Determinants of Capital Structure: A Long Term Perspective

Chinmoy Ghosh
School of Business, University of Connecticut, Storrs, CT 06268, USA, e-mail: Chinmoy.Ghosh@business.uconn.edu

Milena Petrova*
Whitman School of Management, Syracuse University, Syracuse, NY 13244, USA, e-mail: mpetrova@syr.edu

Adam Wang
Whitman School of Management, Syracuse University, Syracuse, NY 13244, USA, e-mail: zwang15@syr.edu

---

Abstract

We examine whether market and operating performance have a long lasting effect on firms' use of leverage We design a weighting scheme that captures the effect of profitability during the periods when the firm rebalances its leverage. Our results show that the constructed variable, weighted average historical profitability, has a strong negative impact on the firm's current capital structure. This impact is robust for small vs. large firms, high vs. low growth firms and is not influenced by market conditions. Our findings imply that the firm's capital structure is to a large extent the outcome of accumulating historical operating profits.

Keywords: capital structure, profitability, trade-off theory, pecking order theory

JEL classification: G30; G32

---

*Contact author: e-mail: mpetrova@syr.edu, phone: (315) 396-3366

Determinants of Capital Structure: A Long Term Perspective

We examine whether market and operating performance have a long lasting effect on firms' use of leverage We design a weighting scheme that captures the effect of profitability during the periods when the firm rebalances its leverage. Our results show that the constructed variable, weighted average historical profitability, has a strong negative impact on the firm's current capital structure. This impact is robust for small vs. large firms, high vs. low growth firms and is not influenced by market conditions. Our findings imply that the firm's capital structure is to a large extent the outcome of accumulating historical operating profits.

Introduction

What drives the corporate use of debt financing and firms' setting of financial policy is a fundamental question in finance that has attracted voluminous theoretical and empirical research. Three main theories have been advanced to explain capital structure: the trade-off theory, pecking order theory, and market timing theory. While these theories make different predictions regarding the existence of optimal target structure, recent research has focused its attention on the cost associated with adjustment to target capital structure (Fischer, Heinkel and Zechner (1989), Leary and Roberts, (2005)) and on the speed of adjustment to target (Hovakimian, Opler and Titman (2001), Leary and Roberts (2005), Flannery and Rangan (2006), Strebulaev (2007), and Huang and Ritter (2009)). However, the factors influencing firm's choice of financial policy remain an empirical issue. While many studies focus on the short-term determinants of use of debt (one period lagged variables), few have examined the effect on leverage of stylized factors over long periods of time (Baker and Wurgler (2002) and Kayhan and Titman (2007)).

This paper attempts to understand whether market and operating performance have a long lasting effect on firms' use of leverage and whether the changes in capital structure due to operating profits can accumulate in the long run.

Early tests to disentangle the three theories involved regressing firms' observed leverage ratios against contemporaneous values of various traditional proxies for information asymmetry, market inefficiencies, and transaction costs. Overall, the findings of these studies are mixed, establishing only a small number of factors related to leverage that are empirically robust (Frank and Goyal (2009)). A significant finding of this line of literature is the consistently negative relation between leverage ratio and profitability, a result Strebulaev (2007) characterizes as a "major failure of the trade-off model." Most studies show a negative relationship between lagged or average profits and debt ratios (Titman and Wessels (1988), Baker and Wurgler (2002), Huang and Ritter (2009), and Kayhan and Titman (2007)). A negative effect of profitability on leverage is consistent with the pecking order theory, as firms prefer internally generated funds over external financing and profitable firms will tend to generate more internal funds and use less debt. While, the observed relationship is not consistent with the static trade-off theory, which implies that profitable firms use more debt to maximize interest tax shields, it is not inconsistent with the dynamic trade-off theory, as firms with higher growth opportunities may retain funds and distribute them at later periods.

The illusive search for optimal capital structure under the static model motivated more recent studies to focus on the long-term behavior of debt ratio (Baker and Wurgler (2002), Welch (2004) and Kayhan and Titman (2007)). Trade-off theory posits that since managers strive to rebalance away short-term deviations from the optimal leverage ratio,

no factor has persistent long-term effect on debt ratios. In contrast, neither pecking order nor market timing theory is inconsistent with persistent impacts. However, while pecking order theory posits that firms prefer debt to equity when raising external equity, market timing theory predicts that profitable firms with high market-to-book ratios tend to issue more equity. As such, in the dynamic setting, under pecking order, long-term debt ratios would reflect firms' financing deficit; under market timing, debt ratio is inversely related to the average historical market-to-book ratio.

In this paper, we examine the effect of profitability on leverage and its persistence over time using data from 1950 – 2008. As previously noted, leverage-profitability negative relationship is the most pervasive regularity in capital structure research. It is a powerful result that allows us to disentangle the trade-off and pecking order theories. However, despite the strong effect of profitability on leverage, the issue of its persistence remains largely unexplored. Tests of persistence and speed of adjustment are useful to further separate the trade-off, pecking order, and market timing theories.

We employ Fama-MacBeth regression analysis, where the dependent variable is the current book leverage or market leverage and the independent variable of interest is the weighted average of historical profits. We design a weighting scheme for historical profits that captures the effect of profitability during the periods when the firm rebalances its leverage through issuance or retirement of debt or equity. Specifically, the more effort is required to rebalance the effect of its earnings on leverage during a year, the higher is the weight given to the firm's profit in that year. The effort to counter-balance the profitability effect is measured by the adjustment through external financing activities, the net debt issuance minus the net equity issuance. Our results show that the weighted

average historical profitability over the firm's entire history has a strong negative impact on the firm's current capital structure measured by either book leverage or market leverage. The impact of weighted average historical profitability remains economically and statistically significant, after controlling for previously identified determinants of capital structure, such as one-period lagged profitability, tangibility, firm size, and market-to-book ratio. This impact is also robust to small versus large firms, and firm with and without credit ratings, high and low M/B ratios. In addition, this effect is not influenced by market conditions.

We further compare the explanatory power of weighted average historical profits in a regression model, which includes previously identified capital structure determinants. We find that the firm's weighted average historical profitability accounts for a greater amount of cross-sectional variation in leverage than the combined effect of all lagged leverage determinants identified by Rajan and Zingales (1995). Our findings indicate that the current leverage, to a large extent, can be viewed as the cumulative result of firm's historical profits.

Our results remain robust when we include firm fixed effects and additional control variables, such as the weighted average of past market-to-book ratio used by Baker and Wurgler (2002). The results also hold over different sample periods. Frank and Goyal (2009) report that one lagged profits become less important in determining the current leverage after 1980s. We perform the analysis for two subsamples: one including all firms from 1950 to 1989 and a second one, including firms during 1990 – 2008. We find that the strong negative relation between leverage and the weighted average historical profits is economically and statistically significant for both subsamples.

Furthermore, this strong negative relation cannot be attributed to survivorship bias, as we estimate our regression model for firms surviving through the period of 1970 to 1989 and firms exiting during that period and obtain similar results.

What are the implications of our findings within the context of the current state of research on capital structure? Market-to-book ratio and stock returns have been found to have persistent effects on leverage ratio (Baker and Wurgler (2002), and Welch (2004)). The conclusions in these studies have been challenged, however. Hovakimian (2006) argues that the persistently negative effect of market-to-book ratio is consistent also with the notion that firms with high growth opportunities maintain low debt ratios to retain the option to issue securities in the future. In addition, several authors report that the speed of adjustment is too fast to be consistent with persistence. Our evidence of the persistent effect of profitability on leverage raises new questions about the trade-off model. Neither the static, nor the modified trade-off theory with partial adjustment can be reconciled with the evidence of strong long lasting negative effect of weighted average historical profits on capital structure.

The rest of this paper is organized as follows. Section I describes the data, sample and variable constructions; Section II reports results of long term effect of weighted average historical profits on firm capital structure; Section III compares the explanatory power of the weighted average historical profits and lagged leverage determinants; Section IV checks the robustness of the main findings; Section V discusses the interpretations for our major results; and finally section VI concludes the paper.

I. Background Literature

Under the trade-off theory, an optimal capital structure exists, which captures the trade-off between the benefits of borrowing (tax-deductibility of interest payments) against the costs associated with financial distress, and debt overhang. Any deviation from the optimal capital structure is transient and firms quickly rebalance to move capital structure back to the optimal level. An important implication of the trade-off theory is that profitable firms use more debt to maximize the tax benefit. Hence, profitability and debt should be positively related. Further, since firms rapidly reverse any deviation from the optimal capital structure by undertaking the appropriate financing action, any change in the firm's debt-equity mix does not persist over time.

According to the pecking order theory, to minimize costs stemming from information asymmetry, firms prefer to use internal capital first, followed by risky debt, and finally equity. Pecking order theory predicts that since profitable firms generate more internal funds, they issue less debt. Further, firms with high financing deficit, and need for external capital to fund investment opportunities have high debt ratios. However, there is no optimal capital structure, and observed leverage ratios are the cumulative effect of firms' information asymmetry, profitability, and investment opportunities. So, firms reveal no strong inclination to reverse leverage changes induced by financing needs and earnings growth.

Finally, the equity market timing theory posits that managers issue equity when the market is overvalued, and issue debt when the market is undervalued. Similar to the pecking order theory, market timing theory does not predict an optimal capital structure;

rather, current debt ratios are dependent on the history of firms' financing choices dictated by the state of the stock market. However, recent research (Alti (2006) and Hovakimian (2006)) presents evidence that the effect of market timing on capital structure is not long lasting. In essence, both pecking order and market timing theories are consistent with persistent effects of relevant factors on leverage ratios.

The early tests of trade-off theory estimate regression models of leverage ratio against firm characteristics including size, profitability, tangibility of assets, and growth opportunities. The results are mixed. Consistent support for trade-off theory draws from the positive effect of size and value of assets on leverage ratio (Titman and Wessels (1988), Rajan and Zingales (1995), and Chang and Dasgupta (2009)). Corroborative support derives from the evidence that firm's debt-equity choice is influenced by deviations from long-term target leverage (Jalilvand and Harris (1984), Hovakimian, Opler and Titman (2001)). An alternative perspective is presented by Shyam-Sunder and Myers (1999) who argue that to minimize cost of information asymmetry, firms will avoid selling equity, and prefer issuing debt. The authors show that net debt issues bear a strong correspondence to financing deficit, which they interpret as consistent with the pecking order theory. However, Frank and Goyal (2003) present two pieces of evidence that are inconsistent with the implications of pecking order. First, net equity financing tracks financing deficit closely, net debt issues do not. Second, the effect of conventional trade-off variables is not wiped out by financing deficit in a nested model incorporating the conventional regressions and the pecking order.

Baker and Wurgler's paper (2002) on the effect of market-to-book ratios on leverage refocused the capital structure literature in two directions. First, it formally

established the impact of equity market valuation on firms' debt-equity choice, and confirmed the anecdotal evidence that managers time equity issues to exploit high market valuations. More significantly, the study demonstrated that the market timing effect is persistent over time; market-to-book ratios from 5-10 years past had significant effect on current leverage ratio. The persistent impact of any firm characteristic on leverage ratio is an important result because it contradicts the notion that firms rebalance away any deviations from the target leverage. While several authors (Hovakimian (2006)) have provided evidence that the negative relation between market-to-book and leverage ratio is consistent also with the notion that high market-to-book ratio firms have high growth opportunities and tend to have lower leverage ratios to preserve financial slack, the evidence on persistence has been the theme of a series of recent studies. Following the Baker and Wurgler study, several authors including Welch (2004), and Kayhan and Titman (2007)) have used the partial adjustment model to find that fluctuations in market-to-book ratios, cash flows, investment opportunities, and stock returns lead to significant deviations from the target leverage ratio, and capital structures move back to the target level albeit at a slow rate. Related to the issue of persistence, authors have examined the speed of adjustment in leverage ratio aftershocks to the system caused deviation from the target. The intense interest in this issue stems from the fact that persistence and speed of adjustment afford a direct test of the implications of alternative theories of capital structure. Under the trade-off theory, firms gradually adjust to the target level; so, there should be no persistent effects. The pecking order theory implies that no optimal capital structure exits and currently observable leverage ratios depend on the history of the firm. Equity market timing theory leads to similar implications.

Our objective is to provide additional evidence to this growing literature by testing the persistence of the effect of profitability on capital structure. Previous literature provides evidence for a negative relationship between lagged or average profits and leverage (Titman and Wessels (1988), Baker and Wurgler (2002), Huang and Ritter (2009), and Kayhan and Titman (2007)). The static trade-off theory predicts that profitable firms, facing lower financial distress costs and enjoying potentially higher benefits from debt, due to the larger interest tax shield, will have higher levels of debt. This implies that the observed negative relationship of profitability and leverage is not consistent with the static trade-off theory. In addition, the agency theory (Jensen (1986)) posits that the benefits of debt will be greater for mature firms with higher free cash flows, as higher leverage and commitment to pay interest will preclude managers from wasting corporate resources, by investing in value destroying projects. However, the dynamic trade-off theory suggests that firms with higher growth opportunities may retain funds, rather than distributing them, which implies that a negative relation between profitability and leverage may be observed for firms with high growth opportunities. Finally, the negative effect of profitability on leverage is consistent with the pecking order theory, as firms prefer internally generated funds over external financing and profitable firms will tend to generate more internal funds and use less debt.

Kayhan and Titman (2007) present some evidence on the long-term persistence of the impact of profitability on leverage. The authors use the sum of past earnings over the last 5 and 5 – 10 years preceding the current period to examine the persistence of profitability. Their results show that the relation between 5-year cumulative profitability and leverage is relatively weak and even weaker for earlier periods. More interestingly,

they find that in market leverage regressions, the effect of profitability is positive, contrary to the notion that profitable firms use less debt.

We examine the long term persistence in the profitability-leverage relationship. In contrast to Kayhan and Titman, we use the weighted average of historical profits. We believe that the weighted average scheme captures the effect of changes in profitability more accurately. Since the purpose of partial adjustment models is to examine the extent to which firms adjust to the target leverage, and the speed of adjustment, it is important to focus on the periods when firms actually adjust by issuing or retiring debt or equity. Leary and Roberts (2005) find that in about 75% of their quarterly observations, firms are inactive in their financing initiatives. As noted by Hovakimian and Li (2010), during the passive periods, changes in capital structure are induced only by changes in profitability with no adjustment, whereas during active financing periods, speed of adjustment is as high as one. The effect of profitability is thus path dependent and a simple sum will tend to underestimate the true impact of changes in profitability. Our weighting scheme is designed to capture the most influential historical profits.

Lemmon, Roberts and Zender (2008) report that variations in capital structure are primarily driven by factors that remain stable for long periods of time, although a transitory component makes some secondary contributions to the evolution of capital structure. By design, the weighted average historical profits over long period are relatively stable and also capture the recent variations in profitability. As such, the superior explanatory power of weighted average historical profits on current capital structure is intuitive.

II. Data and Variable Constructions

A. Data and Descriptive Statistics

Our sample is drawn from all COMPUSTAT firms appearing from 1950 to 2008. The initial data set has 396,192 firm year observations. Following the convention, we exclude financial firms (SIC code from 6000 to 6900), and firm observations with missing values in total assets, EBITDA, and common shares outstanding. We also exclude observations with total debt to total assets ratio less than 0 or greater than 1. This yields our final sample, consisting of 207,101 firm-year observations.

Detailed variable definitions are provided in Table 1. We follow Fama and French (2002) for all of our variable definitions. Book leverage is defined as the book value of total liabilities divided by total assets, while market leverage is defined as the book value of total liabilities divided by the sum of book value of total liabilities and the market value of equity. We define the book value of total liabilities as total assets minus total book value of equity, and define book value of equity as total assets less total liabilities (Item 181) and preferred stock (Item 10) plus deferred taxes (Item 35) and convertible debt (Item 79).

Net equity issuance and net book debt issuance describe the external financing activities of a firm. We define the net equity issuance as the change in book value of equity less the change in retained earnings (Item 36) and define net debt issuance as the changes in total assets less the changes in book value of equity.

[Insert Table 1]

Table 2 reports the descriptive statistics of our sample. On average firms have a book leverage of 45% and a market leverage of 38%, with mean M/B ratio of 1.88 and profitability of 7%.

[Insert Table 2]

III. The Long-term Effects of Historical Profitability on Capital Structure

The main purpose of this paper is to examine the long-run effect of operating results on capital structure. Previous literature recognizes the short-term impact of operating results on capital structure (Titman and Wessels (1988), Rajan and Zingales (1995), Mackay and Phillips (2005)). Several studies have established the significance of one-period lagged profitability as a determinant of capital structure. In part A of this section, we examine the average size of firm's profits /losses and whether firms counter balance the profitability effect by external financing activities; in part B, we construct a variable to measure the historical profitability over the firm's history and conduct regression analysis including this new variable; in part C we study the persistence of the long-term profitability effect.

A. Non-parametric Study of the Long-term Profitability Effect

Changes of capital structure derive from two sources. The first source is internal operating results, profits or losses, and the second is external financing activities - debt issuance or retirement, and equity sales or repurchase. As noted by Hovakimian and Li (2011), a firm's operating profits (losses) increase (decrease) its value of equity, which leads to a decrease (increase) in leverage, if the firm does not counter balance the effect

of profitability by using external financing. Previous literature documents that in the short run, operating profits indeed reduce the firm leverage, indicating that firms insufficiently respond to changes in capital structure induced by operating results. Kayhan and Titman (2007), among others, interpret the negative relationship between the leverage and profitability as the result of partial adjustment, and document that changes in capital structure tend to reverse in the following five years, at least partially. In order to study the cumulative effect of profitability, it is necessary to examine the size of capital structure change due to operating results over the long time period.

Table III reports the size of operating results and the magnitude of external financing activities. The size of operating results is measured by average EBITDA divided by average total assets. We report the magnitude of external financing using three variables - net debt issuance (*d*), net equity issuance (*e*), and net external financing (*d*-*e*). Definitions of net debt issuance and net equity issuance are provided in Table 1. The external financing (*d*-*e*) describes the net effect of external financing on leverage. We calculate, in dollar amount, the averages of EBITDA, net equity issuance, net debt issuance and net external financing effect across firms over 5-year period, and then scale them by the average total assets in that period to get the percentage number.

[Insert Table 3]

From Table 3, we note that the 5-year average EBITDA/TA has been stable during the last 60 years. It ranges from 12% to 19% with a mean of 15%. Net debt increases at an average rate of 4% of total assets per year, while net equity increases at a rate of 2% of total assets per year. Conceivably, firms issue more debt than equity to

counter balance the automatic changes in leverage due to operating profits. However, the external financing activities respond insufficiently to the changes in leverage due to profits. If we hold profits and net equity issuance constant, firms should issue debt up to 14% of total assets to fully counter-balance away the profitability effect (we calculate the leverage effect of profits by using the average leverage ratio of 45%). Therefore, it is reasonable to believe that the profit effect on leverage can accumulate in the long run.

While the summary statistics give us some insight on the long term effect of profitability on leverage, we cannot conclude whether such a relationship exists as mean statistics can be misleading in some extreme cases. For example, if profits accumulate only in those firms with zero leverage, then the historical profits have no effect on the current leverage at all. To investigate the long-term effect of historical profits on current leverage more precisely, in the next section we conduct multiple regression analysis, in which the dependent variable is the book or market leverage ratio and the weighted average of historical profits is the main explanatory variable.

B. Leverage Regression Study on the Long-term Profitability Effects

a. Measuring the Historical Profitability

In order to study the accumulated effect of historical profitability, we construct a new variable - the weighted average of profits over the firm's history. The weighting scheme is designed to capture the most influential historical profits in the firm's history. Specifically, the more effort is required for a firm to counter balance the effect of profit on leverage in a year, the more influence the profit in that year exerts on the firm's long-

term leverage, and thus the more weight is put on the profit in that year. The effort to counter balance the profitability effect is measured by the relative external financing activities, the net debt issuance minus the net equity issuance. The formula of the weighted average historical profits is as follows:

$$Prof_{refwa,it-1} = \sum_{s=0}^{t-1} \frac{d_{is}-e_{is}}{\sum_{r=0}^{t-1}(d_{ir}-e_{ir})} prof_{is} \quad (1)$$

where the summation is taken starting from the first year that the firm appears in the COMPUSTATs dataset. The variable $prof_{it}$ represents profitability in period *t*, measured by EBITDA divided by total assets; d_{it} is the net debt issuance in period *t* scaled by total assets; e_{it} is the net equity issuance scaled by the total assets. The difference of $d_{it} - e_{it}$ describes the outcome of debt-vs.-equity decision. A positive value of $(d_{it} - e_{it})$ implies that a firm issued more debt than equity, indicating an effort to balance away the effect of profit on leverage. If firms are rational in the long run, then the rebalance effort signals that the corresponding profit has long-term influence on firm leverage, otherwise the firm need not take any action. In such a weighting scheme, the weighted average of historical profits is better in describing the firm profit path than a series of lagged profits or a simple moving average of historical profits, because the weighting scheme of the $prof_{refwa,it}$ can, not only pick up the influential profits in the firm history, but also reduce the noise in the time series of $prof_{it}$, which may stem from the short-term fluctuation of profits or from earnings management.

In calculation, we follow Baker and Wurgler (2002) and set the weight $(d_{it} - e_{it})$ to zero to ensure that total weights are increasing, when the difference is negative. Also we ignore the observations with positive $(d_{it} - e_{it})$, but negative profits, in order to

isolate the effect of profits. We also exclude those outliers which have the profits or losses more than 1.5 times total assets.

b. Leverage Regression Analysis

In order to study the long term relation between the leverage and historical profits, we conduct the traditional Fama-MacBeth leverage regression. We use the book and market leverage as dependent variable and use the relative external finance weighted average of historical profits as the main explanatory variable. We also introduce, as control variables, the Rajan and Zingales (1995) one lag leverage determinants, market-to-book ratio, tangibility, profitability and natural logarithm of firm size. Variable definitions are provided in Table 1. Inclusion of one lag profit controls for the effect of current profitability, such that $Prof_{refwa,i\,t-1}$ could reflect the long-term effect of historical profits more precisely. Furthermore, our design includes firm fixed effects to distinguish whether the relation between the weighted average historical profits, $Prof_{refwa,i\,t-1}$, is due to an unidentified firm characteristic or a path-dependent property.

The regression model can be summarized as follows:

$$Leverage_{it} = a + bProf_{refwa,it-1} + cX_{it-1} + \varepsilon_{it} \qquad (2)$$

Table IV reports the Fama-MacBeth regressions of book leverage and market leverage on the main explanatory variable, weighted average historical profitability, $Prof_{refwa,i\,t-1}$, and the control variables, lagged market-to-book ratio, tangibility, profitability and natural logarithm of firm size. Column (1) reports the results of the univariate regression with the $Prof_{refwa,i\,t-1}$ as the only regressor; the model in column

(2) includes four control variables; and that in column (3) includes both the control variables and firm fixed effects. The calculated *t*-statistics are based on robust and firm-clustered standard errors. The results show that the weighted average historical profitability, $Prof_{refwa,i\,t-1}$, is significantly and negatively related to leverage, measured by either book or market debt to assets ratio. The relationship is statistically significant at the one percent level, no matter whether the regression model includes additional control variables and firm fixed effects. Overall market based leverage regressions yield a better fit. The weighted average profitability variable alone explains 13% in the variation of market debt to total assets ratio.

[Insert Table 4]

The weighted average historical profit, $Prof_{refwa,i\,t-1}$ is not only statistically significant, but also economically important. In the model of column (2), a one standard deviation increase in weighted average historical profit is associated with 4.36 percentage points decrease in book leverage ratio (from 46.22 percent, the mean book leverage, to 41.86 percent) and 4.88 percentage points decrease in market leverage ratio (from 31.05, the mean market leverage, to 26.17 percent) . The weighted average historical profit is the most economically important determinant for book leverage and the second-most important one for market leverage after the current market-to-book ratio

Table IV demonstrates that the relationship between weighted average historical profitability and current leverage is statistically significant and economically important, and that the strong negative relationship is probably not due to unobservable, idiosyncratic firm-specific factors since this relationship remains significant after

controlling for firm fixed effects. To flesh out the conclusion of the long-term effect of historical profitability on leverage, we conduct a persistence study in the next section, following the methodology in Baker and Wurgler (2002).

C. Persistence Study on the Long-term Profitability Effects

We examine the persistence of long-term profitability effect on leverage by conducting the following Fama MacBeth leverage regression:

$$Leverage_{it+\tau} = a_1 + b_1 Prof_{refwa,it-1} + c_1(\frac{m}{b})_{efwa,it-1} + d_1 Log(size)_{it-1} + e_1 Prof_{it-1} + f_1 Tangi_{it-1} + g_1(\frac{m}{b})_{it-1} + \varepsilon_{it+\tau} \quad (3)$$

$$Leverage_{it+\tau} = a_2 + b_2 Prof_{refwa,it-1} + c_2(\frac{m}{b})_{efwa,it+\tau-1} + d_2 Log(size)_{it+\tau-1} + e_2 Prof_{it+t-1} + f_2 Tangi_{it+\tau-1} + g_2(\frac{m}{b})_{it+\tau-1} + \varepsilon_{it+\tau} \quad (4)$$

Equation (3) studies the effect of weighted average historical profits until current time, $Prof_{refwa,it-1}$, on the future leverage, $Leverage_{it+\tau}$, (see Rajan and Zingales (1995)) and weighted average historical market-to-book ratio (Baker and Wurgler (2002)); while equation (4) studies the relation between $Prof_{refwa,it-1}$ and future leverage, $Leverage_{it+\tau}$, when controlling for future control variables. The methodology is borrowed from Baker and Wurgler (2002). Table 5 reports the results. For brevity, we only report the coefficients of current profits and weighted average historical profits, b and e, which are the focus of this paper. The *t*-statistics are reported in the parentheses, and are based on robust standard error clustered in firms.

Column (1) in Table 5 reports the effect of weighted average historical profits over the firm history on future leverage, from the year the firm first appears in the COMPUSTAT dataset until current time. The results show that the coefficients of the weighted average historical profits in the above two regression models remain statistically significant for different τ, from 1 to 10 years, when controlling for Rajan and Zingales (1995) determinants at current time or in the future up to 10 years later. In addition, the magnitude of the coefficients of the weighted average historical profitability declines when τ increases, but at a very slow pace. For example, the coefficient of $Prof_{refwa,it-1}$ in the regression of equation (3) with $\tau = 1$ is -0.46 for book leverage and -0.53 for market leverage, and the coefficient of $Prof_{refwa,it-1}$ in the regression with $\tau = 10$ declines to -0.39 for book leverage and -0.49 for market leverage, accounting for 85 percent and 92 percent, respectively, of the coefficient size in the regression when $\tau = 1$. Column (2) in Table 5 reports the effect of current profits, and one-year lagged profit on future leverage. The results show that current profits still have statistically significant effect on future leverage in 10 years. However, the magnitude of the coefficients of current profit declines rapidly as τ increases. For example, the coefficient of $Prof_{it-1}$ for $\tau = 1$ is -0.14 for book leverage and -0.18 for market leverage, and the coefficient of $Prof_{it-1}$ for $\tau = 10$ declines to -0.06 for book leverage and -0.10 for market leverage.

[Insert Table 5]

The results in Table 5 reinforce the findings that the long-term effect of historical profits is very persistent. The persistence is due to the accumulation of the effect of the

profits in every period of the firm history. Although the effect of past profitability on future leverage in a specific year declines rapidly as time passes, the accumulated effect of weighted average historical profitability on future leverage remains very stable. This leads us to conclude that to a large extent, the current leverage of a firm is the cumulative outcome of its past operating results. Overall, the weighted average historical profitability over the entire firm history is an important determinant of leverage. In the next section, we compare the explanatory power of the weighted average profitability, with that of previously identified one period lagged leverage determinants.

IV. Long-term Determinants vs. One-period Lagged Determinants

Studies on long-term evolution of capital structure in Lemmon, Roberts and Zender (2008) find that the capital structure of firms is path-dependent, calling for determinants, which can capture the specific historical experiences of firms. Baker and Wurgler (2002) define a long-term determinant, the external financing weighted average of historical market-to-book ratio, $(\frac{m}{b})_{efwa,it-1}$. They find a strong negative relation between historical market values and firm leverage, and their findings are confirmed in later papers (Hovakimian (2006), and Kayhan and Titman (2007)). While the variable of $(\frac{m}{b})_{efwa,it-1}$, the weighted average past market-to-book ratios, captures the historical experience of firms in the equity market, the weighted average past profit, $Prof_{refwa,i\,t-1}$, used in this paper, captures the historical experience of firms in product markets. We can expect the two long-term determinants, $Prof_{refwa,it-1}$ and$(\frac{m}{b})_{efwa,it-1}$, to have stronger explanatory power in capital structure than the one-period-lagged determinants. We investigate this hypothesis in this section.

First, we conduct the traditional leverage regression on the Rajan and Zingales (1995) lagged determinants as a benchmark. The results are reported in column (1) of Table 6. Consistent with literature, the lagged profitability and market-to-book ratio have statistically significant negative effect on book and market leverage, and the lagged firm size and asset tangibility have significant positive effect on leverage. The adjusted R^2 are 0.06 for book leverage and 0.10 for market leverage. The adjusted R^2 statistics are somewhat different from those reported in previous studies, possibly because we use a sample with a longer time span. Note that in column (1) of Table 4, we show that the adjusted R^2 of the univariate regression on the weighted average historical profits, $Prof_{refwa,it-1}$, is 0.08 for book leverage and 0.13 for market leverage. Clearly, the weighted average historical profitability, the long term determinant proposed in this study does a better job to describe the cross-sectional variation in leverage than the combined effect of the other four determinants. This result suggests that weighted average historical profitability, $Prof_{refwa,it-1}$, captures important aspects of a firm's historical leverage ratio.

[Insert Table 6]

Second, we conduct the leverage regression on the two long term determinants, $Prof_{refwa,it-1}$ and $(\frac{m}{b})_{efwa,it-1}$. The results are reported in column (2) of Table 6. Consistent with our expectation, both long term determinants have statistically significant negative effect on book or market leverage. The adjusted R^2 is 0.11 for the book leverage and 0.25 for the market leverage, double the corresponding number in the regression including the lagged determinants only. Further, adding $(\frac{m}{b})_{efwa,it-1}$ in the regression

with $Prof_{refwa,it-1}$ improves the model's explanatory power. Adjusted R^2 increases from 0.08 to 0.11 for the book leverage regression and from 0.13 to 0.25 for the market leverage regression. Including $Prof_{refwa,it-1}$ in the regression on $(\frac{m}{b})_{efwa,it-1}$ also improves the explanatory power of the model. In an unreported study, the adjusted R^2 increases from 0.07 to 0.13 for the book leverage model and from 0.19 to 0.25 for the market leverage model. This result shows that each of the two long term determinants provides significant information on the current leverage of the firm under different perspectives.

Finally, we include in the leverage regression all the above long term determinants and lagged determinants. The purpose of such an experiment is to study the extent to which the two long term determinants provide the same information as the one-period-lagged determinants. If the long term determinants contain some of the information of the one-period lagged determinants, the adjusted R^2 for the model including both long-term and one-lag determinants will be less than the sum of the adjusted R^2 for the model including long-term determinants only and the model including one-lag determinants only. The larger the overlap in information is, the larger the loss of the adjusted R^2 will be. We report the regression results in column (3) of Table 6.

The results show that both long-term determinants, $Prof_{refwa,it-1}$ and $(\frac{m}{b})_{efwa,it-1}$, remain significant after controlling for the four additional leverage determinants. More importantly, the adjusted $R^2$for the model including both long-term and one-period-lagged determinants is 0.15 for book leverage and 0.33 for market leverage, almost equal to the sum of the adjusted R^2 for the model including long-term

determinants only and for the model including one-lag determinants only. This result shows that the long-term leverage determinants are almost orthogonal to the one-lag determinants, indicating that the long-term determinants provide new information that the one-lag determinants do not contain.

By design, the weighted average historical profits, as well as the weighted average market-to-book ratio (Baker and Wurgler (2002)) remain stable in the long term, and evolve slowly. The above properties of long term determinants fit observations of Lemmon, Roberts and Zender (2008) on the evolution of capital structure. Such fit can explain the high explanatory power of the long-term determinants on firm capital structure. More significantly, the long-term leverage determinants, in a large part, supplement the orthogonal information to the one-period-lagged leverage determinants.

V. Robustness Checks

In the previous sections we show that the weighted average historical profitability over the entire firm history is strongly and negatively associated with the current firm leverage level, and that the negative relation remains significant after controlling for other leverage determinants, including the weighted average historical market-to-book ratio, the long-term leverage determinant used Baker and Wurgler (2002). We also show that including firm fixed effects in the leverage regression models does not change our results. In this section, we investigate the robustness of the strong relation between leverage and the weighted average historical profitability.

First, we examine whether our findings hold over different periods of time, since Frank and Goyal (2009) report that the impact of profitability on leverage declined after

1980s. We divide our sample into two subsamples: firms during the period of 1950-1989 and firms during the period of 1990-2008. Next, for each subsample, we conduct the leverage regression including the weighted average historical profitability, the long-term determinant of Baker and Wurgler (2002) and other leverage determinants as independent variables. The results are reported in the column (1) and (2) of the Table 7. For both subsamples, the coefficients of weighted average historical profitability are negative and statistically significant. However, the magnitude of the coefficient of the weighted average historical profits declines after 1980s, consistent with the observation of Frank and Goyal (2009).

[Insert Table 7]

Second, we check the robustness of the findings in this paper for survivor bias. The observed long-term effect of historical profitability on capital structure maybe a result of a survivorship bias, since it is reasonable to assume that the firms that survive during the sample period will accumulate more profits than the firms that exit the sample during the period studied. To investigate the importance of survivorship bias, we form two subsamples, the survivor sample in which firms survive through 1970 to 1989 and the exitor sample in which firms exit the COMPUSTATs between 1970 and 1989. We conduct the leverage regression on these two subsamples. The results are reported in columns (3) and (4) in Table 7.

The regression results show that the effect of the weighted average historical profits, $Prof_{refwa,it-1}$ remain statistically significant for both sub-samples, surviving and exiting firms, and the magnitude of the coefficient of $Prof_{refwa,it-1}$ remains stable. The

results suggest that survivorship bias does not play an important role in the long-term effect of historical profitability.

We further examine whether the effects observed differ for small vs. large firms. Since larger firms tend to be more mature and diversified, they face lower distress costs. Hence, trade-off theory predicts a positive relationship between firm size and leverage. Similarly, agency theory predicts larger benefits of higher debt for larger mature firms. The pecking order theory generally predicts the opposite relation as larger firms tend to be more transparent, face lower asymmetric information costs, and therefore will be more likely to issue equity than smaller firms. Panel A of Table 8 reports the results for small firms, while Panel B of Table 8, reports the regression statistics for large firms. The coefficient on the variable of interest, the weighted average profitability is the same for small and large firms, which implies that the influence of firm historic profitability is the same for small vs. large firms. However, based on the coefficient of the lagged profitability variable, we observed that the negative relation between lagged profitability and leverage is much more pronounced for larger firms than smaller firms in the short run, which implies that in the short run larger firms tend to retain profits more than smaller firms. This is likely related to small firms being higher growth firm and having larger external financing needs.

[Insert Table 8]

Credit ratings have a significant impact on the financing policy decision (Flannery (1986), Kale and Noe (1990), Graham and Harvey (2001) and Kisgen (2006)). Graham and Harvey (2001) report in their study that credit rating is the second most important

debt policy factor after financial flexibility. Many firms issue short-term debt when they expect they credit ratings to improve in the future (Ibid.). We explore whether profitability affects leverage differently for firms with credit ratings vs. firms without credit ratings. Our results are presented in Table 9. The interaction term between credit rating dummy and historical weighted average profitability is negative and significant indicating that the negative relationship between leverage and profitability is statistically and economically larger for firms with credit ratings. If firms with credit ratings have easier access to the external capital markets and lower cost of debt, we will expect that the effect of profitability will be diminished for such firm, which suggests a positive coefficient on the interaction variable. However, firms with credit ratings tend to also be more transparent, due to increased attention by analysts and hence may face lower adverse selection and asymmetric information and can issue equity at a lower cost. Based on the observed negative coefficient the second effect seems to be dominating the first one.

[Insert Table 9]

Next we examine whether the observed relationship between weighted average profitability and leverage differs for high vs. low growth firms. We categorize firms as high or low growth according to the average market-to-book ratio during the firm history. The high-growth (low) firms' subsample includes firms with an M/B ratio in the fifth (first) quintile in the distribution of the average M/B ratio. Dynamic trade-off theory suggests that firms with higher growth opportunities may retain funds, rather than distributing them, which implies that a negative relation between profitability and leverage may be observed for firms with high growth opportunities. If this is the case,

then we should observe a large negative relationship between the profitability variables and leverage for the high growth firms. Our results exhibited in Table 10 do not support this expectation. The coefficients on the weighted average profitability as well as lagged profitability are smaller in the leverage regression for high growth firms. This means that dynamic trade-off theory cannot explain the negative relationship between historical weighted average returns and leverage.

[Insert Table 10]

Finally, we also investigate whether weighted average profitability impacts differently leverage during different market conditions. Market timing theory posits that managers issue equity when the market is overvalued and debt when the market is undervalued. Barker and Wurgler (2002), using as a proxy for market valuation the historical weighted M/B ratio, present evidence that the effect of market timing is long lasting. Furthermore, Welch (2004) argues that stock price effects on leverage are large and last for at least several years. These studies have been recently challenged by two steams of literature. First, several authors have shown that the long-term effects of M/B ratio and stock returns on leverage are not inconsistent with dynamic trade-off theory (Hennessy and Whited (2005) and Strebulaev (2007). In addition, another stream of literature (Alti (2006) and Hovakimian (2006)) presents evidence that the effect of market timing on capital structure is not long lasting. We analyze the relationship between weighted average historical profitability and leverage for hot and cold issues markets. Hot issue market is defined as a market when the number of IPOs is larger than the average over the period examines, whereas, cold market, is defined as one where the number of IPO offerings is smaller than the mean for the total period. We obtain data on

the number and volume of IPOs by years from Prof. Jay Ritter's site. IPO issues data is only available starting in 1980. Our analysis is displayed in Table 11. The coefficient on the variable of interest, $Prof_{refwa,it-1}$, is the same in both subsamples, which shows that market timing does not have an effect on the relationship between weighted average profitability and leverage.

[Insert Table 11]

VI. Discussion

The above sections show that the negative relation between firm leverage and the weighted average historical profitability over the entire firm's history is strong and robust, indicating that the changes in capital structure due to operating results can accumulate in long term. Why do firms passively accept the accumulation of the changes in capital structure? The findings in this paper raise a new challenge for trade-off theories of capital structure. Holding other things constant, the increase of profitability will decrease the leverage ratio, deviating from the optimal level, if the optimal leverage doesn't change. In fact, increasing of firm's profits calls for larger tax shield and reduces the concern of bankruptcy, and thus increases the level of optimal leverage, making the deviation more severe. Trade-off theory predicts that firms will adjust their leverage ratio to counteract the effect of higher profitability and that there is no long-term effect or there is a positive effect of past higher profits on leverage level. Such prediction contradicts the findings in this paper. In addition, trade-off theory with adjustment costs can accommodate the short-term effect of historical profits on capital structure, but fails to explain the long-term effect of historical profits.

Pecking order theory predicts that profitability decreases the leverage ratio since the management prefers internal capital accumulation. The findings in this paper provide evidence supporting the notion that firms prefer internal capitals to external financing even in a very long term. However, whether firms prefer debt to equity in the long term needs more careful consideration, since the preference of debt to equity has been recently challenged by a number of studies (Kayhan and Titman (2007), Huang and Ritter (2009), and Chang and Dasgupta (2009)). Further investigation of this issue goes beyond the main purpose of this paper.

VII. Conclusion

It is well documented that profitability has negative effect on firm capital structure in short term. This paper studies the question of whether the changes in capital structure due to operating profits can accumulate in the long run. We find that firms do not take sufficient action to counter balance the changes in their capital structure due to operating profits, and thus the current leverage is, to a large extent, the outcome of accumulating past profits over the firm's history.

Lemmon, Roberts and Zender (2008) report that the evolution of capital structure over very long term is dominated by a stable long-term component with a secondary transition component and that previously identified leverage determinants fail to capture the above properties of capital structure. The weighted average historical profit variable constructed in this paper has similar properties to the long term evolution of capital structure and has superior explanatory power for cross sectional leverage level.

References

Alti A. How Persistent Is the Impact of Market Timing on Capital Structure? Journal of Finance 2006; 61:1681–1710.

Baker M., Wurgler J. Market Timing and Capital Structure. Journal of Finance 2002; 57: 1– 32.

Chang X., Dasgupta S. Target Behavior and Financing: How Conclusive Is the Evidence? Journal of Finance 2009; 64:1767–1796.

Fischer E.O., Heinkel R., Zechner J. Dynamic Capital Structure Choice: Theory and Tests. Journal of Finance 1989; 44:19–40.

Flannery M.J. Asymmetric Information and Risky Debt Maturity Choice. Journal of Finance 1986; 41:19–37.

Flannery M.J., Rangan K.P. Partial Adjustment toward Target Capital Structures. Journal of Financial Economics 2006; 79:469–506.

Frank M.Z., Goyal V.K. Capital Structure Decisions: Which Factors are Reliably Important? Financial Management 2009; 38:1–37.

Frank M.Z., Goyal V.K. Testing the Pecking Order Theory of Capital Structure. Journal of Financial Economics 2003; 67:217–248.

Fama E.F., French K.R. Testing Trade-off and Pecking Order Predictions about Dividends and Debt. Review of Financial Studies 2002; 15:1–33.

Graham J.R., Harvey C.R. The Theory and Practice of Corporate Finance: Evidence from the Field. Journal of Financial Economics 2001; 60: 187–243.

Hennessy C.A., Whited T.A. Debt Dynamics. Journal of Finance 2005; 60:1129–1165.

Hovakimian A. Are Observed Capital Structures Determined by Equity Market Timing? Journal of Financial and Quantitative Analysis 2006; 41: 221–243.

Hovakimian A., Li G. In Search of Conclusive Evidence: How to Test for Adjustment to Target Capital Structure. Journal of Corporate Finance 2011; 17: 33–44.

Hovakimian A., Li G. Is the Partial Adjustment Model a Useful Tool for Capital Structure Research? Review of Finance 2010; 1–22.

Hovakimian A., Opler, T., Titman, S., The Debt-Equity Choice. Journal of Financial and Quantitative Analysis 2001; 36:1–24.

Huang R., Ritter J.R. Testing Theories of Capital Structure and Estimating the Speed of Adjustment. Journal of Financial and Quantitative Analysis 2009; 44:237–271.

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

Kale J.R., Noe T.H. Risky Debt Maturity Choice in Sequential Game Equilibrium. Journal of Financial Research 1990; 13:155–165.

Kayhan A., Titman S. Firms' Histories and Their Capital Structure, Journal of Financial Economics 2007; 83:1–32.

Kisgen D.J. Credit Ratings and Capital Structure. Journal of Finance 2006; 61:1035–1072.

Leary M.T., Roberts M.R. Do Firms Rebalance Their Capital Structures? The Journal of Finance 2005; 60:2575 – 2619.

Lemmon M.L., Roberts M.R., Zender J.F. Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure. The Journal of Finance 2008; 63:1575–1607.

Mackay P., Phillips G. How Does Industry Affect Firm Financial Structure? Review of Financial Studies 2005; 18:1433–1466.

Rajan R.G., Zingales L. What Do We Know about Capital Structure: Some Evidence from International Data. Journal of Finance 1995; 50:1421–1460.

Shyam-Sunder L., Myers S.C. Testing Static Tradeoff against Pecking Order Models of Capital Structure. Journal of Financial Economics 1999; 51:219–244.

Strebulaev I.A., Do Tests of Capital Structure Theory Mean What They Say? Journal of Finance 2007; 62:1747–1787.

Titman S., Wessels R. The Determinants of Capital Structure Choice. Journal of Finance 1988; 43:1–21.

Welch I. Capital Structure and Stock Returns. Journal of Political Economy 2004; 112:106–131.

Table 1 Variable Definitions

Book Equity	Book equity is defined as total assets minus total liabilities, preferred stock, deferred taxes and convertible debt.
Book Debt	Book debt is defined as total assets minus book equity.
Net Equity Issuance	Net equity issuance is defined as the change in book equity minus the change in retained earnings.
Net Debt Issuance	Net debt issuance is defined as the change in total assets minus the change in book equity.
Profit	Profit is defined as Max (0, EBITDA).
Loss	Loss is defined as Min (0, EBITDA).
Book Leverage	Book leverage is defined as book debt divided by total assets.
Market Leverage	Market leverage is defined as book debt divided by the sum of book debt and common shares outstanding multiplied by the firm's closing price.
Profitability	Profitability is defined as EBITDA / total assets.
Market-to-Book Ratio	Market-to-book ratio is defined as (book debt + common shares outstanding * closing price) /total assets.
Tangibility	Tangibility is defined as property, plant & equipment divided by total assets.
Size	Size is defined as natural log of total assets.

Table 2 Descriptive Statistics

Table II presents the descriptive statistics, based our sample, which consists of all COMPUSTAT firms appearing from 1950 to 2007. The initial data set has 396,192 firm year observations. Following the convention, we exclude the financial firms (SIC code 6000-6900) and those observations with missing values in total assets, EBITDA, common shares outstanding. Our final sample contains 207,101 firm-year observations. Dollar values are adjusted for inflation and are reported in 1950 dollars.

				Distribution		
Variables	N	Mean	Std	10th	Median	90th
Debt ($ million)	207,101	139.48	925.61	0.39	7.65	224.31
Book Equity ($ million)	207,101	110.46	542.09	0.70	10.14	192.21
Total Assets ($ million)	207,101	249.94	1,350.09	1.42	19.52	420.00
EBITDA ($ million)	207,101	33.85	179.24	-0.29	2.19	57.14
Net Debt Issuance ($ million)	207,101	11.68	160.48	-2.50	0.21	19.17
Net Equity Issuance ($ million)	207,101	4.67	100.28	-0.59	0.12	8.93
Book Leverage	207,101	0.45	0.22	0.15	0.45	0.73
Market Leverage	207,101	0.38	0.25	0.07	0.36	0.73
Log Size	207,101	3.09	2.18	0.35	2.97	6.04
Profitability	207,101	0.07	0.51	-0.11	0.12	0.24
M/B	207,101	1.88	14.34	0.76	1.22	3.20
Tangibility	207,101	0.34	0.25	0.06	0.28	0.75

Table 3 The Effects on Leverage: Profit/Loss vs. External Financing

This table reports the effects on leverage on external financing activities, as a response to the leverage changes induced by profits/losses. EBITDA, Net Debts Issuance*(d/A)* and Net Equity Issuance*(e/A)* are as defined in Table 1. Net External Financing Effect (*(d-e)/A*) is defined as Net Debt Issuance less Net Equity Issuance, which describes the net effect of external financing activities on leverage, when firms issue debt and equity simultaneously. We calculate, in dollar amount, the average EBITDA, Net Equity Issuance, Net Debt Issuance and Net External Financing Effect across firm over the period, and then scale them by average Total Assets to get a percentage number.

Period	Firms	Total Assets ($Million)		EBITDA (%)		Net Debt Issuance (*d/A*)		Net Equity Issuance (*e/A*)		Net External Financing Effects(*(d-e)/A*)		Book Leverage		Market Leverage	
		Mean	*Median*	*Mean*	*Median*	*Mean*	*Median*	*Mean*	*Median*	*Mean*	*Median*	*Mean*	*Median*	*Mean*	*Median*
50-54	512	193.06	52.47	19%	18%	2%	1%	3%	0%	-4%	0%	0.41	0.41	0.38	0.37
55-59	563	288.08	67.87	18%	17%	3%	1%	3%	0%	0%	0%	0.39	0.38	0.31	0.29
60-64	1786	199.18	32.80	16%	15%	2%	1%	1%	0%	1%	0%	0.42	0.41	0.33	0.32
65-69	2950	222.81	34.43	15%	15%	6%	3%	2%	1%	4%	1%	0.46	0.46	0.34	0.33
70-74	4239	277.59	38.78	15%	13%	6%	3%	2%	0%	4%	1%	0.47	0.48	0.47	0.48
75-79	5390	411.72	38.26	16%	14%	5%	2%	2%	0%	3%	1%	0.49	0.50	0.52	0.54
80-84	5604	671.88	45.45	15%	12%	3%	1%	2%	1%	2%	0%	0.48	0.48	0.42	0.42
85-89	6124	928.58	55.07	14%	10%	6%	1%	1%	0%	5%	0%	0.48	0.48	0.38	0.36
90-94	6458	1,284.30	71.41	12%	11%	4%	0%	1%	0%	2%	0%	0.47	0.48	0.36	0.34
95-99	8059	1,582.07	101.66	13%	10%	5%	1%	2%	1%	2%	0%	0.46	0.46	0.32	0.28
00-04	7017	2,762.46	169.31	12%	7%	4%	0%	3%	1%	1%	0%	0.44	0.43	0.33	0.28
05-08	5761	3,870.95	300.76	14%	9%	5%	1%	1%	1%	3%	0%	0.42	0.41	0.30	0.25
All	4539	1,057.72	84.02	15%	13%	4%	1%	2%	0%	2%	0%	0.45	0.45	0.37	0.36

Table 4 Long-term Effects of Historical Profits on Leverage

This table reports the results of the cross-sectional regressions of leverage. The dependent variable in the regressions is the current book or market leverage, and the independent variables include a newly constructed variable and the well-documented leverage determinants, lagged firm size, profitability, market-to-book ratio and tangibility. The most important regression model is as follows and its results are reported in the column (3).

$$Leverage_{it} = a + bProf_{refwa,it-1} + cX_{it-1} + \varepsilon_{it}$$

The focused new variable, $Prof_{refwa,it-1}$, is defined as follows:

$$Prof_{refwa,it-1} = \sum_{s=0}^{t-1} \frac{d_{is} - e_{is}}{\sum_{r=0}^{t-1}(d_{ir} - e_{ir})} prof_{is}$$

and captures the relative external financing weighted average historical profit. The relative external financing describes the effort that profitable firms make to counterbalance the changes in leverage induced by profits. The higher the weight is, the more likely it is the profits to have permanent effect on leverage. T-statistics are in parentheses and are calculated using robust and firm-clustered standard errors.

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.588	0.590	0.505	0.612	0.492	0.482
	(161.26)	(133.25)	(95.00)	(109.40)	(110.04)	(99.07)
Log Size $_{t-1}$			0.017	0.009	0.013	0.016
			(24.49)	(13.56)	(26.74)	(29.55)
Profitability $_{t-1}$			-0.126	-0.131	-0.173	-0.209
			(-12.01)	(-13.08)	(-16.82)	(-17.94)
M/B $_{t-1}$			-0.022	-0.102	-0.003	-0.045
			(-18.45)	(-78.92)	(-5.13)	(-33.97)
Tangibility $_{t-1}$			0.057	0.082	0.111	0.146
			(9.49)	(14.02)	(22.75)	(27.97)
Prof $_{refwa,t-1}$	-0.731	-1.096	-0.549	-0.614	-0.618	-0.605
	(-35.60)	(-43.89)	(-25.23)	(-28.55)	(-30.89)	(-28.96)
Firm Fixed Effects					Yes	Yes
R^2 *Adjusted*	0.08	0.13	0.14	0.33	0.66	0.69
Observations	151,095	150,033	150,954	149,897	150,954	149,897

Table 5 Persistence of the Historical Profits Effects

This table reports the results of regressions of current and future leverage on the $Prof_{refwa}$, controlling for the Baker and Wurgler's (2002) M/B_{efwa} and lagged market-to-book ratio, fixed assets, profitability and firm size.

$$Leverage_{it+\tau} = a_1 + b_1 Prof_{refwa,it-1} + c_1\left(\frac{m}{b}\right)_{efwa,it-1} + d_1 Log(size)_{it-1} + e_1 Prof_{it-1} + f_1 Tangi_{it-1} + g_1\left(\frac{m}{b}\right)_{it-1} + \varepsilon_{it+\tau}$$

$$Leverage_{it+\tau} = a_2 + b_2 Prof_{refwa,it-1} + c_2\left(\frac{m}{b}\right)_{efwa,it+\tau-1} + d_2 Log(size)_{it+\tau-1} + e_2 Prof_{it+\tau-1} + f_2 Tangi_{it+\tau-1} + g_2\left(\frac{m}{b}\right)_{it+\tau-1} + \varepsilon_{it+\tau}$$

We only report the coefficients b_1, b_2, e_1 and e_2. T-statistics are in parentheses and are calculated using the robust and firm-clustered standard errors. Panel A shows the regression results for book leverage and Panel B shows the results for market leverage.

Years	(1) $Prof_{refwa}$ Coefficients				(2) $Prof$ Coefficients			
	b_1	$t(b_1)$	b_2	$t(b_2)$	e_1	$t(e_1)$	e_2	$t(e_2)$
Panel A: Book Leverage								
$\tau = 1$	-0.46	(-20.27)	-0.46	(-20.27)	-0.14	(-10.54)	-0.14	(-10.54)
$\tau = 3$	-0.44	(-17.32)	-0.39	(-16.73)	-0.09	(-6.14)	-0.19	(-12.00)
$\tau = 5$	-0.43	(-15.42)	-0.37	(-14.55)	-0.08	(-4.53)	-0.21	(-11.01)
$\tau = 10$	-0.39	(-10.84)	-0.30	(-9.43)	-0.06	(-2.97)	-0.27	(-13.69)
Panel B: Market Leverage								
$\tau = 1$	-0.53	(-22.79)	-0.53	(-22.79)	-0.18	(-12.00)	-0.18	(-12.00)
$\tau = 3$	-0.54	(-20.01)	-0.46	(-19.02)	-0.11	(-6.65)	-0.24	(-12.67)
$\tau = 5$	-0.55	(-17.79)	-0.43	(-16.38)	-0.10	(-5.15)	-0.27	(-11.68)
$\tau = 10$	-0.49	(-12.26)	-0.35	(-10.81)	-0.10	(-4.15)	-0.38	(-15.20)

Table 6 Long-term Leverage Determinants vs. One-period-lagged Determinants

This table reports the results of the leverage regression, in which we include the external financing weighted average historical market-to-book ratio (Baker and Wurgler (2002)). The regression model is as follows:

$$Leverage_{it} = Prof_{refwa,it-1} + (\frac{m}{b})_{efwa,it-1} + X_{it-1} + \varepsilon_{it}$$

The regression results are reported in column (3). As a comparison, column (1) reports the regression results for the model only including lagged firm size, profitability, market-to-book and tangibility as the independent variables; column (2) reports the results for the model including the two long-term determinants only, the external financing weighted average historical market-to-book ratio and the relative external financing weighted average historical profitability. T-statistics are in parentheses and are calculated using robust and firm-clustered standard errors.

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.352	0.300	0.619	0.670	0.518	0.624
	(53.68)	(18.19)	(162.69)	(141.70)	(93.74)	(103.42)
Log Size $_{t-1}$	0.019	0.016			0.017	0.008
	(27.64)	(18.33)			(24.21)	(12.23)
Profitability $_{t-1}$	-0.034	-0.028			-0.140	-0.183
	(-3.31)	(-2.51)			(-10.54)	(-12.00)
M/B $_{t-1}$	-0.006	-0.017			-0.006	-0.066
	(-2.41)	(-2.57)			(-5.11)	(-26.73)
Tangibility $_{t-1}$	0.070	0.132			0.048	0.077
	(11.47)	(15.68)			(7.92)	(12.80)
M/B $_{efwa,t-1}$			-0.033	-0.075	-0.026	-0.036
			(-24.83)	(-46.79)	(-17.27)	(-20.25)
Prof $_{refwa,t-1}$			-0.553	-0.772	-0.459	-0.534
			(-25.56)	(-28.53)	(-20.27)	(-22.79)
R^2 *Adjusted*	0.06	0.10	0.11	0.25	0.15	0.33
Observations	194,765	194,765	145,508	145,508	145,374	145,374

Table 7 Leverage Determinants by Periods

This table reports the results of the leverage regression for the four subsamples, firms during the period of 1950-1989, firms during the period of 1990-2008, a survivor sample in which firms appear in the period of 1950-1969 and survive through the period of 1970-1989, and an exiting sample in which firms appear in the period of 1950-1969, but exit during the period of 1970-1989. The regression model is as follows:

$$Leverage_{it} = Prof_{refwa,it-1} + (\frac{m}{b})_{efwa,it-1} + X_{it-1} + \varepsilon_{it}$$

Column (1) reports the regression results for the subsample of firms during 1950-1989, column (2) reports the results for the subsample of firms during 1990-2008. Column (3) reports the regression results for the survivor sample, and column (4) reports the results for the exiting firms sample. T-statistics are in parentheses and are calculated using robust and firm-clustered standard errors.

Variables	(1) 1950-1989		(2) 1990-2008		(3) Survivors		(4) Exiting firms	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.557	0.691	0.451	0.504	0.55	0.698	0.535	0.718
	(84.35)	(89.83)	(59.44)	(64.89)	(35.82)	(41.45)	(41.02)	(44.27)
Log Size $_{t-1}$	0.014	0.012	0.022	0.014	0.014	0.008	0.019	0.018
	(14.46)	(12.24)	(23.68)	(15.66)	(7.72)	(4.61)	(9.91)	(8.78)
Profitability $_{t-1}$	-0.263	-0.331	-0.125	-0.186	-0.362	-0.516	-0.447	-0.552
	(-13.96)	(-16.16)	(-7.95)	(-6.90)	(-9.41)	(-11.48)	(-12.20)	(-13.78)
M/B $_{t-1}$	0.006	-0.082	-0.007	-0.050	0.011	-0.075	0.011	-0.094
	(2.80)	(-25.94)	(-5.10)	(-8.63)	(3.10)	(-12.06)	(2.70)	(-13.76)
Tangibility $_{t-1}$	0.050	0.050	0.047	0.081	0.071	0.088	0.033	0.017
	(6.83)	(6.68)	(5.77)	(9.97)	(5.60)	(7.09)	(2.17)	(1.12)
M/B $_{efwa,t-1}$	-0.180	-0.022	-0.027	-0.035	-0.012	-0.014	-0.003	-0.004
	(-7.66)	(-9.53)	(-14.51)	(-9.83)	(-2.86)	(-3.22)	(-0.70)	(-0.76)
Prof $_{refwa,t-1}$	-0.616	-0.660	-0.315	-0.402	-0.727	-0.752	-0.631	-0.715
	(-20.32)	(-20.74)	(-10.80)	(-14.24)	(-10.66)	(-11.09)	(-9.87)	(-10.14)
R^2 *Adjusted*	0.19	0.38	0.15	0.30	0.28	0.46	0.20	0.38
Observations	75,014	75,014	61,973	61,973	26,328	26,328	23,358	23,358

Table 8 Determinants of Leverage for Large Firms vs. Small Firms

This table reports the results of the leverage regression for large and small firms separately. We categorize firms as large or small according to the average total assets during the firm's history. The regression model is as follows:

$$Leverage_{it} = Prof_{refwa,it-1} + (\frac{m}{b})_{efwa,it-1} + X_{it-1} + \varepsilon_{it}$$

As a benchmark, column (1) reports the regression results for the model only including lagged firm size, profitability, market-to-book and tangibility as the independent variables; column (2) reports the results for the model including only the relative external financing weighted average historical profits; and column (3) reports the results for the model including the weighted average historical profits and the control variables. Panel A reports the results for small firms, while panel B reports the results for large firms. T-statistics are in parentheses and are calculated using robust and firm-clustered standard errors.

Panel A: Leverage Regression for Small Firms.

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.414	0.419	0.537	0.518	0.496	0.518
	(44.82)	(29.02)	(100.68)	(82.84)	(48.43)	(45.79)
Log Size $_{t-1}$	0.018	0.029			0.019	0.318
	(7.19)	(11.72)			(7.73)	(12.90)
Profitability $_{t-1}$	-0.179	-0.178			-0.114	-0.121
	(-10.82)	(-10.65)			(-7.65)	(-7.92)
M/B $_{t-1}$	-0.016	-0.068			-0.002	-0.046
	(-9.78)	(-11.47)			(-1.37)	(-8.53)
Tangibility $_{t-1}$	0.069	0.087			0.061	0.075
	(5.32)	(6.69)			(4.78)	(6.09)
M/B $_{efwa,t-1}$					-0.022	-0.039
					(-9.61)	(-12.05)
Prof $_{refwa,t-1}$			-0.581	-0.736	-0.485	-0.500
			(-19.92)	(-22.88)	(-13.88)	(-15.41)
R^2 *Adjusted*	0.04	0.18	0.05	0.07	0.09	0.25
Observations	48,401	47,881	57,323	49,812	48,203	47,693

Table 8 Determinants of Leverage for Large Firms vs. Small Firms -Continued

Panel B: Leverage Regression for Large Firms.						
Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.448	0.564	0.627	0.637	0.524	0.652
	(61.57)	(67.77)	(144.10)	(102.67)	(66.39)	(76.41)
Log Size $_{t-1}$	0.019	0.007			0.018	0.006
	(20.39)	(7.83)			(18.98)	(6.02)
Profitability $_{t-1}$	-0.354	-0.544			-0.159	-0.320
	(-17.46)	(-21.23)			(-8.73)	(-13.71)
M/B $_{t-1}$	-0.031	-0.095			-0.009	-0.069
	(-22.10)	(-33.31)			(-6.32)	(-24.54)
Tangibility $_{t-1}$	0.061	0.109			0.038	0.082
	(8.63)	(14.82)			(5.56)	(11.86)
M/B $_{efwa,t-1}$					-0.027	-0.032
					(-14.88)	(-16.81)
Prof $_{refwa,t-1}$			-0.846	-1.321	-0.468	-0.538
			(-33.24)	(-35.54)	(-15.61)	(-15.97)
R^2 *Adjusted*	0.13	0.33	0.11	0.18	0.18	0.38
Observations	102,869	102,327	114,267	103,820	102,421	101,882

Table 9 The Effect of Credit Rating on the Impact of Profitability on Leverage

This table reports the results of the effect of credit rating on firm's response to profit accumulation. The leverage regression includes an interaction term between credit rating dummy and historical weighted average profitability. The regression model is as follows:

$$Leverage_{it} = a + bProf_{refwa,it-1} + cX_{it-1} + d\ CreditDumy * Prof_{refwa,it-1} + \varepsilon_{it}$$

Column (1) reports the results for the leverage regression without interaction term as a benchmark. Column (2) reports the results for the leverage regression with interaction term. T-statistics are in parentheses and are calculated using robust and firm-clustered standard errors.

Variables	Column (1)		Column (2)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.518	0.624	0.512	0.595
	(93.74)	(103.42)	(94.65)	(98.15)
Log Size $_{t-1}$	0.017	0.008	0.019	0.014
	(24.21)	(12.23)	(25.46)	(19.17)
Profitability $_{t-1}$	-0.140	-0.183	-0.146	-0.210
	(-10.54)	(-12.00)	(-11.70)	(-12.94)
M/B $_{t-1}$	-0.006	-0.066	-0.006	-0.060
	(-5.11)	(-26.73)	(-5.52)	(-16.82)
Tangibility $_{t-1}$	0.048	0.077	0.041	0.064
	(7.92)	(12.80)	(6.71)	(10.47)
M/B $_{efwa,t-1}$	-0.026	-0.036	-0.024	-0.033
	(-17.27)	(-20.25)	(-17.12)	(-16.17)
Prof $_{refwa,t-1}$	-0.459	-0.534	-0.438	-0.428
	(-20.27)	(-22.79)	(-19.09)	(-18.07)
*CreditDummy*Prof* $_{refwa,t-1}$			-0.128	-0.327
			(-8.89)	(-22.24)
R^2 *Adjusted*	0.15	0.33	0.16	0.34
Observations	145,374	145,374	145,374	145,374

Table 10 Determinants of Leverage for High vs. Low Growth Firms

This table reports the results of the leverage regression for high-growth firms and low-growth firms separately. We categorize firms as high- or low-growth firms according to the average market-to-book ratio during the firm's history. The regression model is as follows:

$$Leverage_{it} = Prof_{refwa,it-1} + (\frac{m}{b})_{efwa,it-1} + X_{it-1} + \varepsilon_{it}$$

As a benchmark, column (1) reports the regression results for the model including lagged firm size, profitability, market-to-book and tangibility as the independent variables; column (2) reports the results for the model including only the relative external financing weighted average historical profitability; and column (3) reports the results for the model including the weighted average historical profitability and the rest of the control variables. Panel A (B) reports the results for firms in the top (bottom) quintile of the market-to-book ratio distribution. The t-statistics are calculated using robust and firm-clustered standard errors and are reported in parentheses under the coefficients.

Panel A: Leverage Regression for High Growth Firms.

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.327	0.112	0.411	0.216	0.408	0.256
	(48.42)	(28.90)	(47.80)	(37.71)	(29.52)	(25.89)
Log Size $_{t-1}$	0.001	0.006			0.010	0.004
	(0.52)	(6.41)			(4.90)	(2.75)
Profitability $_{t-1}$	-0.003	0.000			-0.100	-0.085
	(-0.81)	(-0.13)			(-4.95)	(-5.79)
M/B $_{t-1}$	0.000	0.000			-0.007	-0.021
	(-1.68)	(-1.55)			(-6.10)	(-10.30)
Tangibility $_{t-1}$	0.065	0.055			0.098	0.071
	(4.55)	(6.60)			(4.63)	(5.07)
M/B $_{efwa,t-1}$					-0.014	-0.004
					(-6.21)	(-2.59)
Prof $_{refwa,t-1}$			-0.222	-0.226	-0.131	-0.120
			(-6.48)	(-10.75)	(-3.32)	(-5.02)
R^2 *Adjusted*	0.00	0.02	0.02	0.03	0.06	0.18
Observations	29,586	29,358	15,536	14,760	14,445	14,377

Table 10 Determinants of Leverage for High vs. Low Growth Firms - Continued

Panel B: Leverage Regression for Low Growth Firms.

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.327	0.639	0.643	0.715	0.447	0.796
	(40.64)	(65.76)	(92.35)	(96.14)	(38.46)	(61.42)
Log Size $_{t-1}$	0.025	0.022			0.018	0.014
	(19.63)	(16.43)			(13.26)	(10.01)
Profitability $_{t-1}$	-0.325	-0.338			-0.242	-0.224
	(-12.31)	(-12.84)			(-7.15)	(-7.11)
M/B $_{t-1}$	0.088	-0.165			0.126	-0.166
	(16.61)	(-33.45)			(18.10)	(-26.68)
Tangibility $_{t-1}$	0.024	0.013			0.038	0.030
	(2.48)	(1.30)			(3.85)	(2.96)
M/B $_{efwa,t-1}$					-0.026	-0.019
					(-3.79)	(-2.52)
Prof $_{refwa,t-1}$			-0.951	-1.125	-0.769	-0.830
			(-18.37)	(-19.73)	(-12.83)	(-13.33)
R^2 *Adjusted*	0.11	0.12	0.08	0.09	0.16	0.16
Observations	60,446	59,860	56,493	51,516	50,355	49,859

Table 11 Leverage Regression Results for Hot vs. Cold Market Periods

This table reports the results of the leverage regression for firms in hot period and cold period separately. We divide the sample period into hot and cold periods, based on the number of IPO issues in each year. We obtain IPO issuance data from Prof. Jay Ritter's website. The IPO data covers the period of 1980-2008. The regression model is as follows:

$$Leverage_{it} = Prof_{refwa,it-1} + (\frac{m}{b})_{efwa,it-1} + X_{it-1} + \varepsilon_{it}$$

As a benchmark, column (1) reports the regression results for the model only including the lagged firm size, profitability, market-to-book and tangibility as the independent variables; column (2) reports the results for the model, including only the relative external financing weighted average historical profitability; and column (3) reports the results for the regression including the weighted average historical profitability and the control variables. Panel A and B report the results for firms in hot and cold periods, respectively. The t-statistics are calculated based on robust and firm-clustered standard errors and are reported in parentheses under the coefficients.

Panel A: Leverage Regression for Firms in Hot Periods

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.322	0.210	0.581	0.549	0.502	0.556
	(75.28)	(44.10)	(127.01)	(99.64)	(69.34)	(74.79)
Log Size $_{t-1}$	0.024	0.023			0.023	0.015
	(29.19)	(25.08)			(24.35)	(16.55)
Profitability $_{t-1}$	-0.040	0.003			-0.121	-0.170
	(-6.70)	(0.61)			(-7.28)	(-8.69)
M/B $_{t-1}$	0.000	-0.001			-0.008	-0.052
	(-1.36)	(-1.10)			(-6.45)	(-22.41)
Tangibility $_{t-1}$	0.065	0.138			0.006	0.043
	(8.93)	(18.04)			(0.74)	(5.28)
M/B $_{efwa,t-1}$					-0.026	-0.033
					(-14.08)	(-17.45)
Prof $_{refwa,t-1}$			-0.641	-0.978	-0.436	-0.530
			(-24.18)	(-30.41)	(-14.56)	(-17.41)
R^2 *Adjusted*	0.07	0.08	0.06	0.11	0.15	0.31
Observations	71,975	71,329	59,103	54,183	53,322	52,862

Table 11 Leverage Regression Results for Hot vs. Cold Market Periods - Continued

Panel B: Leverage Regression for Firms in Cold Periods

Variables	Column (1)		Column (2)		Column (3)	
	Book Leverage	Market Leverage	Book Leverage	Market Leverage	Book Leverage	Market Leverage
Intercept	0.334	0.220	0.576	0.548	0.512	0.572
	(81.42)	(43.31)	(136.97)	(112.53)	(77.25)	(59.10)
Log Size $_{t-1}$	0.017	0.019			0.016	0.010
	(24.60)	(24.21)			(19.97)	(12.86)
Profitability $_{t-1}$	-0.001	0.002			-0.134	-0.204
	(-0.59)	(0.62)			(-8.11)	(-7.49)
M/B $_{t-1}$	0.000	-0.001			-0.008	-0.061
	(-0.91)	(-1.20)			(-5.14)	(-6.65)
Tangibility $_{t-1}$	0.071	0.155			0.053	0.105
	(10.61)	(21.28)			(7.19)	(12.86)
M/B $_{efwa,t-1}$					-0.029	-0.038
					(-17.04)	(-10.26)
Prof $_{refwa,t-1}$			-0.673	-0.964	-0.443	-0.500
			(-27.64)	(-35.93)	(-15.93)	(-18.35)
R^2 *Adjusted*	0.05	0.08	0.06	0.10	0.14	0.32
Observations	70,414	69,796	61,198	55,594	54,926	54,498