# Firms' Histories and Their Capital Structure

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**Abstract**

This paper examines how cash flows, investment expenditures and stock price histories affect corporate debt ratios. Consistent with earlier work, we find that these variables have a substantial influence on capital structure choices. However, in contrast to previous conclusions, we find that the influence of some of these variables tends to dissipate over time. Specifically, we find that market timing behavior (i.e., issuing equity when stock prices are relatively high) has only a weak effect on observed debt ratios and this effect does not appear to persist. In contrast, stock price changes and firms' financial deficits (i.e., the amount firms raise externally) have relatively strong effects on capital structures that do persist for quite some time. However, the evidence suggests that even these effects partially reverse, and that over long periods of time firms make financing choices that move them towards their target debt ratios.

## I. Introduction

Capital structure theory suggests that firms determine what is often referred to as a target debt ratio, which is based on various tradeoffs between the costs and benefits of debt versus equity. In a recent survey of CFOs, Graham and Harvey (2001) report that 37% of their respondents have a flexible target, 34% have a somewhat tight target or range and 10% have a strict target. Consistent with the idea that targets may be flexible, capital structure theory provides arguments based on information asymmetries, market inefficiencies, and transaction costs that explain why firms' cash flows, investment expenditures and stock price histories can lead them to deviate from the targets suggested by the traditional tradeoff theories. Indeed, a substantial part of the recent literature on capital structure focuses on those forces that move firms away from their target ratios and often gives the impression that a firm's history is a more important determinant of capital structure than are firm characteristics that proxy for the costs and benefits of debt versus equity financing.

This paper provides a comprehensive analysis of how cash flows, investment expenditures and stock price histories affect capital structure choices. Our analysis confirms that history does in fact have a major influence on observed debt ratios. However, the long-term effects of a firm's history on its capital structure has been exaggerated in the recent literature, and as we show, changes in debt ratios tend to be consistent with the hypothesis that they move towards target ratios based on traditional tradeoff variables.

Our analysis focuses on the following variables, which we describe and discuss in detail later in the paper:

1) **Past profitability**: Titman and Wessels (1988) and others find that firms with higher past profits tend to have lower debt ratios. This evidence, which has been attributed to the Donaldson (1961) and Myers (1984) pecking order of financing preferences, is consistent with tax, transaction costs, and adverse selection arguments that imply that internally generated equity is less costly than equity capital that is raised externally.

2) **Financial deficits**: Shyam-Sunder and Myers (1999) find that firms with higher financial deficits, i.e., firms that raise more external capital, tend to increase their leverage. This evidence is consistent with Myers and Majluf's (1984) adverse selection model.[1]

3) **Past stock returns:** A number of articles have noted that firms tend to issue equity following increases in their stock prices and tend to repurchase shares following stock price declines.[2] This evidence implies that leverage ratios are likely to be strongly related to past stock returns, which was recently documented by Welch (2004).

4) **Market timing:** Graham and Harvey's (2001) survey evidence suggests that firms issue equity following stock price increases because CFOs believe that they can raise equity capital under more favorable terms in such situations. Baker and

[1] Frank and Goyal (2003) examine a larger sample of firms and also find a strong relation between financial deficits and changes in debt ratios. However, they note that the relation between financial deficits and changes in the debt ratio is stronger for larger and older firms. Since these firms might be expected to be less subject to asymmetric information problems, they argue that this evidence is inconsistent with Myers and Majluf (1984).

[2] Taggart (1977), Marsh (1982), Asquith and Mullins (1986), Korajczyk, Lucas and McDonald (1991), Jung, Kim and Stulz (1996), and Hovakimian, Opler and Titman (2001) demonstrate evidence for market timing with seasoned equity. Loughran and Ritter (1995) and Pagano, Panetta, and Zingales (1998) show that firms tend to initiate IPOs when they have high market valuations. Ikenberry, Lakonishok, and Vermaelen (1995) provide evidence for market timing with share repurchases. See Ritter (2002) for a detailed list of papers that provide evidence for market timing.

Wurgler (2002) examine how this tendency to "time the equity markets" affect debt ratios and find that firms that raise substantial amounts of capital when the equity market is perceived to be more favorable, i.e., when market-to-book ratios are higher, tend to have lower debt ratios.

Our investigation of the effect of these four variables on capital structure choices departs from earlier studies in a number of ways. First, since our focus is on whether history has more than a fleeting effect on capital structure, we examine changes in capital structure over somewhat longer time periods (5 and 10 year changes) than either Shyam-Sunder and Myers (1999) or Frank and Goyal (2003) who look at changes in leverage over one year. In addition, by including a proxy for the leverage deficit (the difference between the actual debt ratio and a proxy for the target ratio) in our regressions, we reduce a potential endogeneity problem that could bias the estimates in the Shyam-Sunder and Myers (1999) regressions. This bias can arise if firms with debt ratios that exceed their target ratios choose to reduce investment, and hence reduce their financial deficits, because of a desire to move towards their target debt ratio.

Our examination of stock returns and timing also departs from the existing literature. In particular, we consider a new timing measure that captures the intuition described by Baker and Wurgler (2002) but eliminates a potential bias in their original measure. In addition, by including timing variables in the same regression as the pecking order and stock return variables we can better understand their independent effects on changes in capital structure. Finally, we focus on how timing considerations and stock returns relate to changes in the debt ratio. In contrast, the existing literature examines the relation between these variables and debt ratio levels.

Although our evidence indicates that financial deficits generally affect debt ratios in the way described by Shyam-Sunder and Myers (1999), there are some important exceptions. In particular, we find a somewhat weaker relation between the financial deficit and leverage and show that this relation is reduced (and can be reversed) for firms with sufficiently high market-to-book ratios.[3]

In addition, although we take issue with the specific construction of the Baker and Wurgler (2002) timing measure, we confirm that firms that happen to raise capital in years in which their stock prices are relatively high tend to reduce their debt ratios. However, our timing measure, which captures the spirit of the Baker and Wurgler intuition, has only a temporary effect on observed debt ratios; after five years the effect of timing on changes in debt ratio disappears. In addition, a second "timing" variable that interacts a firm's financial deficit with its average market-to-book ratio is shown to be more strongly related to changes in the debt ratio and its affect is more long-lasting. As it turns out, it is the persistence of the firm's average market to book ratio (which is captured in our second measure) rather than the covariance between market to book and the financial deficit (which is captured in our first measure) that drives the persistence result in Baker and Wurgler.

Finally, our evidence confirms the Welch (2004) observation that stock price changes have a strong effect on market leverage ratios. In addition, we find that past stock returns influence the debt to book value of assets ratio, which is consistent with the

[3] Lemmon and Zender (2002) make a similar observation and argue that the tendency of high market-to-book firms to fund their financial deficits by issuing equity rather than debt could be due to the fact that high market-to-book firms have a lower debt capacity. This possibility will be briefly discussed later.

observation that firms are more likely to issue equity subsequent to stock price increases. However, in contrast to Welch's claim, the stock return effect does partially reverse and does not subsume other determinates of capital structure. Indeed, our results indicate that after controlling for the changes in stock prices and other timing and pecking order effects, changes in debt ratios are still partially explained by movements towards a target debt ratio.

The remainder of the paper is organized as follows. Section II describes our methodology and presents the measures that we construct to proxy for timing and pecking order effects. Section III reports the data, followed by the empirical analysis in Section IV. Section V investigates the persistence of the market timing and pecking order effects on capital structure and Section VI analyzes the extent to which these effects reverse. Section VII concludes.

## II. Methodology and Variable Construction

As we discuss in detail below, we examine how the debt ratios of firms change over time. These changes can be generated as a result of shocks that can cause the firm to move away from their target debt ratios; these shocks include cash inflows and investment outlays as well as what we will call changes in market conditions, i.e., changes in the firms' stock prices and market-to-book ratios. Changes in debt ratios may also be motivated by a desired move towards the firm's target debt ratio.

The empirical methodology we follow is closely related to the partial adjustment models that have been previously examined in the literature.[4] Similar to these models,

[4] See for example, Auerbach (1985), Fama and French (2002), Jalilvand and Harris (1984), Hovakimian, Opler and Titman (2001) and Shyam-Sunder and Myers (1999).

we estimate the determinants of changes in the debt ratio in two steps. In the first step we construct a proxy for the target leverage ratio as the predicted value from a regression of debt ratios on tradeoff variables that are employed in prior cross-sectional studies.[5] Next, using this target leverage proxy, we construct a leverage deficit variable as the difference between the target leverage ratio and the leverage ratio at the beginning of the period ($D_{t-1} - D_T$).[6] In the second step, we estimate a regression of changes in the debt ratio on this estimated leverage deficit along with the history variables described below.

A. The financial deficit variable:

The financial deficit, or equivalently, the amount of external capital that is raised, plays a central role in both Myers' pecking order effect, as discussed in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), and the timing effect, as discussed by Baker and Wurgler (2002). We will present three different definitions of the financial deficit. Our simplest definition, which is employed in the above studies and which we initially focus on, is simply the net amount of debt and equity the firm issues or repurchases in a given year. Specifically, the financial deficit (FD) is defined as the sum of investments (I), dividends (D) and changes in working capital ($\Delta WC$), net of net cash flow (CF). This sum, described below, is identical to net debt issues ($\Delta d$) plus net equity issues ($\Delta e$):

$$\text{Financial Deficit (FD)} = \Delta WC + I + D - CF \equiv \Delta e + \Delta d \qquad (1)$$

[5] Shyam-Sunder and Myers (1999) use the average of the debt ratio over the sample period to proxy for the target debt ratio. Hovakimian, Opler and Titman (2001) predict the target leverage using the variables that are suggested in the tradeoff theory.

[6] The alternative method would be to use to target proxies directly in the regression rather than using the predicted target leverage that is estimated from these proxies that potentially reduces the sampling error due to imputed regressors (Hovakimian (2003)). Our results regarding the history variables remain robust to either specification.

When this variable is positive the firm invests more than it internally generates. When it is negative, the firm generates more cash than it invests; in other words, the firm has positive free cash flow. The interpretation of the pecking order hypothesis, described in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), is that since debt is likely to be the marginal source of financing, firms with high financial deficits are likely to increase their debt ratios.

B. Our timing measures:

Baker and Wurgler (2002) develop a timing measure based on the idea that firms tend to raise funds with equity when their stock price is high and with debt when their stock price is low. Given this, firms are expected to have lower debt ratios if they happen to raise capital when their stock prices are high and have higher debt ratios if they happen to raise capital when their stock prices are low. In this subsection we present our own timing measures, which have properties that we think are preferable to the Baker and Wurgler measure. However, as we will show, our measures are closely related to the Baker and Wurgler measure.

Similar to Baker and Wurgler, the financial deficit, or equivalently, the amount of capital raised, plays a key role in the two timing measures that we describe below:

$$\text{Yearly Timing (YT)} = \left( \sum_{s=0}^{t-1} FD_s * (M/B)_s \right) / t - \overline{FD} * \overline{M/B} \tag{2}$$

$$= \hat{\text{cov}}\,(FD,\ M/B)$$

$$\text{Long-Term Timing (LT)} = \left(\sum_{s=0}^{t-1}(M/B)_s/t\right)*\left(\sum_{s=0}^{t-1}FD_s/t\right) \quad (3)$$

$$= \overline{M/B} * \overline{FD}$$

where the summations are taken for each firm-year observation over a five year period.

The yearly timing measure (*YT*), i.e., the sample covariance between total external financing and the market-to-book ratio, captures the Baker and Wurgler's (2002) idea that a firm that raises external capital at times when its stock price is relatively high is more likely to decrease its debt ratio. The logic here is that managers take advantage of short-term over-valuation to fund their capital needs by issuing equity. In this case the notion of over- or under-valuation is determined by the firm's current market-to-book ratio relative to its market-to-book ratio in surrounding years. One might also posit that managers form their beliefs about whether or not their stock is over- or under-valued based on how high their market-to-book ratios are relative to all firms in general. This is one interpretation of our long-term timing measure (*LT*). Put slightly differently, the long-term timing measure allows us to test whether managers act as though their costs of equity financing is inversely related to the market-to-book ratio (which some would argue is consistent with empirical observations), leading them to fund their financial deficit with equity rather than debt if their market-to-book ratio is sufficiently high.

The long-term timing measure can also be interpreted relative to the pecking order tests of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Specifically, this variable allows us to estimate how the pecking order effect is related to market-to-book ratios. There are a variety of reasons why the pecking order effect may be related to the market-to-book ratio that have nothing to do with market timing. First, it is plausible that firms with high market-to-book ratios are more willing to issue equity because they are subject to less asymmetric information problems. Second, firms with higher market-to-book ratios may be more willing to be exposed to the increased scrutiny that occurs when their shares are issued on public markets.[7] Third, since firms with higher market-to-book ratios are likely to have higher growth opportunities, they may wish to finance their current financial deficit with equity because they want to reserve their borrowing capacity for the future.[8] Finally, it may be the case that firms with low market-to-book values are relatively under-levered, since they tend to add a lot of equity to their balance sheets via retained earnings. Growth firms, on the other hand, generate less retained earnings and therefore need to finance their financial deficits at least partially with equity to keep from becoming over-levered.

The two timing measures that we discuss in the preceding paragraphs are closely related to the timing measure considered by Baker and Wurgler (2002). Specifically, as we show in the following equation, the Baker and Wurgler timing measure can be viewed as a linear combination of the yearly and long-term timing measures (see Appendix 1 for the derivation):[9]

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[7] A recent paper by Almazan, Suarez and Titman (2003) develops a model that indicates that in some situations firms will choose not to issue equity because they do not want the scrutiny associated with an equity issue. It is plausible that these scrutiny costs are related to whether a firm is likely to be growing in the future. Scrutiny is likely to benefit growing firms, which may that with favorable attention they can more easily attract new customers and employees. In contrast, scrutiny can be costly to firms that are not likely to grow, and may lose existing customers and employees if the scrutiny associated with an equity issue reveals negative information.

[8] However, this argument requires that the market to book ratio times the financial deficit provides information about the firm's target capital structure that are not contained in the proxy for the target debt ratio included in the regression. This would be the case if the product of the financial deficit and the market to book ratio provides a better estimate of a firm's growth opportunities than the market to book ratio, which is used to estimate the target proxy.

[9] It should be noted that this decomposition applies only to the case where the Baker and Wurgler timing measure is positive. When it is negative they set it equal to zero.

$$\left(M/B\right)_{\text{timing},t-1} = \frac{\sum_{s=0}^{t-1} FD_s * (M/B)_s}{\sum_{r=0}^{t-1} FD_r}$$

$$= \frac{\hat{\text{cov}}(FD, M/B)}{\overline{FD}} + \overline{(M/B)} \qquad (4)$$

$$= (YT + LT)/\overline{FD}$$

The first term in this decomposition, $\text{cov}(FD, M/B)$ divided by $\overline{FD}$, is the same as our yearly timing measure; however, this term is scaled by the average financial deficit, making it invariant to the amount of capital raised. In contrast, our yearly timing measure (*YT*), accounts for the fact that market timing (specifically, the tendency to raise funds with equity rather than debt when stock prices are high) is likely to affect a firm's capital structure more if the firm raises more external capital.

The second term in the decomposition, the average market-to-book ratio ($\overline{M/B}$), does not really capture the BW timing intuition. However, the presence of this term in their timing measure can induce a negative relation between the BW timing measure and changes in the debt ratio for reasons that have nothing to do with market timing incentives. Specifically, the market-to-book ratio is likely to proxy for a firm's investment opportunity set, which in theory should be negatively related to observed debt ratios, i.e., firms with better investment opportunities tend to avoid debt financing in order to keep their financial flexibility. Baker and Wurgler recognize this possibility and include a one period lag of *M/B* to control for differences in investment opportunities. However, if leverage changes more slowly than investment opportunities, or alternatively if *M/B* is a very noisy proxy for investment opportunities, the average market-to-book ratio, calculated over a number of prior years, may provide a better proxy for a firm's investment opportunities than does the one year lagged *M/B*.

In unreported regressions we find a strong relation between $(M/B)_{\text{timing}}$ and observed debt ratios, which is consistent with what is found in Baker and Wurgler (2002). However, the regressions that include the two components in place of $(M/B)_{\text{timing}}$ reveal that it is the second term $(\overline{M/B})$ that drives these results and that the covariance term scaled by the average financial deficit is not significantly related to observed leverage ratios.[10] However, as we show below, when the covariance term is not scaled by the average financial deficit it is in fact significantly related to the debt ratio.

C. Stock returns:

To examine the direct effect of stock price changes on the debt ratio we include firms' stock returns (*r*), measured as the cumulative log return on the stock over the previous five years. This variable can also be interpreted as a proxy for the market timing effect we discussed before. However, it is not interacted with the financial deficit variable. As Welch (2004) emphasizes, stock returns will be negatively associated with debt ratios (measured with the market value of equity) if firms choose not to rebalance their debt ratios following periods of increasing and decreasing stock prices. Moreover, a negative relationship between the book leverage and the cumulative log return on the stock would provide further evidence that firms are more willing to issue equity when they experience relatively high market valuations.

[10] We later discuss that the average market to book variable is very persistent which contributes to its persistent relationship with leverage.

D. Profitability:

Profitability, which we define as the sum of earnings before interest, taxes, and depreciation over the previous five years, scaled by the beginning period firm value,[11] is related to the availability of internal funds. Although the previously cited tests of the pecking order effect (Shyam-Sunder and Myers (1999) and Frank and Goyal (2003)) do not include profitability in their regressions, the pecking order suggests that profitability should have an independent effect on capital structure even after controlling for the financial deficit. To understand this, consider the extreme case of the pecking order where levered firms finance new projects with retained earnings but choose not to issue either new debt or new equity. In this case, the financial deficit will be exactly zero, but more profitable firms will reduce their leverage (relative to less profitable firms) through retained earnings.

It also should be noted that profitability could affect capital structure for tax reasons that are independent of the asymmetric information effect described by Myers (1984). In particular, as Auerbach (1979) and others have noted, if distributions are taxed at the personal level, there will be a tax advantage associated with retaining equity that lead more profitable firms to reduce their debt ratios.[12] Given this tax effect, and the potential correlation between profitability and the financial deficit, it is possible that the observed relation between the financial deficit and changes in capital structure could also be driven by taxes. However, taxes should not induce a relation between the financial deficit and changes in the debt ratio after controlling for profitability.

[11] In book leverage regressions, the beginning period firm value is the sum of book debt and book equity. In the market leverage regression the scaling factor is the sum of book debt and market equity.

[12] A recent paper by Hennessy and Whited (2003) examines this possibility in detail and provides simulations that indicate that the observed negative relation between debt ratios and past profitability can be generated entirely by taxes on distributions.

E. Leverage Deficit:

If firms have a tendency to move towards their target debt ratios, then firms that have leverage ratios lower (higher) than their target are likely to experience future increases (decreases) in their debt ratios.[13] We define the leverage deficit as the difference between a firm's target leverage and its realized level.

Our proxy for the target debt ratio is the predicted value from a Tobit regression of observed debt ratios on variables that have been suggested in the previous literature as proxies for the benefits (e.g., tax deductibility of interest and the reduction of free cash flow) and costs (e.g., potential financial distress and bankruptcy costs) of leverage. These variables are profitability (*EBITD*), asset tangibility (*PPE*), research and development expense (*R&D*), selling expense (*SE*), firm size (*SIZE*), and the market-to-book ratio *(M/B)*.[14] In addition, we include industry dummies to capture the industry specific determinants of leverage not captured by the above variables.[15] The motivation for selecting these target proxies are discussed in detail in Appendix 2.

F. Other issues relating to the financial deficit variable

F.1. Endogeneity of the financial deficit variable

Ideally, one would like to have a financial deficit variable that is exogenous with respect to the capital structure choice. Indeed, the pecking order argument is based on the idea that firms make financing choices in response to exogenously generated cash flows and investment choices. However, in reality, the financial deficit is an endogenous

[13] We simplify the specification of adjustment costs by assuming that both leverage increasing and leverage decreasing adjustments are symmetric. In other words, we abstract from potential differences that can arise because of wealth transfers from equity holders to debt holders that keep firms from paying down their debt (Myers (1977)), or information asymmetries that make it more difficult to issue equity than debt.

[14] These variables were previously considered by Titman and Wessels (1988), Rajan and Zingales (1995) and others.

[15] Specifically, we use the Fama and French (1997) industry classification. See Kenneth French's website.

variable that is likely to be influenced by the firm's capital structure as well as by conditions in the debt and equity markets. Specifically, firms that are temporarily overly levered may cut back their investment expenditures to reduce their financial deficit or equivalently increase the free cash flow available to pay down their debt. This can induce a positive relation between the financial deficit and changes in the leverage ratio for reasons that have nothing to do with the pecking order theory. In addition, firms may raise external capital, and thus generate a high financial deficit, because the external markets view the firm favorably. If firms tend to try to time equity markets more than debt markets, this behavior will induce a relation between the tendency of firms to raise capital when their market-to-book ratios are high and changes in the debt ratio.

Our regression specification addresses (but probably does not eliminate) these potential endogeneity problems. Specifically, by including a leverage deficit variable as the difference between the actual leverage ratio and the target, we mitigate the first problem. We address the second endogeneity problem by examining two alternative versions of the financial deficit variable. The first alternative excludes changes in cash ($\Delta$cash) as a part of the financial deficit, since it is a decision that management makes simultaneously with debt and equity issues. The necessity of this adjustment becomes clearer when we consider the possibility that firms sometimes issue equity, only because their managers think that the firm's stock price is over-valued, and places the proceeds in cash. In this case, an increase in the financial deficit is associated with a decrease (rather than an increase) in leverage. The resulting reduction in the coefficient on the financial deficit variable arising from this activity is likely to be more significant for high market-to-book firms, if we believe these firms are more likely to engage in this sort of timing activity. To explore the implications of this possibility we subtract changes in cash from the definition of the financial deficit

$$FD \equiv \Delta e + \Delta d - \Delta cash \qquad (5)$$

For the second alternative we exclude dividends as well as changes in cash from the financial deficit. Again, if the manager raises equity because of favorable stock prices and distributes the proceeds as a dividend, the estimate of the financial deficit coefficient will be reduced, i.e., an increase in the financial deficit will be associated with a decrease in leverage. To eliminate this effect on the coefficient of the financial deficit we consider a third version of the financial deficit variable that takes the following form:

$$FD \equiv \Delta e + \Delta d - \Delta cash - D \qquad (6)$$

F.2. Negative financial deficit

It is likely that the positive financial deficit and the negative financial deficit (i.e., positive free cash flow) affect debt ratios differently. For example, the information issues involved in share repurchase may not be the same as those involved in a share issuance. For this reason we introduce a dummy variable (*d*), which takes the value one when the financial deficit is positive, to separate the positive and negative values of the financial deficit variable.[16]

[16] Shyam-Sunder and Myers (1999) acknowledge that this may be an issue but choose not to account for this lack of symmetry in their empirical analysis.

## III. Data

Our sample consists of firms listed in the Compustat Industrial Annual Files at any point between 1971 and 2002.[17] Data on stock prices is obtained from CRSP Files. We exclude financial firms (SIC codes 6000-6999) and regulated utilities (SIC codes 4900-4999) from the sample. In addition, we restrict the sample to include firms with book value of assets above $10 million.[18] Additional data restrictions are stated in the following discussion of our regression variables.

Book leverage is defined as the ratio of book debt to total assets, where book debt is defined as total assets minus book equity, and book equity is equal to total assets less total liabilities and preferred stock plus deferred taxes and convertible debt.[19] We drop observations where this ratio is greater than one for individual firm-year observations. Market leverage is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity.[20]

Net debt and net equity issues that are used both in market timing and financial deficit variables are calculated using balance sheet items. We define net equity issues as the change in the book value of equity minus the change in retained earnings (Baker and

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[17] The sample period is constrained by the availability of cash flow statement variables. U.S. firms started reporting fund flow statements in year 1971. Since market timing and financial deficit variables require five years of history on market prices, net equity and net debt issues; leverage regressions are estimated after year 1976.

[18] As a robustness check, we exclude the firms involved in large asset sales and big mergers (identified by Compustat footnote code AB). This does not have any material effect on our results.

[19] We follow Baker and Wurgler (2002) and treat preferred stock as debt. The rationale for this is that for the purposes of considering timing and pecking order effects, preferred stock, being a fixed claim, more closely resembles debt than equity. When preferred stock data is missing we replace it with the redemption value of preferred stock.

[20] Since our analysis is based on the changes in the leverage ratio, a potential problem arises from the fact that our measured debt ratios cannot be negative. To examine whether this creates a bias in our results, we examined subsamples that exclude the firm-year observations from the sample where the leverage ratio is less then 10%. When we do this, the sample mean of book leverage increases from 47.9% to 51.17%, and the sample mean of market leverage increases from 40.1 to 45.3%, but our regression results do not change materially.

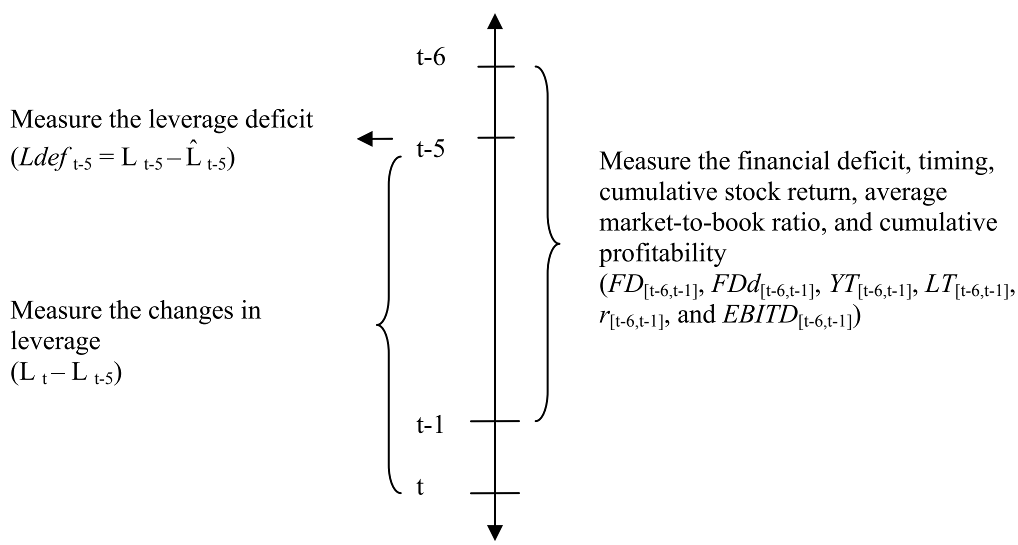
Wurgler (2002) use this approach). Net debt issues are then defined as the change in total assets net of the change in retained earnings and net equity issues.[21]

A detailed discussion of the variable construction is presented in Table 1.

**Insert Table 1**

## IV. Empirical Analysis

Our analysis examines how financial deficits, timing and stock return variables relate to changes in leverage after controlling for the leverage deficit that is measured at the beginning of the period. Our intuition is that while these variables tend to move firms away from a possibly time varying target debt ratio, firms tend to revert back to their target over time. The timeline of the observations and our two-stage regression specification are as follows:




[21] Alternatively, these variables can also be calculated from the cash flow statements (as in Frank and Goyal (2003) and Shyam-Sunder and Myers (1999)). Specifically, net equity issues is equal to the sale of common and preferred stock minus the purchase of common and preferred stock; and net debt issues is equal to long-term debt issuance minus long-term debt reduction (refer to Frank and Goyal (2003) for a detailed discussion of the components of the financial deficit variable for different format codes in the cash flow statement). Variables constructed from cash flow statements have a significant amount of missing data and thus fewer observations available for empirical analysis. Therefore, we use the first method for calculating net debt and net equity issues.

Stage 1: predict the target leverage

$$L_{t-5} = \alpha_0 + \beta_1 M/B_{t-6} + \beta_2 PPE_{t-6} + \beta_3 EBITD_{t-6} + \beta_4 R\&D_{t-6} + \beta_5 (R\&D\,d)_{t-6} + \beta_6 SE_{t-6} + \beta_7 SIZE_{t-6} + \beta_8 Industry\,dummy_{t-5} + \varepsilon_{t-5} \quad (7)$$

and construct the leverage deficit ( $Ldef_{t-5} = L_{t-5} - \hat{L}_{t-5}$).

Stage 2: estimate the regression model

$$L_t - L_{t-5} = \alpha_0 + \beta_1 FDd_{[t-1,t-6]} + \beta_2 FD_{[t-1,t-6]} + \beta_3 YT_{[t-1,t-6]} + \beta_4 LT_{[t-1,t-6]} + \beta_5 r_{[t-1,t-6]} + \beta_6 EBITD_{[t-1,t-6]} + \beta_7 Ldef_{t-5} + \beta_8 Industry\,dummy_{t-1} + \varepsilon_t \quad (8)$$

The first stage regression is estimated using a Tobit specification where the predicted value of the leverage ratio is restricted to be between 0 and 1.[22] In the second stage regression we estimate the coefficient estimates with standard OLS regressions, and use a bootstrapping technique to determine the statistical significance of the estimated coefficients. Standard regression models are not appropriate to determine the significance of the parameter estimates since the standard errors violate the assumptions under which these models are estimated. Bootstrapping allows us to estimate standard errors that are robust to heteroskedasticity, correlation that arise as a result of multiple observations for each firm, and autocorrelation that we induce by including observations in the overlapping periods.[23]

[22] The regression results for the first stage regression are reported in Table A2.
[23] A detailed explanation of the procedure we follow is provided in Appendix 3.

A. Results

Table 2 summarizes the coefficient estimates obtained from the regressions of the changes in book leverage and market leverage on our proxies for market timing, pecking order, cumulative stock returns, cumulative profitability, and the leverage deficit. We report our results for both market leverage and book leverage regressions in three panels (one for each financial deficit measure). The base case is represented under the "*e+d*" panel where, as in the earlier cited research, the financial deficit is the sum of net debt and equity issues. The second and third panels adjust the financial deficit for cash, and cash and dividends, respectively, by subtracting them from the sum of net debt and equity issues.

**Insert Table 2**

The results in the base case regressions (Panel "*e+d*") are consistent with the idea that pecking order, stock returns, profitability, and market timing considerations tend to move firms away from their target debt ratios, but that there is also a tendency for firms to move back towards their targets. In particular, consistent with the pecking order prediction, we find strong evidence that firms with higher positive financial deficits tend to increase their debt ratios. In addition, firms tend to reduce their debt ratios when they have higher free cash flow, suggesting that the Myers and Majluf prediction holds for both negative and positive values of the financial deficit. However, the point estimates of *FD* and *FDd* indicate that positive financial deficits have nearly twice the effect on leverage as negative financial deficits suggesting that the pecking order effect is more pronounced when firms are raising rather than retiring capital. One possible interpretation is that firms find it is easier (or less costly) to repurchase equity than to issue shares, and because of this asymmetry, the change in leverages generated by positive financial deficits exceed the changes generated by free cash flow.

The negative coefficient estimates for yearly timing (*YT*) and long-term timing (*LT*) indicate that firms that raise capital when their market-to-book ratios are high tend to reduce their debt-equity ratios. For example, book leverage decreases by 0.75 percent (-0.75 =-0.13*5.74) with a one standard deviation increase in *YT*. *LT* has a stronger effect; one standard deviation increase in *LT* leads to a 3.82 percent (-3.82 = -0.20*19.10) decrease in book leverage.

The *LT* variable, defined as the product of the average market-to-book ratio and the total financial deficit, may also be interpreted in relation to the pecking order. Specifically, our regressions suggest that the extent to which the financial deficit leads to an increase in the leverage ratio is inversely related to the average market-to-book ratio. In other words, the pecking order is less important for growth firms. In particular, when leverage is measured using book values, and the financial deficit is defined as $e+d$, firms that have positive financial deficits and an average market-to-book ratio that is above 4.75 tend to decrease leverage with increases in their financial deficit.[24]

Changes in stock prices also induce changes in both book and market leverage ratios. The strong inverse relation between the five-year cumulative stock return and market leverage is consistent with the idea that firms that experience changes in their stock prices do not tend to rebalance their leverage ratios. Moreover, the negative coefficient estimate for the cumulative stock return variable in the book leverage regressions indicates that firms actually do the opposite; they tend to take actions that

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[24] We calculate the composite effect of the positive financial deficit as $FD + FDd + LT/5$. The point estimate of *LT* is scaled by five since it is constructed as $\overline{M/B} * \overline{FD}$ while FD is cumulative 5 year deficit.

change the composition of their capital structure towards more (less) equity capital when they experience appreciation (depreciation) in their stock prices.

The negative relationship between five-year cumulative profitability and book leverage show that more profitable firms tend to reduce their leverage, which is consistent with the idea that firms do not offset the availability of retained earnings by repurchasing shares and borrowing more. As we mentioned previously, this is consistent with tax as well as asymmetric information arguments. However, the coefficient estimate for cumulative profitability is positive in the market leverage regressions, which is inconsistent with these arguments. Apparently, this positive coefficient estimate arises because of a strong relationship between cumulative stock returns and cumulative earnings and a very strong but non-linear relation between stock returns and the leverage ratio. Consistent with this interpretation, the coefficient is in fact strongly negative in an unreported regression that does not include stock returns as an independent variable.

Our regression estimates also indicate that debt ratios tend to move towards their target ratios. Specifically, the significant negative sign on the leverage deficit variable suggest that firms that are underlevered (or overlevered) relative to their industry peers with similar characteristics tend to increase (or decrease) their debt ratios in the future.

We also run (unreported) regressions without the leverage deficit variable that are similar to the regressions in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Our motivation was to determine the extent to which these earlier regressions were biased from the endogeniety of the financial deficit variable.[25] Consistent with this

[25] Indeed, the sample correlation between the financial deficit and the leverage deficit is negative (measured in market value it is -0.23 and using book values it is -0.06) indicating that firms that are overlevered tend to have lower financial deficits. As we mentioned earlier, this can create a positive relation between the

reasoning, our results suggest that when we do not control for the leverage deficit, the effect of the financial deficit on the leverage ratio tends to be greater. The evidence is stronger in market leverage regressions.

### B. Adjustments to the financial deficit

The results presented in Table 2 suggest that with some exceptions our findings are fairly robust with respect to the different measures of the financial deficit. Book leverage regressions indicate that the effects of *FD* and *FDd* on leverage do not seem to change across panels with different financial deficit definitions. In the market leverage regressions, the definitions of the financial deficit (that excludes changes in cash and both dividends and changes in cash) yield higher coefficient estimates for the negative financial deficit variable (*FD*).

The differences in coefficient estimates for the yearly timing variable in panels with different financial deficit definitions could reflect the tendency of managers to issue equity and increase their cash holdings when they believe that it is a good time to issue equity. In particular, our results indicate that when the financial deficit variable excludes the changes in cash balances, the yearly timing effect on the book leverage ratio is lower. In other words, the decrease in the leverage ratio as a result of yearly timing tends to be lower when we exclude the timing activity that results in increases in cash balances. The coefficient estimate of the long-term timing variable does not vary much across different definitions of the financial deficit variable.

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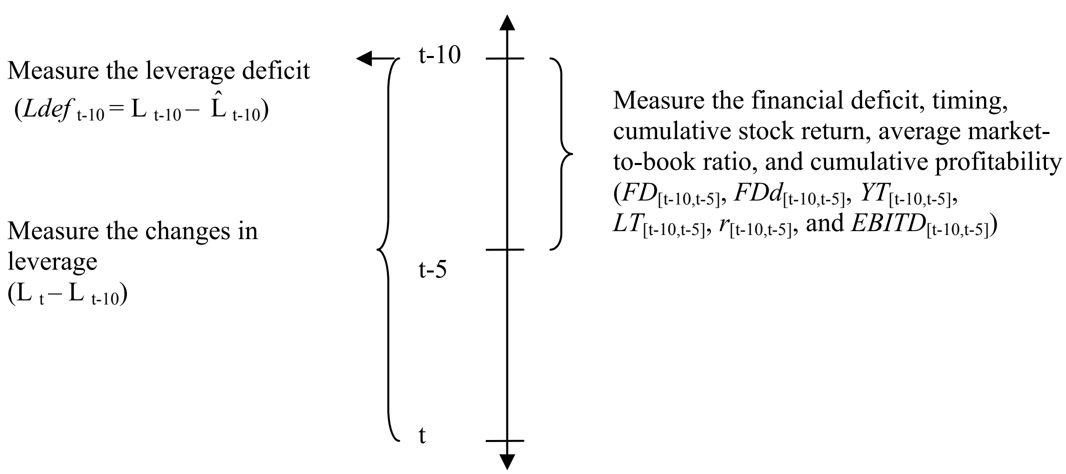
financial deficit and changes in leverage when the leverage deficit is excluded, since overlevered firms will tend to cut back on investment to reduce their leverage.

## V. Do the effects of history persist?

Having documented that a firm's prior 5 year history affects its debt ratio, we next examine whether the effects of history persists. Specifically, we examine whether the firms' cash flow, investment and stock price histories over the five-year period from years t-10 to t-5 affect how leverage ratios change over the entire ten-year period that includes the subsequent five years. If the effects observed in the previous regressions from t-10 to t-5 subsequently reverse, then we will observe a much weaker relation between the history variables and changes in capital structure over the entire 10 year period. Again, we estimate coefficients with OLS and bootstrap the standard errors as we discuss in the previous sections.

**Insert Table 3**

The following timeline describes the observation periods of the variables.




The regression results reported in Table 3 Panel A indicate that some of the effects of history at least partially persist. However, a comparison of the coefficient estimates reported in Table 3 with those reported in Table 2 indicates that some of the effects of history are subsequently reversed. Both in the book and market leverage regressions the negative and the positive financial deficit variables, the long-term timing variable, the cumulative stock return, and the cumulative profitability variables are significant in each of the specifications, indicating that their effect persists in the following five-year period. However, the yearly timing variable is insignificant in all of the specifications, suggesting that yearly timing has only a temporary effect on capital structure. Note also, that the profitability variable, which had what we thought was spurious positive effect in the previous contemporaneous regression on the market debt ratio, has a significant negative coefficient when the variable is lagged.

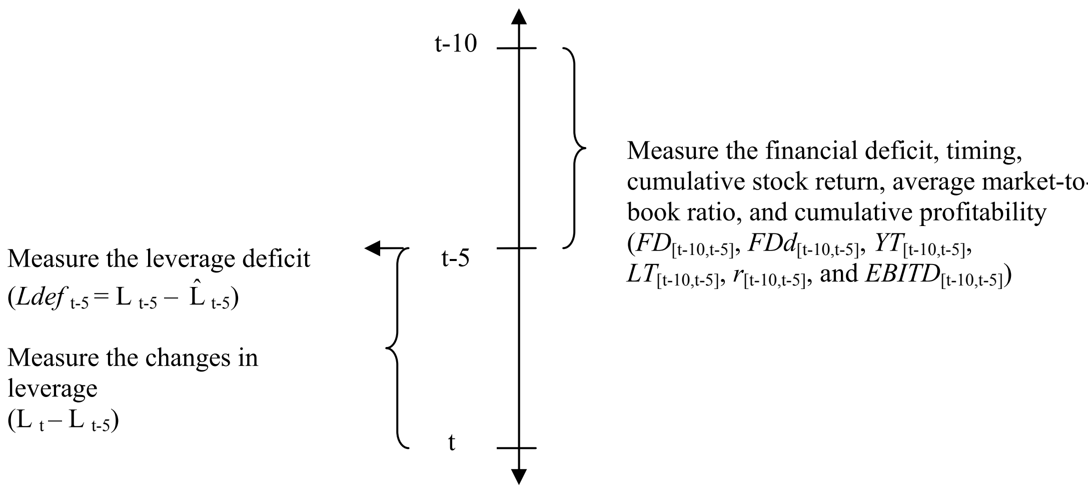
It is possible that the persistence of the relationship between the market timing, financial deficit, and profitability variables and leverage are due to the persistence of the variables themselves.[26] To analyze this possibility we estimate regressions that include the current financial deficit, market timing, stock return, and profitability variables in addition to their realizations in the prior five-year period. However, the results of these regressions, reported in Table 3 Panel B, are generally quite similar to the Panel A results.

## VI. Do the effects of history reverse?

In this section, we provide a more direct test of the extent to which the effect of pecking order and timing variables on the debt ratio is later reversed. Specifically, we examine whether the firms' cash flow, investment and stock price histories (from years t-10 to t-5) affect how leverage ratios change over the subsequent five year period using

[26] To get a sense of the persistence of the timing and financial deficit variables over time, we calculate the cross-sectional correlation between their realizations in each year starting with 1980 with their realization five years later. The financial deficit variable has the lowest level of correlation ranging between 0.12 and 0.38, whereas average market-to-book has the highest (between 0.68 and 0.82). The correlation for the LT variable is also relatively high due its relation to average market-to-book variable (between 0.22 and 0.47). The correlation of the YT variable fluctuates considerably taking both negative and positive values (between -0.08 and 0.94).

the same estimation technique we employed in our change regressions. The following timeline describes the observation periods of the variables.




Before we proceed, we should clarify that it is possible that the effect of these variables on capital structure can both partially persist and partially reverse. For example a stock price change that results in a change in the debt ratio from .3 to .4 over a five year period may result in a decline in the debt ratio from .4 to .35 in the subsequent five years. In the regressions reported in the last section, we tested whether the effect persists relative to the null hypothesis that the effect completely reverses, (i.e., whether the debt ratio of .35 is significantly different than .3. In this section the null hypothesis is that the effect is permanent, (i.e., we test whether the .35 is different than .4)

The regressions reported in Panel A of Table 4, which regresses changes in the debt ratio on lagged independent variables, find no reliable evidence of reversals in the regressions in which the book value debt ratio is used as the dependent variable. However, in the market value regressions the evidence indicates that the effect of stock returns, yearly timing and profits on the debt ratio partially reverses. In Panel B, which also includes the contemporaneous independent variables, the evidence on yearly timing, becomes insignificant. However, these regression estimates indicate that the effect of financial deficits on the debt ratio does partially reverse.

**Insert Table 4**

## VII. Conclusion

There is considerable disagreement about the importance of the concept of a target debt ratio. On one hand, it is intuitive to think about how the tradeoffs between the costs and benefits of debt financing lead to an optimal capital structure. On the other hand, it is also possible that at the optimum, the relation between the debt ratio and corporate value is relatively weak, so that the cost of deviating from the optimum is quite small. When this is the case, capital structures are likely to be strongly influenced by transaction costs and market considerations that may temporarily affect the relative costs of debt versus equity financing, making the idea of a target debt ratio much less important. The results in this paper supports an view that suggests that firms behave as though they have target debt ratios, but their cash flows, investment needs and stock price realizations lead to transitory deviations from these targets.

The evidence in a recent paper by Baker and Wurgler (2002) suggests that market conditions have a major influence on capital structures, and this influence tends to persist for many years. Although we have replicated the Baker and Wurgler results on a sample that includes old as well as young firms (Baker and Wurgler examine firms in the first 10 years after their IPO) our interpretation of the results are very different than theirs. Specifically, while we find evidence that timing behavior has a short-term influence on capital structure, in contrast to Baker and Wurgler, our results suggest that the capital structure changes generated from timing do not tend to persist for long. Similarly, while we find strong evidence that pecking order considerations do have a long-term effect on changes in leverage, a significant fraction of that effect appears to reverse within five years.

Consistent with Welch (2004), stock returns do seem to induce the strongest and most persistent effect on debt ratios. However, in contrast to Welch's assertion, the stock returns effect does not subsume other determinants of leverage. Indeed, the evidence indicates that firms tend to move towards their target capital structure and undo some of the change in their leverage ratio induced by the changes in their stock prices.

Future research should examine this stock return effect more closely. It could be the case that firms that are extremely successful change the nature of their businesses in ways that change their optimal capital structures. For example, a company that successfully produces relatively generic products may choose to produce more specialized products that require the firm to be more conservatively financed. Perhaps, by continuing to issue equity rather than debt, the firm can attract more attention to these changes, which can in turn, positively affect the firm's operations.[27] There are also incentive issues that must be considered. It is likely that the top executives of firms that perform well become more entrenched and thus have more control of the capital structure choice. If one believes that managers have preferences for less than the value-maximizing level of debt (because they personally suffer bankruptcy costs and have less discretion in more levered firms), one would expect them to take actions that reduce debt

[27] This feedback from information generated by investors to the operations of the firm is considered in Subrahmanyam and Titman (2001) and Almazan, Suarez and Titman (2003).

ratios when their control increases.[28] Both of these issues should be considered in future research.

[28] Berger, Ofek, and Yermack (1997) provide evidence that suggests that leverage ratios are lower in firms where managers have more control.

**Appendix 1: Decomposition of Baker and Wurgler Market Timing Measure**

Recall that the financial deficit is defined as

$$FD \equiv \Delta e + \Delta d \quad (A1.1)$$

Then we can write the Baker and Wurgler (BW) measure as:

$$BW = \sum_{s=0}^{t-1} \frac{FD_s}{\sum_{r=0}^{t-1} FD_r} (M/B)_s \quad (A1.2)$$

We can also rewrite A1.2 as

$$BW * (\sum_{s=0}^{t-1} FD_s) = \sum_{s=0}^{t-1} FD_s * (M/B)_s \quad (A1.3)$$

Let $(\sum_{s=0}^{t-1} FD_s)/t = \overline{FD}$ and $(\sum_{s=0}^{t-1} (M/B)_s)/t = \overline{M/B}$

Scaling A1.3 by *t* and adding and subtracting $\overline{FD} * \overline{M/B}$ from it results

$$BW * \overline{FD} = \left( \sum_{s=0}^{t-1} FD_s * (M/B)_s \right) / t - \overline{FD} * \overline{M/B} + \overline{FD} * \overline{M/B} \quad (A1.4)$$

which can also be represented as

$$BW * \overline{FD} = \hat{\text{cov}}(FD, M/B) + \overline{FD} * \overline{M/B} \quad (A1.5)$$

**Appendix 2:**

The profitability variable (defined as earnings before interest, taxes and depreciation) plays multiple roles in tradeoff models. First, more profitable firms are likely to be better positioned to take advantage of the debt tax shield and may be perceived as less risky, suggesting a positive relationship between profitability and the debt ratio. In addition, a positive relation between profitability and leverage may arise as a mechanism to offset the tendency of managers of firms with significant free cash flows to overinvest (see for example, Jensen (1986) and Hart and Moore (1995)). Finally, profitability may be an indication of market power. In contrast to other arguments, a negative relation between profitability and leverage is plausible if firms with market power prefer keeping their leverage at low levels to deter potential entrants into their lines of business.[29]

We also include the value of tangible assets (defined as net property, plant and equipment), which can proxy for the collateral ability of the assets and may thus be associated with higher debt capacity. Size, defined as the natural logarithm of net sales, is likely to be positively correlated with leverage, since large firms are likely to be more diversified and have greater access to capital markets. Research and development expense and selling expense are included to proxy for the uniqueness of the firm's products as well as the uniqueness (and the lack of liquidity) of the firm's collateral. Both R&D and selling expenses are expected to decrease firms' target debt ratios. A dummy variable (*R&Dd*) is included to differentiate observations where R&D expenses are not reported.[30] We include the market-to-book ratio (*M/B*) to proxy for the investment opportunity sets that firms face. Selling expense and research and development expense are scaled by net sales and total assets are used to scale the other target proxies. All of the scaled variables are expressed in percentage terms.

[29] See for example, Bolton and Scharfstein (1990) and others.

[30] *R&Dd* takes the value one if the firm does not report any R&D expense. Since not reporting does not always imply that there is no R&D, it is important to distinguish firms that do not report any R&D expense from those that report very small amounts.

## Appendix 3: Bootstrapping

Bootstrapping allows us to obtain consistent standard errors from our regression model by resampling the original data. Although there are several variants, the procedure first proposed by Efron (1979) is a nonparametric randomization technique that draws from the observed distribution of the data to model the distribution of a test statistic of interest. Given the panel structure of the data, the sample we draw during each replication is a bootstrap sample of firm clusters. Drawing firm clusters instead of individual firm-year observations is necessary since we want to protect the time-series structure of the data.

The following procedure is designed to construct the correct standard errors from the sample of coefficient estimates that are obtained by bootstrapping the sample of observations. Specifically, we start by drawing, with replacement, N clusters of observations (clusters of dependent and independent variables) from the dataset with N firm-clusters. In this random drawing, some of the firm clusters will appear once, some more than once, and some not at all. In the second step, we apply the regression model and obtain the coefficient estimates using this new dataset. Eventually, we build a sample of estimated coefficients by repeating this procedure $k$ times.[31] From this bootstrap-sample of coefficient estimates we calculate the correct standard errors of regression variables as $\{\sum(\theta_i^* - \overline{\theta}^*)^2 /(k-1)\}^{1/2}$, where $\overline{\theta}^*$ is the average of the bootstrap statistic and $\theta_i^*$ is the statistic calculated the using the $i$th bootstrap sample and $k$ is the number of replications. The point estimates of our regression variables are obtained from the regression on the original sample with N firm clusters.

The main advantage of this procedure is that it allows us to control for the presence of potentially biasing factors such as the overlapping leverage change intervals, the lagged correlation between independent and dependent regressions variables, and the heteroskedasticity problem in the residuals.

[31] It is generally believed that for estimates of standard error only 50-200 replications are needed (Efron and Tibshirani (1986)).

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## Table 1: Variable Definitions

| Variable: | Data Name: | COMPUSTAT Annual Data Item: |
|---|---|---|
| Book Debt | Total Assets-Book Equity | Data6 - Book Equity |
| Book Equity | Total Assets - [Total Liabilities + Preferred Stock] + Deferred Taxes + Conv. Debt | Data6 - [Data181 + Data10]+ Data35 + Data79 |
| Market Equity | Common Shares Outstanding * Price | Data25 * Data199 |
| Book Leverage | Book Debt / Total Assets | Book Debt / Data6 |
| Market Leverage | Book Debt / (Total Assets – Book Equity + Market Equity) | |
| Newly Retained Earnings (ΔRE/A) | Δ Retained Earnings / Total Assets | Δ Data36 / Data6 |
| Net Equity Issue (Δ e/A) | (Δ Book Equity – Δ Balance Sheet Retained Earnings) / Total Assets | (Δ Book Equity – Δ Data36) / Data6 |
| | Sale of common and preferred stock – purchase of common and preferred stock | Data 108 – Data 115 |
| Net Debt Issues (Δ d/A) | (Δ Total Assets / Total Assets) – (e/A) –(Δ Retained Earnings / Total Assets) | |
| | Long-term debt issuance – long-term debt reduction | Data 111- Data 114 |
| NPPE (Asset Tangibility) | Net Property, Plan and Equipment/Total Assets | Data8/data6 |
| EBITD (Profitability) | Earnings before interest, tax and depreciation/Total Assets | Data13/data6 |
| R&D (Uniqueness) | Research and Development Expense/Sales | Data 46 / Data 12 |
| SE (Uniqueness) | Selling Expense/Sales | Data 181 / Data12 |
| Ln(Sales) (Size) | Natural logarithm of net sales | Data12/data6 |

# Table 2 – Changes in Leverage

$$L_t - L_{t-5} = \alpha_0 + \beta_1 FDd_{[t-1,t-6]} + \beta_2 FD_{[t-1,t-6]} + \beta_3 YT_{[t-1,t-6]} + \beta_4 LT_{[t-1,t-6]} + \beta_5 r_{[t-1,t-6]} + \beta_6 EBITD_{[t-1,t-6]} + \beta_7 Ldef_{t-5} + \varepsilon_t$$

The statistics are obtained from 500 bootstrap replications resampled from the actual dataset with replacement of clusters. Observations that belong to the same firm form a cluster. "Observed" is the coefficient estimate obtained by fitting the model using the original dataset. The standard error is the sample standard deviation of the 500 estimates. The 95 % confidence interval is obtained from the sample of bootstrap coefficients. The dependent variable is the change in leverage (book leverage is book debt to book assets and market leverage is book debt to the sum of book debt and market equity) between year t and t-5. The regressions are run on a panel sample between 1976 and 2002. *Financial deficit* (*FD*) is total external financing between year t-1 and t-6. *Positive Financial Deficit* (*FDd*) is the total financial deficit interacted with a dummy variable that takes the value one when FD is positive. Both Panel A and Panel B include three separate regressions for different definitions of the financial deficit. (e+d), the simplest version of FD, is net equity issues plus net debt issues. (e+d-c) adjusts FD by subtracting the changes in cash. (e+d-c-div) is defined as FD minus changes in cash minus dividends. Yearly timing (*YT*) is the covariance between financial deficit and market-to-book ratio from year t-1 to t-6. Long-term timing (*LT*) is the product of average market-to-book ratio and average external financing between year t-1 and t-6. 5-year cumulative stock return (*r*) is the cumulative log return on stock between year t-1 and t-6. 5-year cumulative profitability (*EBITD*) is the sum of earnings before interest, taxes, and depreciation between year t-1 and t-6, scaled by the beginning period firm value. In book leverage regressions, the beginning period firm value is the sum of book debt and book equity. In the market leverage regression the scaling factor is the sum of the book debt and the market equity. *Leverage Deficit* (*Ldef*) is the difference between the leverage and the target leverage at t-5, where target leverage is proxied for by the predicted value of the leverage ratio (details of this prediction regression are presented in Table A2). All variables except the cumulative stock return and cumulative profitability are expressed in percentage terms. The statistics for the industry dummies are suppressed.

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 3070) | | | | *e+d* –c (clusters = 2859) | | | | *e+d* –c-div (clusters = 2831) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.09 | 0.02 | 0.06 | 0.12 | 0.12 | 0.01 | 0.10 | 0.15 | 0.13 | 0.01 | 0.11 | 0.15 |
| Positive Financial Deficit ($FD^*d_{[t-1,t-6]}$) | 0.10 | 0.02 | 0.06 | 0.13 | 0.07 | 0.02 | 0.03 | 0.10 | 0.07 | 0.01 | 0.04 | 0.10 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.13 | 0.05 | -0.22 | -0.06 | -0.12 | 0.04 | -0.21 | -0.04 | -0.14 | 0.04 | -0.22 | -0.06 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.20 | 0.02 | -0.23 | -0.16 | -0.20 | 0.02 | -0.24 | -0.17 | -0.23 | 0.02 | -0.28 | -0.19 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -4.24 | 0.18 | -4.65 | -3.96 | -4.14 | 0.19 | -4.56 | -3.78 | -4.09 | 0.19 | -4.50 | -3.72 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | -1.03 | 0.24 | -1.54 | -0.59 | -0.88 | 0.24 | -1.38 | -0.40 | -0.88 | 0.24 | -1.37 | -0.43 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.44 | 0.01 | -0.45 | -0.41 | -0.42 | 0.01 | -0.44 | -0.40 | -0.43 | 0.01 | -0.46 | -0.41 |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 3116) | | | | *e+d* –c (clusters = 2904) | | | | *e+d* –c-div (clusters = 2876) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.12 | 0.01 | 0.10 | 0.15 | 0.15 | 0.01 | 0.13 | 0.18 | 0.16 | 0.01 | 0.14 | 0.19 |
| Positive Financial Deficit ($FD^*d_{[t-1,t-6]}$) | 0.09 | 0.02 | 0.06 | 0.12 | 0.06 | 0.02 | 0.03 | 0.10 | 0.05 | 0.02 | 0.01 | 0.08 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.06 | 0.04 | -0.13 | 0.02 | -0.07 | 0.04 | -0.16 | 0.00 | -0.07 | 0.04 | -0.15 | 0.00 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.22 | 0.02 | -0.25 | -0.19 | -0.23 | 0.02 | -0.27 | -0.20 | -0.22 | 0.02 | -0.26 | -0.19 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -11.32 | 0.21 | -11.71 | -10.89 | -11.11 | 0.22 | -11.53 | -10.71 | -11.18 | 0.20 | -11.63 | -10.83 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | 2.01 | 0.38 | 1.28 | 2.76 | 2.31 | 0.34 | 1.65 | 2.98 | 2.57 | 0.32 | 2.00 | 3.29 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.48 | 0.01 | -0.50 | -0.45 | -0.48 | 0.01 | -0.49 | -0.45 | -0.49 | 0.01 | -0.50 | -0.46 |

## Table 3 – Do the Effects of History Persist?

The statistics are obtained from 500 bootstrap replications resampled from the actual dataset with replacement of clusters. Observations that belong to the same firm form a cluster. "Observed" is the coefficient estimate obtained by fitting the model using the original dataset. The standard error is the sample standard deviation of the 500 estimates. The 95 % confidence interval is obtained from the sample of bootstrap coefficients. The dependent variable is the change in leverage (book leverage is book debt to book assets and market leverage is book debt to the sum of book debt and market equity) between year t and t-10. The regressions are run on a panel sample between 1981 and 2002. *Financial deficit* (*FD*) is total external financing between year t-5 and t-10. *Positive Financial Deficit* (*FD*d*) is the total financial deficit interacted with a dummy variable that takes the value one when FD is positive. Both Panel A and Panel B include three separate regressions for different definitions of the financial deficit. (e+d), the simplest version of FD, is net equity issues plus net debt issues. (e+d-c) adjusts FD by subtracting the changes in cash. (e+d-c-div) is defined as FD minus changes in cash minus dividends. Yearly timing (*YT*) is the covariance between financial deficit and market-to-book ratio from year t-5 to t-10. Long-term timing (*LT*) is the product of average market-to-book ratio and average external financing between year t-5 and t-10. 5-year cumulative stock return (*r*) is the cumulative log return on stock between year t-5 and t-10. 5-year cumulative profitability (*EBITD*) is the sum of earnings before interest, taxes, and depreciation between year t-5 and t-10, scaled by the beginning period firm value. In book leverage regressions, the beginning period firm value is the sum of book debt and book equity. In book leverage regressions, the beginning period firm value is the sum of book debt and book equity. In the market leverage regression the scaling factor is the sum of the book debt and the market equity. *Leverage Deficit* (*Ldef*) is the difference between the leverage and the target leverage at t-10, where target leverage is proxied for by the predicted value of the leverage ratio (details of this prediction regression are presented in Table A2). Panel B additionally includes the realizations of timing, financial deficit and stock return variables between year t-1 and t-6 and the leverage deficit at t-5. All variables except the cumulative stock return and cumulative profitability are expressed in percentage terms. The statistics for the industry dummies are suppressed.

Panel A:

$$L_t - L_{t-10} = \alpha_0 + \beta_1 FDd_{[t-5,t-10]} + \beta_2 FD_{[t-5,t-10]} + \beta_3 YT_{[t-5,t-10]} + \beta_4 LT_{[t-5,t-10]} + \beta_5 r_{[t-5,t-10]} + \beta_6 EBITD_{[t-5,t-10]} + \beta_7 Ldef_{t-10} + \varepsilon_t$$

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1771) | | | | *e+d* –c (clusters = 1625) | | | | *e+d* –c-div (clusters = 1611) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | 0.08 | 0.02 | 0.05 | 0.12 | 0.09 | 0.02 | 0.05 | 0.14 | 0.11 | 0.02 | 0.07 | 0.16 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | 0.10 | 0.02 | 0.05 | 0.14 | 0.10 | 0.03 | 0.04 | 0.15 | 0.10 | 0.02 | 0.06 | 0.15 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.05 | 0.09 | -0.23 | 0.11 | 0.00 | 0.10 | -0.22 | 0.18 | -0.07 | 0.10 | -0.28 | 0.14 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.19 | 0.04 | -0.26 | -0.11 | -0.22 | 0.05 | -0.31 | -0.13 | -0.29 | 0.04 | -0.39 | -0.21 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | -2.79 | 0.27 | -3.29 | -2.24 | -2.80 | 0.31 | -3.46 | -2.22 | -2.77 | 0.30 | -3.33 | -2.15 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -1.90 | 0.36 | -2.67 | -1.23 | -1.78 | 0.43 | -2.61 | -0.91 | -1.75 | 0.39 | -2.51 | -1.01 |
| Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$) | -0.62 | 0.02 | -0.66 | -0.59 | -0.62 | 0.02 | -0.65 | -0.57 | -0.64 | 0.02 | -0.67 | -0.60 |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1795) | | | | *e+d* –c (clusters = 1649) | | | | *e+d* –c-div (clusters = 1635) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | 0.12 | 0.02 | 0.08 | 0.17 | 0.13 | 0.03 | 0.08 | 0.19 | 0.14 | 0.03 | 0.08 | 0.19 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | 0.14 | 0.03 | 0.08 | 0.19 | 0.15 | 0.04 | 0.07 | 0.21 | 0.13 | 0.03 | 0.05 | 0.18 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.02 | 0.08 | -0.20 | 0.13 | -0.03 | 0.09 | -0.20 | 0.15 | -0.07 | 0.09 | -0.25 | 0.10 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.28 | 0.04 | -0.35 | -0.21 | -0.32 | 0.05 | -0.41 | -0.23 | -0.31 | 0.04 | -0.39 | -0.22 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | -6.66 | 0.39 | -7.53 | -5.99 | -7.12 | 0.48 | -8.11 | -6.25 | -7.35 | 0.46 | -8.51 | -6.54 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -2.62 | 0.54 | -3.71 | -1.61 | -2.53 | 0.59 | -3.86 | -1.44 | -2.01 | 0.63 | -3.21 | -0.74 |
| Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$) | -0.59 | 0.02 | -0.62 | -0.55 | -0.60 | 0.02 | -0.64 | -0.55 | -0.61 | 0.02 | -0.64 | -0.56 |

Panel B:

$$L_t - L_{t-10} = \alpha_0 + \beta_1 FDd_{[t-1,t-6]} + \beta_2 FD_{[t-1,t-6]} + \beta_3 YT_{[t-1,t-6]} + \beta_4 LT_{[t-1,t-6]} + \beta_5 r_{[t-1,t-6]} + \beta_6 EBITD_{[t-5,t-10]}$$
$$+ \beta_7 FDd_{[t-5,t-10]} + \beta_8 FD_{[t-5,t-10]} + \beta_9 YT_{[t-5,t-10]} + \beta_{10} LT_{[t-5,t-10]} + \beta_{11} r_{[t-5,t-10]} + \beta_{12} EBITD_{[t-5,t-10]} + \beta_{13} Ldef_{t-10} + \varepsilon_t$$

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1694) | | | | *e+d* –c (clusters = 1402) | | | | *e+d* –c-div (clusters = 1380) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | 0.07 | 0.02 | 0.03 | 0.11 | 0.07 | 0.02 | 0.03 | 0.12 | 0.09 | 0.02 | 0.05 | 0.13 |
| Positive Financial Deficit ($FD^*d_{[t-5,t-10]}$) | 0.04 | 0.02 | -0.02 | 0.08 | 0.04 | 0.03 | -0.02 | 0.09 | 0.03 | 0.02 | -0.02 | 0.07 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.16 | 0.09 | -0.34 | 0.03 | -0.14 | 0.10 | -0.33 | 0.07 | -0.20 | 0.11 | -0.39 | 0.04 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.12 | 0.05 | -0.21 | -0.03 | -0.14 | 0.06 | -0.25 | -0.01 | -0.19 | 0.06 | -0.30 | -0.09 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | -2.79 | 0.31 | -3.41 | -2.21 | -2.98 | 0.35 | -3.65 | -2.30 | -2.88 | 0.35 | -3.55 | -2.17 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -1.25 | 0.37 | -2.05 | -0.52 | -1.29 | 0.47 | -2.31 | -0.42 | -1.00 | 0.45 | -1.92 | -0.16 |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.06 | 0.02 | 0.03 | 0.09 | 0.06 | 0.02 | 0.03 | 0.10 | 0.10 | 0.02 | 0.06 | 0.14 |
| Positive Financial Deficit ($FD^*d_{[t-1,t-6]}$) | 0.12 | 0.02 | 0.08 | 0.16 | 0.11 | 0.02 | 0.06 | 0.15 | 0.10 | 0.02 | 0.06 | 0.15 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.25 | 0.09 | -0.44 | -0.07 | -0.15 | 0.09 | -0.32 | 0.03 | -0.10 | 0.09 | -0.27 | 0.08 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.17 | 0.04 | -0.26 | -0.09 | -0.15 | 0.06 | -0.26 | -0.05 | -0.24 | 0.04 | -0.32 | -0.15 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -4.30 | 0.29 | -4.86 | -3.76 | -4.38 | 0.35 | -5.07 | -3.70 | -4.36 | 0.34 | -5.10 | -3.70 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | -0.82 | 0.48 | -1.76 | -0.01 | -0.10 | 0.48 | -1.15 | 0.68 | -0.23 | 0.45 | -1.17 | 0.75 |
| Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$) | -0.64 | 0.02 | -0.67 | -0.59 | -0.62 | 0.02 | -0.66 | -0.57 | -0.64 | 0.02 | -0.68 | -0.59 |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1717) | | | | *e+d* –c (clusters = 1424) | | | | *e+d* –c-div (clusters = 1401) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | 0.10 | 0.02 | 0.06 | 0.14 | 0.11 | 0.03 | 0.06 | 0.16 | 0.11 | 0.02 | 0.07 | 0.15 |
| Positive Financial Deficit ($FD^*d_{[t-5,t-10]}$) | 0.03 | 0.03 | -0.02 | 0.08 | 0.03 | 0.03 | -0.05 | 0.08 | 0.02 | 0.03 | -0.04 | 0.06 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.09 | 0.07 | -0.24 | 0.04 | -0.16 | 0.08 | -0.32 | -0.01 | -0.20 | 0.09 | -0.40 | -0.03 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.16 | 0.04 | -0.25 | -0.08 | -0.17 | 0.05 | -0.26 | -0.08 | -0.16 | 0.05 | -0.26 | -0.07 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | -6.64 | 0.41 | -7.47 | -5.77 | -7.16 | 0.51 | -8.21 | -6.12 | -7.25 | 0.48 | -8.23 | -6.31 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -1.86 | 0.46 | -2.74 | -1.05 | -1.63 | 0.57 | -2.67 | -0.59 | -1.10 | 0.55 | -2.34 | -0.11 |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.13 | 0.02 | 0.10 | 0.16 | 0.12 | 0.02 | 0.08 | 0.17 | 0.12 | 0.02 | 0.08 | 0.17 |
| Positive Financial Deficit ($FD^*d_{[t-1,t-6]}$) | 0.09 | 0.02 | 0.05 | 0.13 | 0.08 | 0.03 | 0.03 | 0.13 | 0.07 | 0.03 | 0.02 | 0.12 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.07 | 0.08 | -0.20 | 0.11 | -0.02 | 0.08 | -0.17 | 0.13 | -0.01 | 0.08 | -0.15 | 0.16 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.26 | 0.04 | -0.32 | -0.19 | -0.24 | 0.04 | -0.32 | -0.15 | -0.21 | 0.04 | -0.29 | -0.13 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -11.39 | 0.32 | -12.09 | -10.85 | -11.40 | 0.39 | -12.24 | -10.74 | -11.64 | 0.39 | -12.53 | -10.95 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | 2.86 | 0.60 | 1.71 | 3.97 | 3.68 | 0.64 | 2.49 | 4.89 | 4.20 | 0.59 | 3.12 | 5.42 |
| Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$) | -0.60 | 0.02 | -0.63 | -0.56 | -0.59 | 0.02 | -0.63 | -0.55 | -0.61 | 0.02 | -0.64 | -0.56 |

## Table 4 – Do the Effects of History Reverse?

The statistics are obtained from 500 bootstrap replications resampled from the actual dataset with replacement of clusters. Observations that belong to the same firm form a cluster. "Observed" is the coefficient estimate obtained by fitting the model using the original dataset. The standard error is the sample standard deviation of the 500 estimates. The 95 % confidence interval is obtained from the sample of bootstrap coefficients. The dependent variable is the change in leverage (book leverage is book debt to book assets and market leverage is book debt to the sum of book debt and market equity) between year t and t-5. The regressions are run on a panel sample between 1981 and 2002. *Financial deficit* (*FD*) is total external financing between year t-5 and t-10. *Positive Financial Deficit* (*FD*d*) is the total financial deficit interacted with a dummy variable that takes the value one when FD is positive. Both Panel A and Panel B include three separate regressions for different definitions of the financial deficit. (e+d), the simplest version of FD, is net equity issues plus net debt issues. (e+d-c) adjusts FD by subtracting the changes in cash. (e+d-c-div) is defined as FD minus changes in cash minus dividends. Yearly timing (*YT*) is the covariance between financial deficit and market-to-book ratio from year t-5 to t-10. Long-term timing (*LT*) is the product of average market-to-book ratio and average external financing between year t-5 and t-10. 5-year cumulative stock return (*r*) is the cumulative log return on stock between year t-5 and t-10. 5-year cumulative profitability (*EBITD*) is the sum of earnings before interest, taxes, and depreciation between year t-5 and t-10, scaled by the beginning period firm value. In book leverage regressions, the beginning period firm value is the sum of book debt and book equity. In the market leverage regression the scaling factor is the sum of the book debt and the market equity. *Leverage Deficit* (*Ldef*) is the difference between the leverage and the target leverage at t-10, where target leverage is proxied for by the predicted value of the leverage ratio (details of this prediction regression are presented in Table A2). Panel B additionally includes the realizations of timing, financial deficit and stock return variables between year t-1 and t-6 and the leverage deficit at t-5. All variables except the cumulative stock return and cumulative profitability are expressed in percentage terms. The statistics for the industry dummies are suppressed.

Panel A:

$$L_t - L_{t-5} = \alpha_0 + \beta_1 FDd_{[t-5,t-10]} + \beta_2 FD_{[t-5,t-10]} + \beta_3 YT_{[t-5,t-10]} + \beta_4 LT_{[t-5,t-10]} + \beta_5 r_{[t-5,t-10]} + \beta_6 EBITD_{[t-5,t-10]} + \beta_7 Ldef_{t-5} + \varepsilon_t$$

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1986) | | | | *e+d* –c (clusters = 1817) | | | | *e+d* –c-div (clusters = 1802) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | -0.03 | 0.02 | -0.07 | 0.00 | -0.03 | 0.02 | -0.06 | 0.01 | -0.02 | 0.02 | -0.06 | 0.01 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | 0.04 | 0.02 | 0.00 | 0.08 | 0.05 | 0.02 | 0.00 | 0.09 | 0.06 | 0.02 | 0.02 | 0.10 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | 0.05 | 0.07 | -0.07 | 0.23 | 0.01 | 0.08 | -0.13 | 0.16 | 0.00 | 0.08 | -0.17 | 0.16 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.01 | 0.03 | -0.06 | 0.06 | -0.02 | 0.03 | -0.07 | 0.07 | -0.05 | 0.04 | -0.12 | 0.04 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | 0.28 | 0.23 | -0.27 | 0.66 | 0.01 | 0.27 | -0.55 | 0.51 | 0.02 | 0.27 | -0.48 | 0.58 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -0.44 | 0.24 | -0.92 | 0.03 | -0.36 | 0.30 | -1.00 | 0.18 | -0.52 | 0.30 | -1.13 | 0.02 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.43 | 0.02 | -0.46 | -0.39 | -0.42 | 0.02 | -0.45 | -0.38 | -0.43 | 0.02 | -0.46 | -0.39 |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 2008) | | | | *e+d* –c (clusters = 1835) | | | | *e+d* –c-div (clusters = 1820) | | | |
| Variable | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] | Observed | Std. Err. | [95% Conf. | Interval] |
| Financial Deficit ($FD_{[t-5,t-10]}$) | -0.05 | 0.02 | -0.08 | -0.01 | -0.03 | 0.02 | -0.07 | 0.01 | -0.01 | 0.02 | -0.06 | 0.02 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | 0.11 | 0.02 | 0.06 | 0.14 | 0.12 | 0.02 | 0.07 | 0.16 | 0.11 | 0.02 | 0.06 | 0.15 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | 0.18 | 0.08 | 0.03 | 0.34 | 0.12 | 0.09 | -0.03 | 0.32 | 0.12 | 0.08 | -0.04 | 0.29 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | -0.04 | 0.03 | -0.10 | 0.02 | -0.07 | 0.04 | -0.14 | 0.01 | -0.07 | 0.04 | -0.14 | 0.02 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | 2.99 | 0.38 | 2.25 | 3.87 | 2.73 | 0.41 | 1.90 | 3.54 | 2.67 | 0.41 | 1.87 | 3.50 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -1.88 | 0.50 | -2.86 | -0.92 | -2.34 | 0.54 | -3.51 | -1.39 | -2.31 | 0.56 | -3.36 | -1.18 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.45 | 0.02 | -0.48 | -0.41 | -0.46 | 0.02 | -0.49 | -0.41 | -0.46 | 0.02 | -0.49 | -0.42 |

Panel B:

$$L_t - L_{t-5} = \alpha_0 + \beta_1 FDd_{[t-1,t-6]} + \beta_2 FD_{[t-1,t-6]} + \beta_3 YT_{[t-1,t-6]} + \beta_4 LT_{[t-1,t-6]} + \beta_5 r_{[t-1,t-6]} + \beta_6 EBITD_{[t-5,t-10]7}$$
$$+ \beta FDd_{[t-5,t-10]} + \beta_8 FD_{[t-5,t-10]} + \beta_9 YT_{[t-5,t-10]} + \beta_{10} LT_{[t-5,t-10]} + \beta_{11} r_{[t-5,t-10]} + \beta_{12} EBITD_{[t-5,t-10]} + \beta_{13} Ldef_{t-5} + \varepsilon_t$$

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1880) | | | | *e+d* –c (clusters = 1611) | | | | *e+d* –c-div (clusters = 1585) | | | |
| Variable | Observed | Std. Err. | [95% Conf. Interval] | | Observed | Std. Err. | [95% Conf. Interval] | | Observed | Std. Err. | [95% Conf. Interval] | |
| Financial Deficit ($FD_{[t-5,t-10]}$) | -0.04 | 0.01 | -0.06 | -0.01 | -0.04 | 0.02 | -0.08 | -0.01 | -0.05 | 0.02 | -0.08 | -0.02 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | -0.05 | 0.02 | -0.09 | -0.02 | -0.05 | 0.02 | -0.08 | -0.01 | -0.03 | 0.02 | -0.06 | 0.00 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.12 | 0.05 | -0.22 | 0.00 | -0.17 | 0.06 | -0.29 | -0.05 | -0.15 | 0.07 | -0.28 | -0.02 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | 0.06 | 0.04 | 0.00 | 0.13 | 0.05 | 0.04 | -0.03 | 0.14 | 0.05 | 0.04 | -0.03 | 0.14 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | 0.03 | 0.21 | -0.43 | 0.44 | -0.35 | 0.25 | -0.81 | 0.13 | -0.29 | 0.26 | -0.86 | 0.18 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | 0.70 | 0.33 | 0.10 | 1.33 | 0.76 | 0.37 | 0.01 | 1.38 | 0.63 | 0.35 | -0.03 | 1.36 |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.10 | 0.02 | 0.08 | 0.14 | 0.11 | 0.02 | 0.08 | 0.16 | 0.13 | 0.02 | 0.09 | 0.16 |
| Positive Financial Deficit ($FD*d_{[t-1,t-6]}$) | 0.11 | 0.02 | 0.07 | 0.14 | 0.10 | 0.02 | 0.04 | 0.14 | 0.10 | 0.02 | 0.06 | 0.14 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.22 | 0.08 | -0.37 | -0.05 | -0.15 | 0.08 | -0.29 | 0.00 | -0.13 | 0.07 | -0.28 | 0.01 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.20 | 0.04 | -0.29 | -0.12 | -0.20 | 0.05 | -0.31 | -0.11 | -0.25 | 0.05 | -0.36 | -0.17 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -5.23 | 0.25 | -5.75 | -4.73 | -5.22 | 0.29 | -5.87 | -4.75 | -5.13 | 0.28 | -5.69 | -4.64 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | -1.16 | 0.54 | -2.25 | -0.33 | -0.59 | 0.56 | -1.71 | 0.12 | -0.58 | 0.51 | -1.68 | 0.10 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.39 | 0.02 | -0.41 | -0.35 | -0.37 | 0.02 | -0.40 | -0.33 | -0.38 | 0.02 | -0.41 | -0.35 |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *e+d* (clusters = 1895) | | | | *e+d* –c (clusters = 1624) | | | | *e+d* –c-div (clusters = 1598) | | | |
| Variable | Observed | Std. Err. | [95% Conf. Interval] | | Observed | Std. Err. | [95% Conf. Interval] | | Observed | Std. Err. | [95% Conf. Interval] | |
| Financial Deficit ($FD_{[t-5,t-10]}$) | -0.04 | 0.01 | -0.07 | -0.02 | -0.05 | 0.02 | -0.08 | -0.02 | -0.05 | 0.02 | -0.08 | -0.02 |
| Positive Financial Deficit ($FD*d_{[t-5,t-10]}$) | -0.03 | 0.02 | -0.06 | 0.00 | -0.01 | 0.02 | -0.06 | 0.02 | -0.01 | 0.02 | -0.05 | 0.03 |
| Yearly Timing ($YT_{[t-5,t-10]}$) | -0.06 | 0.05 | -0.17 | 0.03 | -0.07 | 0.07 | -0.20 | 0.04 | -0.09 | 0.07 | -0.23 | 0.02 |
| Long-term Timing ($LT_{[t-5,t-10]}$) | 0.06 | 0.03 | 0.01 | 0.12 | 0.06 | 0.04 | -0.01 | 0.13 | 0.05 | 0.04 | -0.02 | 0.12 |
| 5-year Cumulative Stock Return ($r_{[t-5,t-10]}$) | 3.04 | 0.29 | 2.54 | 3.71 | 2.65 | 0.35 | 2.08 | 3.41 | 2.53 | 0.35 | 1.87 | 3.17 |
| 5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$) | -1.44 | 0.34 | -2.17 | -0.81 | -1.55 | 0.41 | -2.44 | -0.80 | -1.41 | 0.42 | -2.25 | -0.66 |
| Financial Deficit ($FD_{[t-1,t-6]}$) | 0.14 | 0.01 | 0.11 | 0.16 | 0.15 | 0.02 | 0.11 | 0.19 | 0.15 | 0.02 | 0.11 | 0.19 |
| Positive Financial Deficit ($FD*d_{[t-1,t-6]}$) | 0.11 | 0.02 | 0.07 | 0.15 | 0.10 | 0.02 | 0.05 | 0.15 | 0.08 | 0.02 | 0.03 | 0.13 |
| Yearly Timing ($YT_{[t-1,t-6]}$) | -0.12 | 0.07 | -0.27 | 0.01 | -0.08 | 0.08 | -0.21 | 0.12 | -0.08 | 0.08 | -0.20 | 0.10 |
| Long-term Timing ($LT_{[t-1,t-6]}$) | -0.24 | 0.02 | -0.29 | -0.20 | -0.25 | 0.03 | -0.33 | -0.20 | -0.22 | 0.03 | -0.29 | -0.16 |
| 5-year Cumulative Stock Return ($r_{[t-1,t-6]}$) | -12.47 | 0.28 | -13.05 | -11.97 | -12.35 | 0.30 | -12.99 | -11.83 | -12.46 | 0.31 | -13.06 | -11.88 |
| 5-year Cum. Profitability ($EBITD_{[t-1,t-6]}$) | 2.39 | 0.49 | 1.50 | 3.46 | 2.96 | 0.49 | 1.95 | 3.82 | 3.34 | 0.50 | 2.45 | 4.29 |
| Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$) | -0.42 | 0.01 | -0.44 | -0.39 | -0.41 | 0.02 | -0.44 | -0.37 | -0.42 | 0.02 | -0.45 | -0.39 |

## Table A2: Predicting Leverage (Tobit Regressions)

We use the tobit specification to predict the leverage ratio with market-to-book ratio (*M/B*), asset tangibility (*PPE,* net property, plant and equipment divided by total assets), profitability (*EBITD*, operating income before depreciation divided by net sales), research and development expense (*R&D*, scaled by net sales). *R&DD* (a dummy variable that is set to one if the firm has no R&D expense), selling expense (*SE*, scaled by net sales), and firm size (*SIZE*, logarithm of net sales), where the predicted value of the leverage ratio is restricted to be between 0 and 1. The statistics for the industry dummies are suppressed.

| | Book Leverage | | Market Leverage | |
|---|---|---|---|---|
| | b | t(b) | b | t(b) |
| Market-to-book $_{t-1}$ | -3.02 | -41.02 | -8.57 | -107.95 |
| Prop., Plant & equip. $_{t-1}$ | 0.00 | -6.17 | 0.00 | -1.20 |
| Profitability $_{t-1}$ | -0.10 | -26.88 | -0.14 | -35.05 |
| Selling Expense $_{t-1}$ | -0.11 | -25.72 | -0.15 | -33.63 |
| Research & Dev. $_{t-1}$ | 0.00 | 0.84 | 0.00 | 0.92 |
| R&D dummy $_{t-1}$ | 5.83 | 15.18 | 5.20 | 12.59 |
| Size $_{t-1}$ | 2.35 | 48.82 | 0.79 | 15.24 |
| Number of observations | 47377 | | 48455 | |
| Prob. > chi2 | 0 | | 0 | |
| LR chi2(48) | 9673.92 | | 21254.19 | |