Capital Structure and Stock Returns

Ivo Welch

Yale University and National Bureau of Economic Research

U.S. corporations do not issue and repurchase debt and equity to counteract the mechanistic effects of stock returns on their debt-equity ratios. Thus over one- to five-year horizons, stock returns can explain about 40 percent of debt ratio dynamics. Although corporate net issuing activity is lively and although it can explain 60 percent of debt ratio dynamics (long-term debt issuing activity being most capital structure–relevant), corporate issuing motives remain largely a mystery. When stock returns are accounted for, many other proxies used in the literature play a much lesser role in explaining capital structure.

I. Introduction

This paper shows that U.S. corporations do little to counteract the influence of stock price changes on their capital structures. As a consequence, their debt-equity ratios vary closely with fluctuations in their own stock prices. The stock price effects are often large and last a long time, at least several years.

This paper decomposes capital structure changes into effects caused by corporate issuing net of retirement activity (henceforth, called "net issuing" or just "issuing") and into effects caused by stock returns. While all stock return–caused equity growth can explain about 40 percent of capital structure dynamics, all corporate issuing activity together can explain about 60–70 percent. Long-term debt issuing is the most capital

An earlier draft was titled "Columbus Egg." I thank Judy Chevalier, Eugene Fama, Ken French, William Goetzmann, John Graham, David Hirshleifer, Gerard Hoberg, Steve Kaplan, Florencio Lopez-De-Silanes, Vojislav Maksimovic, Roni Michaely, Gordon Philips, Jay Ritter, Mike Stutzer, Sheridan Titman, and many seminar participants for comments. I am particularly grateful to John Cochrane, the editor. Gerard Hoberg provided terrific research assistance.

[*Journal of Political Economy*, 2004, vol. 112, no. 1, pt. 1]
© 2004 by The University of Chicago. All rights reserved. 0022-3808/2004/11201-0008$10.00

structure–relevant corporate activity, explaining about 30 percent of the variation in corporate debt ratio changes.

However, the corporate issuing motives themselves remain largely a mystery. Issuing activities are *not* used to counterbalance stock return–induced equity value changes. The better-known proxy variables used in the literature—such as tax costs, expected bankruptcy costs, earnings, profitability, market-book ratios, uniqueness, market timing, or the exploitation of undervaluation—also fail to explain much of capital structure dynamics when stock value mechanics are accounted for. In previous work, these proxies passively correlated with debt ratios primarily *indirectly*, because they correlated with omitted stock return–caused dynamics. Put differently, these proxies have not so much induced managers to *actively engage* in altering their capital structures as much as they have allowed firms to *experience* different equity values and therefore different capital structures. The proactive managerial component in capital structure remains largely unexplained.

The paper concludes that over reasonably long time frames, the stock price effects are considerably more important in explaining debt-equity ratios than previously identified proxies. Stock returns are the primary known component of capital structure and capital structure changes.

II. Capital Structure Ratios

My paper investigates whether actual debt ratios by and large behave as though firms readjust to their previous debt ratios (targeting a largely static target) or whether they permit their debt ratios to fluctuate with stock prices. The basic specification estimates are

$$\text{ADR}_{t+k} = \alpha_0 + \alpha_1 \cdot \text{ADR}_t + \alpha_2 \cdot \text{IDR}_{t,t+k} + \epsilon_t. \tag{1}$$

The term ADR is the actual corporate debt ratio, defined as the book value of debt (D) divided by the book value of debt plus the market value of equity (E),

$$\text{ADR}_t \equiv \frac{D_t}{E_t + D_t}, \tag{2}$$

and it has been the dependent variable in many capital structure papers. Also, ADR is a component of the weighted average cost of capital (WACC). The term IDR is the implied debt ratio that comes about if the corporation issues (net) neither debt nor equity,

$$\text{IDR}_{t,t+k} \equiv \frac{D_t}{E_t \cdot (1 + x_{t,t+k}) + D_t}, \tag{3}$$

where x is the stock return net of dividends. (Whether dividends are included matters little in this study.)

The *stark* hypotheses are

$$\text{perfect readjustment hypothesis: } \alpha_1 = 1,\ \alpha_2 = 0,$$

$$\text{perfect nonreadjustment hypothesis: } \alpha_1 = 0,\ \alpha_2 = 1. \tag{4}$$

Firms could also adopt convex combination strategies, more appropriate than these two "straw man" extremes, and different firms could behave differently. If included, the intercept α_0 can capture a constant target debt ratio. The empirical specifications are primarily cross-sectional.

The dynamics of capital structure that underlie specification (1) can be expressed as follows. The amount of debt changes with new debt issues, debt retirements, coupon payments, and debt value changes. Corporate debt evolves as

$$D_{t+k} \equiv D_t + \text{TDNI}_{t,t+k}, \tag{5}$$

where TDNI is the total debt net issuing activity. Equivalently, the amount of corporate equity changes with stock returns (net of dividends) and new equity issues net of equity repurchases. Corporate equity evolves as

$$E_{t+k} \equiv E_t \cdot (1 + x_{t,t+k}) + \text{ENI}_{t,t+k}, \tag{6}$$

where ENI is net equity issuing and stock repurchasing activity. With these definitions, debt ratios evolve as

$$\begin{aligned} \text{ADR}_{t+k} &= \frac{D_{t+k}}{E_{t+k} + D_{t+k}} \\ &= \frac{D_t + \text{TDNI}_{t,t+k}}{D_t + \text{TDNI}_{t,t+k} + E_t \cdot (1 + x_{t,t+k}) + \text{ENI}_{t,t+k}}. \end{aligned} \tag{7}$$

Mathematically, if the corporation issues debt and equity so that

$$\frac{\text{ENI}_{t,t+k}}{E_t} = \frac{\text{TDNI}_{t,t+k}}{D_t} - x_{t,t+k}, \tag{8}$$

then ADR remains perfectly constant across periods ($\text{ADR}_{t+k} = \text{ADR}_t \Rightarrow \alpha_1 = 1, \alpha_2 = 0$). In contrast, if the corporation issues debt and equity so that

$$\frac{\text{ENI}_{t,t+k}}{E_t} = \frac{\text{TDNI}_{t,t+k}}{D_t} + x_{t,t+k} \cdot \frac{\text{TDNI}_{t,t+k}}{D_t}, \tag{9}$$

then IDR perfectly predicts debt ratios ($\text{IDR}_{t,t+k} = \text{ADR}_t \Rightarrow \alpha_1 = 0, \alpha_2 = 1$). Unfortunately, equations (8) and (9) are unsuitable for direct cross-sectional estimation because many firms have zero or tiny debt levels.

III. Data

My data set begins with all publicly traded U.S. corporations from the period 1962–2000 from the annual Compustat and Center for Research in Security Prices (CRSP) files. The paper predicts debt ratios for all firm-years that have an *initial* equity market capitalization of at least the Standard & Poor's 500 level divided by 10 (*in year* t, *not* t + k!). So, in 1964, the first year for which I predict debt ratios, the S&P500 stood at 75, and therefore the minimum market capitalization is $75 million; in 2000, it is $1.47 billion. Nevertheless, the number of sample firms grows from 412 in 1964 to 2,679 in 2000. In total, 60,317 firm-years qualify, but only 54,211 firm-years have data in two consecutive years, and only 40,080 firm-years have data over five years. The results are robust when the firm size filter is varied or even eliminated.

The term D is the Compustat book value of debt, E is the CRSP market value of equity, and x is the CRSP percentage price change in the market value of equity and differs slightly from r (the stock rate of return) because of dividends. In tables 1, 2, and 4, TDNI and ENI are computed from D and E dynamics, respectively. All issuing activity in this paper is "net": there are no data to separate issuing from retiring activity. More detailed data definitions are in Appendix table A1 and method descriptions are in Appendix B.

Table 1 shows that the average sample firm is about $3.3 billion in market value and $4.6 billion in book value, both in 2000 (consumer price index [CPI]) dollars. However, the median firm is worth only about $550–$580 million. The debt ratio, the dependent variable, has a mean of about 30 percent of firm value and a median of about 25 percent.

A quick measure of the relative importance of the dynamic components of debt ratios can be gleaned from summary statistics for the components of debt ratios, normalized by firm size, $E_t + D_t$, in the month in which issues occur. Over 40 years, corporations in the sample experience average stock returns of 8.8 percent (11.2 percent unwinsorized), of which they pay out 1.6 percent in dividends. Therefore, they experience 7.0 percent (9.4 percent unwinsorized) in stock price–induced capitalization change. On average, firms also issue 3.7 percent in net debt and 2.4 percent in net equity. (All medians are below their respective means.)

My paper investigates debt ratio dynamics primarily in cross section. Dividends show little cross-sectional dispersion (1.6 percent), which is why subsequent results are indifferent to running tests with stock returns (r) or capital gains (x). Stock-induced equity growth heterogeneity (28.5

TABLE 1
SELECTED DESCRIPTIVE STATISTICS

Abbreviation	Description	One-Year Mean	One-Year Median	One-Year Standard Deviation	Five-Year Mean	Five-Year Median	Five-Year Standard Deviation
ADR_t	Actual debt ratio	29.8	24.9	25.3			
$IDR_{t,t+k}$	Implied debt ratio	28.3	22.5	25.0	25.0	23.8	17.7
$E_t + D_t$	Market value (in $ millions [2000])	$3,294	$552	$14,179			
$Assets_t$	Total accounting assets (in $ millions [2000])	$4,645	$583	$21,259			
	Normalized by Market Value ($D+E$) and Winsorized (%)						
$TDNI_{t,t+1}$	Net debt issuing	3.7	.6	9.8	27.4	12.2	45.0
$ENI_{t,t+1}$	Net equity issuing before dividends	2.4	.2	6.2	21.0	5.0	41.1
$TDNI_{t,t+1} + ENI_{t,t+1}$	Debt and equity issuing	6.6	2.4	13.7	50.9	23.4	77.7
$DIV_{t,t+1} = (r_{t,t+1} - x_{t,t+1}) \cdot E_t$	Dividends	1.6	1.2	1.6	11.9	10.7	10.2
$ENI_{t,t+1} - DIV_{t,t+1}$	Activist equity expansion	.7	−.7	6.6	8.3	−4.3	43.6
$TDNI_{t,t+1} + ENI_{t,t+1} - DIV_{t,t+1}$	Activist total expansion	4.8	.9	14.0	38.1	10.9	78.8
$r_{t,t+1} \cdot E_t$	Total dollar return	8.8	5.5	28.8	80.8	46.3	112.4
$x_{t,t+1} \cdot E_t$	Induced equity growth	7.0	3.5	28.5	67.6	31.3	110.3

NOTE.—The sample is all reasonably large publicly traded firms, with a minimum market capitalization of $75 million in the first year of the sample (1964), increasing to $1.47 billion in the last year of the sample (2000). There were 60,317 firm-years in the one-year panel and 40,080 firm-years in the five-year panel. The firm size normalization is relative to the issue month and uses the book value for debt. The normalized series are then winsorized at the fifth and ninety-fifth percentiles.

percent) is larger than managerial activity–induced heterogeneity (14.0 percent). However, contrary to a common academic perception that issuing activity is rare, firms in the sample are not averse to issuing activity. In both means and standard deviations, corporate net issuing activity is about half as large as stock market–induced equity value changes. (And issuing activity is necessarily larger than *net* issuing activity!) In principle, issuing activity may be large enough to counteract a good part of the capital structure effects of stock returns.

Before I estimate the full nonlinear influence of stock returns, a simple classification can show the significance of stock returns. All firms are first sorted by year and then by sales and, within each consecutive set of 10 (similarly sized) firms, allocated into 10 bins on the basis of their S&P net stock return performance. This procedure keeps a roughly equal number of firms in each decile and maximizes the spread in stock returns across decile, holding calendar year and firm size constant. The sort itself does not use any historical capital structure information. The headings in table 2 show the median net stock returns of each decile.

The first five data rows report corporate activity, and the sixth row reports equity growth, again all normalized by firm size in the month of activity. Over one year, firms respond to poor performance with more debt issuing activity and to good performance with more equity issuing activity. This hints that firms do not immediately readjust: firms whose debt ratios increase (decrease) because of poor (good) stock return performance seem to use their issuing activities not to readjust but to amplify the stock return changes (see also Baker and Wurgler 2002). However, over both one-year and five-year horizons, the relationship is not strong. The fourth row shows that the relationship between stock returns and "activist equity expansion" is more U-shaped when dividends are considered.

The fifth row explores whether firms deliberately expand or contract in response to stock price performance. Over annual horizons, the group average total firm expansion is not only small but also only a little more pronounced for firms experiencing either very good or very bad stock returns. Over five-year horizons, the very best decile stock price performers *do* engage in some activist expansion, roughly 32 percent of their firm value (6 percent per year). Still, their five-year stock return–caused mechanistic equity growth is a much larger 265 percent. In other deciles, the activist expansion is flat and economically small, ranging from 7 percent to 18 percent.

In sum, in cross section, when compared to their direct influence on equity growth, even large stock returns trigger only modest corporate activity. The median firm in each decile does not do much either to expand or contract the firm or to undo or amplify the effects of stock

TABLE 2
Corporate Activity, Equity Growth, and Capital Structure, Classified by Stock Returns (Year-Adjusted and Sales-Adjusted)

A. Sort by Calendar Year, Sales, One-Year Net Stock Returns

	Sort Criterion, Net Return (t, $t+1$)									
	−55	−33	−22	−13	−5	3	11	21	37	79
1. Net debt issuing, $TDNI_{t,t+1}$	.7	.8	.8	.9	.8	.6	.7	.5	.1	.0
2. Net equity issuing $ENI_{t,t+1}$	.2	.2	.2	.1	.2	.2	.2	.3	.5	1.0
3. Dividends $DIV_{t,t+1}$	.0	.7	1.2	1.5	1.7	1.8	1.8	1.7	1.3	.5
4. Activist equity expansion (ENI − DIV)	0	−.4	−.9	−1.2	−1.3	−1.4	−1.3	−1.1	−.5	.1
5. Activist expansion (TDNI + ENI − DIV)	1.8	1.1	.9	.5	.5	.2	.4	.5	1.1	2.8
6. Induced equity growth, $x_{t,t+1} \cdot E_t$	−30	−16	−8	−2	2	6	12	20	33	63
7. Ending ADR_{t+1}	37	30	29	27	27	26	25	22	19	14
8. Starting ADR_t	22	22	22	23	25	25	26	25	23	22
9. Return-induced $IDR_{t,t+1}$	34	27	26	24	24	24	23	20	17	13

B. Sort by Calendar Year, Sales, Five-Year Net Stock Returns

	Sort Criterion, Net Return (t, $t+5$)									
	−106	−64	−37	−12	10	32	61	103	176	406
1. Net debt issuing, $TDNI_{t,t+5}$	6	9	10	12	13	14	14	15	15	16
2. Net equity issuing $ENI_{t,t+5}$	4	3	3	3	4	5	5	7	8	16
3. Dividends $DIV_{t,t+5}$	3	8	10	12	14	14	14	14	12	10
4. Activist equity expansion (ENI − DIV)	0	−3	−5	−7	−8	−7	−7	−6	−3	4
5. Activist expansion (TDNI + ENI − DIV)	9	9	8	7	9	10	10	13	18	32
6. Induced equity growth, $x_{t,t+5} \cdot E_t$	−37	−13	2	16	28	43	63	91	143	265
7. Ending ADR_{t+5}	41	34	32	30	29	28	25	22	18	13
8. Starting ADR_t	20	20	23	24	27	29	30	29	29	31
9. Return-induced $IDR_{t,t+5}$	34	23	23	21	20	19	17	14	11	8

Note.—All numbers are medians and are quoted as percentages. Firms are sorted first by calendar year, then by sales decile (to control for size), and then allocated to deciles on the basis of their stock return rank (within each group of 10 consecutive firms). In each panel, the first six rows are normalized by firm size in the month of issue; the last three rows are not. In panel A, there are between 5,849 and 6,118 observations per decile; in panel B, between 3,868 and 4,097. Net return means net of the S&P500.

returns on debt ratios. Stock return–based sorts cannot uncover the large heterogeneity in issuing activity documented in table 1.

This paper is less interested in issuing activity per se (e.g., as are Hovakimian, Opler, and Titman [2001]) than it is in *capital structure–relevant* issuing activity. Not all net issuing activity is equally important for corporate debt ratios. For example, when a 100 percent equity-financed firm issues equity, it does not change its debt ratio. I sorted the subset of best stock performers (decile 10) by their debt-equity ratios (not reported in the table). Zero debt-equity firms were especially eager to issue more equity, a median of 33 percent of firm value, which ultimately had no influence on capital structure. The most levered quintile firms, where equity issues were most capital structure–relevant, issued only 9 percent in equity. Thus the relatively high equity issuing activity median of 16 percent in this tenth decile ends up not being as capital structure–relevant as one might suspect.

The actual capital structure relevance of the dynamic components is explored in the three lower rows. The ending ADR rows show that there is a large spread of resulting debt ratios across firms having recently experienced different rates of return. Over one year, firms that have underperformed the S&P500 by 55 percent end up with an actual debt ratio of 37 percent, whereas firms that have outperformed the S&P500 by 79 percent end up with an actual debt ratio of 14 percent. Over five years, the worst stock performers end up with debt ratios of 41 percent and the best stock performers end up with debt ratios of 13 percent.

The starting ADR rows show that the ending debt ratio differences are not due to the originating debt ratios. Over one-year horizons, starting leverage does not correlate with net return performance: most return deciles start out with actual debt ratios of just about 22 percent. Over five-year horizons, if anything, firms with poorer stock returns start out with *lower* debt ratios.

Any snapshot of actual debt ratios in the economy therefore reflects differences in historical stock returns. When firms are sorted by ending debt ratios instead of by stock returns (still year and sales adjusted), the lowest decile median debt ratio firm ($ADR_t = 1$ percent) has experienced +5 percent stock returns in the most recent year (+53 percent in the most recent five years), whereas the highest decile median debt ratio firm ($ADR_t = 75$ percent) has experienced −13 percent (−19 percent) stock returns (not reported in the table).

The implied IDR rows impute the effects of stock returns on starting debt ratios (ADR) in the appropriate nonlinear fashion (eq. [3]). Can IDR explain future debt ratios better than starting ADR? It appears so. In explanations of ending ADR, the implied debt ratio IDR fits visually better than the starting ADR. Of course, all power of my later readjustment tests must derive from the extreme stock return deciles. There is no economic difference between readjustment and nonreadjustment for firms that experience only small stock returns.

TABLE 3
FAMA-MACBETH REGRESSIONS EXPLAINING FUTURE ACTUAL DEBT RATIOS ADR_{t+k} WITH DEBT RATIOS ADR_t AND STOCK RETURN–MODIFIED DEBT RATIOS $IDR_{t,t+k}$

Horizon k (Fama-MacBeth)	Constant	$IDR_{t,t+k}$	ADR_t	R^2 (%)	Cross-Sectional Regressions
		A. Without Intercept			
1-year		102.1 (1.4)	−.5 (1.4)	96.3	37
3-year		94.6 (2.1)	9.5 (2.1)	90.4	35
5-year		86.7 (2.8)	18.7 (2.1)	86.5	33
10-year		68.3 (4.6)	37.7 (1.8)	80.0	28
		B. With Intercept			
1-year	2.7 (.1)	101.4 (1.3)	−5.3 (1.2)	91.3	37
3-year	6.8 (.3)	94.4 (1.5)	−4.2 (1.4)	78.4	35
5-year	9.3 (.4)	86.9 (2.1)	−.5 (1.6)	70.2	33
10-year	13.8 (.6)	70.8 (3.7)	+6.9 (2.7)	56.0	28

NOTE.—The cross-sectional regression specifications are

$$ADR_{t+k} = [\alpha_0 +]\ \alpha_1 \cdot IDR_{t,t+k} + \alpha_2 \cdot ADR_t + \epsilon_{t+k}.$$

Reported coefficients and standard error estimates (in parentheses) are computed from the time series of cross-sectional regression coefficients and quoted as percentages. A coefficient of 100 percent on implied debt ratio ($IDR_{t,t+k}$) indicates perfect lack of readjustment, and a coefficient of 100 percent on actual debt ratio (ADR_t) indicates perfect readjustment. The R^2's are time-series averages of cross-sectional estimates. In the one-year regressions, 60,317 firm-years are used; in the 10-year regressions, 25,180 firm-years.

IV. Estimation

A. *Regression Specification*

The basic regression specification of the paper, equation (1), is estimated in table 3. The reported coefficients and standard errors are computed from the time series of cross-sectional regression coefficients (called Fama-MacBeth). Both the methods and variables are discussed in detail in the Appendices, as is the robustness to alternatives.

Panel A omits the intercept and thus does not allow for a constant debt ratio target. Over annual horizons, the average firm shows no tendency to revert to its old debt ratio and instead allows its debt ratio to drift almost one to one (102.1 percent) with stock returns. Over five to 10 years, firms began to readjust, but the influence of stock returns through IDR remains more important than the effects of readjustment activity.

Panel B shows that this ADR coefficient reflected less a desire of firms to revert to their starting debt ratios than a tendency of firms to prevent debt ratios from wandering too far away from a constant: In competition with the constant, ADR loses most economic significance.

I conclude that observed corporate debt ratios at any fixed point in time are largely transient, comoving with stock returns. Any deliberate readjustment is slow and modest.

B. Change Regressions

The regression can also be estimated in changes or with a restriction that the coefficients on IDR and ADR add up to one:

$$\text{ADR}_{t+k} = \alpha_0 + \alpha_1 \cdot \text{IDR}_{t,t+k} + (1 - \alpha_1) \cdot \text{ADR}_t + \epsilon_t. \tag{10}$$

After rearrangement, the estimated regressions are

$$\text{ADR}_{t+1} - \text{ADR}_t = 2.1\% + 102.2\% \cdot (\text{IDR}_{t,t+1} - \text{ADR}_t),\ R^2 = 43.2\%;$$

$$\text{ADR}_{t+5} - \text{ADR}_t = 8.0\% + 92.9\% \cdot (\text{IDR}_{t,t+5} - \text{ADR}_t),\ R^2 = 40.2\%. \tag{11}$$

The coefficient estimates are highly statistically significant, and a first-difference term in ADR adds no statistical or economic power. I can conclude that stock return–induced equity changes have roughly a one-to-one influence on observed debt ratio changes over one-year horizons. Even over five-year horizons, corporate debt ratio reversion activity is rather modest.

C. Variance Decomposition

One can isolate the dynamic components laid out in equation (7). That is, it is possible to predict ADR_{t+k} not only with ADR_t updated only for stock returns (which is $\text{IDR}_{t,t+k}$), but also with ADR_t updated, for example, for corporate issuing activity between t and $t + k$ (with other dynamic components kept at a constant zero).

Table 4 shows that history is important: 85 percent of firms' capital structure levels can be explained by last year's capital structures and 54 percent by capital structure five years earlier. More interesting, the table also shows that stock return–induced changes in capital structure are *less* important than corporate issuing activity, although not by much. Over one year, stock returns[1] are responsible for 43.2 percent of the change in debt ratios, whereas all net issuing activities together are responsible for about 56.9 percent of the change in debt ratios. Over five years, stock returns are responsible for 40.2 percent of debt ratio changes, whereas all net issuing activities are responsible for 68.8 percent. (The two need not add up to 100 percent.) In principle, there is more than enough capital structure–relevant corporate issuing activity to counteract stock return–induced equity growth. Firms are not inactive: they just do not choose to counteract their stock returns. Over 10 years, the results are similar to those for five years (not reported).

[1] Here, I mean IDR. Stock returns by themselves (without interaction with past capital structure) can explain only 26 percent of the one-year change and 15–25 percent of the five-year change in ADR.

TABLE 4
Explanatory Power of Components of Debt Ratios and Debt Ratio Dynamics: Time-Series Average R^2's from Cross-Sectional Fama-MacBeth Regressions

	k = 1 Year, Average R^2		k = 5 Years, Average R^2	
	Levels (%)	Differences (%)	Levels (%)	Differences (%)
1. Past debt ratio, ADR_t	85.0		54.0	
2. Implied debt ratio, $IDR_{t,t+k}$	91.2	43.2	68.3	40.2
3. Implied debt ratio, with dividend payout	91.3	43.6	70.0	41.5
4. All issuing and dividend activity	93.4	56.9	85.7	68.8
5. All issuing activity	93.4	56.5	84.9	65.9
6. Net equity issuing activity	85.6	5.2	63.3	16.2
7. Net debt issuing activity	92.3	49.7	71.3	40.6
Convertibles only		3.3		4.0
Short-term only		15.9		13.7
Long-term only		30.7		31.9

Note.—In levels, ADR_{t+k} is explained by the regressor. In differences, $ADR_{t+k} - ADR_t$ is explained by the regressor minus ADR_t. The ratios are defined as follows: row 1: $D_t/(D_t + E_t)$; row 2: $D_t/[D_t + E_t \cdot (1 + x_{t,t+k})]$; row 3: $D_t/[D_t + E_t \cdot (1 + r_{t,t+k})]$; row 4: $(D_t + TDNI_{t,t+k})/(D_t + TDNI_{t,t+k} + E_t + ENI_{t,t+k} - DIV_{t,t+k})$; row 5: $(D_t + TDNI_{t,t+k})/(D_t + TDNI_{t,t+k} + E_t + ENI_{t,t+k})$; row 6: $D_t/(D_t + E_t + ENI_{t,t+k} - DIV_{t,t+k})$; row 7: $(D_t + TDNI_{t,t+k})/(D_t + TDNI_{t,t+k} + E_t)$.

But the conclusion that research should focus only on (capital structure–relevant) issuing activity would also be mistaken. If the ultimate goal is to explain capital structure, explaining issuing activity alone cannot do the job: even if a researcher could perfectly predict 100 percent of all managerial capital structure activities, she would still miss close to half of the variation in year-to-year capital structure *changes*. And, as table 5 below will show, 100 percent is utopian. Previously used variables have little power to explain any of this capital structure–relevant managerial activity.

Table 4 can also suggest where researchers should focus their efforts to better explain debt ratios: debt issuing activities are more capital structure–relevant than equity issuing activities, even though table 1 indicated equal heterogeneity. (Equity issuing presumably occurs more in firms already heavily equity-financed.) The final rows narrow the culprit even further. Over both one-year and five-year horizons, long-term debt issuing activities are most capital structure–relevant.[2] Over five-year horizons, equity issuing activities become as important as short-term debt issuing activities, yet are still only half as important as long-term debt issuing activity.

[2] Although Hovakimian et al. (2001) seek to explain *all*, not just capital structure–relevant, net issuing activity, they succeed in explaining only 1.8 percent of the variation in net long-term debt issuing activities among 4,558 observations with large long-term debt changes.

D. Aggregate Effects

The focus of this paper is the cross section. Still, one can aggregate the debt and market equity of *all* firms on Compustat and use the value-weighted market rate of return to compute IDR. (The results are similar with firms meeting only the size criterion.) The estimated single time-series regressions on the aggregate data series are

$$\text{1-year: } \mathrm{ADR}_{t+1} - \mathrm{ADR}_t = 2.3\% + 105.9\% \cdot (\mathrm{IDR}_{t,t+1} - \mathrm{ADR}_t), \quad R^2 = 89\%;$$

$$\text{5-year: } \mathrm{ADR}_{t+5} - \mathrm{ADR}_t = 11.2\% + 93.3\% \cdot (\mathrm{IDR}_{t,t+5} - \mathrm{ADR}_{t-5}), \quad R^2 = 82\%. \tag{12}$$

This suggests that the overall stock market level has a similarly long-lived effect on the aggregate corporate debt ratio, just as it is the major influence in determining the debt ratio of firms in cross section. Unfortunately, the influence of stock returns may be misstated here because debt is quoted in terms of book value (for lack of available market data); and in contrast to the cross-sectional year-by-year regressions, in these regressions, annual aggregate interest rate changes can drive a considerable wedge between book and market values of debt (see also Ritter and Warr 2002).

V. Alternative Proxy Variables

A natural question is whether the variables used in the prior capital structure and issuing literatures have economic relevance when the effects of stock returns are properly controlled for. For example, corporate profitability was found to predict lower debt ratios in previous studies. If profitability has no incremental significance when IDR is controlled for, then it would have correlated with capital structures only *indirectly* through its correlation with stock returns. Put differently, managers would not so much have "acted" to lower their debt ratios (by issuing more net equity) when profitability increased. Instead, managers of more profitable companies would have experienced higher stock prices, which in turn would have mechanistically reduced their debt ratios.

The multivariate columns in table 5 estimate

$$\mathrm{ADR}_{t+k} - \mathrm{ADR}_t = \alpha_0 + \alpha_1 \cdot X_{t,t+k} + \sum_{c=1}^{C} [\alpha_{2c} \cdot V_{c_t} + \alpha_{2c+1} \cdot V_{c_t} \times X_{t,t+k}] + \epsilon, \tag{13}$$

where $X_{t,t+k} \equiv \mathrm{IDR}_{t,t+k} - \mathrm{ADR}_t$, and $V_1, \ldots, V_C$ are named third variables

TABLE 5
Fama-MacBeth Regressions Explaining Debt Ratio Changes ($ADR_{t+k} - ADR_t$): Adding Variables Used in Prior Literature

	k = 1 Year (N=57,921)			k = 5 Years (N=34,880)		
Variable	Multivariate	Four-Variate	Standard Deviation	Multivariate	Four-Variate	Standard Deviation
Intercept	2.70*	varies		−.62	varies	
	Flow Variables Measured from t to $t+k$					
$\Delta IDR \equiv IDR_{t,t+k} - ADR_t$	7.38***	varies	.07	10.47**	varies	.13
Log volatility	−2.54***	−.61***	.80	−5.27***	−.30	.67
× ΔIDR	−.97	−.18	.19	3.33	3.83*	.37
Stock return	−.06	−.28	.54	−1.33	−1.68	3.78
× ΔIDR	−.46	.32	.08	−3.02*	−.79	1.12
Mergers and acquisitions activity	1.26***	1.28***	.39	2.51***	2.17***	.24
× ΔIDR	.08	.06	.03	.34	−.07	.04
Profitability/sales	−.20	−.09	.14	−1.29***	−.17	.12
× ΔIDR	−.40	.01	.01	−.97*	−.39	.03
Profitability/assets	−1.45***	−.62***	.09	−2.57***	−.40	.08

× ΔIDR	.91***	.74***	.01	1.76**	3.19***	.02
Tax rate	.25*	−.05	.28	.74***	.73*	.17
× ΔIDR	−.03	.22	.03	.19	1.75***	.05
	Stock Variables Measured at t					
Industry deviation	−1.83***	−1.13***	.19	−6.87***	−4.86***	.21
× ΔIDR	−.14	−.14	.01	−.91*	−.73	.03
Log assets	−2.71***	−.20*	1.88	−4.67***	−.58**	1.93
× ΔIDR	−2.62	.22	.44	1.42	−1.49	.84
Log relative market capitalization	1.77***	.01	1.54	3.47***	.54	1.71
× ΔIDR	.75	.12	.10	.53	−.07	.26
Book-market ratio	.16	−.22	.55	.75*	−1.19***	.57
× ΔIDR	.37	.24	.07	.61	−.02	.17
Cross-sectional regressions	37	varies		33	varies	
Average R^2	54%	varies		59%	varies	

NOTE.—The reported coefficient estimates are time-series means of cross-sectional regression coefficients (1966–2000) and are quoted as percentages. Except for the intercept, variables were unit-normalized (coefficients were multiplied by the standard deviation of the variable). The multivariate columns are the coefficients from one big specification. The four-variate columns are the coefficients from individual specifications, one variable V at a time, $ADR_{t+k} - ADR_t = \alpha_0 + \alpha_1 \cdot X_{t,t+k} + \alpha_2 \cdot V + \alpha_3 \cdot V \times X_{t,t+k} + \epsilon_{t+k}$. Four-variate regressions avoid multicollinearity.

* The Fama-MacBeth-type t-statistic is above 3.

** The Fama-MacBeth-type t-statistic is above 4.

*** The Fama-MacBeth-type t-statistic is above 5.

(described in detail in App. A). When a coefficient on V_c is reliably positive, then V_c incrementally helps to explain *actual debt ratios.* When a coefficient on $V_c \times X_{t,t+k}$ is positive, V_c incrementally helps to explain *readjustment.* To avoid multicollinearity, the same specifications are also run with one V_c variable at a time in a four-variable regression,

$$\mathrm{ADR}_{t+k} - \mathrm{ADR}_t = \alpha_0 + \alpha_1 \cdot X_{t,t+k} + \alpha_2 \cdot V_{c_t} + \alpha_3 \cdot V_{c_t} \times X_{t,t+k} + \epsilon. \quad (14)$$

The chosen V_c variables include most important variables used in prior capital structure and issuing literature. In contrast to existing literature, the V_c variables here are challenged to explain not only issuing activity but net issuing activity that is *capital structure–relevant* and is competing for marginal explanatory power with IDR effects. Flow variables are measured contemporaneously with the differencing interval in the dependent variable.

The regressions in table 5 report unit-normalized coefficients (coefficient times standard deviation of the variable in the sample). These coefficients indicate relative *economic* importance. Over annual horizons, return-induced debt ratio changes have a considerably bigger impact than other proxies do. A one-standard-deviation higher ΔIDR is associated with a 7.38 percent increase in debt ratio. (The nonstandardized coefficient is 7.38%/0.07 ≈ 109.80 percent.) The best other proxy is that firms that have taken over other firms also tend to increase leverage and that firms that wander away from their industry average debt-equity ratio seek to return to it. Asset-based profitability and firm volatility are statistically significant, but only of modest economic importance. The only variable that suggests modestly greater nonadjustment (cross term) is asset-based profitability: More profitable firms tend to adjust less for stock return–induced capital structure changes.

Over five-year horizons, return-induced debt ratio changes continue to exert the strongest influence. (The nonstandardized coefficient is 82 percent.) Again, the strong negative coefficient on industry deviation suggests that firms are eager to move toward their industry's average debt ratio and that firms that have engaged in mergers and acquisitions activity tend to increase leverage. Two of the cross coefficients indicate good economic significance: firms with more profitable assets and firms with more volatility tend to have avoided readjusting (but recall that return volatility is contemporaneous with ΔIDR). Put differently, in a stratification, their ΔIDR coefficients in a bivariate regression would be significantly higher than those of other firms.

The increase in R^2, from the 43 percent in the one-year difference regression when only IDR is used to the 54 percent reported R^2 when the additional 20 variables in table 5 are included, is modest. The increase in R^2 is more pronounced for the five-year regressions (40 percent in the IDR-only regression, 59 percent in the 20 + 1 variable regression).

But it is fair to state that the additional 20 variables make only modest headway in reducing the 60 percent variation that can be attributed to corporate net issuing activity.[3] Most corporate issuing motives remain unexplained.

There is an important caveat: When the flow variable is measured contemporaneously with the dependent variable differencing interval, the flow variables are *not* known at the outset *t*. This simultaneity can cause spurious correlation: it is not clear whether the dependent or independent variable is exogenous. Worse, the proxy variable in later parts of the measuring period may respond to debt ratio changes in earlier parts of the measuring period. For example, firms for which the debt ratio has gone up in the first two years may experience improved profitability in the final three years. Most flow coefficients are therefore an optimistic upper bound.[4] Stock returns suffer less from these problems because neither are they under the direct control of management, nor can they respond to (known) earlier debt ratio changes.

Some variables had to be excluded from table 5 because data availability would have dropped the number of observations in the multivariate specifications. The following two variables were explored in four-variate regressions without other control variables.

Graham's tax rate.—This variable is an improved iterative tax variable (Graham 2000), which over five years works better than only the simpler tax variable in table 5. Firms with one-standard-deviation higher tax rates are likely to take on an additional 2.4 percent in debt ratio over five years. Firms with higher tax rates are more likely to nonadjust and in an economically significant fashion.

Interest coverage.—Firms with one-standard-deviation higher high cash flows relative to their interest payments reduced debt over one year, but only by 0.4 percent. However, the five-year cross variable was economically important, suggesting that firms with more cash flows relative to their earnings readjust less, not more. (The most significant interest coverage–related specification indicates that firms with poor recent returns *and* very high interest payments are more likely to unlever over the next year—perhaps necessary for survival.)

A number of other variables were found to be unimportant. Three

[3] A full set of two-digit standard industrial classification (SIC) dummies raises the R^2 by about 5 percent. Their inclusion does not change the significance of most variables. Industry herding becomes a little more important, profitability a little less important.

[4] When flow variables are measured strictly prior to the dependent variable to avoid these problems, their coefficients are typically undistinguishable from zero (not reported). Over 10 years (not reported), the simultaneity problem becomes even more pertinent. More profitable firms paying more taxes appear to lever up. Future work must be careful not to overinterpret such naive coefficients as evidence of trade-off theories/corporate maximization.

variables are interesting although/because they do not show any significance.

Uniqueness.—Sales-adjusted research and development and selling expenses (Titman and Wessels 1988) have no incremental explanatory power over one year and modest explanatory power over five years. The reasons are that high-R&D firms had good returns and that many high-R&D equity issuers are already 100 percent equity-financed. (Such issues do not alter capital structure.)

Future stock return reversals.—Firms that experience large stock price reversals the year after the measuring period do not behave differently from firms that experience stock price continuation. Managers do not delay readjusting because they know something that the market does not know.

Profitability changes.—Firms experiencing current profitability *changes* show no unusual capital structure activities or tendencies to change their debt ratios over one year and a very modest inclination over five years. Cross effects do not matter. This indicates that even firms whose stock returns and revised debt ratios are due to or accompanied by immediate cash flow effects (rather than due to long-run discount factor effects or far-off growth opportunities) are no more eager to readjust.

In sum, although about half to two-thirds of the dynamics of capital structure are due to net issuing activity, the variables here could not make a *large* dent in our understanding of resulting capital structure. They could not explain much of the part of capital structure that is *not* due to stock price changes. The proxies have only modest incremental influence either in predicting debt ratios or in predicting higher tendencies to readjust. Much of their correlation with capital structure in earlier papers was due to their correlations with IDR, in many cases a sufficient statistic. None of these variables change the coefficient on the IDR variable, much less rival it in importance.

VI. Interpretation

Corporations are not inactive with respect to issuing activity. This makes it all the more startling that they do not use their net issuing activities to counteract the external and large influences of stock returns on their capital structures. The challenge is to explain why. The answer must lie in the cost-benefit trade-off to undoing stock return–induced capital structure changes. The benefits relate to how the hypothetically friction-free optimal debt ratio shifts with stock returns. The costs relate to direct financial transaction costs or indirect costs of change that can arise from a variety of distortions.

1. *Dynamic optima.*—If the optimal debt ratio changes one to one with stock returns, then there is no need for firms to rebalance toward their

previous or static debt ratio targets. For example, if stock prices relate more to changes in discount factors or far-away growth opportunities, then firms with positive stock returns would not experience changes in earnings in the near future. They may find that increasing the debt ratio would provide few additional tax benefits in exchange for risking a short-term liquidity crunch or outright bankruptcy (see also Barclay, Morellec, and Smith 2001). Such theories can at least predict that stock returns correlate negatively with debt ratios (over short horizons), the correct sign.

But, by itself, this explanation has drawbacks. First, the argument is less compelling for *value firms* with already low debt ratios, which experience further large positive stock returns. (And a number of authors have argued that such firms already have too little debt.)[5] Such firms show no greater tendency to readjust or lever up. Second, even firms experiencing the most immediate *increases* in profitability—that is, firms whose stock price movements are less likely due to far-away growth opportunities or discount rate changes—do not show any differences in their readjustment tendencies. Third, it would be curious if the optimal dynamic debt ratio were as one to one with stock priced–induced changes in equity values as the evidence suggests.

2. *Direct transaction costs.*—This suggests that another part of the explanation is likely to be transaction costs. Transaction costs cannot only induce path dependency, but also produce flat corporate objective functions (Miller 1977; Fischer, Heinkel, and Zechner 1989; Leland 1998). The fact that there is more readjustment over longer horizons is also consistent with transaction costs playing a role. But by itself, this explanation, too, has some drawbacks.

First, for large U.S. corporations, direct transaction costs are small, and practitioners believe them to be small (Graham and Harvey 2001).

Second, readjustment patterns are similar across firms in which transaction costs are very different. Even if transaction costs are high for a firm that issues equity to reduce debt in response to falling enterprise valuation,[6] they are low for a firm that issues debt to repurchase equity in response to increasing enterprise valuation. Similarly, small firms

[5] The average (median) operating income divided by interest payments in the sample is 43 (6.5), suggesting only a modest probability of bankruptcy for many firms. An otherwise typical firm in the sample ($500 million size, 33 percent tax rate, 25 percent debt ratio) that experiences a 5 percent debt-equity ratio change should issue $40 million in debt, thus obtaining about $.33 \cdot \$40 \approx \$13$ million (perpetual net present value) in tax savings. Graham (2000) calculates that the average publicly traded firm could gain about 10 percent *in firm value* if it increased its debt ratio.

[6] However, first a debt ratio can also be reduced by selling off assets to pay off debt or by using former dividends to repurchase debt. Second, equity values would have *already* fallen significantly, and an equity-for-debt exchange (e.g., with existing creditors) should increase enterprise value, not decrease it (in the absence of direct frictions).

should have higher transaction costs than large firms, and yet table 5 shows that large firms are no more eager to readjust. Finally, even firms experiencing the most dramatic changes in debt ratios readjust very little, too. This suggests that inventory-type transaction cost minimization models (under which one should observe more readjustment for larger deviations from the optimum) are not likely to explain the evidence.

Third, firms do not seem to lack the inclination to be capital structure–active. They just seem to lack the proper inclination to readjust for equity value changes! (A more consistent transaction cost argument may have to suggest that transaction costs are higher after large positive or negative equity movements.) And if corporations really wanted to readjust at low transaction costs, they could issue securities that convert automatically into debt when corporate values increase and into equity as corporate values decrease—the opposite of convertible securities. They do not.

3. *Indirect costs.*—A number of theories can explain why firms face implicit costs to reacting or adjusting, either actual or perceived. These theories suffer from problems similar to those of direct transaction cost explanations: they can explain inertia better than lack of readjustment, although firms are very active in real life, instead. Moreover, few tests of such theories have explored their unique noninertia implications.

The pecking order theory (Myers 1984; Myers and Majluf 1984) is not the only model of inertia, but it is the most prominent. Firms are reluctant to raise more equity when their stock prices deteriorate because of negative inference by investors. The theory is known to have more difficulties explaining why firms are reluctant to rebalance more toward debt when their stock prices increase. To its credit, the pecking order theory does not need to rely on an agency explanation (debt discipline) to explain an additional fact, the negative stock price response to equity issuing activity.

Other theories can predict corporate inertia if firms suffer from limited memory retention (e.g., Hirshleifer and Welch 2002); if agency or influence problems paralyze the firm (e.g., Rajan and Zingales 2000); if managers believe that their equity is too expensive/cheap for repurchases after stock price increases/decreases (e.g., Berger, Ofek, and Yermack 1997); if managers prefer equity to debt and increasing equity values make them harder to dislodge (e.g., Zwiebel 1995); or if firms engage in near-rational or irrational behavior (e.g., Samuelson and Zeckhauser 1988; Benartzi and Thaler 2001).

Finally, one could argue that different reasons drive corporate behavior on the upside and on the downside. For example, on the upside, managers may become more entrenched and dislike issuing debt (or exchanging equity for debt), whereas on the downside, managers may believe (or have inside information) that their firms have become too "undervalued" and dislike selling equity (or exchanging debt for equity).

VII. Prior Capital Structure Literature

My paper has shown that stock returns and stock return–adjusted historical capital structure are the best variables forecasting market-based capital structure.

Some prior literature has examined capital structure ratios based not only on market equity value but also on book equity value. Yet, the book value of equity is primarily a "plug number" to balance the left-hand side and the right-hand side of the balance sheet—and it can even be negative. Furthermore, book values correlate less with market values among small firms. But more important, accounting rules imply that the book value of equity increases with historical cash flows and decreases with asset depreciation. Not surprisingly, profitability (growth) and fixed assets are the important predictors of book value–based debt ratios (e.g., Shyam-Sunder and Myers 1999). Yet, some authors find book values attractive because they have lower volatility than market equity values and therefore permit corporate issuing activity to appear more important.

In any case, compared to a book value–based debt ratio, its cousin, the interest coverage ratio, would be a better alternative for measuring the advantages of debt to firms. Operating cash flows (or cash) may be the best available measure of assets in place and tax advantages. Immediate interest payments may be the best measure of potential bankruptcy and liquidity problems. Thus trade-off theories may be better tested with the ratio of current interest burden to current operating cash flows (or cash). Moreover, managers are known to pay attention to coverage ratios and credit ratings (which are in turn highly related to coverage ratios). But before one sets one's hopes too high, the typical firm paid out only about 15 percent of its operating cash flows in interest, indicating that most firms could probably have easily borrowed more.

My evidence of readjustment failure is in line with the survey responses in Graham and Harvey (2001): queried executives apparently care little about transaction costs, most theories of optimal capital structure, or rebalancing when equity values change. To the extent that they do care *when actively issuing,* managers claim that they care about financial flexibility and credit ratings for debt issues and about earnings dilution and past stock price appreciation for equity issues. Yet, executives also claim that they issue equity to maintain a target debt-equity ratio, especially if their firm is highly levered—for which we could not find much evidence.

Most existing empirical literature has interpreted capital structure from the perspective of proactive managerial choice. Titman and Wessels (1988) find that only "uniqueness" (measured by R&D/sales, high selling expenses, and employees with low quit rates) and earnings are reliably important. Rajan and Zingales (1995) offer the definitive description of OECD capital structures and find a strong negative correlation between market-book ratios and leverage. Like Rajan and Zingales, Barclay, Smith, and Watts (1995) find that debt ratios are negatively related to market-book ratios. Graham (2003) surveys the voluminous tax literature. Hovakimian et al. (2001) find a mild tendency of firms to issue in order to return to a target debt-equity accounting ratio. The implied debt ratio can subsume most of the power of the variables in this literature.

Baker and Wurgler (2002) investigate the influence of past stock market returns (see also Rajan and Zingales 1995). But they are interested in how these returns influence the *active* issuing decisions of firms and do not consider the implied change. My own paper is more interested in the failure of firms to undo the effects of stock returns and the consequent strong relation between lagged stock returns and capital structure. Other literature has focused on nonaction, though none has focused on the dramatic fluctuations that nonaction can cause. In addition to pecking order tests (such as Shyam-Sunder and Myers [1999] and Fama and French [2002]), some theories have been built on transaction costs. For example, Fischer et al. (1989) use option pricing theory and find that even small recapitalization costs can lead to wide swings in optimal debt ratios.

Finally, some behavioral finance papers find a similar lack of readjustment in other contexts. For example, Benartzi, Michaely, and Thaler (1997) find that, in contrast to optimizing theories of dividend payments, managers seem to pay dividends more in response to *past* earnings than in response to an expectation of future earnings. Benartzi and Thaler (2001) find that $1/N$ diversification heuristics are more powerful than the effects of stock market value changes in pension portfolio adjustments.

VIII. Conclusion

Market-based debt ratios describe the relative ownership of the firm by creditors and equity holders, and they are an indispensable input in WACC computations. This paper has shown that stock returns are a first-order determinant of debt ratios, that they are perhaps the *only* well-understood influence of debt ratio dynamics, and that many previously used proxies seem to have helped explain capital structure dynamics primarily because they correlated with omitted dynamics caused by stock price changes.

Appendix A

TABLE A1
VARIABLE DEFINITIONS

Variable	Definition
D_t	The sum of long-term debt (Compustat item [9]) and debt in current liabilities ([34]); convertible securities are excluded; broader definitions were tried and found not to affect the results
E_t	CRSP market value, the number of shares times closing price at the end of the fiscal year; exactly time-aligned with D_t
Assets	Assets, defined by [6], adjusted to 2000 levels using the CPI
ADR_t	Actual debt ratio: $D_t/(E_t + D_t)$ (the dependent variable); all results, including the relative importance of debt issuing and equity issuing, are invariant to predicting an actual equity ratio (AER) instead of ADR (because AER $\equiv 1 - \text{ADR}_t$) or to predicting D_t/EQ_t
$\text{IDR}_{t,t+k}$	Implied debt ratio: $D_t/[E_t \cdot (1 + x_{t,t+k}) + D_t]$
$r_{t,t+k}$	Stock returns with dividends, from CRSP
$x_{t,t+k}$	Stock returns without dividends, from CRSP
$\text{TDNI}_{t,t+k}$	Difference in total debt value: $D_{t+k} - D_t$
$\text{ENI}_{t,t+k}$	Difference in total equity value without return and dividend effects: $E_{t+k} - E_t \cdot (1 + x_{t,t+k})$
$\text{DIV}_{t,t+k}$	$(r_{t,t+k} - x_{t,t+k}) \cdot E_t$
Tax rate	Total income tax ([16]) divided by the sum of earnings ([53] × [54]) plus income tax ([16]); winsorized to between −100% and +200%
Log equity volatility	Standard deviation of returns, computed from CRSP; timed from $t-1$ to t; logged, not winsorized
Log firm volatility	Equity volatility times $E_t/(E_t + D_t)$; logged, not winsorized
Mergers and acquisitions activity	A dummy of one if Compustat footnotes indicate a flag of AA, AR, AS, FA, FB, FC, AB, FD, FE, or FF
Profitability/sales	Operating income ([13]) divided by sales ([12]); winsorized at 5% and 95%
Profitability/assets	Operating income ([13]) divided by assets ([6]); winsorized at 5% and 95%
Stock returns	As used in the IDR computation, but by itself
Book-market ratio	Book value of equity ([60]) divided by CRSP market value; winsorized at 5% and 95%
Log assets	Defined by [6], adjusted to 2000 levels using the CPI; not winsorized
Log relative market capitalization	E divided by the price level of the S&P500; always greater than 0.1
Deviation from industry debt ratio	Industry herding or conformity: ADR of a firm minus the ADR average in its three-digit SIC code industry (similar answers are obtained if two-digit industry definitions are used instead)*
Selling expense	Selling expense ([189]) divided by sales ([12]); winsorized at 5% and 95%
R&D expense	R&D expense ([46]) divided by sales ([12]); winsorized at 5% and 95%

TABLE A1
(*Continued*)

Variable	Definition
Interest coverage	Operating income ([13]) divided by interest paid ([15]); winsorized at 5% and 95%
Graham's tax rate	Provided by John Graham (see Graham 2000)
Future stock return reversals	This variable is *not* fully known at time t; it multiplies the stock returns from t, $t+k$ with stock returns from $t+k$, $t+2k$; the variable measures future price continuation (consecutive positive and consecutive negative rates of return result in positive values); not winsorized
Profitability changes	This variable is *not* fully known at time t; profitability divided by sales, an average from t to $t+k$, minus profitability divided by sales at $t-2$ (other definitions were tried and not found to make a difference); not winsorized

NOTE.—In tables 1 and 2, ENI, DIV, and induced equity growth were obtained from the sum of market values minus lagged market values adjusted by compounded returns. The reported statistics sit about halfway between statistics normalized by firm value at the beginning of the period (t) and statistics normalized by firm value at the end of the period ($t+k$). All independent *stock* variables used in table 5 have to be known at the outset, i.e., at time t, when predicting ADR_{t+k}. All *flow* variables are measured over the same time interval as the rate of return, i.e., from t to $t+k$. (Over five years, the reported standard deviations pertain to the average over the five flow variables, not the sum.) In some cases, various variable definitions were explored. The results were robust in that no reported insignificant variable achieved significance in alternatives, and vice versa.

* This variable was also used in Hovakimian et al. (2001). MacKay and Philips (2002) independently provide a more detailed examination of industry capital structure. Bikhchandani et al. (1998) review the herding literature.

Appendix B

A. *Fama-MacBeth Method*

Regressions in tables 3, 4, and 5 are run one Compustat period at a time. (In Compustat, year 1987 includes firms with fiscal years ending between June 1987 and May 1988.) The coefficients and standard errors reported in the tables are computed from the time series of ordinary least squares regression coefficients. (Cross-sectional standard errors are therefore ignored.) In general, the reader is well advised to ignore statistical standard errors. Statistical significance at conventional significance levels is rarely lacking. The reader's first concern should be the *economic* meaning of the coefficients, not their *statistical* significance.

Pooling all firm-years (instead of Fama-MacBeth) does not change coefficient estimates: for example, a one-year pooled regressions has coefficients of 2.7 percent, 101.7 percent, and −5.9 percent instead of the reported 2.7 percent, 101.4 percent, and −5.3 percent coefficients in the Fama-MacBeth method. *Fixed-effects* regressions keep the IDR coefficient at about the same level but drop the ADR coefficient, in some cases to −30 percent.

When horizons are more than one year, the same firm can appear in overlapping regressions. *Overlap* does not change the coefficient estimates: for example, in a 10-year regression that is run with three nonoverlapping periods (1970–80, 1980–90, and 1990–2000), the coefficient estimates are 13.9 percent, 75.1 percent, and 6.0 percent instead of the reported 13.8 percent, 70.8 percent, and 6.9 percent coefficients in the paper. Statistical significance drops mildly, but no reported inference in this paper changes.

Not reported, the Fama-MacBeth coefficient estimates typically have negative serial correlation. For example, the coefficient time series of IDR in the annual regressions displays a *negative* serial correlation of about −50 percent, which implies that the critical 5 percent level is around 1.1, not 1.96. This negative serial correlation in coefficients implies that the standard errors are overstated. However, although for the one-year level regressions the firm-specific residuals from the cross-sectional regressions also have, on average, a negative −12 percent time-series correlation (from regression to regression), this is not the case for the differences regression (+30 percent correlation). The rolling overlap in the five-year regressions further increases the same-firm residual correlation (to +42 percent). This average positive serial correlation in residuals implies that the standard errors are understated. Fortunately, even if one increases the standard error by a factor of $\sqrt{T = 37} \approx 6$ (i.e., a worst case) or used the average cross-sectional standard error instead of the time-series variation in the Fama-MacBeth coefficients, the inferences in table 3 would not change. And in table 5, it is the economic significance of the variable coefficients that is emphasized anyway.

The residuals in cross-sectional or pooled regressions have a nice bell shape and are generally well behaved. In cross-sectional regressions, unit roots are not a concern (even if the autocoefficient is close to one).

B. *Other Robustness Checks*

Reported results in table 2 are robust with respect to the use of means rather than medians (or vice versa). All results are robust with respect to the use of various scale controls and with respect to different definitions of debt, specifically to the use of short-term and investment grade debt only (so that the debt is almost risk-free, which eliminates much concern about the use of debt book value rather than the debt market value).

Unfortunately, the more interesting hypothesis that firms target an optimal debt ratio (rather than just their past debt ratio) is not explorable because of lack of identification of an "optimum"—both theoretically and empirically. However, added lags in actual debt ratio terms in the regressions have no significance.

Over longer horizons, there are fewer observations because firms can disappear. For the year 2000, the 10-year regression predicts debt ratios for only 1,131 firms, whereas the equivalent one-year regression has 2,679 firms. To my surprise, simulations indicate that survivorship bias does not significantly influence the ADR/IDR coefficient estimates. Even eliminating *all* firms with negative stock returns barely budges the coefficient estimates. (The better stock performance of more levered companies in table 2, however, is probably influenced by survivorship bias.)

The robustness of the specifications in table 5 was confirmed with alternatives in which either the plain or the crossed variable was included only by itself. Further, the lack of cross-sectional predictability in readjustment tendency (the cross term) also clearly shows up when we use each variable to classify observations into quintiles and compare the IDR/ADR coefficients across quintiles. The estimated coefficients on IDR are always close to one in all quintile subcategories and not very different from one another. The one exception is mergers and acquisitions activity in the latter half of the sample period: in a classification table, acquirers do show systematic debt increases (relative to the stock return implied debt ratios). In sum, the modest significance in any of the cross variables indicates that nonreadjustment is a relatively universal phenomenon, at least across the examined dimensions.

References

Baker, Malcolm, and Jeffrey Wurgler. 2002. "Market Timing and Capital Structure." *J. Finance* 57 (February): 1–32.

Barclay, Michael J., Erwan Morellec, and Clifford W. Smith. 2001. "On the Debt Capacity of Growth Options." Manuscript. Rochester, N.Y.: Univ. Rochester, Simon School.

Barclay, Michael J., Clifford W. Smith, and Ross L. Watts. 1995. "The Determinants of Corporate Leverage and Dividend Policies." *J. Appl. Corp. Finance* 7 (Winter): 4–19.

Benartzi, Shlomo, and Richard H. Thaler. 2001. "Naive Diversification Strategies in Defined Contribution Saving Plans." *A.E.R.* 91 (March): 79–98.

Benartzi, Shlomo, Roni Michaely, and Richard H. Thaler. 1997. "Do Changes in Dividends Signal the Future or the Past?" *J. Finance* 52 (July): 1007–34.

Berger, Philip G., Eli Ofek, and David L. Yermack. 1997. "Managerial Entrenchment and Capital Structure Decisions." *J. Finance* 52 (September): 1411–38.

Bikhchandani, Sushil, David Hirshleifer, and Ivo Welch. 1998. "Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades." *J. Econ. Perspectives* 12 (Summer): 151–70.

Fama, Eugene F., and Kenneth R. French. 2002. "Testing Trade-off and Pecking Order Predictions about Dividends and Debt." *Rev. Financial Studies* 15 (Spring): 1–33.

Fischer, Edwin O., Robert Heinkel, and Josef Zechner. 1989. "Dynamic Capital Structure Choice: Theory and Tests." *J. Finance* 44 (March): 19–40.

Graham, John R. 2000. "How Big Are the Tax Benefits of Debt?" *J. Finance* 55 (October): 1901–41.

———. 2003. "Taxes and Corporate Finance: A Review." *Rev. Financial Studies* 16 (Winter): 1074–1129.

Graham, John R., and Campbell R. Harvey. 2001. "The Theory and Practice of Corporate Finance: Evidence from the Field." *J. Financial Econ.* 60 (May/June): 187–243.

Hirshleifer, David, and Ivo Welch. 2002. "An Economic Approach to the Psychology of Change: Amnesia, Inertia, and Impulsiveness." *J. Econ. and Management Strategy* 11 (Fall): 379–421.

Hovakimian, Armen, Timothy C. Opler, and Sheridan Titman. 2001. "The Debt-Equity Choice." *J. Financial and Quantitative Analysis* 36 (March): 1–24.

Leland, Hayne E. 1998. "Agency Costs, Risk Management, and Capital Structure." *J. Finance* 49 (August): 1213–43.

MacKay, Peter, and Gordon M. Philips. 2002. "Is There an Optimal Industry Financial Structure?" Manuscript. College Park: Univ. Maryland.

Miller, Merton H. 1977. "Debt and Taxes." *J. Finance* 32 (May): 261–75.

Myers, Stewart C. 1984. "The Capital Structure Puzzle." *J. Finance* 39 (July): 575–92.

Myers, Stewart C., and Nicholas S. Majluf. 1984. "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have." *J. Financial Econ.* 13 (June): 187–221.

Rajan, Raghuram G., and Luigi Zingales. 1995. "What Do We Know about Capital Structure: Some Evidence from International Data." *J. Finance* 50 (December): 1421–60.

———. 2000. "The Tyranny of Inequality." *J. Public Econ.* 76 (June): 521–58.

Ritter, Jay R., and Richard S. Warr. 2002. "The Decline of Inflation and the Bull Market of 1982–1999." *J. Financial and Quantitative Analysis* 37 (March): 29–61.

Samuelson, William, and Richard J. Zeckhauser. 1988. "Status Quo Bias in Decision Making." *J. Risk and Uncertainty* 1 (March): 7–59.

Shyam-Sunder, Lakshmi, and Stewart C. Myers. 1999. "Testing Static Tradeoff against Pecking Order Models of Capital Structure." *J. Financial Econ.* 51 (February): 219–44.

Titman, Sheridan, and Roberto Wessels. 1988. "The Determinants of Capital Structure Choice." *J. Finance* 43 (March): 1–19.

Zwiebel, Jeffrey. 1995. "Corporate Conservatism and Relative Compensation." *J.P.E.* 103 (February): 1–25.