NBER WORKING PAPER SERIES

FIRMS' HISTORIES AND THEIR CAPITAL STRUCTURES

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Working Paper 10526
http://www.nber.org/papers/w10526

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
May 2004

This paper has benefited from useful comments from Andres Almazan, Aydogan Alti, Malcolm Baker, Long Chen, John Graham, Charlie Hadlock, Mike Lemmon, Gordon Phillips, and Husayn Shahrur. We thank seminar participants at NYU, Cornell, the 2003 FMA meetings, the Spring 2004 NBER Corporate Finance Meetings, and the first annual UBC finance conference for their useful comments. The views expressed herein are those of the author(s) and not necessarily those of the National Bureau of Economic Research.

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JEL No. G3

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 changes in capital structure. Specifically, stock price changes and financial deficits (i.e., the amount of external capital raised) have strong influences on capital structure changes, but in contrast to previous conclusions, we find that their effects are subsequently at least partially reversed. These results indicate that although a firm's history strongly influence their capital structures, that over time, financing choices tend to move firms towards target debt ratios that are consistent with the tradeoff theories of capital structure.

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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:** 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. This observation is consistent with a number of articles that find that firms tend to issue equity following increases in their stock prices and tend to repurchase shares following stock price declines, which is the opposite of what one might expect if firms tended to rebalance their capital structures towards a static target.[2] This

[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.

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:** Baker and Wurgler (2002) examine the tendency of managers to "time the equity markets" by interacting the market-to-book ratio with the amount of capital that a firm raises (i.e., its financial deficit). Their evidence suggests that firms tend to reduce their leverage ratios when they raise substantial amounts of capital when the equity market is perceived to be more favorable, i.e., when market-to-book ratios are higher.

There seems to be a consensus in the literature that suggests that these variables affect capital structures, at least temporarily. The issue that we explore, which was raised by Baker and Wurgler (2002) and later by Welch (2004), is the extent to which these variables have a permanent effect on capital structure. This is an important issue that has implications for the notion that firms have meaningful target debt ratios.

In addition to the fact that we consider each of these determinants of capital structure changes together, our analysis 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 analysis of financial deficits is generally consistent with Shyam-Sunder and Myers (1999), there are some noteworthy differences in our conclusions. 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, we find that the financial deficit has a much stronger effect on capital structure when it is positive (i.e., when firms are raising capital) than when it is negative (i.e., when firms are paying out capital).

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

[3] Lemmon and Zender (2004) 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.

intuition, has a relatively weak effect on observed debt ratios.[4] 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.[5]

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 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 explained by the leverage deficit (i.e., the distance between the observed debt ratio and a target ratio based on traditional tradeoff variables).

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

[4] Alti (2004), in a study of IPOs, measures timing by whether firms go public in hot IPO markets. He finds that firms that go public in hot IPO markets are initially less levered; however, whether or not the firm went public in a hot IPO market does not have a significant lasting effect on capital structure.

[5] Hovakimian (2004) independently examines the Baker and Wurgler timing measure and also concludes that the results in Baker and Wurgler are generated by the persistence of the market-to-book ratio.

order effects on capital structure and Section VI analyzes the extent to which these effects reverse. In Section VII we provide a number of robustness tests and Section VIII concludes the paper.

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.[6] Similar to these models, 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.[7] 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 ($D_{t-1} - D_T$).[8] 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.

[6] See for example, Auerbach (1985), Fama and French (2002), Jalilvand and Harris (1984), Hovakimian, Opler and Titman (2001) and Shyam-Sunder and Myers (1999).
[7] 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.
[8] 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

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 (ΔWC), net of net cash flow (CF). This sum, described below, is identical to net debt issues (Δd) plus net equity issues (Δe):

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

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.

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to imputed regressors (Hovakimian (2003)). Our results regarding the history variables remain robust to either specification.

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:

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

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

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

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

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.[9] Third, since firms with higher market-to-book

[9] 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, since with favorable attention they can more easily

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.[10] 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):[11]

$$\begin{aligned}(M/B)_{\text{timing},t-1} &= \frac{\sum_{s=0}^{t-1} FD_s * (M/B)_s}{\sum_{r=0}^{t-1} FD_r} \\ &= \frac{\hat{\text{cov}}(FD, M/B)}{\overline{FD}} + \overline{(M/B)} \qquad (4) \\ &= (YT + LT)/\overline{FD}\end{aligned}$$

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attract new customers and employees. In contrast, scrutiny can be costly to firms that are not likely to grow, since they may lose existing customers and employees if the scrutiny associated with an equity issue reveals negative information.

[10] 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. 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.

[11] 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.

The first term in this decomposition, $\hat{cov}(FD, M/B)$ 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.[12] 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.

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,[13] 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

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

[13] 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.

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.[14] 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.

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.[15] We define the leverage deficit as the difference between a firm's realized leverage and its target level.

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[14] 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. In Titman and Tsyplakov (2004) and Strebulaev (2004), there is also discussion of the fact that profitability will lead to decreases in the debt ratio if more profitable firms become more valuable, which, holding their debt levels constant, results in lower debt ratios. We expect that this effect should be subsumed by our stock return variable.

[15] 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

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)*.[16] In addition, we include industry dummies to capture the industry specific determinants of leverage not captured by the above variables.[17] 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 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

(Myers (1977)), or information asymmetries that make it more difficult to issue equity than debt. In section VII we will discuss this potential asymmetry in firms' tendencies to move towards their targets in more detail.

[16] These variables were previously considered by Titman and Wessels (1988), Rajan and Zingales (1995) and others. As in Hovakiminan et al. (2001), we also constructed the target proxy without the profitability and the market-to-book ratio in the Tobit regressions, since these variables are generally associated with changes in leverage. The unreported results based on this target proxy construction yield similar results.

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

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 (Δcash) 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.

$$FD \equiv \Delta e + \Delta d - \Delta cash \tag{5}$$

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:

$$FD \equiv \Delta e + \Delta d - \Delta cash - D \tag{6}$$

F.2. Negative financial deficit

It is likely that a positive financial deficit and a 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.[18]

III. Data

Our sample consists of firms listed in the Compustat Industrial Annual Files at any point between 1971 and 2002.[19] Data on stock prices is obtained from CRSP Files.

[18] 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.

[19] 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 1975.

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.[20] 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.[21] 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.[22]

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 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.[23]

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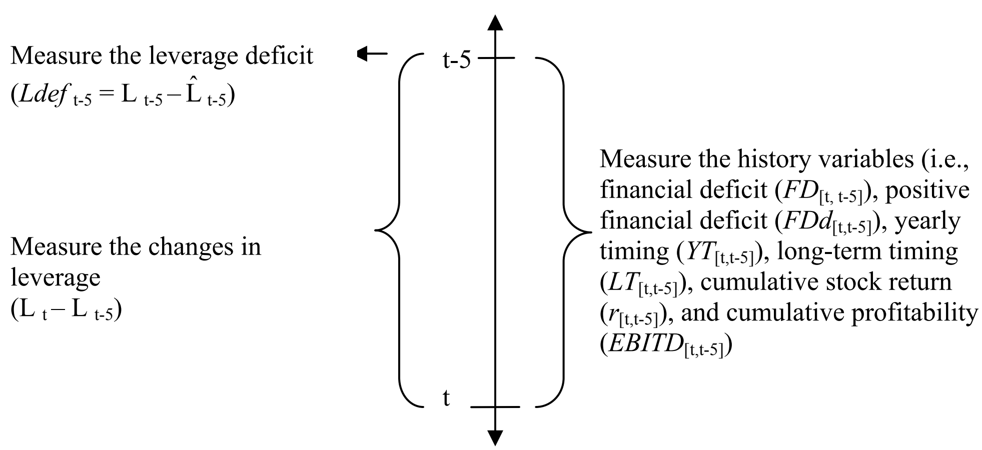
[20] As a robustness check, we exclude the firms involved in large asset sales and big mergers (identified by Compustat footnote code AB). This does not have any material effect on our results.
[21] We follow Baker and Wurgler (2002) and treat preferred stock as debt. The rationale for this is that for 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.
[22] 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.
[23] 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

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, stock return, and profitability 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:



Stage 1: predict the target leverage

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

data and thus fewer observations available for empirical analysis. Therefore, we use the first method for calculating net debt and net equity issues.

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

Stage 2: estimate the regression model

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

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.[24] 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. 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 return, 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*"

[24] The regression results for the first stage regression are reported in Table A2.

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

Table 3 provides estimates of the magnitudes of the changes in capital structure that are generated by the variables we consider. Specifically, we examine the effect of a one standard deviation change in the independent variables on changes in the book and market debt ratios. The evidence indicates that the financial deficit, stock returns, and the leverage deficit have important effects on changes in the debt ratios, while the effects of the other variables are relatively minor. For example, a one standard deviation increase in stock returns, decreases book leverage by 5.028 percent and market leverage by 16.583 percent. In addition, a one standard deviation increase in the leverage deficit increase book leverage by 6.687 percent and market leverage by 6.414.

Insert Table 3

The effect of the financial deficit on capital structure depends on whether the financial deficit is positive or negative, and whether the market-to-book ratio is high or low. To capture these effects, we provide four numbers to describe how the financial deficit affects both the book and market debt ratios. As shown in the table, when it is positive, a one standard deviation increase in the financial deficit leads to an 8.020 percent increase in book leverage for low $\overline{M/B}$ firms. In contrast, when it is negative, a one standard deviation increase in the financial deficit leads to a 3.022 percent increase in book leverage for low $\overline{M/B}$ firms. For high- $\overline{M/B}$ firms, the financial deficit has much less of an effect on the debt ratio. Specifically, a one standard deviation change in the financial deficit results in a 3.378 percent change in the debt ratio when the financial deficit is positive, and a -1.620 change in the debt ratio when the financial deficit is negative.[25] The financial deficit has a similar effect on market leverage ratios.

Although we see significant differences between the effect of the financial deficit for high and low $\overline{M/B}$ firms, (i.e., the long-term timing effect), the yearly timing effect (*YT*) has only a weak effect on leverage. For example, book leverage decreases by only 0.870 percent with a one standard deviation increase in *YT*.[26] In addition, the relation between five-year cumulative profitability and leverage is also relatively weak; for example, a one standard deviation increase in cumulative profitability decreases book leverage by 1.377 percent.

Insert Table 4

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 and market leverage regressions indicate that the composite effect of positive financial deficit on leverage does not seem to vary across panels with different financial deficit definitions. Furthermore, evidence suggests that whether the financial deficit

[25] The pecking order suggests that firms with a negative financial deficit (i.e., positive free cash flow) should reduce their leverage. However, this effect will be lower for firms with low market-to-book ratios since they are more likely to use their financial surplus to repurchase shares as well as to pay down debt. Since our specification does not specify separate M/B interaction effects for positive and negative financial deficits we do not account for this possibility. Unreported regressions that do include separate interaction variables for positive and negative financial deficits do not generate the expected effect. We conjecture that it is difficult to estimate the effect of M/B on firms with negative financial deficits because our sample firms with negative financial deficits is relatively small, and does not include a lot of dispersion in M/B, (high MB firms generally do not have negative financial deficits).

[26] We estimated our regression by eliminating the outliers at the highest and lowest one percentile. In unreported results we find that the yearly timing effect on changes in debt ratio becomes marginally more important. However, its effect on changes in leverage is still relatively weak.

takes positive or negative values matters less when we use the financial deficit constructs that excludes the "changes in cash" and "dividends and changes in cash."

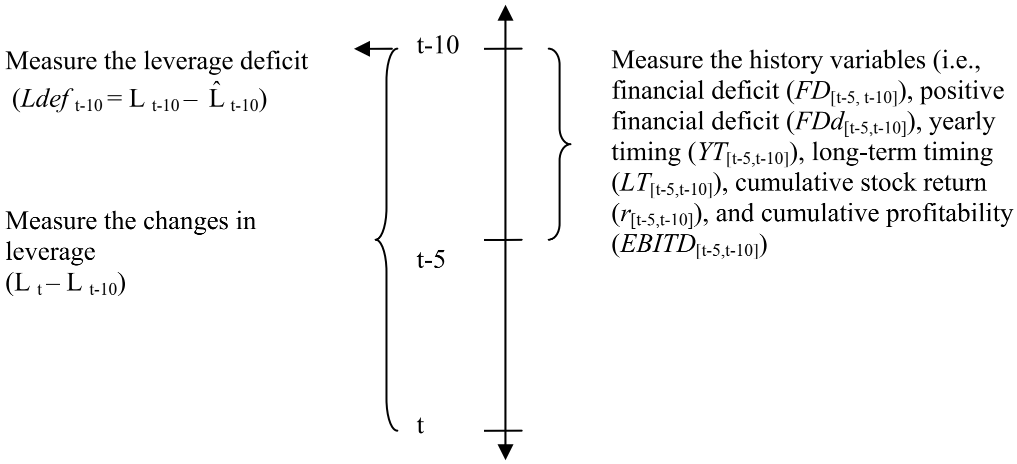
One could argue that the effect of yearly timing on changes in leverage could also be a result of managers' tendencies to issue equity and increase their cash holdings when they believe that it is a good time to issue equity. Consistent with this argument, our results suggest that when the financial deficit variable excludes the changes in cash balances, the yearly timing effect on the book leverage ratio is slightly 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.

V. Do the effects of history persist?

Having documented that a firm's prior 5 year history significantly 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 an entire ten-year period that includes the subsequent five years along with the contemporaneous 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 did in the previous sections.

Insert Table 4

The following timeline describes the observation periods of the variables.



The regression results reported in Table 4 Panel A indicate that some of the effects of history at least partially persist. However, a comparison of the coefficient estimates reported in Table 4 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. Note also, that the profitability variable, which had what we thought was a spurious positive effect in the previous contemporaneous regression on the market debt ratio, has a significant negative coefficient when the variable is lagged.

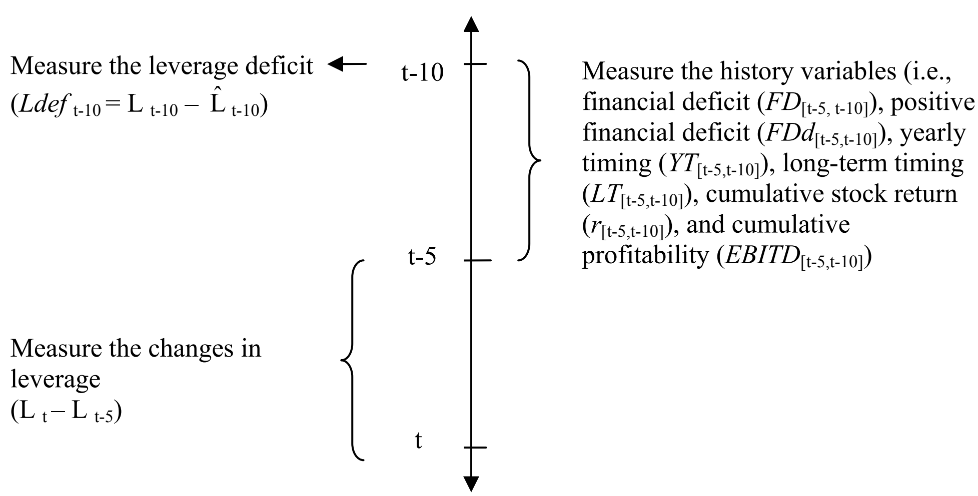
It is possible that the persistence of the relationship between the market timing, financial deficit, and profitability variables and leverage are due to the persistence of the variables themselves.[27] To analyze this possibility we estimate regressions that include

[27] 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

the current financial deficit, market timing, stock return, and profitability variables in addition to their realizations in the prior five-year period. The results of these regressions, reported in Table 4 Panel B, are 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 the same estimation technique we employed in our change regressions. The following timeline describes the observation periods of the variables.



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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).

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 5, 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 except for a slight reversal of the stock return and profitability effect. However, in the market value regressions the evidence indicates that the effect of negative financial deficits, stock returns, yearly timing, and cumulative profits on the debt ratio partially reverses.

An explanation for the relatively weak evidence of the reversal of the financial deficit effect is that financial deficits are highly correlated across time. Firms that have high financial deficits in one period also tend to have high financial deficits in subsequent periods, which may limit the extent to which their leverage ratios tend to revert back to their targets. To control for this possibility, we regress changes in the debt ratio on the contemporaneous independent variables as well as the lagged variables. The results of these regressions, reported in Panel B, indicate that the financial deficit effect is indeed reversed. The point estimates from these regressions suggest that the financial deficit effect reverses to a much greater extent than the stock return effect.

Finally, it should be noted that the leverage deficit variable is highly significant in all of the regressions. Firms that are under (over) levered relative to our estimates of their target ratios tend to realize an increase (decrease) in their leverage ratios over the subsequent 10 years. This evidence is consistent with a significant, but relatively slow, movement towards the firms' target debt ratios.

Insert Table 5

VII. Robustness[28]

This section presents a number of alternative specifications and a discussion of the robustness of our results. We describe a number of regressions that are not included in the paper, but are available upon request.

A. Interpreting the average market-to-book ratio

First, we consider whether the average market-to-book ratio has a separate effect on debt ratios, and the extent to which changes that are generated as a result of the average market-to-book ratio are later reversed. As we mentioned earlier, the significance of the Baker and Wurgler (2002) measure is largely due to the average market-to-book ratio, which is an important element of their measure. While the average market-to-book ratio could be picking up the effect of timing in the Baker and Wurgler (2002) estimates, it is also possible that the average market-to-book ratio captures other determinants of the capital structure choice, such as growth opportunities.[29]

[28] Most of the robustness tests that are discussed in this section were suggested by participants at the April 9, 2004 NBER conference in Chicago. We would like to especially thank Malcolm Baker and Gordon Phillips for these suggestions.
[29] A recent paper by Chen and Zhao (2004) conclude that the high market-to-book firms are motivated to issue equity for market timing reasons rather than to move towards their target debt ratios.

To examine these issues in more detail, we estimated various specifications of our model that included the average market-to-book ratio as an independent variable. When we add the average market-to-book ratio to our first book leverage regressions that we report in Table 2, the variable is statistically insignificant and has only minor effects on the other coefficients. In the market leverage regression its effect is statistically significant but not particularly large, (market leverage decreases by 1.76 percent with a one standard deviation increase in the average market-to-book ratio). Furthermore, our persistence regressions indicate that the average market-to-book ratio does not have a long lasting effect on changes in leverage, and in fact, its effect fully reverses in the subsequent five-year period.

To further examine the relevance of the average market-to-book ratio we compare the explanatory power of the firm's average market-to-book ratio and the industry mean of the average market-to-book ratio in explaining changes in the debt ratio. While the average market-to-book ratio measured at the industry level can conceivably be interpreted as measuring timing incentives, (i.e., firms like to issue equity when equity values in their industry are high relative to book values), we think that this variable provides a weaker measure of timing incentives than the firm's own average market-to-book ratio. However, the industry market-to-book ratio may provide an equally good measure of a firm's growth opportunities.

A comparison of the results with the two versions of the average market-to-book ratio reveals that the industry measure explains changes in both book leverage and market leverage better than the firm's own market-to-book ratio. However, the changes in the debt ratios that are generated as a result of this industry measure are not very long-lasting.

Reversal tests suggest that more than 2/3 of the effect of the industry mean of $\overline{M/B}$ on the debt ratio reverses in the subsequent five-year period.

B. Is the relation between changes in the debt ratio and the leverage deficit spurious?

It is possible that the relation between changes in the debt ratio and the leverage deficit can be spurious. For example, since our regressions track changes in capital structure for 5 and 10 years, we require firms to survive over these periods. One might expect that those firms that are initially over levered, and do not take steps to reduce their leverage, are less likely to survive, and hence will not be included in our sample. What this means is that within our sample of survivors, we are likely to see a negative relation between the leverage deficit and changes in leverage.

In addition, even without survival bias we might expect to have a spurious relation between the leverage deficit and changes in leverage. Since the debt ratio must be between zero and one, there may be a mechanical relation between the leverage deficit and future changes in the debt ratio. To understand this, consider a firm that has no debt, and thus a debt ratio of zero, and presumably a negative leverage deficit (i.e., it is considered under-levered). Since such a firm cannot possibly reduce its leverage ratio, it will, on average, increase its leverage ratio and will thus contribute to a positive correlation between the leverage deficit and future changes in the debt ratio.

To explore whether these spurious relations could be driving the estimated relation between the leverage deficit and future changes in the debt ratio we considered four changes to our estimated regressions. First, we estimated our regressions on a sample that excludes all firms with debt ratios under 10%, and found that our results do not change significantly. Second, we reexamine our regressions by including the beginning period debt ratio in addition to the leverage deficit as independent variables. As one would expect, this additional variable is in fact negatively related to the changes in the debt ratio, but it does not materially change our estimates of our variables other than the leverage deficit variable. The significance of the leverage deficit in the market leverage regressions declines slightly, and we observe almost no effect on the coefficient estimate of the leverage deficit in the book leverage regressions.

In addition, we reestimate our regressions with alternative debt ratios that subtract each firm's cash and short-term marketable assets from their debt levels (the idea is that cash is negative debt). One advantage of these alternative debt ratios is that they can be negative as well as positive, and are thus less subject to the above-mentioned mechanical relation. Our unreported results suggest that this adjustment has a marginal effect on our results and the qualitative evidence on the dynamic changes in the debt ratio remains the same.

Finally, we examine whether the reversal towards a target debt ratio is different for firms with negative and positive leverage deficits. If our results are driven solely because of survival bias, we expect to see a relation only for firms with positive leverage deficits. We investigate this possibility by including an additional leverage deficit variable that is interacted with an indicator variable that takes a value of one when the leverage deficit is positive and zero otherwise. The results indicate that the leverage deficits do have a greater effect on changes in leverage for over-levered firms, which is consistent with survival bias. However, the evidence suggests that under-levered firms do tend to increase their leverage indicating that the leverage deficit effect is not driven purely by survival bias.[30]

C. Should we control for the changes in firms' target debt ratio?

Over time, a firm's target debt ratio may change as the characteristics of its business changes. To examine how such changes affect the firm's capital structure we include a variable that measures changes in the firms' target ratios. We find that our measure of the change in the target, constructed for each firm as the difference between its current target (t=5) and its target at the beginning of the period (t=0), is in fact positively related to changes in the debt ratio. The introduction of this variable has a noticeable effect on only one variable in our regression; the cumulative stock return variable. Specifically, when this variable is included in the regression, a one standard deviation change in stock returns decreases the debt ratio by 3.714 percent rather than the 5.028 percent decrease in the debt ratio in our original specification. This finding suggests that part of the stock return effect on the debt ratio is due to changes in the target, (e.g., firms that experience higher stock returns are likely to have both greater growth opportunities and more entrenched managers).

D. The Welch (2004) variable

Welch (2004) constructs a measure that may more explicitly measure the extent to which market leverage ratios are expected to change in response to stock returns. His measure, which he calls the implied debt ratio (IDR), is used to determine the extent to

[30] Even without survival bias we might expect to see asymmetry in the tendency for firms to respond to positive and negative leverage deficits. For example, the Myers (1977) debt overhang effect, which indicates that a reduction of debt may not be favored by equity holders because of a wealth transfer to debt holders, implies that firms are less likely to respond to positive leverage deficits. However, if entrenched managers personally favor lower debt ratios, they may have greater incentives to move towards their targets when they are over-levered (e.g., Friend and Lang (1988), Mehran (1992) and Kayhan (2004)).

which the market leverage ratio changes mechanically because of stock return induced changes in the market value of equity. Consistent with our notation, the IDR at period t is:

$$IDR_t = \frac{D_{t-5}}{E_{t-5} * (1 + r_{[t,t-5]}) + D_{t-5}} \qquad (9)$$

where D, E, and r are, respectively, the book value of debt, the market value of equity, and the five-year cumulative stock return.

To measure the change in leverage that arises purely from stock returns, we construct a variable as the difference between IDR and the lagged debt ratio. Our unreported regressions examine the extent to which this variable explains changes in the market leverage ratio. Consistent with Welch (2004), this variable is highly significant, but its level of significance is slightly less than what we find for the stock return variable in the regressions that we do report. In addition, the coefficients of the other variables in the regression are qualitatively unchanged.

VIII. 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 support the view that firms behave as though they have target debt ratios, but their cash flows, investment needs and stock price realizations lead to significant deviations from these targets. Our results indicate that the capital structures of firms do move back towards their targets, but the rate at which they do this is relatively slow. In this sense, our evidence is consistent with the dynamic capital structure models presented in Fischer, Heinkel, and Zechner (1989) and Titman and Tsyplakov (2004) that show that, with reasonable levels of transaction costs, along with the traditional costs and benefits of debt financing, debt ratios will vary over a relatively large range.

In particular, we find substantial capital structure changes that are due to what Shyam-Sunder and Myers (1999) refer to as the financial deficit. In addition, as in Welch (2004), stock returns have a very important effect on capital structure. However, although the variable motivated by the Baker and Wurgler (2002) intuition influences capital structure in the predicted direction, the magnitude of this effect is quite small relative to the stock price and financial deficit effects.

We also find that our estimate of the difference between a firm's current debt ratio and its target debt ratio explains subsequent changes in leverage, which is consistent with the idea that firm's have meaningful target debt ratios. Moreover, the stock return effect and the financial deficit effect partially reverse in the subsequent period in the market leverage regressions, and the financial deficit variable also partially reverses in the book leverage regressions, providing further evidence that firms have relevant target debt ratios.

It is noteworthy that stock price changes have a more permanent effect on capital structures than do financial deficits. This evidence suggests that stock price changes may be associated with changes in the target debt ratio. [31] There are a number of reasons why this might be the case. First, high stock returns are likely to be associated with increased growth opportunities, which are likely to be associated with lower target debt ratios. It could also 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.[32] 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

[31] We initially conjectured that because of an endogeniety problem, the evidence of the reversal of the financial deficit effect on changes would be weak. Specifically, we argued that firms that tend to be under-levered (over-levered) are expected to have larger (smaller) financial deficits and experience increases (decreases) in leverage for this reason. Since movements towards the target ratio are not expected to be reversed, we do not expect to see the effects of financial deficits to fully reverse. In contrast, since we have no reason to believe that stock returns are affected by deviations from the target (i.e., stock returns are exogenous), we expect to observe a full reversal in the stock return effect if they are not associated with changes in the target.

[32] 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.[33] These issues should be considered in future research.

[33] 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

$$FD \equiv \Delta e + \Delta d \qquad \text{(A1.1)}$$

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

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

We can also rewrite A1.2 as

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

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

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

which can also be represented as

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

Appendix 2: Predicting Target Leverage

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.[34]

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.[35] We eliminate the very high values of the selling expense variable (the ones in the 99 percentile) to reduce the impact of outliers on the target debt ratio. We include the market-to-book ratio (*M/B*) to proxy for the investment opportunity sets that firms face. Following Baker and Wurgler (2002) we drop the observations that have a market-to-book ratio greater than 10. 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.

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

[35] *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.[36] 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 θ_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.

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

References:

Almazan, Andres, Javier Suarez, and Sheridan Titman, 2003, "Capital Structure and Transparency," University of Texas Working Paper.

Alti, Aydogan, 2004, "How Persistent is the Impact of Market Timing on Capital Structure?" Working Paper, University of Texas at Austin.

Asquith, Paul, and David W. Mullins, 1986, "Equity Issues and Offering Dilution, *Journal of Financial Economics*, 15, 61-89.

Auerbach, Alan J., 1985, "Real Determinants of Corporate Leverage," in Benjamin J. Friedman (ed.) Corporate Capital Structures in the United States, University of Chicago Press, Chicago.

Auerbach, Alan J., 1979, "Share Valuation and Corporate Equity Policy," *Journal of Public Economics*, 11, 291-305.

Baker M., and J. Wurgler, 2002, "Market Timing and Capital Structure," *Journal of Finance*, 57(1), 1-32.

Berger, Philip G., Eli Ofek, and David L. Yermack, 1997, "Managerial Entrenchment and Capital Structure Decisions," *Journal of Finance*, 52(4), 1411-1438.

Bolton, Patrick, and David Scharfstein, 1990, "A Theory of Predation Based on Agency Problems in Financial Contracting," *American Economic Review*, 80(1), 93–106.

Chen, Long, and Xinlei Zhao, 2004, "Understanding the Role of the Market-to-Book Ratio in Corporate Finance Decisions," Working Paper.

Donaldson, G., 1961, "Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity." Harvard Business School, Division of Research, Harvard University.

Efron, B., and R. Tibshirani, 1986, "Bootstrap Measures for Standard Errors, Confidence Intervals, and Other Measures of Statistical Accuracy," *Statistical Science*, 1, 54-77.

Efron, B., 1979, "Bootstrap Methods: Another Look at the Jackknife," *Annals of Statistics*, 7, 1-26.

Fama, Eugene, and Kenneth R. French, 2002, "Testing tradeoff and pecking order predictions about dividends and debt," *Review of Financial Studies*, 15(1), 1-33.

Fama, Eugene, and Kenneth R. French, 1997, "Industry Costs of Equity," *Journal of Financial Economics*, 43(2), 153-93.

Fischer, O. Edwin, Robert Heinkel, and Josef Zechner, 1989, “Dynamic Capital Structure Choice: Theory and Tests,” *Journal of Finance*, 44(1), 19-40.

Frank, Murray, and Vidhan Goyal, 2003, “Testing the Pecking Order Theory of Capital Structure,” *Journal of Financial Economics*, 67(2), 217-48.

Friend, Irwin, and Larry H. P. Lang, 1988, “An Empirical Test of the Impact of Managerial Self-Interest on Corporate Capital Structure,” *Journal of Finance*, 47, 271-281.

Graham, John R., and Campbell R. Harvey, 2001, ‘The Theory and Practice of Corporate Finance: Evidence from the Field,” *Journal of Financial Economics*, 60, pp. 187-243.

Hart, Oliver D. and John Moore, 1995, "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management,” *American Economic Review*, 85(3), 567-85.

Hennessy, Christopher A., and Toni Whited, 2003, “Debt Dynamics,” Working Paper.

Hovakimian, Armen, forthcoming, “The Role of Target Leverage in Security Issues and Repurchases,” *Journal of Business*.

Hovakimian, Armen, 2004, “Are Observed Capital Structures Determined by Equity Market Timing?” Working Paper, Baruch College.

Hovakimian, Armen, Tim Opler, and S. Titman, 2001, “The debt-equity choice”, *Journal of Financial and Quantitative Analysis*, 36(1), 1-24.

Ikenberry, David, Josef Lakonishok, and Theo Vermaelen, 1995, “Market Underreaction to Open Market Share Repurchases, *Journal of Financial Economics*, 39, 181-208.

Jalilvand, A., and R. S. Harris, 1984, “Corporate Capital Behavior in Adjusting to Capital Structure and Dividend Targets: An Econometric Study,” *Journal of Finance*, 39, 127-145.

Jensen, M. C., 1986, “Agency Costs of Free-Cash Flow, Corporate Finance, and Takeovers,” *American Economic Review*, 76, 323-329.

Jung, Kooyul, Yong Cheol Kim, and Rene M. Stulz, 1996, “Timing, Investment Opportunities, Managerial Discretion, and Security Issue Decision, *Journal of Financial Economics*, 42, 159-185.

Kayhan, Ayla, 2004, "Managerial Entrenchment and the Debt-Equity Choice," Working Paper, University of Texas at Austin.

Korajczyk, Robert, Deborah Lucas, and Robert McDonald, 1991, "The Effects of Information Releases on the Pricing and Timing of Equity Issues," *Review of Financial Studies*, 4, 685-708.

Lemmon, Michael L., and Jaime F. Zender, 2004, "Debt Capacity and Tests of Capital Structure Theories," Working Paper.

Loughran, Tim, and Jay Ritter, 1995, "The New Issues Puzzle," *Journal of Finance*, 50(1), 23-51.

Marsh, Paul, 1982, "The Choice between Equity and Debt: An Empirical Study," *Journal of Finance*, 37, 121-144.

Mehran, Hamid, 1992, "Executive Incentive Plans, Corporate Control, and Capital Structure," *Journal of Financial and Quantitative Analysis*, 27, 539-560.

Miller, Merton, 1977, "Debt and Taxes," *Journal of Finance*, 32(77), 261-275.

Myers, S. C., 1977, ""Determinants of corporate borrowing," *Journal of Financial Economics*, 5, 147-175.

Myers, S. C., 1984, "The Capital Structure Puzzle," *Journal of Finance*, 39, 575-592.

Myers, S. C., and N. Majluf, 1984, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics*, 13, 187-221.

Pagano, Marco, Fabio Panetta, and Luigi Zingales, 1998, "Why Do Companies Go Public? An Empirical Analysis," *Journal of Finance*, 53(1), 27-64.

Rajan, R. G., and L. Zingales, 1995, "What do we know about capital structure? Some evidence from international data" *Journal of Finance*, 50, 1421-1460.

Ritter, Jay, 2002, "Investment Banking and Securities Issues." Handbook of the Economics of Finance, ed., George Constantinides, Milton Harris, and Rene Stulz.

Shyam-Sunder, Lakshimi and Stewart C. Myers, 1999, "Testing Static Tradeoff against Pecking Order Models of Capital Structure," *Journal of Financial Economics*, 51, 219-244.

Strebulaev, Ilya, 2003, "Do Tests of Capital Structure Theory Mean What They Say?," Working Paper.

Subrahmanyam, Avanidhar, and Sheridan Titman, 2001, "Feedback from Stock Prices to Cash Flows," *Journal of Finance*, 56(6), pp. 2389-2413.

Taggart, Robert A., 1977, "A Model of Corporate Financing Decisions," *Journal of Finance*, 32, 1467-1484.

Titman, Sheridan and Sergey Tsyplakov, 2004, "A Dynamic Model of Optimal Capital Structure," Working Paper.

Titman, Sheridan, and Roberto Wessels, 1988, "The Determinants of Capital Structure," *Journal of Finance*, 43(1), 1-19.

Welch, Ivo, 2004, "Capital Structure and Stock Returns," *Journal of Political Economy*, 112(1), 106-131.

White, H., 1980, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica*, 48, 817-838.

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

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

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 1975 and 2002. *Financial deficit* (*FD*) is total external financing between year t and t-5. *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 to t-5. *Long-term timing (LT)* is the product of average market-to-book ratio and average external financing between year t and t-5. *5-year cumulative stock return (r)* is the cumulative log return on stock between year t and t-5. *5-year cumulative profitability (EBITD)* is the sum of earnings before interest, taxes, and depreciation between year t and t-5, 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 = 3419)				*e+d* –c (clusters = 3182)				*e+d* –c-div (clusters = 3148)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t,t-5]}$)	0.100	0.014	0.073	0.127	0.129	0.013	0.107	0.156	0.137	0.012	0.111	0.159
Positive Financial Deficit ($FD*d_{[t,t-5]}$)	0.111	0.019	0.073	0.147	0.084	0.017	0.049	0.117	0.077	0.015	0.047	0.103
Yearly Timing ($YT_{[t,t-5]}$)	-0.158	0.045	-0.258	-0.082	-0.131	0.042	-0.225	-0.053	-0.147	0.040	-0.231	-0.074
Long-term Timing ($LT_{[t,t-5]}$)	-0.220	0.018	-0.257	-0.186	-0.219	0.022	-0.266	-0.179	-0.237	0.022	-0.277	-0.196
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-4.372	0.180	-4.760	-4.060	-4.235	0.189	-4.638	-3.908	-4.125	0.186	-4.507	-3.786
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	-1.377	0.280	-1.912	-0.847	-1.096	0.272	-1.611	-0.599	-1.131	0.264	-1.674	-0.674
Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$)	-0.414	0.011	-0.433	-0.386	-0.396	0.011	-0.413	-0.366	-0.409	0.011	-0.429	-0.384

Market Leverage

	e+d (clusters = 3482)				*e+d* –c (clusters = 3240)				*e+d* –c-div (clusters = 3148)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t,t-5]}$)	0.152	0.015	0.129	0.185	0.176	0.012	0.153	0.201	0.173	0.012	0.152	0.198
Positive Financial Deficit ($FD*d_{[t,t-5]}$)	0.059	0.017	0.023	0.091	0.031	0.015	0.001	0.061	0.013	0.014	-0.016	0.038
Yearly Timing ($YT_{[t,t-5]}$)	-0.096	0.039	-0.175	-0.025	-0.102	0.037	-0.180	-0.032	-0.108	0.035	-0.180	-0.043
Long-term Timing ($LT_{[t,t-5]}$)	-0.222	0.017	-0.255	-0.191	-0.227	0.019	-0.264	-0.191	-0.213	0.017	-0.246	-0.180
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-14.420	0.196	-14.804	-14.050	-14.226	0.207	-14.627	-13.826	-14.265	0.195	-14.632	-13.872
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	2.475	0.314	1.911	3.124	2.852	0.321	2.250	3.460	3.200	0.307	2.666	3.906
Leverage deficit ($L_{t-5} - \hat{L}_{t-5}$)	-0.348	0.008	-0.364	-0.331	-0.344	0.009	-0.359	-0.325	-0.356	0.009	-0.375	-0.338

Table 3 – Percentage Change in Leverage Generated by History Variables

This table presents the standard deviations our history variables (financial deficit (FD), yearly timing (YT), 5-year cum. stock return, 5-year cum. profitability, and the leverage deficit (LDef)) (Panel A) and the percentage changes in leverage that are generated by these variables (Panel B). Calculations are based on the coefficient estimates reported in Table 2 Panel A (*e*+*d*).

The percentage change in leverage due to the composite negative financial deficit is calculated as the sum of the coefficient estimates of FD and LT/5 multiplied by the standard deviation of FD, separately for low- and high-average market-to-book ratio firms (The point estimate of *LT* is scaled by five since it is constructed as $\overline{M/B} * \overline{FD}$ while FD is the cumulative 5-year deficit). The low- and high- $\overline{M/B}$ values are determined by the level of average market-to-book ratio in the 5 and 95 percentiles of its sample distribution, respectively. The magnitude of the composite positive financial deficit is calculated as the standard deviation of FD times the sum of the coefficient estimates of FD, FDd and LT/5.

Panel A

Variable:	Std. Dev.
Financial Deficit (FD)	45.17
Yearly Timing (YT)	5.51
Long-term Timing (LT)	22.20
5-year Cumulative Stock Return	1.15
5-year Cum. Profitability	1.00
Leverage deficit (book)	16.15
Leverage deficit (market)	18.44

Panel B

One standard change in:	Percentage change in:			
	Book Leverage		Market Leverage	
Yearly Timing (YT)	-0.870		-0.531	
5-year Cumulative Stock Return	-5.028		-16.583	
5-year Cumulative Profitability	-1.377		2.475	
Leverage deficit	-6.687		-6.414	
	low M/B	high M/B	low M/B	high M/B
Composite Negative Financial Deficit	3.022	-1.620	5.366	0.682
Composite Positive Financial Deficit	8.020	3.378	8.025	3.341

Table 4 – 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 1980 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, stock return, and the profitability variables between year t and 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 = 1961)				*e+d* –c (clusters = 1797)				*e+d* –c-div (clusters = 1783)			
Variable	Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]	
Financial Deficit ($FD_{[t-5,t-10]}$)	0.067	0.018	0.037	0.111	0.087	0.021	0.046	0.133	0.102	0.021	0.065	0.146
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	0.106	0.022	0.053	0.143	0.101	0.025	0.046	0.147	0.147	0.027	0.090	0.194
Yearly Timing ($YT_{[t-5,t-10]}$)	-0.049	0.080	-0.212	0.095	-0.008	0.084	-0.168	0.161	0.016	0.072	-0.108	0.183
Long-term Timing ($LT_{[t-5,t-10]}$)	-0.155	0.038	-0.234	-0.088	-0.175	0.043	-0.262	-0.091	-0.249	0.032	-0.311	-0.188
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	-2.847	0.273	-3.340	-2.260	-2.963	0.296	-3.512	-2.419	-6.877	0.401	-7.677	-6.071
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	-1.778	0.332	-2.423	-1.116	-1.650	0.416	-2.570	-0.929	-2.303	0.507	-3.287	-1.280
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.628	0.018	-0.658	-0.584	-0.618	0.020	-0.655	-0.576	-0.590	0.018	-0.621	-0.550

Market Leverage

	e+d (clusters = 1978)				*e+d* –c (clusters = 1822)				*e+d* –c-div (clusters = 1807)			
Variable	Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]	
Financial Deficit ($FD_{[t-5,t-10]}$)	0.102	0.021	0.065	0.146	0.121	0.026	0.072	0.176	0.126	0.024	0.079	0.176
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	0.147	0.027	0.090	0.194	0.147	0.032	0.084	0.209	0.130	0.029	0.071	0.178
Yearly Timing ($YT_{[t-5,t-10]}$)	0.016	0.072	-0.108	0.183	-0.011	0.080	-0.168	0.148	-0.048	0.083	-0.203	0.126
Long-term Timing ($LT_{[t-5,t-10]}$)	-0.249	0.032	-0.311	-0.188	-0.287	0.039	-0.353	-0.199	-0.278	0.037	-0.354	-0.205
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	-6.877	0.401	-7.677	-6.071	-7.168	0.409	-8.071	-6.470	-7.327	0.416	-8.161	-6.583
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	-2.303	0.507	-3.287	-1.280	-2.493	0.529	-3.365	-1.310	-1.989	0.575	-3.048	-0.840
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.590	0.018	-0.621	-0.550	-0.601	0.020	-0.638	-0.561	-0.616	0.020	-0.656	-0.578

Panel B:

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

	Book Leverage											
	e+d (clusters = 1824)				*e+d* –c (clusters = 1492)				*e+d* –c-div (clusters = 1465)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t,t-5]}$)	0.068	0.016	0.037	0.102	0.074	0.021	0.034	0.118	0.106	0.022	0.067	0.148
Positive Financial Deficit ($FD*d_{[t,t-5]}$)	0.121	0.019	0.080	0.152	0.106	0.026	0.046	0.150	0.098	0.027	0.030	0.142
Yearly Timing ($YT_{[t,t-5]}$)	-0.329	0.094	-0.536	-0.160	-0.259	0.094	-0.434	-0.054	-0.203	0.090	-0.372	-0.032
Long-term Timing ($LT_{[t,t-5]}$)	-0.146	0.040	-0.219	-0.068	-0.126	0.051	-0.219	-0.020	-0.214	0.052	-0.305	-0.107
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-5.144	0.302	-5.814	-4.651	-5.267	0.356	-6.003	-4.620	-5.069	0.378	-5.890	-4.396
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	-0.710	0.471	-1.739	0.046	0.013	0.455	-0.771	0.889	-0.276	0.444	-1.068	0.572
Financial Deficit ($FD_{[t-5,t-10]}$)	0.071	0.020	0.030	0.112	0.086	0.023	0.044	0.135	0.097	0.023	0.051	0.139
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	0.056	0.024	0.006	0.099	0.051	0.026	-0.017	0.092	0.041	0.023	-0.010	0.084
Yearly Timing ($YT_{[t-5,t-10]}$)	-0.187	0.081	-0.343	-0.035	-0.171	0.091	-0.353	0.008	-0.227	0.099	-0.401	-0.008
Long-term Timing ($LT_{[t-5,t-10]}$)	-0.121	0.041	-0.205	-0.043	-0.120	0.053	-0.212	0.006	-0.175	0.056	-0.279	-0.063
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	-4.051	0.279	-4.564	-3.537	-4.285	0.324	-4.965	-3.698	-4.103	0.361	-4.800	-3.446
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	-0.835	0.367	-1.570	-0.158	-0.879	0.449	-1.789	-0.068	-0.465	0.412	-1.327	0.260
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.633	0.018	-0.667	-0.594	-0.612	0.020	-0.647	-0.565	-0.634	0.022	-0.673	-0.585

	Market Leverage											
	e+d (clusters = 1848)				*e+d* –c (clusters = 1516)				*e+d* –c-div (clusters = 1487)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t,t-5]}$)	0.142	0.016	0.110	0.172	0.143	0.020	0.109	0.187	0.139	0.021	0.102	0.185
Positive Financial Deficit ($FD*d_{[t,t-5]}$)	0.058	0.021	0.016	0.096	0.044	0.026	-0.013	0.093	0.024	0.026	-0.028	0.074
Yearly Timing ($YT_{[t,t-5]}$)	-0.150	0.064	-0.275	-0.024	-0.116	0.063	-0.224	0.038	-0.089	0.068	-0.196	0.057
Long-term Timing ($LT_{[t,t-5]}$)	-0.216	0.034	-0.278	-0.154	-0.196	0.039	-0.276	-0.123	-0.178	0.035	-0.245	-0.108
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-14.408	0.318	-15.004	-13.749	-14.331	0.354	-14.985	-13.658	-14.349	0.361	-15.081	-13.690
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	3.158	0.580	1.985	4.183	3.855	0.601	2.728	5.059	4.081	0.609	2.935	5.458
Financial Deficit ($FD_{[t-5,t-10]}$)	0.119	0.027	0.073	0.175	0.144	0.027	0.093	0.193	0.135	0.023	0.092	0.184
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	0.031	0.031	-0.030	0.083	0.019	0.033	-0.044	0.084	0.003	0.025	-0.046	0.047
Yearly Timing ($YT_{[t-5,t-10]}$)	-0.142	0.083	-0.294	0.033	-0.218	0.063	-0.345	-0.095	-0.232	0.064	-0.351	-0.098
Long-term Timing ($LT_{[t-5,t-10]}$)	-0.139	0.032	-0.201	-0.074	-0.158	0.041	-0.232	-0.074	-0.156	0.037	-0.227	-0.085
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	-10.334	0.422	-11.092	-9.421	-10.348	0.515	-11.309	-9.382	-10.228	0.485	-11.144	-9.234
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	0.698	0.404	-0.099	1.446	0.540	0.541	-0.598	1.445	1.220	0.543	0.113	2.325
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.574	0.016	-0.602	-0.543	-0.575	0.019	-0.610	-0.538	-0.599	0.019	-0.633	-0.556

Table 5 – 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 1980 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, stock return, and profitability variables between year t and 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 = 1953)				*e+d* –c (clusters = 1789)				*e+d* –c-div (clusters = 1775)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t-5,t-10]}$)	-0.029	0.016	-0.055	0.009	-0.056	0.017	-0.088	-0.017	-0.058	0.017	-0.091	-0.022
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	-0.037	0.019	-0.074	0.001	0.003	0.020	-0.039	0.044	0.019	0.019	-0.017	0.056
Yearly Timing ($YT_{[t-5,t-10]}$)	0.045	0.074	-0.084	0.214	0.010	0.075	-0.125	0.158	0.066	0.076	-0.072	0.217
Long-term Timing ($LT_{[t-5,t-10]}$)	0.036	0.032	-0.038	0.090	0.019	0.043	-0.074	0.096	0.000	0.043	-0.104	0.076
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	0.744	0.283	0.211	1.366	0.421	0.329	-0.315	1.005	0.391	0.323	-0.272	1.063
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	0.851	0.316	0.256	1.529	0.856	0.377	0.113	1.584	0.750	0.341	0.122	1.446
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.203	0.015	-0.232	-0.172	-0.218	0.016	-0.249	-0.181	-0.217	0.016	-0.251	-0.187

	Market Leverage											
	e+d (clusters = 1978)				*e+d* –c (clusters = 1822)				*e+d* –c-div (clusters = 1807)			
Variable	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]	Observed	Std. Err.	[95% Conf.	Interval]
Financial Deficit ($FD_{[t-5,t-10]}$)	-0.067	0.020	-0.110	-0.031	-0.093	0.022	-0.132	-0.045	-0.089	0.020	-0.126	-0.050
Positive Financial Deficit ($FD*d_{[t-5,t-10]}$)	0.056	0.025	0.011	0.107	0.101	0.027	0.038	0.147	0.116	0.023	0.074	0.159
Yearly Timing ($YT_{[t-5,t-10]}$)	0.201	0.069	0.068	0.340	0.180	0.069	0.059	0.320	0.218	0.070	0.086	0.354
Long-term Timing ($LT_{[t-5,t-10]}$)	0.022	0.030	-0.039	0.084	0.006	0.033	-0.057	0.075	-0.004	0.034	-0.072	0.067
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	8.221	0.384	7.327	8.885	7.991	0.421	7.134	8.739	7.924	0.438	6.986	8.676
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	-4.022	0.500	-5.021	-3.074	-4.619	0.516	-5.671	-3.627	-4.747	0.531	-5.702	-3.659
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.251	0.016	-0.280	-0.216	-0.277	0.018	-0.309	-0.241	-0.275	0.018	-0.312	-0.239

Panel B:

$$L_t - L_{t-5} = \alpha_0 + \beta_1 FDd_{[t,t-5]} + \beta_2 FD_{[t,t-5]} + \beta_3 YT_{[t,t-5]} + \beta_4 LT_{[t,t-5]} + \beta_5 r_{[t,t-]} + \beta_6 EBITD_{[t,t-5]_7} + \beta FDd_{[t-5,t-10]} + \beta_8 FD_{[t-5,t-10]} + \beta_9 YT_{[t-5,t-10]} + \beta_{10} LT_{[t-5,t-10]} + \beta_{11} r_{[t-5,t-10]} + \beta_{12} EBITD_{[t-5,t-10]} + \beta_{13} Ldef_{t-5} + \varepsilon_t$$

	Book Leverage											
	e+d (clusters = 1819)				*e+d* –c (clusters = 1485)				*e+d* –c-div (clusters = 1458)			
Variable	Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]	
Financial Deficit ($FD_{[t,t-5]}$)	0.153	0.016	0.124	0.187	0.153	0.022	0.120	0.205	0.158	0.019	0.122	0.196
Positive Financial Deficit ($FD{*}d_{[t,t-5]}$)	0.089	0.024	0.038	0.136	0.078	0.031	-0.006	0.123	0.079	0.027	0.019	0.126
Yearly Timing ($YT_{[t,t-5]}$)	-0.388	0.108	-0.610	-0.183	-0.251	0.095	-0.470	-0.076	-0.253	0.090	-0.473	-0.105
Long-term Timing ($LT_{[t,t-5]}$)	-0.234	0.038	-0.306	-0.155	-0.218	0.051	-0.321	-0.123	-0.258	0.045	-0.353	-0.175
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-6.094	0.316	-6.725	-5.484	-6.009	0.355	-6.721	-5.399	-5.832	0.348	-6.694	-5.224
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	-1.563	0.849	-3.352	-0.593	-0.815	0.875	-2.682	0.030	-0.907	0.857	-2.762	-0.014
Financial Deficit ($FD_{[t-5,t-10]}$)	-0.025	0.016	-0.055	0.007	-0.043	0.019	-0.083	-0.006	-0.058	0.018	-0.100	-0.029
Positive Financial Deficit ($FD{*}d_{[t-5,t-10]}$)	-0.111	0.019	-0.147	-0.071	-0.083	0.021	-0.123	-0.039	-0.077	0.019	-0.112	-0.038
Yearly Timing ($YT_{[t-5,t-10]}$)	-0.074	0.078	-0.216	0.093	-0.147	0.078	-0.301	0.003	-0.108	0.077	-0.266	0.054
Long-term Timing ($LT_{[t-5,t-10]}$)	0.093	0.038	0.011	0.163	0.087	0.052	-0.012	0.199	0.111	0.050	0.015	0.212
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	-0.755	0.286	-1.227	-0.112	-1.117	0.347	-1.775	-0.456	-1.003	0.343	-1.698	-0.330
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	2.379	0.389	1.642	3.060	2.374	0.444	1.520	3.215	2.473	0.437	1.752	3.250
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.193	0.012	-0.217	-0.170	-0.190	0.014	-0.217	-0.161	-0.198	0.015	-0.231	-0.169

	Market Leverage											
	e+d (clusters = 1848)				*e+d* –c (clusters = 1516)				*e+d* –c-div (clusters = 1487)			
Variable	Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]		Observed	Std. Err.	[95% Conf. Interval]	
Financial Deficit ($FD_{[t,t-5]}$)	0.186	0.015	0.158	0.217	0.180	0.021	0.142	0.222	0.165	0.022	0.124	0.213
Positive Financial Deficit ($FD{*}d_{[t,t-5]}$)	0.070	0.021	0.024	0.105	0.070	0.028	0.014	0.125	0.059	0.028	0.003	0.115
Yearly Timing ($YT_{[t,t-5]}$)	-0.198	0.073	-0.339	-0.028	-0.141	0.069	-0.258	0.025	-0.152	0.074	-0.278	0.016
Long-term Timing ($LT_{[t,t-5]}$)	-0.233	0.030	-0.296	-0.176	-0.239	0.037	-0.308	-0.168	-0.208	0.036	-0.285	-0.139
5-year Cumulative Stock Return ($r_{[t,t-5]}$)	-16.074	0.319	-16.696	-15.461	-15.920	0.384	-16.650	-15.060	-15.888	0.375	-16.636	-15.190
5-year Cum. Profitability ($EBITD_{[t,t-5]}$)	2.231	0.551	1.181	3.235	3.342	0.592	2.327	4.470	3.695	0.571	2.692	4.985
Financial Deficit ($FD_{[t-5,t-10]}$)	-0.046	0.012	-0.069	-0.023	-0.062	0.017	-0.094	-0.029	-0.075	0.014	-0.103	-0.052
Positive Financial Deficit ($FD{*}d_{[t-5,t-10]}$)	-0.086	0.016	-0.117	-0.055	-0.058	0.020	-0.096	-0.021	-0.048	0.015	-0.078	-0.018
Yearly Timing ($YT_{[t-5,t-10]}$)	0.002	0.056	-0.105	0.111	-0.044	0.059	-0.180	0.063	0.002	0.061	-0.103	0.135
Long-term Timing ($LT_{[t-5,t-10]}$)	0.137	0.029	0.085	0.200	0.137	0.038	0.073	0.219	0.136	0.034	0.079	0.220
5-year Cumulative Stock Return ($r_{[t-5,t-10]}$)	4.242	0.348	3.571	4.877	4.409	0.422	3.671	5.268	4.646	0.430	3.793	5.425
5-year Cum. Profitability ($EBITD_{[t-5,t-10]}$)	0.012	0.352	-0.820	0.621	-0.547	0.422	-1.371	0.281	-0.404	0.430	-1.479	0.299
Leverage deficit ($L_{t-10} - \hat{L}_{t-10}$)	-0.229	0.010	-0.250	-0.210	-0.232	0.013	-0.260	-0.208	-0.244	0.012	-0.267	-0.222

Table A2: Predicting Leverage (Tobit Regressions)

We use the tobit specification to predict the leverage ratio (both in book and market values) 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 total assets), 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. Panel A presents the coefficient estimates (b) and the corresponding t-statistics (t(b)) of the variables used in the regression. The statistics for the industry dummies are suppressed. The mean and the standard deviation of the predicted target leverage and the leverage deficit are presented in Panel B.

Panel A

	Book Leverage		Market Leverage	
	b	t(b)	b	t(b)
Market-to-book $_{t-1}$	-2.12	-30.25	-7.40	-99.33
Prop., Plant & Equip. $_{t-1}$	0.08	14.24	0.08	12.69
Profitability $_{t-1}$	-0.41	-56.93	-0.52	-70.96
Selling Expense $_{t-1}$	-0.08	-19.67	-0.12	-27.91
Research & Dev. $_{t-1}$	-0.05	-7.02	-0.03	-3.69
R&D dummy $_{t-1}$	4.84	13.24	4.94	12.71
Size $_{t-1}$	2.59	54.58	1.14	22.44
Number of observations	52346		53708	
Prob. > chi2	0		0	
LR chi2(48)	13370.25		26603.76	

Panel B

	Mean	St. Dev.	Mean	St. Dev.
Leverage deficit $_{t-5}$	-0.48	16.79	-2.09	18.44
Predict target leverage $_{t}$	45.62	9.04	41.94	11.83