model of credit spreads. First, the ***trade-off theory*** of capital structure maintains that each firm has a value-maximizing, target leverage ratio. Whenever leverage deviates from this target, firms adjust back toward it. With positive adjustment costs, however, firms generally find it more cost effective to approach their target leverage gradually (Leary and Roberts (2005)). The trade-off theory implies that investors should expect a future increase in leverage whenever the firm's leverage is below its target and a decrease whenever the firm's leverage presently exceeds the target. If investors believe that firms exhibit trade-off behavior, credit-spread changes should reflect not only contemporaneous leverage changes but also changes in target leverage.

The ***pecking order theory*** of capital structure provides a second mechanism for predicting future leverage changes. If the adverse selection (transaction) costs of issuing risky securities are substantial, firms should prefer to issue debt rather than equity when they need to raise external funds. Conversely, firms with excess internally-generated funds will tend to retire debt in order to preserve future options to borrow again (Lemmon and Zender (2004)). The pecking order theory implies no leverage target; leverage simply reflects the past imbalances between internal cash flows and investment opportunities. Under this theory, a financing deficit should be matched dollar-for-dollar by a change in firm debt (Shyam-Sunder and Myers (1999), Lemmon and Zender (2005)). Thus, investors should expect that firms about to face a financing deficit will be increasing their leverage, and hence their probability of default (*ceteris paribus*). Conversely, firms expected to run a financing surplus should be reducing their leverage.

If investors use current information to form expectations about a firm's future leverage, bond prices should reflect that information today. Furthermore, if investors consider capital structure theories relevant, bond prices should reflect the theory investors consider most relevant for the firms they hold in their portfolios. In this study, we examine whether credit spreads reflect investors' expectations of future leverage, and whether these expectations are consistent with the target-adjustment and/or pecking-order theories of capital structure.[1] We use a sample of publicly traded firms with outstanding bonds from 1986 to 1998 to investigate whether bondholders' expected leverage changes are consistent with the trade-off and/or pecking-order theories of capital structure. When tested against each other, neither theory seems to dominate as a basis for

[1] Two additional theories of capital structure have recently emerged, but we are unsure how to operationalize them in the framework of this study. Baker and Wurgler (2002) propose a market-timing theory under which managers issue equity shares whenever these relatively overvalued and thus exploit informational asymmetries to benefit current shareholders. Welch (2004) proposes a managerial inertia theory under which observed changes in leverage are the result of general movements in equity values rather than specific managerial actions.

forming investors' expectations. The financing decisions of the *average* firm in our sample seem to be characterized by both target-adjustment and pecking-order considerations. However, a more detailed investigation reveals that for some *particular* firm types this is not the case. Investors appear to believe that less levered firms are more likely to behave in accordance with the target-adjustment theory, while more levered firms are making financing choices based on pecking-order considerations. We also document support for the existence of debt capacity constraints consistent with Lemmon and Zender (2004). Finally, we examine whether the possibility of a credit-rating change affects firms' choice of financing as documented by Kisgen (2005). We find that firms on the verge of an upgrade/downgrade experience lower credit-spread changes, consistent with our hypothesis that these firms are likely to decrease their future leverage. Our main results are robust to alternative leverage definitions and alternative methods for forming expectations.

The rest of the study is organized as follows. In Section II we develop our model and derive our main testable hypotheses. Section III describes our data sources and sample selection criteria. Section IV presents our empirical findings on how changes in leverage expectations affect credit-spread changes. Section V concludes.

II. A Model of Credit Spreads in the Context of Corporate Financing Decisions

In modeling a firm's credit spread we begin with structural models of default risk. These models are based on the insight of Black and Scholes (1973) and Merton (1974) that limited liability allows for the application of contingent-claim analysis to the valuation of a firm's equity and debt. In structural models, a firm defaults when the firm-value process crosses a default threshold. Thus, variables governing the firm-value process and default threshold will ultimately determine credit spreads and credit-spread changes. We focus on leverage as one such variable and explicitly incorporate the notion that prices of financial assets reflect not only current information but also investors' expectations of changes in this information over the life of the assets. That is, credit-spreads and credit-spread changes should be determined by both contemporaneous leverage changes and by changes in investors' expectations of future leverage. We rely on existing capital structure theories to provide the mechanism through which investors form these leverage expectations.

When firm *i* releases its quarter *t* accounting information, investors assess the firm's default probability and incorporate this information into the credit spreads at time *t*. Default probability depends on current leverage and investors' expectations of future (time *t+1*) leverage. That is,

$$CS_{i,t} = \alpha \cdot LEV_{i,t} + \gamma \cdot E_t LEV_{i,t+1} + \theta \cdot \mathrm{Z}_{\mathrm{i,t}} + \widetilde{\omega}_{i,t} \quad (1)$$

where $CS_{i,t}$ is the i^{th} firm's credit spread at the end of quarter *t*,

$LEV_{i,t}$ is the i^{th} firm's debt-to-assets ratio at the end of quarter *t*, and

$\mathbf{Z}_{\mathbf{i,t}}$ is a vector of control variables motivated by structural models of credit risk, as in Collin-Dufresne *et al.* (2001).

Re-writing equation (1) as a difference equation eliminates unobserved, bond-specific features that may affect the credit spread:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma \cdot \Delta E_t LEV_{i,t+1} + \boldsymbol{\theta} \cdot \boldsymbol{\Delta} \mathbf{Z}_{\mathbf{i,t}} + \varepsilon_{i,t} \quad (2)$$

where $\varepsilon_{i,t} = \Delta \widetilde{\omega}_{i,t}$.

One naturally expects that $\alpha > 0$: an increase in leverage raises the probability of default and hence the credit spread on outstanding bonds. We also expect that $\gamma > 0$ in (2). Note that α could be zero if investors expected a firm to reverse any leverage change very quickly. However, $\Delta E_t LEV_{i,t+1}$ must carry a nonzero coefficient if investors form expectations about future leverage changes from contemporaneous information. In modeling investors' expectations of future leverage we turn to the two dominant theories of corporate capital structure – the trade-off theory and the pecking-order theory.

The ***trade-off theory*** of capital structure argues that firms would select a target leverage ratio by trading off the costs and benefits of debt financing. It is typically assumed that target leverage can vary over time in response to changes in firm characteristics. The partial adjustment modification of the trade-off theory recognizes that leverage adjustments can be costly, which might make it optimal for firms to adjust back to their target partially over several years rather than fully in any given year. In fact, recent studies document adjustment speeds of less than 100 percent consistent with the existence of such adjustment costs (Fama and French (2002), Flannery and Rangan (2006) and Leary and Roberts (2005)). To account for these recent findings, we specify a partial-adjustment model based on Flannery and Rangan (2006) in which target leverage is based on firm characteristics. Each quarter, the target-adjustment hypothesis specifies that a firm will change its leverage in the following manner:

$$LEV_{i,t+1} - LEV_{i,t} = \lambda\left(LEV^{*}_{i,t+1} - LEV_{i,t}\right) + \delta_{i,t+1} \qquad (3)$$

where $LEV_{i,t}$ is defined above,

$LEV^{*}_{i,t}$ is the i^{th} firm's target debt-to-assets ratio at the end of quarter *t*. $LEV^{*}_{i,t}$ depends on a vector of firm characteristics described below.

λ is the quarterly adjustment speed.

In words, the typical firm closes a proportion λ of the distance between its actual and its target leverage every quarter. Under this hypothesis, today's expectation of next quarter's leverage is given by:

$$E_t LEV_{i,t+1} = [\hat{\lambda}\, LEV^{*}_{i,t+1} + (1-\hat{\lambda}\,)\cdot LEV_{i,t}] \qquad (4)$$

where $\hat{\lambda}$ is the estimated adjustment speed.

Substituting equation (4) into (2) gives a model of credit-spread changes conditional on the target-adjustment behavior of firm's leverage ratios:

$$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \tag{5}$$

If investors form leverage expectations based on the trade-off theory, we anticipate that $\gamma > 0$ in (5).

The ***pecking-order theory*** of capital structure proposes an alternative mechanism for forming expectations of a firm's future leverage. The basic idea is that a firm has either excess or surplus cash available during each time period. In particular, we define a firm's net need to raise external funds as

$$FINDEFA_{i,t} = (DIV_{i,t} + I_{i,t} + \Delta W_{i,t} - C_{i,t}) / Assets_{i,t} \tag{6}$$

where $DIV_{i,t}$ is the i^{th} firm's cash dividends paid during the quarter ending at *t*,

$I_{i,t}$ is the i^{th} firm's net investments during the quarter ending at *t*,

$\Delta W_{i,t}$ is the i^{th} firm's change in working capital during the quarter ending at *t*,

$C_{i,t}$ is the i^{th} firm's net cash flow after interest and taxes during quarter *t,* and

$Assets_{i,t}$ is the book value of the i^{th} firm's assets at the end of quarter *t.* [2]

As presented by Myers (1984), the pecking order hypothesis is based on a refutable presumption that transaction costs – in particular the asymmetric information component of those costs – are

[2] Investment ($I_{i,t}$) is defined by the following Computat Quarterly data items: [91-85-109+90-83+94-110] for format code 7, and [91-85+90-83+94+95] for format codes 1, 2 and 3. Change in working capital ($\Delta W_{i,t}$) is defined by the following Computat Quarterly data items: [74-103-104-105-106-107-75-112] for format code 7, [74+75+73] for format code 1 and [74-75-73] for format codes 2, 3. Net cash flow after interest and taxes ($C_{i,t}$) is defined by the following Computat Quarterly data items: [76+77+78+79+80+102+81+114] for format code 7 and [76+77+78+79+80+102+81+87] for format codes 1, 2 and 3.

higher on equity issuances than bond issuances. Retained earnings represent the preferred source of investment financing. If high desired investment makes (6) positive, firms strongly prefer to issue external debt. Equity is issued only as a last resort. Shyam-Sunder and Myers (1999) specify that the pecking order hypothesis should result in leverage changes following the pattern

$$LEV_{i,t+1} - LEV_{i,t} = FINDEFA_{i,t+1} + \delta_{i,t+1} \tag{7}$$

Under the pecking order, therefore, expected future leverage follows from a simple re-arrangement of equation (7):

$$E_t LEV_{i,t+1} = E_t FINDEFA_{i,t+1} + LEV_{i,t} \tag{8}$$

Substituting equation (8) into (2) results in a model of credit-spread changes in which changes in investors' expectations of the firm's financing needs are added to the set of standard structural-model variables:

$$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \tag{9}$$

If investors form expectations based on the pecking-order theory, we anticipate that $\gamma > 0$ in specification (9).

III. Data

This study uses corporate bond data from the Warga-Lehman Brothers Fixed Income Database. The database reports monthly price quotes for the major private and government debt issues traded in the United States. Bond prices are available from January 1973 until March 1998, but we begin our sample in January 1986 because one of our macro control variables (VIX) is unavailable before that time. We use only actual trader quotes on fixed-rate, coupon-paying bonds issued by U.S. industrial firms.[3] We eliminate secured bonds, those with a call or put feature, and those backed by mortgages/assets. As in Collin-Dufresne *et al.* (2001), we also

[3] While most prices reflect "live" trader quotes, some are "matrix" prices estimated from price quotes on bonds with similar characteristics. Sarig and Warga (1989) have shown that these matrix prices can be problematic, so we exclude them from our sample.

require that bonds have at least 4 years to maturity and 25 monthly observations during the period 1986 – March 1998.

In order to compute a credit-risk spread, we collect yields on constant-maturity Treasury bonds from the Federal Reserve Board's H.15 releases. For each corporate bond *i*, we define a credit spread ($CS_{i,t}$) as the difference between its yield and the corresponding constant-maturity Treasury yield at the end of month *t*. When there is no precise maturity match, we interpolate to obtain an appropriate Treasury yield. We then retain only the spread observations corresponding to the quarter-ends for which Compustat provides financial information on the issuing firm. We eliminate from our sample observations for which $CS_{i,t}$ is negative or greater than 10%, as these are likely to be data entry errors or bonds in distress (for which a linear model like (2) is probably inappropriate). We define a change in credit spread ($\Delta CS_{i,t}$) as the change in a bond's credit spread between two consecutive quarter ends and winsorize the quarterly $\Delta CS_{i,t}$ observations at the 1st and 99th percentiles to reduce the effect of outliers. Our final sample includes 666 bonds issued by 266 unique firms.

We obtain financial information for each of these 266 firms from the quarterly Compustat file. Our analysis employs both market leverage and book leverage measures. Market leverage is defined using the market value of firm assets:

$$LEV_M = \left[\frac{Long\ TermDebt\ [51] + Short\ Term\ Debt\ [45]}{Total\ assets\ [44] - Book\ Equity\ [60] + Market\ Equity\ [14*61]} \right] \tag{10}$$

Book leverage is defined using book-valued instead of market-valued assets:

$$LEV_B = \left[\frac{Long\ TermDebt\ [51] + Short\ Term\ Debt\ [45]}{Total\ assets\ [44]} \right] \tag{11}$$

The numbers in brackets indicate the quarterly Compustat item numbers. Compustat also provides the financial data required to generate investor expectations about a firm's future leverage. (See below.) Consistent with previous capital-structure studies, we convert nominal accounting values to real 1983 values using the consumer price index. We then mitigate the effect of outliers by winsorizing the raw data and any resulting ratios at the 1st and 99th percentiles.

Finally, we follow Collin-Dufresne *et al.* (2001) in selecting macroeconomic series to control for bond market conditions (**Z_t** in equation (1) above):

> R_t^{10} = the 10-year, constant maturity Treasury bond rate at the end of month *t*;
>
> $SLOPE_t$ = the difference between the 10-year and 2-year Treasury yields at the end of month *t*;
>
> VIX_t = the implied volatility of the S&P 100 index, calculated by the Chicago Board of Options Exchange on the basis of historical data on the S&P 100 index options;[4]
>
> $S\,\&\,P_t$ = the return on the S&P 500 index for the quarter ending at *t*;
>
> $JUMP_t$ = the slope of the "smirk" of implied volatilities from options on S&P 500 futures. We calculate this variable as described in Collin-Dufresne et al. (2001), using option and futures prices obtained from the Chicago Mercantile Exchange;
>
> $CRPREM_t$ = the difference between Moody's average yield on Baa and Aaa-rated bond indices, as a measure of market aversion to default risk.

The treasury and corporate bond yields are obtained from the Federal Reserve Board's H.15 releases. VIX comes from the Chicago Board of Options Exchange, and the S&P returns come from CRSP.

Table 1 provides summary statistics for our final sample of 666 bonds issued by 264 U.S. industrial firms. The average number of quarterly quotes per bond is 22. The average credit

[4] Strictly speaking, "VIX" refers to the implied volatility in S&P 500 index options, but these data are unavailable before 1990. We therefore use the implied S&P 100 volatility to measure market uncertainty throughout our sample period.

spread is 1.12% and the average quarterly credit-spread change is -0.02%. The average market–valued leverage for firms in our sample is 24%, with a mean quarterly change -0.2%. Book-valued leverage averages 33%, with a mean quarterly change of -0.1%.

IV. Expected Future Leverage and Credit Spreads

A. Are Future Leverage Changes Determinants of Credit-spread Changes?

We start our analysis with a simple test of whether bondholders can foresee changes in a firm's leverage and appropriately price these in the firm's bonds. If future leverage changes are priced, then credit spreads should be affected by both contemporaneous leverage and by investors' expectations of future leverage as in (1). Omitting future leverage changes from the model will result in the estimation of:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \tag{12}$$

where $\varepsilon_{i,t} = \gamma \cdot \Delta E_t LEV_{i,t+1} + \tilde{\omega}_{i,t}$[5]. Our hypothesis that an increase in future leverage affects credit spreads today implies that the sign of the residuals from estimating equation (12) contains information. If the residuals are positive and investors' expectations are on average correct, then the firm will likely increase its debt (or reduce equity) in the quarters to come. Similarly, if the residuals from estimating equation (12) are negative, we should observe a decrease in future leverage.

We estimate equation (12) using simple OLS and present the results in Table 2, Panel A. We then use the residuals from this estimation to classify firms into two groups: those with positive residuals and those with negative residuals. We expect that firms with negative residuals experience a smaller average increase in future leverage than do firms with positive residuals.

[5] If the firm specific information is informative about firm's default probability for the upcoming k periods, this would result in: $\varepsilon_{i,t} = \gamma_1 \cdot \Delta E_t LEV_{i,t+1} + \gamma_2 \cdot \Delta E_t LEV_{i,t+1} + \gamma_3 \cdot \Delta E_t LEV_{i,t+1} + \ldots + \gamma_k \cdot \Delta E_t LEV_{i,t+k} + \tilde{\omega}_{i,t}$. The T tests in Table 2 indicate that γ_k are positive and significant for $k \leq 3$.

Table 2, Panel A reports the p-values for these difference- in-means tests. The tests indicate that up to three quarter ahead, the average leverage increase for positive-residual firm-quarters are larger than those for negative-residual one. This implies that changes in credit spreads in any given quarter reflect leverage changes up to three quarters into the future. These findings are robust to the inclusion of bond or firm fixed effects in the regression (not tabulated).

Given this evidence that credit spreads predict subsequent leverage changes, we can test whether bond prices are consistent with alternative bases for investors' leverage-change expectations. Specifically, we test whether the expectations are consistent with the target-adjustment and/or on the pecking-order theories of capital structure. Note that it is possible for both theories to explain investors' reactions to leverage changes as long as some firms behave according to each theory.

B. Tests of the Trade-off Theory

Equation (5) indicates that credit-spread changes will be affected not only by contemporaneous leverage changes but also by changes in investors' expectations about the firm's target leverage. As a first step in our analysis we estimate leverage targets for each firm in our sample. Because this estimation entails several important econometric difficulties, we use a variety of econometric approaches.

In general, previous researchers have estimated target leverage models that permit targets to vary across firms and over time:

$$LEV^{*}_{i,t+1} = \beta X_{i,t} \qquad (13)$$

where $X_{i,t}$ is a vector of the i^{th} firm's characteristics designed to proxy for the costs and benefits of debt. We use the following set of such proxies:

EBIT_TA = earnings before interest and taxes as a proportion of total assets,

MB = the ratio of assets' market to book values,

DEP_TA = depreciation expense as a proportion of total assets,

Ln(TA) = log of total book assets (a measure of firm size),

FA_TA = fixed assets as a proportion of total assets,

R&D_TA = research and development expenses as a proportion of total assets,

R&D_DUM = a dummy variable equal to one if R&D expenditures are not reported; otherwise zero.

IND_Median = the prior quarter's median leverage ratio for the firm's industry. Industries are defined according to Fama and French (1997).

RATED = a dummy variable equal to one if the firm has a debt rating; otherwise zero.

Table 1 provides summary statistics for these variables.

Flannery and Rangan (2006) and Lemmon *et al.* (2006) assert that partial adjustment is important, and that firm fixed effects (F_i) should be added to the set of explanatory variables in equation (13):

$$LEV^*_{i,t+1} = \beta X_{i,t} + F_i \tag{14}$$

Substituting equation (14) into (3) produces the following estimable model:

$$LEV_{i,t+1} = (\lambda \cdot \beta) \cdot X_{i,t} + (1 - \lambda) \cdot LEV_{i,t} + \lambda \cdot F_i + \delta_{i,t+1} \tag{15}$$

Equation (15) represents a dynamic panel regression, which cannot be estimated properly using OLS. Following Flannery and Rangan (2006), we therefore substitute a fitted value for the lagged dependent variable, using the lagged book value of leverage and $\mathbf{X_t}$ as instruments (Greene, 2003).[6] The estimation results are presented in column (1) of Table 3. The estimated quarterly adjustment speed of 11.8% implies an annual rate of about 39%.[7] Although this adjustment speed is likely biased upwards, Leary and Roberts (2005) and Flannery and Rangan (2006) document

[6] In a dynamic panel, the error term in the lagged dependent variable is correlated with the firm fixed effect, yielding downward-biased estimates of (1-λ) in (15). (See Baltagi (2001), chapter 8.) Using an appropriate instrument for the lagged dependent variable eliminates this bias. When the dependent variable is book leverage, we use market leverage as an instrument.

[7] The quarterly adjustment speed is 10.7% using book leverage and implies an annual rate of about 36%.

annual adjustment speeds in the 30-40% range. However, this adjustment speed is a matter of considerable uncertainty for econometric reasons. For example, Lemmon *et al*. (2006) and Hankins (2006) report annual adjustment speeds of 20-22% per year.

Given the importance of econometric issues in properly estimating the target leverage ratio, we present our main results using a variety of target leverage proxies. Column (2) of Table 3 therefore re-estimates equation (14) without the lagged dependent variable. This specification imposes the assumption that the typical firm is at its long-run target leverage. The resulting coefficients on the $\mathbf{X_t}$ variables should be compared to the estimated long-run effects $(\hat{\beta})$ from column (1). Column (3) of Table 3 removes the fixed effects from the specification in column (2) and yields broadly similar results. Finally, note that the book leverage results in columns (4) – (6) of Table 3 closely resemble those for market leverage in the first three columns.

We use the estimated, long-run targets implied by the three specifications in Table 3 to form alternative target leverage estimates for each firm in our sample in each quarter. We will also allow for the possibility that firms might have leverage targets that are relatively stable over time, so instead of quarterly targets we construct annual targets as the average of the prior year's quarterly targets. Finally, we will also proxy for the quarterly leverage target with a lagging average of the firm's own observed leverage, as in Shyam-Sunder and Myers (1999) and others.

Table 4 reports the results of estimating our basic regression for ΔCS (equation (5)), using alternative proxies for firm target leverage. Panel A defines leverage using the market value of firm assets; Panel B uses book values. The first column of Table 4, Panel A defines the expected future change in leverage as a change in the firm's long-run target leverage and includes bond fixed effects.[8] ΔLEV is strongly significant and ΔLEV^* marginally significant at conventional levels. This implies that credit-spread changes are affected not only by contemporaneous leverage changes but also by changes in investors' expectations based on the trade-off theory. The rest of Table 4, Panel A demonstrates that this basic result becomes even stronger depending on how we estimate leverage targets. Column (2) includes the target leverage computed from the estimated coefficients in the second column of Table 3, which assumes that the typical firm always operates at its target leverage. Column (3) is based on a target computed without fixed effects, estimated in the third column of Table 3. In column (4) we construct annual targets for each calendar year as the average of the firm's quarterly targets over the previous year. Columns (5) and (6) of Table 4A specify each firm's target leverage as its average observed leverage over the preceding one or three years. These simpler target estimations yield even stronger support for the target-adjustment theory. Both ΔLEV and ΔLEV^* are highly significant at conventional levels. Regardless of how the market-valued target leverage is measured, credit spreads respond significantly to changes in that target, *beyond* their response to contemporaneous leverage changes. Panel B of Table 4 repeats these same regression specifications for book-valued measures of leverage and the leverage target. The statistical significance of the control variables and contemporaneous leverage are basically unchanged from Panel A, while target leverage gains explanatory power.

C. Tests of the Pecking-order Theory

If bond investors form expectations of future leverage in a manner consistent with the pecking-order theory, then equation (9) implies that credit-spread changes will be affected by changes in investors' expectations about a firm's future financing deficit. We thus need a model for forecasting a firm's future financing deficit:

$$FINDEFA_{i,t+1} = \boldsymbol{\varphi}\mathbf{Y_{i,t}} + \upsilon_{i,t+1} \qquad (16)$$

[8] Unlike regression (15), (5) includes no lagged dependent variable, so estimating (5) as a panel regression involves no bias.

where $\mathbf{Y_{i,t}}$ is a vector of firm *i*'s characteristics at the end of quarter *t*.

We know of no prior study evaluating the components of $\mathbf{Y_{i,t}}$ and therefore start with the following firm-specific variables:

$FINDEFA_{i,t-k+1}$, (k=1 to 4) = up to four lags of the dependent variable defined above,

$IND\_DUM_{i,t}$ = an industry dummy based on the 47 industries defined in Fama and French (1997)

$EBIT\_TA_{i,t}$ = earnings before interest and taxes as a proportion of total assets,

A subset of the results from these OLS estimations is presented in the first four columns of Table 5, for a variety of included lags of the dependent variable. The first lag of the financing deficit measure has the strongest explanatory power and adding additional lags does not improve the model's fit from an adjusted $R^2 = 0.39$. Out of the remaining accounting variables, lagged earnings (*EBIT_TA*) appear to be the most important determinant of a firm's financing deficit. Adding any of the remaining accounting variables above, leaves the explanatory power of the financing-deficit forecasting model unchanged (results not included).

Column (5) of Table 5 incorporates the data's panel characteristics by adding firm fixed effects to control for unobserved variables that are relatively stable over time for each firm. The resulting coefficient estimates and fit are similar to those in column (4). However, the dynamic panel specification in column (5) might provide biased coefficient estimates on the lagged dependent variable. We re-estimate this regression substituting an instrumental variable for the lagged dependent variable and then report the results in the last column of Table 5. This correction does not materially affect the model's fit or the estimated coefficients.

We treat the fitted values from the six alternative specifications of equation (16) as our measures of financing-deficit expectations and use them to explain credit-spread changes via regression specification (9). The results from a panel regression with bond fixed effects are reported in Panel A of Table 6 for market-valued leverage. The coefficient on $\Delta E_t FINDEFA_{t+1}$ is positive and strongly significant in all cases, consistent with the hypothesis that investors adjust their expectations of a firm's future leverage as that firm's expected financing needs change. To put this differently, investors seem to believe that firms' leverage decisions are affected by their financing deficit or surplus, as implied by the pecking-order theory of capital structure.

Panel B of Table 6 replicates our analysis using book-leverage instead of market-leverage ratios. In contrast to Panel A, contemporaneous leverage now shows no significant effect on the change in credit spreads, but the change in expected future leverage remains highly significant. For all six alternative proxies for expected financing deficits, an increase in that deficit raises the market's expected future leverage, and hence raises the observed spread.

D. Joint Tests of the Trade-off and Pecking-order Theories

The analysis so far provides individual support for the target-adjustment and pecking-order theories in isolation. However, investors might believe that both theories are important in firms' financing decisions. We use the following specification to test this possibility:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^*_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (17)$$

If investors believe largely in the target-adjustment model of capital structure, we should find that $\Delta LEV^*_{i,t+1}$ carries a positive coefficient while the one on $\Delta E_t FINDEFA_{i,t+1}$ is zero. If instead, investors believe largely in the pecking order model, we should find $\mathbf{\Delta} E_t FINDEFA_{i,t+1}$ with the positive coefficient and $\Delta LEV^*_{i,t+1}$ showing no significant effect. If each model applies to a non-trivial number of firms, both estimated coefficients could be non-zero.

Table 7 presents the results from a panel estimation of equation (17) with bond fixed effects. For simplicity, we use the PO_6 Model from Table 5 for pecking order expectations in all columns of the table. Panel A measures leverage in market-value terms; Panel B presents book-valued leverage results. In Panel A, both ΔLEV^* and $\Delta E_t FINDEFA_{t+1}$ uniformly carry significantly positive coefficients of similar magnitude to those reported in the individual tests of the target-adjustment and pecking-order models. In contrast, the effect of contemporaneous leverage changes on credit-spread changes becomes less significant. This suggests that when pricing default risk, bond investors focus much more on future leverage than they do on contemporaneous leverage. They seem to consider both the firm's target leverage and its expected financing needs when forming expectations about future leverage. This is consistent with recent evidence that firms might have target debt ratios, but also prefer internal funds to external financing (Hovakimian *et al*. (2001), Hovakimian *et al*. (2004) and Strebulev (2003)). The book leverage results in panel B carry the same implication about investor expectations. Once again, however, the contemporaneous leverage measures have small and largely insignificant effect on credit spreads.

E. Further Investigation of the Capital Structure Theories

The analysis so far offers support to the conjecture that for an *average* firm corporate-bond credit spreads incorporate information about a firm's current financial state as well as expectations of future leverage changes formed under both the target-adjustment and pecking-order theories of capital structure. However, it is conceivable that for any *particular type* of firm or any *particular type* of bond, target-adjustment considerations dominate pecking-order considerations or vice versa. In the subsections that follow we attempt to identify the characteristics that might make a subset of firms more or less likely to behave according to either one of the two capital structure theories. The presented results use our market-leverage specification (equation (10) above), but are robust to an alternative book-leverage specification.

1. Leverage Groups

We first examine whether a firm's current leverage affects the extent to which future leverage expectations are priced in its bonds' credit spreads. We conduct the above capital structure tests for different subsets of firms grouped according to their lagged leverage. The results are presented in Table 8 and show an interesting pattern. For the range of firms with moderate leverage, both the target-adjustment and pecking-order theories play a significant role in forming expectations of future leverage changes. However, for firms with extreme levels of debt in their capital structure, the theories compete with each other: for low-leverage firms target-adjustment considerations dominate pecking-order considerations, and for high-leverage firms the opposite is true.

2. Firm Size Groups

The driving assumption behind the pecking-order theory of capital structure is the existence of asymmetric information costs, which are likely to be higher for equity issuances than for debt issuances. This implies that for firms facing low asymmetric information costs, pecking-order considerations might be less relevant in forming expectations about future leverage changes. Although we might have difficulties addressing this issue with our sample (all of the firms have both public equity and public debt outstanding), we nonetheless do so by using firm size as a proxy of asymmetric information. In each quarter-year of our sample period, we rank firms according to their market capitalization. We then use these rankings to assign firms to one of three size groups. Finally, we estimate equations (5), (9), and (17) for each size tercile using panel estimation with bond fixed effects. The results are reported in Table 9. As expected, the size of the coefficient on $\Delta E_t FINDEFA_{i,t+1}$ decreases monotonically across firm-size terciles. This finding supports the notion that the pecking order theory offers better basis for forming future leverage expectations for firms with higher asymmetric information costs. We also document that target-adjustment considerations seem to be relevant only for firms subject to moderate asymmetric-information costs.

3. Maturity Groups

The extent to which expectations are an important pricing consideration can depend on a bond's remaining maturity. Future leverage changes might be of less consequence to the pricing of short-term bonds since these changes might not occur until after the bond matures. This is why short-term bonds might react more strongly to contemporaneous leverage changes than to changes in expectations about future leverage. On the other hand, changes in expectations might be more relevant to long-term bonds since the longer remaining maturity leaves more time for the expectations to materialize. To examine this issue we re-estimate equations (5), (9) and (17) separately for short, medium and long-term bonds.[9] The results from these panel estimations with bond fixed effects are presented in Table 10. For each of the three models the magnitude of the coefficient on the change-in-expectations proxy increases as maturity increases and only the last coefficient is statistically significant at conventional levels. This confirms that expectations are an increasingly important consideration for the pricing of bonds with long remaining maturity.

4. Credit Rating Categories

According to Lemmon and Zender (2004) debt capacity constraints might prevent firms with high default risk from issuing additional debt despite their preference for debt over equity financing. Their findings suggest that pecking-order considerations might be empirically less important for high default-risk firms. To test this conjecture in the framework of our study we use a below-investment-grade credit rating as a proxy for debt capacity constraints. We then undertake separate regressions for investment-grade and junk-rated bonds, and report the results in Table

[9] In assigning bonds to the short, medium, and long-term maturity we follow Collin-Dufresne *et al.* (2001). Short-term bonds as those having remaining maturity of less than 9 years; medium-term bonds are those with remaining maturity in the 9-12 year range; and long-term bonds have remaining maturity of more than 12 years.

11. Changes in investors' expectations of future leverage appear important only for the pricing of investment-grade bonds. This is consistent with the idea that firms with poor credit ratings are constrained in the manner suggested by Lemmon and Zender (2004). The results in Table 11 also indicate that contemporaneous leverage changes affect below-investment-grade bonds significantly more than they affect investment-grade bonds, consistent with the theory of bonds carrying a default option.

F. Expected versus Unexpected Changes in Contemporaneous Leverage

The results presented so far yield support to our conjecture that investors price their expectations of a firm's future financing choices as soon as these expectations are formed. That is, quarter-ahead leverage changes as predicted by the trade-off and pecking-order theories of capital structure are reflected in this quarter's credit-spread changes. But an additional implication of our conjecture is that credit spreads might react differently to the expected and unexpected components of *contemporaneous* leverage changes. If at time t-1 investors have already incorporated into a bond's credit spread expected leverage at time t, then at time t credit spreads would be affected by a change in leverage only to the extent that such a change were a surprise or that it resolved some of the uncertainty surrounding the previous-quarter formed expectation. More formally, we can re-write equation (2) as:

$$\Delta CS_{i,t} = \alpha_1 \Delta LEV_{i,t}^{EXP} + \alpha_2 \Delta LEV_{i,t}^{UNEXP} + \alpha_3 \Delta LEV_{i,t+1}^{EXP} + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \qquad (18)$$

where

$$\Delta LEV_{i,t}^{UNEXP} = \Delta LEV_{i,t} - \Delta LEV_{i,t}^{EXP} \qquad (19)$$

If credit spread changes react more strongly to surprises, we anticipate that $\alpha_1 < \alpha_2$ under both capital-structure theories. Under the target-adjustment theory, a firm's expected leverage change equals the necessary adjustment towards its leverage target:

$$\Delta LEV_{i,t}^{EXP} = LEV_{i,t}^{*} - LEV_{i,t-1}, \qquad (20)$$

And under the pecking-order theory, a firm's expected leverage matches its financing deficit dollar for dollar:

$$\Delta LEV_{i,t}^{EXP} = FINDEFA_{i,t} \tag{21}$$

The results from estimating equation (18) under the target-adjustment theory are presented in column (1) of Table 12. On average, an expected change in leverage increases credit spreads significantly less (0.384) than an unexpected change in leverage (0.695). This difference in coefficients is strongly significant and consistent with the predictions of the target-adjustment theory. In columns (2) and (3) of Table 12 we allow for an asymmetric impact of leverage changes on credit spreads. It is conceivable that corporate-bond investors price leverage changes differently for firms above their leverage target compared to firms below their leverage target. We therefore estimate equation (18) separately for these two subsets of firms. The results reported in columns (2) and (3) of Table 12 make two noteworthy points. First, investors seem to react more strongly to the leverage changes of firms above their leverage target (i.e. firms expected to decrease their debt) than to those of firms below their leverage target (i.e. firms expected to increase their debt). Second, the contemporaneous leverage change expected under the target-adjustment theory, has a smaller (and for below-target firms, insignificant) effect on credit-spread changes.

Column 4 of Table 12 presents the results from estimating equation (18) under the pecking order theory. On average, both expected and unexpected leverage changes significantly affect credit spread changes; however, even though the coefficient on unexpected leverage changes (0.315) is higher than that on expected leverage changes (0.303), the difference is not statistically significant. To better understand this finding, we once again allow for an asymmetric effect of leverage changes on credit spreads. We estimate equation (18) separately for firms operating with a financing deficit and those operating with a financing surplus. Note that this is analogous to separating firms into those expected to increase their leverage and those expected to decrease it. The estimation results, shown in columns (5) and (6) respectively, demonstrate that investors are not reacting differently to expected and unexpected leverage changes for the subset of financing-deficit firms. The opposite is true for financing-surplus firms: the unexpected leverage changes have a significantly larger impact on credit spreads than do expected leverage changes.

G. Credit -rating Considerations and Capital Structure Theories

In a recent study, Kisgen (2005) demonstrates that a firm's financing decisions are motivated by considerations beyond the usual target-adjustment and pecking-order ones. He argues that since there are clear benefits associated with higher credit-rating levels, the manager of a firm close to a rating change will choose equity over debt financing in an attempt to push the firm into a higher rating category. He finds evidence that credit-rating upgrades and downgrades are an important second-order determinant of firm leverage changes. To test whether investors recognize this and use the likelihood of a credit-rating change as another tool for predicting future leverage, we add proxies for this likelihood to our earlier tests of the two standard capital structure theories. More specifically, we follow Kisgen (2005) and construct an indicator variable, *CRPOM*, which equals 1 for firms with a "plus or minus" credit rating and 0 otherwise. *CRPOM* is designed to proxy for how close a firm is to a credit-rating upgrade or downgrade. We then add this newly constructed variable to equations (5), (9) and (17):

$$\begin{aligned}\Delta CS_{i,t} &= [\alpha + \gamma(1-\hat{\lambda})]\cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}]\cdot \Delta LEV^{*}_{i,t+1} + \kappa \cdot CRPOM \\ &\quad + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{22}$$

$$\begin{aligned}\Delta CS_{i,t} &= (\alpha + \gamma)\cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \kappa \cdot CRPOM \\ &\quad + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{23}$$

$$\begin{aligned}\Delta CS_{i,t} &= \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^{*}_{i,t+1} + \kappa \cdot CRPOM \\ &\quad + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{24}$$

If investors take a firm's credit-rating considerations into account, then we would observe that $\kappa < 0$ since a potential credit-rating change will make a firm more likely to decrease its leverage. This expectation of a leverage decrease will reduce current credit spreads. We estimate equations (22), (23), and (24) using panel regression with bond fixed effects. The results are presented in Tables 13, 14, and 15 respectively. In all three specifications *CRPOM* is uniformly significant with a negative sign. This implies that if firms on the verge of a credit-rating change are more likely to reduce their leverage, then investors recognize this behavior and price it in the firm's bond spreads. The effect of these credit-rating considerations is above and beyond that of the target-adjustment and pecking-order theories as indicated by the continued significance of the leverage target and financing deficit expectations.

V. Conclusion

Collin-Dufresne and Goldstein (2001) show that a firm's option to adjust its leverage can have a first-order impact on bond credit spreads. Despite the fact that there is an extensive literature on firms' capital structure decisions, recent studies examining the information contained in bond credit spreads have made no explicit connection to this important idea.

In this study we examine investors' pricing decisions to infer their beliefs about how firms make capital structure choices. We find that investors' expectations about future leverage changes do significantly affect credit spread changes. There is empirical support for expectations based on both the target-adjustment and pecking-order theories: changes in a firm's target leverage and changes in its expected financing needs both have a positive and significant effect on that firm's bond spreads. A joint test of the two theories is consistent with the hypothesis that investors use information on both target leverage and expected financing deficits when forming expectations about the *average* firm's future leverage. However, this is not the case for some *particular* firm types. We document that the target adjustment theory of capital structure is the sole determinant of investor expectations for less levered firms, while pecking-order considerations are the sole determinants of investor expectations for firms with high leverage. Consistent with the existence of debt capacity constraints for high default-risk firms, we document that changes in expectations about future leverage are not important for below-investment-grade firms. Finally, we document that for bonds with longer remaining maturity expectations about future leverage dominate contemporaneous leverage as determinants of credit spread changes. The opposite is true for short-maturity bonds.

We also document that bond credit spreads react differently to the expected and unexpected components of contemporaneous leverage changes. We find evidence that investors price leverage expectations formed under the target-adjustment theory of capital structure in an efficient and timely manner. This seems to be less so for expectations formed under the pecking order theory of capital structure, especially for firms running a financing deficit.

Finally, we find evidence that the possibility of a credit-rating change is an important consideration for firms' financing choices as argued by Kisgen (2005). Firms whose default-probability places them close to an upgrade or downgrade experience a smaller change in credit spreads, which is consistent with them being less likely to increase leverage in the future. This effect is above and beyond the effect of target-adjustment and pecking-order considerations.

Overall, we find evidence that in forming expectations of future leverage changes bond investors do not rely on any single capital structure theory. On the contrary, they seem to believe that a firm's future financing decisions are driven by a combination of target-adjustment, pecking-order, and credit-rating considerations.

References

Avramov, D., G. Jostova, and A. Philipov, 2005, Credit risk changes: common factors and firm-level fundamentals. Working paper, University of Maryland.

Baker, M., and J. Wurgler, 2002. Market timing and capital structure. *The Journal of Finance* 57, 1–32.

Baltagi, B., Econometric Analysis of Panel Data, 2nd edition, John Wiley & Sons, 2001.

Black, Fischer, and Myron Scholes, 1973, The pricing of options and corporate liabilities, *Journal of Political Economy* 81, 637–654.

Campbell, John Y and Glen B. Taksler 2003, "Equity volatility and corporate bond yields," *Journal of Finance* 58, 2321- 2349.

Chen, Lesmond and Wei, 2006, Corporate yield spreads and bond liquidity, *Journal of Finance,* forthcoming.

Collin-Dufresne, P., and R. Goldstein, 2001, Do credit spreads reflect stationary leverage ratios? *Journal of Finance* 56, 1929-1957.

Collin-Dufresne, P., R. Goldstein and J. S. Martin, 2001, The determinants of credit-spread changes, *Journal of Finance* 56, 2177-2207.

Elton, E. J., M. Gruber, D. Agrawal, and C. Mann, 2001, Explaining the rate spread on corporate bonds, *Journal of Finance* 56, 247-277.

Fama, E. and K. French, 1997, "Industry Costs of Equity," *Journal of Financial Economics*, 43, 153-193.

Fama, E., and K. French, 2002, Testing tradeoff and pecking order predictions about dividends and debt, *Review of Financial Studies* 15, 1-33.

Flannery, M., and K. Rangan, 2006, Partial adjustment and target capital structures, *Journal of Financial Economics*, 79(3), 2006, pp. 469–506.

Frank, M., and V, Goyal, 2003, Testing the pecking order theory of capital structure. *Journal of Financial Economics* 67, 217–248.

Graham, J., and C. Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60, 187–243.

Hankins, Kristin Watson, 2006, A theory of capital structure adjustment speed, University of Florida working paper.

Hovakimian, A., G. Hovakimian, and H. Tehranian, 2004, Determinants of target capital structure: The case of dual debt and equity issuers, *Journal of Financial Economics* 71, 517-540.

Hovakimian, A., T. Opler and S. Titman, 2001, The debt-equity choice, *Journal of Financial and Quantitative Analysis* 36, 1-24.

Krishnan, C.N.V, Peter Ritchken and James Thomson, 2005, Monitoring and Controlling Bank Risk: Does Risky Debt Help?, *Journal of Finance* 60, 343-377.

Leary, M. and M. Roberts, 2005, Do firms rebalance their capital structure?, *Journal of Finance* 60, 2575-2619.

Lemmon, M. and J. Zender, 2004, Debt Capacity and Tests of Capital Structure, Working paper, University of Utah.

Lemmon, M., M. Roberts, and J. Zender, Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure, working paper (February 2006).

Longstaff, F., S. Mithal, and E. Neis, forthcoming, Corporate yield spreads: Default risk or liquidity? New evidence from the credit-default swap market, *Journal of Finance*.

Merton, R., 1974, On the pricing of corporate debt: The risk structure of interest rates, *Journal of Finance* 29, 449–470.

Myers, Stewart C., 1984, The capital structure puzzle, *Journal of Finance* 39, 575-592.

Myers, S. and N. Majluf, 1984, Corporate investment and financing decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187–222.

Shyam-Sunder, L. and S. Myers, 1999, Testing static trade-off against pecking order models of capital structure, *Journal of Financial Economics 51, 219-244.*

Strebulaev, I., 2003, Do tests of capital structure theory mean what they say?, Working paper, Stanford University.

Welch, Ivo, 2004, Capital structure and stock returns, *Journal of Political Economy* 112, 106-131.

Table 1: Summary Statistics

Summary statistics are on our sample of 666 bonds issued by 266 unique industrial firms. The sample covers the period January 1986 – March 1998 (when the data source ceased publishing).

Variables	Definition	Mean	Std Dev	Median	Min	Max
Bond characteristics:		1.12	0.77	0.89	0.10	9.23
CS	Credit spread measured as the difference between the bond's yield and the yield on a Treasury with equal maturity (%)	-0.02	0.23	-0.01	-0.80	1.00
ΔCS	Change in credit spread between two consecutive quarter-ends	12.94	8.30	9.09	4.01	39.73
Maturity	Bond maturity in years	7.15	2.48	6.48	3.16	13.35
Duration	Bond duration in years	208,819	134,578	175,564	9,211	1,250,000
Issue Amount	Bond issue amount still outstanding in $thousands	7.24	2.59	7.00	1.00	18.00
Moody's Rating	Moody's credit rating on an ordinal scale with 1=Aaa	1.12	0.77	0.89	0.10	9.23
Leverage-related variables:						
LEV (market)	Book value of debt ([51]+[45]) / (Total assets [44] - Book value of equity[60] + Market value of equity [14*61])	0.24	0.12	0.22	0.00	0.74
ΔLEV (market)	Change in LEV	0.00	0.03	0.00	-0.10	0.11
LEV (book)	Book value of debt ([51]+[45]) / Total assets [44]	0.33	0.13	0.32	0.00	0.84
ΔLEV (book)	Change in BLEV	0.00	0.04	0.00	-0.11	0.13
FINDEFA	Financing deficit / Total assets [44]	0.01	0.05	0.00	-0.16	0.30
Variables used to predict target leverage:						
EBIT_TA	Earnings before interest and taxes ([8]+[22]+[6]) / Total assets [44]	0.02	0.02	0.02	-0.05	0.09
MB	Book value of debt plus market value of equity ([51]+[45]+[55]+[14]*[61]) / Book value of total assets [44]	1.19	0.56	1.06	0.14	3.75
DEP_TA	Depreciation [5] as a proportion of total assets [44]	0.01	0.01	0.01	0.00	0.03
lnTA	Log of total assets [44], measured in 1983 dollars	17.81	1.08	17.91	14.19	20.11
FA_TA	Property, plant, and equipment [42] / Total assets [44]	0.43	0.21	0.38	0.00	0.92
RD_TA	R&D expenses [4] / Total assets [44]	0.00	0.01	0.00	0.00	0.03
RD_DUM	An indicator variable equal to 1if a firm did not report R&D expenses and equal to 0 otherwise	0.40	0.49	0.00	0.00	1.00
RATED	An indicator variable equal to 1 if the firm has a public debt rating in Compustat and equal to 0 otherwise	0.99	0.12	1.00	0.00	1.00
IND_Median	Prior quarter's median leverage ratio for the firm's industry. Industries are defined according to Fama and French (1997).	0.21	0.06	0.21	0.04	0.46
MVE ($M)	Market value of equity	10,969	14,842	5,225	31	69,269
Macro variables measuring bond market conditions						
ΔR^{10}	Change in the spot rate measured as the 10-year Treasury yield	-0.04	0.53	-0.02	-1.89	1.36
ΔSLOPE	Change in the slope of the yield curve measured as the difference between the 10-year and 2-year Treasury yields	-0.05	0.27	-0.06	-0.85	0.68
S&P	Quarterly return on the S&P 500	3.68	5.28	3.89	-30.17	20.45
ΔVIX	Change in the implied volatility of the S&P 500 index	0.24	3.83	0.02	-25.86	44.96
ΔJUMP	Change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures	0.00	1.16	0.12	-5.89	6.78
ΔCRPREM	Change in the credit risk premium measured as the difference between the yields on Aaa and Baa rated bonds	-0.01	0.09	0.00	-0.33	0.32

*Winsorizing ΔVIX does not significantly alter any of our findings.

Table 2: Future Leverage Changes as Determinants of Credit-spread Changes

Panel A presents the results from an OLS estimation of the following model on the sample of 666 bonds over the 1986-1998 period:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \quad (11)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively. Panel B presents p-values for the t-tests which evaluate the hypothesis that firms with positive residuals from the OLS estimation above experience larger *k*-period-ahead increases in leverage than do firms with negative residuals. $\Delta LEV_{i,t+k}^{Neg}$ is the *k*-quarter-ahead change in leverage for firms with negative residuals and $\Delta LEV_{i,t+k}^{Pos}$ is the *k*-quarter-ahead change in leverage for firms with positive residuals. After a test of whether the leverage-change variances across the two residual groups are equal which rejects the null, we conduct the difference-in-means T-tests below assuming unequal variances. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

PANEL A. OLS estimation results	
$\Delta LEV_{i,t}$	0.868
	(0.079)***
ΔR^{10}	-0.111
	(0.004)***
$(\Delta R^{10})^2$	0.096
	(0.007)***
$\Delta SLOPE$	-0.115
	(0.008)***
ΔVIX	0.004
	(0.001)***
$S\&P$	-0.002
	(0.000)***
$\Delta JUMP$	0.025
	(0.002)***
$\Delta CRPREM$	0.310
	(0.021)***
Intercept	-0.043
	(0.003)***
Observations	11521
R^2	0.12
PANEL B. T-test results	
	P-values Assuming Unequal Variances
$\Delta LEV_{i,t+1}^{Neg} < \Delta LEV_{i,t+1}^{Pos}$	0.0020***
$\Delta LEV_{i,t+2}^{Neg} < \Delta LEV_{i,t+2}^{Pos}$	0.0006***
$\Delta LEV_{i,t+3}^{Neg} < \Delta LEV_{i,t+3}^{Pos}$	0.0001***
$\Delta LEV_{i,t+4}^{Neg} < \Delta LEV_{i,t+4}^{Pos}$	0.6731

Table 3: Estimation of Target Leverage

This is an estimation of the following model on the quarterly accounting data for the 266 bond issuers in our sample:

$$LEV_{i,t+1} = (\lambda \cdot \beta) \cdot X_{i,t} + (1-\lambda) \cdot LEV_{i,t} + \lambda \cdot F_i + \delta_{i,t+1} \quad (15)$$

LEV is a debt-to-assets ratio. *EBIT_TA* is earnings before interest and taxes scaled by total assets. *MB* is the ratio of market-to-book value of assets. *DEP_TA* is depreciation expense to total assets. *lnTA* is the natural log of total assets. *FA_TA* is the ratio of fixed-to-total assets. *R&D_DUM* is an indicator variable for whether the firm reports an R&D expenditure or not. *R&D_TA* is R&D expenditures scaled by total assets. *RATED* is an indicator for whether the firm has rated debt. *IND_MED* is the median leverage for each firm's industry. FE is a dynamic panel estimation of the model and uses instruments for the lagged independent variable. FE λ=1 is a panel estimation under the assumption of full adjustment towards target every period (i.e. λ=1). OLS λ=1 is an OLS estimation under the full-adjustment assumption. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	PANEL A. MARKET LEVERAGE			**PANEL B. BOOK LEVERAGE**		
	FE	**FE λ=1**	**OLS λ=1**	**FE**	**FE λ=1**	**OLS λ=1**
LEV $_{t-1}$	0.882			0.893		
	(0.004)***			(0.004)***		
EBIT_TA $_{t-1}$	-0.143	-0.818	-1.403	-0.127	-0.777	-1.276
	(0.017)***	(0.033)***	(0.053)***	(0.019)***	(0.038)***	(0.062)***
MB $_{t-1}$	-0.001	-0.045	-0.045	0.001	0.004	0.004
	(0.001)	(0.002)***	(0.002)***	(0.001)	(0.002)**	(0.002)**
DEP_TA $_{t-1}$	-0.153	-0.814	-0.017	-0.066	-0.498	0.379
	(0.060)**	(0.123)***	(0.170)	(0.068)	(0.139)***	(0.182)**
lnTA $_{t-1}$	0.000	0.018	0.000	-0.002	0.006	-0.003
	(0.001)	(0.001)***	(0.001)	(0.001)**	(0.001)***	(0.001)***
FA_TA $_{t-1}$	0.020	0.096	0.044	0.017	0.075	0.052
	(0.004)***	(0.008)***	(0.006)***	(0.004)***	(0.009)***	(0.006)***
R&D_DUM $_{t-1}$	0.002	0.002	0.027	-0.004	-0.024	0.003
	(0.002)	(0.004)	(0.003)***	(0.003)*	(0.005)***	(0.004)
R&D_TA $_{t-1}$	0.013	-0.387	-0.918	-0.283	-2.326	-3.436
	(0.137)	(0.280)	(0.235)***	(0.156)*	(0.319)***	(0.270)***
RATED $_{t-1}$	0.001	0.005	0.021	0.007	0.028	0.030
	(0.001)	(0.002)***	(0.002)***	(0.001)***	(0.002)***	(0.002)***
IND_MED $_{t-1}$	0.009	0.466	0.569	-0.007	0.408	0.681
	(0.005)*	(0.010)***	(0.013)***	(0.006)	(0.011)***	(0.015)***
Intercept	0.008	-0.135	0.139	0.050	0.068	0.137
	(0.011)	(0.022)***	(0.013)***	(0.012)***	(0.025)***	(0.015)***
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,078	20,078	20,078	20,262	20,262	20,262
R^2	0.92	0.30	0.34	0.92	0.25	0.27

Table 4: Tests of the Target-adjustment Theory

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (5)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. FE λ=1 uses target leverage based on the panel estimation of equation (14) under the assumption of full-adjustment towards target in every quarter. CONSTANT 1 YR uses the same leverage target for each quarter in a calendar year where this target is constructed as the average of the prior year's FE quarterly targets. OLS λ=1 uses target leverage based on the OLS estimation of equation (14) under the full-adjustment assumption. TRAIL 1 YR and TRAIL 3 YR use respectively the 1-year and 3-year trailing average of that firm's leverage as a measure of its leverage target. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	PANEL A. MARKET LEVERAGE					
	FE	**FE λ=1**	**OLS λ=1**	**CONSTANT 1 YR**	**TRAIL 1 YR**	**TRAIL 3 YR**
$\Delta LEV_{i,t}$	0.800	0.764	0.767	0.789	0.613	0.689
	(0.115)***	(0.120)***	(0.117)***	(0.115)***	(0.123)***	(0.115)***
$\Delta LEV^{*}_{i,t+1}$	0.168	0.229	0.181	1.130	0.941	2.223
	(0.098)*	(0.122)*	(0.080)**	(0.287)***	(0.236)***	(0.418)***
ΔR_t^{10}	-0.112	-0.112	-0.111	-0.113	-0.112	-0.110
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.100	0.099	0.099	0.099	0.099	0.099
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
$\Delta SLOPE_t$	-0.124	-0.124	-0.124	-0.125	-0.126	-0.131
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
ΔVIX_t	0.004	0.004	0.004	0.004	0.004	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P$	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**	(0.001)**
$\Delta JUMP$	0.025	0.025	0.025	0.026	0.025	0.026
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.304	0.305	0.304	0.302	0.308	0.310
	(0.029)***	(0.029)***	(0.029)***	(0.029)***	(0.028)***	(0.028)***
Intercept	-0.046	-0.047	-0.046	-0.046	-0.045	-0.046
	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,258	11,258	11,307	11307	11,521	11,521
R^2	0.12	0.12	0.12	0.12	0.13	0.13

Table 4: Tests of the Target-adjustment Theory (Cont.)

	PANEL B. BOOK LEVERAGE					
	FE	FE λ=1	OLS λ=1	CONSTANT 1 YR	TRAIL 1 YR	TRAIL 3 YR
$\Delta LEV_{i,t}$	0.339	0.269	0.265	0.323	0.243	0.250
	(0.091)***	(0.091)***	(0.091)***	(0.091)***	(0.095)**	(0.091)***
$\Delta LEV^*_{i,t+1}$	0.163	0.331	0.230	1.397	0.420	1.476
	(0.037)***	(0.130)**	(0.081)***	(0.320)***	(0.195)**	(0.384)***
ΔR_t^{10}	-0.113	-0.114	-0.114	-0.116	-0.114	-0.114
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.099	0.097	0.096	0.096	0.096	0.096
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
$\Delta SLOPE_t$	-0.116	-0.124	-0.123	-0.124	-0.124	-0.127
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
ΔVIX_t	0.004	0.004	0.004	0.004	0.004	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P$	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$\Delta JUMP$	0.026	0.025	0.025	0.026	0.025	0.025
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.274	0.306	0.306	0.307	0.308	0.312
	(0.030)***	(0.029)***	(0.029)***	(0.029)***	(0.029)***	(0.029)***
Intercept	-0.044	-0.044	-0.043	-0.044	-0.043	-0.045
	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,273	11,273	11,307	11320	11,552	11,552
R^2	0.12	0.12	0.12	0.12	0.12	0.12

Table 5: Estimation of Expected Financing Deficit

This is an estimation of the following model on the sample of 666 bonds from 1986 to 1998:

$$FINDEFA_{i,t+1} = \boldsymbol{\varphi}\mathbf{Y}_{\mathbf{i,t}} + \upsilon_{i,t+1} \quad (16)$$

FINDEFA is a measure of financing deficit scaled by total assets. **Y** is a vector of firm characteristics, which includes the following variables in addition to lags of *FINDEFA*. *EBIT_TA* is EBIT as a proportion of total assets. *IND_DUM* is an industry indicator variable based on the Fama-French 47 industry categorizations. PO_1-PO_4 are OLS estimations of the model. PO_5 is a panel estimation that includes firm fixed effects. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6
$FINDEFA_{i,t-1}$	0.581	0.586	0.594	0.596	0.552	0.509
	(0.014)***	(0.013)***	(0.013)***	(0.011)***	(0.012)***	(0.011)***
$FINDEFA_{i,t-2}$	-0.016	-0.020	-0.002			
	(0.013)	(0.013)	(0.011)			
$FINDEFA_{i,t-3}$	-0.025	0.029				
	(0.011)**	(0.010)***				
$FINDEFA_{i,t-4}$	0.089					
	(0.010)***					
$EBIT\_TA_{i,t-1}$	-0.086	-0.086	-0.082	-0.071	-0.027	-0.045
	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.023)	(0.020)**
IND_DUM_{t-1}	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	-0.007	-0.007	-0.008	-0.008	-0.008	-0.008
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Observations	19,304	19,629	19,958	20,288	20,288	19,950
R^2	0.38	0.38	0.39	0.39	0.32	0.38

Table 6: Tests of the Pecking-order Theory

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (9)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. PO_1-PO_4 are OLS estimations of the model. PO_5 is a panel estimation that includes firm fixed effects. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

PANEL A. MARKET LEVERAGE

	PO_1	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**
$\Delta LEV_{i,t}$	0.352	0.326	0.328	0.328	0.330	0.329
	(0.142)**	(0.142)**	(0.142)**	(0.142)**	(0.142)**	(0.142)**
$\mathbf{\Delta} E_t FINDEFA_{i,t+1}$	0.317	0.423	0.410	0.410	0.436	0.475
	(0.104)***	(0.107)***	(0.105)***	(0.105)***	(0.113)***	(0.122)***
ΔR_t^{10}	-0.117	-0.117	-0.117	-0.117	-0.117	-0.117
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.101	0.101	0.101	0.101	0.101	0.101
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
$\Delta SLOPE_t$	-0.131	-0.132	-0.131	-0.131	-0.131	-0.131
	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***
ΔVIX_t	0.004	0.004	0.004	0.004	0.004	0.004
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P_t$	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$\Delta JUMP_t$	0.027	0.027	0.027	0.027	0.027	0.027
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.324	0.324	0.323	0.323	0.324	0.324
	(0.032)***	(0.032)***	(0.032)***	(0.032)***	(0.032)***	(0.032)***
Intercept	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,521	11,521	11,521	11,521	11,521	11,521
R^2	0.11	0.11	0.11	0.11	0.11	0.11

Table 6: Tests of the Pecking-order Theory (Cont.)

	PANEL B. BOOK LEVERAGE					
	PO_1	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**
$\Delta LEV_{i,t}$	0.038	0.015	0.017	0.017	0.020	0.019
	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
$\Delta E_t FINDEFA_{i,t+1}$	0.425	0.529	0.515	0.515	0.548	0.597
	(0.103)***	(0.107)***	(0.105)***	(0.105)***	(0.113)***	(0.123)***
ΔR_t^{10}	-0.118	-0.118	-0.118	-0.118	-0.118	-0.118
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.099	0.100	0.100	0.100	0.100	0.100
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
$\Delta SLOPE_t$	-0.131	-0.131	-0.131	-0.131	-0.131	-0.131
	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***
ΔVIX_t	0.004	0.004	0.004	0.004	0.004	0.004
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P_t$	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$\Delta JUMP_t$	0.027	0.027	0.027	0.027	0.027	0.027
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.324	0.323	0.323	0.323	0.323	0.323
	(0.032)***	(0.032)***	(0.032)***	(0.032)***	(0.032)***	(0.032)***
Intercept	-0.042	-0.042	-0.042	-0.042	-0.042	-0.042
	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,552	11,552	11,552	11,552	11,552	11,552
R^2	0.10	0.11	0.11	0.11	0.11	0.11

Table 7: Joint Tests of Target-adjustment and Pecking-order Theories

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^*_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (17)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged dependent variable. FE λ=1 uses target leverage based on the panel estimation of equation (14) under the assumption of full-adjustment towards target in every quarter. OLS λ=1 uses target leverage based on the OLS estimation of equation (14) under the full-adjustment assumption. CONSTANT 1 YR uses the same leverage target for each quarter in a calendar year where this target is constructed as the average of the prior year's FE quarterly targets. TRAIL 1 YR and TRAIL 3 YR use respectively the 1-year and 3-year trailing average of that firm's leverage as a measure of its leverage target. Expected financing deficit is proxied by the fitted value from specification PO_6 above. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	PANEL A. MARKET LEVERAGE					
	FE	**FE λ=1**	**OLS λ=1**	**CONSTANT 1 YR**	**TRAIL 1 YR**	**TRAIL 3 YR**
$\Delta LEV_{i,t}$	0.662	0.294	0.297	0.702	0.108	0.212
	(0.181)***	(0.147)**	(0.145)**	(0.122)***	(0.150)	(0.142)
$\Delta LEV^*_{i,t+1}$	0.297	0.282	0.228	1.173	1.297	2.680
	(0.143)**	(0.141)**	(0.097)**	(0.286)***	(0.259)***	(0.458)***
$\mathbf{\Delta} E_t FINDEFA_{i,t+1}$	0.431	0.458	0.469	0.356	0.534	0.518
	(0.134)***	(0.123)***	(0.123)***	(0.111)***	(0.124)***	(0.123)***
ΔR_t^{10}	-0.126	-0.117	-0.116	-0.113	-0.117	-0.115
	(0.006)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.095	0.101	0.101	0.099	0.102	0.101
	(0.011)***	(0.008)***	(0.009)***	(0.007)***	(0.008)***	(0.008)***
$\Delta SLOPE_t$	-0.128	-0.131	-0.132	-0.126	-0.136	-0.141
	(0.012)***	(0.010)***	(0.010)***	(0.009)***	(0.010)***	(0.010)***
ΔVIX_t	0.004	0.004	0.004	0.004	0.005	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P_t$	-0.002	-0.002	-0.002	-0.001	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$\Delta JUMP$	0.031	0.027	0.027	0.026	0.027	0.028
	(0.003)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.332	0.313	0.318	0.301	0.323	0.326
	(0.035)***	(0.032)***	(0.032)***	(0.029)***	(0.032)***	(0.032)***
Intercept	-0.041	-0.044	-0.044	-0.045	-0.043	-0.044
	(0.005)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,258	11,258	11,307	11307	11,521	11,521
R^2	0.09	0.11	0.11	0.13	0.11	0.11

	PANEL B. BOOK LEVERAGE					
	FE	FE λ=1	OLS λ=1	CONSTANT 1 YR	TRAIL 1 YR	TRAIL 3 YR
$\Delta LEV_{i,t}$	0.224	0.171	0.167	0.213	0.111	0.129
	(0.098)**	(0.098)*	(0.098)*	(0.098)**	(0.103)	(0.099)
$\Delta LEV^{*}_{i,t+1}$	0.183	0.302	0.213	1.369	0.503	1.572
	(0.037)***	(0.131)**	(0.081)***	(0.318)***	(0.193)***	(0.384)***
$\Delta E_t FINDEFA_{i,t+1}$	0.503	0.446	0.445	0.474	0.494	0.491
	(0.113)***	(0.112)***	(0.112)***	(0.111)***	(0.112)***	(0.112)***
ΔR_t^{10}	-0.113	-0.114	-0.113	-0.116	-0.114	-0.113
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R_t^{10})^2$	0.099	0.097	0.096	0.096	0.096	0.096
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
$\Delta SLOPE_t$	-0.117	-0.125	-0.124	-0.125	-0.126	-0.129
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
ΔVIX_t	0.004	0.004	0.004	0.005	0.004	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$S\&P_t$	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
$\Delta JUMP_t$	0.026	0.025	0.025	0.026	0.025	0.025
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
$\Delta CRPREM_t$	0.268	0.305	0.305	0.305	0.307	0.311
	(0.029)***	(0.029)***	(0.029)***	(0.029)***	(0.029)***	(0.028)***
Intercept	-0.044	-0.044	-0.043	-0.044	-0.043	-0.045
	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
Observations	11,273	11,273	11,307	11320	11,552	11,552
R^2	0.12	0.12	0.12	0.12	0.12	0.12

Table 8: Separate and Joint Tests of Target-adjustment and Pecking-order Theories by Leverage

This is a panel estimation with bond fixed effects on the subsets of low, medium, and high-leverage firms. Low-leverage firms are defined as those having lagged market leverage of less than 0.25; medium-leverage firms have lagged market leverage in the 0.25-0.35 range; and high-leverage firms have lagged market leverage higher than 0.35. The estimation is of the following models:

TA model: $$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (5)$$

PO model: $$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (9)$$

Joint TA and PO model: $$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \Delta LEV^{*}_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (17)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. For ease of exposition we present results with target leverage estimated through the FE approach and expected financing deficit estimated through the PO_6 specification. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged dependent variable. $\mathbf{PO_6}$ is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	Panel A. TA model			Panel B. PO model			Panel C. Joint TA and PO model		
	Low	**Medium**	**High**	**Low**	**Medium**	**High**	**Low**	**Medium**	**High**
$\Delta LEV_{i,t}$	-0.019	1.101	1.243	0.003	0.943	1.107	-0.015	1.012	1.122
	(0.130)	(0.442)**	(0.292)***	(0.139)	(0.430)**	(0.283)***	(0.139)	(0.438)**	(0.289)***
$\Delta LEV^{*}_{i,t+1}$	0.249	0.577	-0.304				0.250	0.529	-0.328
	(0.086)***	(0.245)**	(0.516)				(0.086)***	(0.244)**	(0.519)
$\Delta E_t FINDEFA_{i,t+1}$				0.000	0.736	1.292	-0.017	0.748	1.324
				(0.116)	(0.308)**	(0.356)***	(0.110)	(0.312)**	(0.364)***
ΔR^{10}	-0.068	-0.157	-0.215	-0.068	-0.155	-0.205	-0.068	-0.157	-0.206
	(0.005)***	(0.014)***	(0.020)***	(0.005)***	(0.014)***	(0.020)***	(0.005)***	(0.014)***	(0.021)***
$(\Delta R^{10})^2$	0.084	0.112	0.158	0.084	0.107	0.152	0.084	0.111	0.153
	(0.008)***	(0.022)***	(0.026)***	(0.008)***	(0.021)***	(0.025)***	(0.008)***	(0.022)***	(0.027)***
$\Delta SLOPE$	-0.101	-0.169	-0.226	-0.104	-0.166	-0.221	-0.101	-0.173	-0.225
	(0.009)***	(0.025)***	(0.029)***	(0.010)***	(0.024)***	(0.028)***	(0.009)***	(0.025)***	(0.029)***
ΔVIX	0.004	0.002	0.010	0.004	0.002	0.009	0.004	0.003	0.010
	(0.001)***	(0.002)	(0.003)***	(0.001)***	(0.002)	(0.003)***	(0.001)***	(0.002)	(0.003)***
$S\&P$	-0.001	-0.004	-0.005	-0.001	-0.004	-0.005	-0.001	-0.004	-0.005
	(0.001)	(0.002)**	(0.002)**	(0.001)	(0.002)**	(0.002)**	(0.001)	(0.002)**	(0.002)*
$\Delta JUMP$	0.024	0.015	0.043	0.024	0.016	0.041	0.024	0.015	0.041
	(0.002)***	(0.005)***	(0.007)***	(0.002)***	(0.005)***	(0.007)***	(0.002)***	(0.005)***	(0.007)***
$\Delta CRPREM$	0.157	0.294	0.626	0.173	0.330	0.590	0.157	0.296	0.604
	(0.032)***	(0.068)***	(0.086)***	(0.033)***	(0.069)***	(0.086)***	(0.032)***	(0.068)***	(0.087)***
Intercept	-0.044	-0.044	-0.047	-0.043	-0.040	-0.042	-0.044	-0.042	-0.043
	(0.004)***	(0.011)***	(0.014)***	(0.004)***	(0.011)***	(0.014)***	(0.004)***	(0.011)***	(0.014)***
Observations	6,509	2,711	2,038	6,630	2,801	2,090	6509	2711	2038
R^2	0.09	0.11	0.17	0.09	0.11	0.18	0.09	0.12	0.18

Table 9: Separate and Joint Tests of Target-adjustment and Pecking-order Theories by Firm Size

This is a panel estimation with bond fixed effects on the subsets of small, medium, and large firms. Size terciles are based on each firm's market capitalization rank in each year quarter in our sample. The estimation is of the following models:

TA model: $$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^*_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (5)$$

PO model: $$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (9)$$

Joint TA and PO model: $$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^*_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (17)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. For ease of exposition we present results with target leverage estimated through the FE approach and expected financing deficit estimated through the PO_6 specification. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. $\mathbf{PO_6}$ is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	Panel A. TA model			Panel B. PO model			Panel C. Joint TA and PO model		
	Small	**Medium**	**Large**	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**
$\Delta LEV_{i,t}$	0.456	0.242	0.576	0.259	0.184	0.556	0.315	0.112	0.555
	(0.227)**	(0.325)	(0.102)***	(0.236)	(0.351)	(0.103)***	(0.242)	(0.354)	(0.103)***
$\Delta LEV^{*}_{i,t+1}$	-0.378	0.918	0.018				-0.414	0.911	-0.000
	(0.260)	(0.190)***	(0.091)				(0.261)	(0.189)***	(0.091)
$\Delta E_t FINDEFA_{i,t+1}$				0.673	0.441	0.216	0.693	0.417	0.224
				(0.251)***	(0.208)**	(0.112)*	(0.251)***	(0.208)**	(0.113)**
ΔR^{10}	-0.172	-0.115	-0.065	-0.170	-0.112	-0.066	-0.171	-0.114	-0.065
	(0.012)***	(0.009)***	(0.005)***	(0.012)***	(0.009)***	(0.005)***	(0.012)***	(0.009)***	(0.005)***
$(\Delta R^{10})^2$	0.153	0.073	0.068	0.156	0.068	0.068	0.154	0.071	0.068
	(0.021)***	(0.013)***	(0.008)***	(0.021)***	(0.013)***	(0.007)***	(0.021)***	(0.013)***	(0.008)***
$\Delta SLOPE$	-0.157	-0.145	-0.090	-0.159	-0.148	-0.090	-0.158	-0.146	-0.091
	(0.023)***	(0.015)***	(0.011)***	(0.023)***	(0.015)***	(0.011)***	(0.023)***	(0.015)***	(0.011)***
ΔVIX	0.003	0.006	0.005	0.003	0.006	0.005	0.003	0.006	0.005
	(0.002)*	(0.001)***	(0.001)***	(0.001)*	(0.001)***	(0.001)***	(0.002)*	(0.001)***	(0.001)***
$S\&P$	-0.005	-0.002	-0.001	-0.005	-0.002	-0.001	-0.005	-0.002	-0.001
	(0.001)***	(0.001)	(0.001)	(0.001)***	(0.001)	(0.001)	(0.001)***	(0.001)*	(0.001)
$\Delta JUMP$	0.031	0.030	0.016	0.032	0.029	0.016	0.032	0.029	0.016
	(0.005)***	(0.004)***	(0.002)***	(0.005)***	(0.004)***	(0.002)***	(0.005)***	(0.004)***	(0.002)***
$\Delta CRPREM$	0.439	0.294	0.067	0.457	0.299	0.065	0.436	0.295	0.068
	(0.065)***	(0.047)***	(0.035)*	(0.064)***	(0.048)***	(0.034)*	(0.064)***	(0.047)***	(0.034)**
Intercept	-0.050	-0.043	-0.040	-0.048	-0.042	-0.040	-0.048	-0.042	-0.040
	(0.010)***	(0.007)***	(0.005)***	(0.010)***	(0.007)***	(0.004)***	(0.010)***	(0.007)***	(0.005)***
Observations	3652	3811	3795	3745	3924	3852	3652	3811	3795
R^2	0.13	0.11	0.12	0.13	0.10	0.12	0.13	0.11	0.12

Table 10: Separate and Joint Tests of Target-adjustment and Pecking-order Theories by Bond Maturity

This is a panel estimation with bond fixed effects on the subsets of short, medium, and long-term bonds. Short-term bonds are defined as those having remaining maturity of less than 9 years; medium-term bonds have remaining maturity in the 9-12 year range; and long-term bonds have remaining maturity longer than 12 years. The estimation is of the following models:

TA model: $\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t}$ (5)

PO model: $\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t}$ (9)

Joint TA and PO model: $\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^{*}_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t}$ (17)

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. For ease of exposition we present results with target leverage estimated through the FE approach and expected financing deficit estimated through the PO_6 specification. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. $PO_{\mathbf{6}}$ is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	Panel A. TA model			Panel B. PO model			Panel C. Joint TA and PO model		
	Short	**Medium**	**Long**	**Short**	**Medium**	**Long**	**Short**	**Medium**	**Long**
$\Delta LEV_{i,t}$	0.844	0.762	0.723	0.313	1.012	0.139	0.330	1.005	0.113
	(0.168)***	(0.320)**	(0.191)***	(0.181)*	(0.522)*	(0.223)	(0.184)*	(0.523)*	(0.225)
$\Delta LEV^{*}_{i,t+1}$	-0.082	0.124	0.520				-0.129	0.178	0.559
	(0.143)	(0.254)	(0.151)***				(0.172)	(0.298)	(0.170)***
$\Delta E_t FINDEFA_{i,t+1}$				0.122	0.484	1.028	0.120	0.481	0.998
				(0.186)	(0.342)	(0.189)***	(0.185)	(0.342)	(0.191)***
ΔR^{10}	-0.099	-0.109	-0.125	-0.103	-0.109	-0.132	-0.104	-0.109	-0.131
	(0.007)***	(0.013)***	(0.007)***	(0.008)***	(0.014)***	(0.007)***	(0.008)***	(0.014)***	(0.008)***
$(\Delta R^{10})^2$	0.117	0.130	0.063	0.120	0.144	0.061	0.119	0.145	0.064
	(0.011)***	(0.020)***	(0.012)***	(0.013)***	(0.021)***	(0.012)***	(0.013)***	(0.022)***	(0.013)***
$\Delta SLOPE$	-0.140	-0.243	-0.093	-0.145	-0.253	-0.103	-0.144	-0.255	-0.104
	(0.014)***	(0.026)***	(0.013)***	(0.017)***	(0.026)***	(0.013)***	(0.017)***	(0.027)***	(0.013)***
ΔVIX	0.005	0.010	0.004	0.004	0.010	0.004	0.004	0.010	0.004
	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***	(0.001)***	(0.001)***	(0.002)***	(0.001)***
$S\&P$	-0.001	0.003	-0.002	-0.002	0.003	-0.003	-0.002	0.004	-0.003
	(0.001)	(0.002)*	(0.001)**	(0.001)**	(0.002)*	(0.001)***	(0.001)**	(0.002)*	(0.001)***
$\Delta JUMP$	0.027	0.037	0.020	0.030	0.038	0.020	0.029	0.040	0.021
	(0.003)***	(0.006)***	(0.003)***	(0.003)***	(0.006)***	(0.003)***	(0.003)***	(0.006)***	(0.003)***
$\Delta CRPREM$	0.311	0.438	0.236	0.331	0.464	0.256	0.301	0.467	0.254
	(0.045)***	(0.068)***	(0.046)***	(0.052)***	(0.077)***	(0.049)***	(0.051)***	(0.077)***	(0.049)***
Intercept	-0.060	-0.053	-0.032	-0.056	-0.056	-0.026	-0.056	-0.056	-0.028
	(0.006)***	(0.009)***	(0.006)***	(0.008)***	(0.010)***	(0.006)***	(0.008)***	(0.011)***	(0.006)***
Observations	5521	1501	4236	5645	1520	4356	5521	1501	4236
R^2	0.12	0.22	0.12	0.10	0.19	0.12	0.10	0.19	0.12

Table 11: Separate and Joint Tests of Target-adjustment and Pecking-order Theories by Credit Rating

This is a panel estimation with bond fixed effects on the subsets of investment-grade and junk bonds. To classify bonds into investment-grade and junk we use Moody's credit rating whenever available, and S&P credit rating whenever the Moody's rating is missing. The estimation is of the following models:

TA model: $$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (5)$$

PO model: $$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta E}_t FINDEFA_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (9)$$

Joint TA and PO model:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta E}_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^{*}_{i,t+1} + \boldsymbol{\theta} \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (17)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. For ease of exposition we present results with target leverage estimated through the FE approach and expected financing deficit estimated through the PO_6 specification. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. $\mathbf{PO_6}$ is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	Panel A. TA model		**Panel B. PO model**		**Panel C. Joint TA and PO model**	
	Low	**High**	**Low**	**High**	**Low**	**High**
$\Delta LEV_{i,t}$	0.549	1.700	0.484	1.797	0.481	1.831
	(0.097)***	(0.478)***	(0.101)***	(0.524)***	(0.102)***	(0.518)***
$\Delta LEV^{*}_{i,t+1}$	0.194	-0.021			0.178	0.012
	(0.083)**	(0.609)			(0.083)**	(0.616)
$\mathbf{\Delta E}_t FINDEFA_{i,t+1}$			0.333	-0.332	0.318	-0.354
			(0.094)***	(0.426)	(0.095)***	(0.438)
ΔR^{10}	-0.093	-0.263	-0.094	-0.262	-0.094	-0.265
	(0.004)***	(0.029)***	(0.004)***	(0.029)***	(0.004)***	(0.029)***
$(\Delta R^{10})^2$	0.090	0.252	0.088	0.246	0.089	0.252
	(0.006)***	(0.050)***	(0.006)***	(0.050)***	(0.006)***	(0.050)***
$\Delta SLOPE$	-0.110	-0.340	-0.111	-0.330	-0.111	-0.341
	(0.008)***	(0.062)***	(0.008)***	(0.062)***	(0.008)***	(0.062)***
ΔVIX	0.006	-0.005	0.006	-0.006	0.006	-0.005
	(0.001)***	(0.004)	(0.001)***	(0.004)	(0.001)***	(0.004)
$S\&P$	0.000	-0.011	-0.000	-0.012	-0.000	-0.011
	(0.000)	(0.003)***	(0.000)	(0.004)***	(0.000)	(0.003)***
$\Delta JUMP$	0.024	0.046	0.024	0.045	0.024	0.046
	(0.002)***	(0.011)***	(0.002)***	(0.011)***	(0.002)***	(0.011)***
$\Delta CRPREM$	0.321	0.300	0.326	0.278	0.321	0.296
	(0.028)***	(0.184)	(0.028)***	(0.181)	(0.028)***	(0.185)
Intercept	-0.043	-0.112	-0.041	-0.104	-0.042	-0.113
	(0.003)***	(0.026)***	(0.003)***	(0.027)***	(0.003)***	(0.026)***
Observations	10174	1084	10430	1091	10174	1084
R^2	0.15	0.16	0.15	0.15	0.15	0.16

Table 12: Testing Expected versus Unexpected Changes in Leverage

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = \alpha_1 \Delta LEV_{i,t}^{EXP} + \alpha_2 \Delta LEV_{i,t}^{UNEXP} + \alpha_3 \Delta LEV_{i,t+1}^{EXP} + \theta \cdot \mathbf{\Delta Z_{i,t}} + \varepsilon_{i,t} \quad (18)$$

Under the target-adjustment (TA) theory:

$$\Delta LEV_{i,t}^{EXP} = LEV_{i,t}^{*} - LEV_{i,t-1}, \quad (19)$$

Under the pecking-order (PO) theory:

$$\Delta LEV_{i,t}^{EXP} = FINDEFA_{i,t} \quad (21)$$

And: $\Delta LEV_{i,t}^{UNEXP} = \Delta LEV_{i,t} - \Delta LEV_{i,t}^{EXP}$ (20)

Below-target, above-target, deficit and surplus groups are formed in the prior quarter. ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. For ease of exposition we present results with target leverage estimated through the FE approach and expected financing deficit estimated through the PO_6 specification. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively. Reported p-values are for the null hypothesis that the coefficient on $\Delta LEV_{i,t}^{UNEXP}$ is smaller than that on $\Delta LEV_{i,t}^{EXP}$.

	TA	TA Above	TA Below	PO	PO Deficit	PO Surplus
$\Delta LEV_{i,t}^{EXP}$	0.384	0.663	0.114	0.303	0.211	-0.214
	(0.126)***	(0.225)***	(0.158)	(0.177)*	(0.227)	(0.389)
$\Delta LEV_{i,t}^{UNEXP}$	0.695	1.063	0.478	0.315	0.280	0.278
	(0.153)***	(0.242)***	(0.209)**	(0.118)***	(0.145)*	(0.185)
$\Delta LEV_{i,t+1}^{EXP,}$	0.231	0.121	0.538	0.595	0.773	0.166
	(0.105)**	(0.156)	(0.158)***	(0.117)***	(0.146)***	(0.224)
ΔR^{10}	-0.107	-0.124	-0.082	-0.112	-0.117	-0.102
	(0.005)***	(0.007)***	(0.006)***	(0.005)***	(0.006)***	(0.008)***
$(\Delta R^{10})^2$	0.092	0.104	0.073	0.097	0.108	0.074
	(0.007)***	(0.011)***	(0.011)***	(0.007)***	(0.009)***	(0.012)***
ΔSLOPE	-0.113	-0.130	-0.104	-0.128	-0.124	-0.134
	(0.009)***	(0.012)***	(0.013)***	(0.009)***	(0.011)***	(0.016)***
ΔVIX	0.005	0.004	0.006	0.005	0.005	0.006
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
S&P	-0.001	-0.001	-0.002	-0.002	-0.001	-0.003
	(0.001)***	(0.001)	(0.001)**	(0.001)***	(0.001)	(0.001)***
ΔJUMP	0.024	0.026	0.021	0.025	0.031	0.014
	(0.002)***	(0.003)***	(0.003)***	(0.002)***	(0.003)***	(0.003)***
ΔCRPREM	0.302	0.399	0.137	0.310	0.311	0.244
	(0.030)***	(0.040)***	(0.045)***	(0.028)***	(0.036)***	(0.044)***
Intercept	-0.046	-0.070	-0.037	-0.048	-0.055	-0.056
	(0.005)***	(0.013)***	(0.005)***	(0.004)***	(0.005)***	(0.010)***
Observations	11,258	5,854	4,890	11,521	7,847	3,674
R^2	0.12	0.14	0.10	0.12	0.13	0.11
H_0: $\Delta LEV_{i,t}^{UNEXP} < \Delta LEV_{i,t}^{EXP}$	0.001***	0.013***	0.019***	0.456	0.320	0.046***

Table 13: Tests of the Target Adjustment Theory with Credit-Rating Considerations

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = [\alpha + \gamma(1-\hat{\lambda})] \cdot \Delta LEV_{i,t} + [\gamma\hat{\lambda}] \cdot \Delta LEV^{*}_{i,t+1} + \kappa \cdot CRPOM + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \quad (22)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. CRPOM= 1 if the bond's credit rating is plus or minus; 0 otherwise. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. FE λ=1 uses target leverage based on the panel estimation of equation (14) under the assumption of full-adjustment towards target in every quarter. OLS λ=1 uses target leverage based on the OLS estimation of equation (14) under the full-adjustment assumption. CONSTANT 1 YR uses the same leverage target for each quarter in a calendar year where this target is constructed as the average of the prior year's FE quarterly targets. TRAIL 1 YR and TRAIL 3 YR use respectively the 1-year and 3-year trailing average of that firm's leverage as a measure of its leverage target. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	FE	**FE λ=1**	**OLS λ=1**	**CONSTANT 1 YR**	**TRAIL 1 YR**	**TRAIL 3 YR**
$\Delta LEV_{i,t}$	0.725	0.760	0.762	0.781	0.611	0.687
	(0.175)***	(0.119)***	(0.117)***	(0.115)***	(0.122)***	(0.115)***
$\Delta LEV^{*}_{i,t+1}$	0.307	0.212	0.171	1.258	0.909	2.106
	(0.144)**	(0.121)*	(0.080)**	(0.274)***	(0.236)***	(0.419)***
CRPOM	-0.026	-0.032	-0.030	-0.032	-0.028	-0.025
	(0.012)**	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
ΔR^{10}	-0.126	-0.112	-0.111	-0.113	-0.112	-0.111
	(0.006)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R^{10})^2$	0.095	0.099	0.098	0.098	0.099	0.098
	(0.011)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
ΔSLOPE	-0.128	-0.125	-0.125	-0.132	-0.127	-0.132
	(0.012)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
ΔVIX	0.004	0.004	0.004	0.004	0.004	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
S&P	-0.002	-0.001	-0.001	-0.002	-0.001	-0.001
	(0.001)***	(0.001)**	(0.001)**	(0.001)***	(0.001)***	(0.001)**
ΔJUMP	0.031	0.025	0.025	0.025	0.025	0.026
	(0.003)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
ΔCRPREM	0.334	0.305	0.304	0.304	0.308	0.310
	(0.035)***	(0.029)***	(0.029)***	(0.029)***	(0.028)***	(0.028)***
Intercept	-0.025	-0.025	-0.026	-0.024	-0.027	-0.030
	(0.009)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***
Observations	11,244	11,244	11,292	11244	11,506	11,506
R^2	0.09	0.13	0.12	0.13	0.13	0.13

Table 14: Tests of the Pecking-order Theory with Credit Rating Considerations

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = (\alpha + \gamma) \cdot \Delta LEV_{i,t} + \gamma \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \kappa \cdot CRPOM + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \quad (23)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. CRPOM= 1 if the bond's credit rating is plus or minus; 0 otherwise. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. PO_1-PO_4 are OLS estimations of the model. PO_5 is a panel estimation that includes firm fixed effects. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6
$\Delta LEV_{i,t}$	0.727	0.708	0.708	0.708	0.710	0.709
	(0.120)***	(0.120)***	(0.121)***	(0.121)***	(0.121)***	(0.121)***
$\mathbf{\Delta} E_t FINDEFA_{i,t+1}$	0.222	0.289	0.284	0.284	0.302	0.329
	(0.094)**	(0.095)***	(0.093)***	(0.093)***	(0.101)***	(0.109)***
CRPOM	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
ΔR^{10}	-0.112	-0.112	-0.112	-0.112	-0.112	-0.112
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R^{10})^2$	0.098	0.098	0.098	0.098	0.098	0.098
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
ΔSLOPE	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
ΔVIX	0.004	0.004	0.004	0.004	0.004	0.004
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
S&P	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
ΔJUMP	0.025	0.025	0.025	0.025	0.025	0.025
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
ΔCRPREM	0.309	0.308	0.308	0.308	0.308	0.308
	(0.029)***	(0.028)***	(0.028)***	(0.028)***	(0.028)***	(0.028)***
Intercept	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***
Observations	11,506	11,506	11,506	11,506	11,506	11,506
R^2	0.13	0.13	0.13	0.13	0.13	0.13

Table 15: Joint Tests of Target-adjustment and Pecking-order Theories with Credit Rating Considerations

This is a panel estimation with bond fixed effects of the following model on the sample of 666 bonds from 1986 to 1998:

$$\Delta CS_{i,t} = \alpha \cdot \Delta LEV_{i,t} + \gamma' \cdot \mathbf{\Delta} E_t FINDEFA_{i,t+1} + \gamma'' \cdot \mathbf{\Delta} LEV^*_{i,t+1} + \kappa \cdot CRPOM + \theta \cdot \Delta Z_{i,t} + \varepsilon_{i,t} \quad (24)$$

ΔCS=change in bond credit spreads. ΔLEV=change in debt-to-assets ratio. ΔLEV*=change in target debt-to-assets ratio. ΔE FINDEFA=change in expected financing deficit scaled by total assets. CRPOM= 1 for plus/minus credit ratings; 0 otherwise. ΔZ includes the following structural-model motivated variables: ΔR=change in the spot rate measured by the 10-year Treasury yield. ΔSLOPE=change in the slope of the yield curve measured as the difference between 10-year and 2-year Treasury yields. ΔVIX=change in the implied volatility on the S&P 500 index. S&P=quarterly S&P 500 return. ΔJUMP=change in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. ΔCRPREM=change in the spread between the yield on Aaa and Baa-rated bonds. Changes are measured over consecutive quarters. FE uses target leverage measures obtained through a dynamic panel estimation of equation (14) and the use of instruments for the lagged independent variable. FE λ=1 uses target leverage based on the panel estimation of equation (14) under the assumption of full-adjustment towards target in every quarter. OLS λ=1 uses target leverage based on the OLS estimation of equation (14) under the full-adjustment assumption. CONSTANT 1 YR uses the same leverage target for each quarter in a calendar year where this target is constructed as the average of the prior year's FE quarterly targets. TRAIL 1 YR and TRAIL 3 YR use respectively the 1-year and 3-year trailing average of that firm's leverage as a measure of its leverage target. Expected financing deficit is proxied by the fitted value from PO_6 above. PO_6 is a dynamic panel estimation with firm fixed effects and instruments for the lagged independent variable. Standard errors are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and * respectively.

	FE	**FE λ=1**	**OLS λ=1**	**CONSTANT 1 YR**	**TRAIL 1 YR**	**TRAIL 3 YR**
$\Delta LEV_{i,t}$	0.633	0.282	0.284	0.215	0.100	0.204
	(0.180)***	(0.147)*	(0.145)*	(0.097)**	(0.149)	(0.141)
$\Delta LEV^*_{i,t+1}$	0.289	0.265	0.220	1.375	1.266	2.551
	(0.144)**	(0.141)*	(0.097)**	(0.314)***	(0.260)***	(0.461)***
$\mathbf{\Delta} E_t FINDEFA_{i,t+1}$	0.419	0.432	0.445	-0.030	0.499	0.483
	(0.121)***	(0.111)***	(0.113)***	(0.008)***	(0.113)***	(0.113)***
CRPOM	-0.026	-0.036	-0.035	0.425	-0.033	-0.029
	(0.012)**	(0.009)***	(0.009)***	(0.102)***	(0.009)***	(0.009)***
ΔR^{10}	-0.126	-0.117	-0.117	-0.116	-0.118	-0.116
	(0.006)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
$(\Delta R^{10})^2$	0.095	0.101	0.101	0.096	0.102	0.101
	(0.011)***	(0.008)***	(0.009)***	(0.007)***	(0.008)***	(0.008)***
ΔSLOPE	-0.129	-0.133	-0.134	-0.127	-0.137	-0.142
	(0.012)***	(0.010)***	(0.010)***	(0.009)***	(0.010)***	(0.010)***
ΔVIX	0.004	0.004	0.004	0.004	0.005	0.005
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
S&P	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
ΔJUMP	0.031	0.027	0.027	0.026	0.027	0.027
	(0.003)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
ΔCRPREM	0.334	0.315	0.320	0.307	0.325	0.328
	(0.035)***	(0.032)***	(0.032)***	(0.029)***	(0.032)***	(0.032)***
Intercept	-0.024	-0.020	-0.021	-0.024	-0.021	-0.025
	(0.009)***	(0.008)***	(0.007)***	(0.006)***	(0.007)***	(0.007)***
Observations	11,244	11,244	11,292	11304	11,506	11,506
R^2	0.09	0.11	0.11	0.12	0.11	0.11