Market Timing and Capital Structure*

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Abstract

We trace capital structure to past market valuations. Unlevered firms tend to be those that raised funds when their valuations were high, as measured by the market-to-book ratio. Levered firms tend to be those that raised funds when their valuations were low. The results are difficult to reconcile with the tradeoff theory because temporary changes in market-to-book lead to permanent changes in capital structure. The results are also difficult to reconcile with the pecking order because temporary increases in market-to-book lead to permanent increases in cash balances. The results are consistent with the theory that capital structure is the cumulative outcome of a series of market-timing-motivated financing decisions.

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I. Introduction

Many corporate financing decisions depend on market valuations. Firms tend to issue equity instead of debt when market value is high, relative to book value and past market values, and repurchase equity when market value is low. These relationships are strong and regular, apparent across business cycles and around the world. They are documented for seasoned equity issuers by Marsh (1982) and Asquith and Mullins (1986), for initial equity issuers by Loughran, Ritter, and Rydqvist (1994) and Pagano, Panetta, and Zingales (1998), and for repurchasers by Ikenberry, Lakonishok, and Vermaelen (1995), among others. In this paper we consider the implications of these results for capital structure.

Our first goal is purely empirical. We connect capital structure to past market valuations. We are guided by a simple intuition. Capital structure is by definition the cumulative outcome of past financing decisions. Past financing decisions are known to depend on past market valuations. Therefore it is possible that capital structure itself depends on the historical path of market valuations. We find this to be the case. We find that unlevered firms tend to be those that raised funds when their market valuations were high, as measured by the market-to-book ratio. Levered firms tend to be those that raised funds when their market valuations were low.

Let us outline the methodology and the main regression result. We summarize the historical path of market valuations in two ways. The first way is in the maximum market-to-book ratio that the firm faced between the initial public offering and today. The second way is in the "external finance weighted-average" market-to-book ratio. This is an average of past market-to-book ratios which, for example, takes high values for firms that raised their external finance – equity or debt – when their market-to-book ratios were high. The intuitive but atheoretical motivation for this weighting scheme is that external financing events represent practical opportunities to change capital structure.

Now if equity is issued when market valuations are high and debt otherwise, and if these financing decisions have persistent effects, then the maximum and weighted-average market-to-book ratios will help to explain capital structure outcomes. In particular, they will be positively related to the equity-to-assets ratio. Our main result is that this is robustly true. These relationships hold controlling for a variety of firm characteristics, including both the market-to-book at the initial public offering as well as the current value. The insensitivity of the results to these "endpoint" controls is particularly illuminating, because these endpoints control for cross-firm variation in market-to-book. This leaves the weighted average to pick up only the within-firm time-series variation. The fact that this variation helps to explain capital structure outcomes demonstrates that temporary fluctuations in market valuations can lead to permanent changes in capital structure.

We study capital structure in "IPO time" cross-sections, which hold the time since the initial public offering constant, and in traditional calendar time cross-sections. The focus on IPO time is novel and reveals the robustness of the main result. The weighted average market-to-book is the most important statistical determinant of capital structure among the several potential determinants that we consider. This is true for firms of all ages. In contrast, the explanatory power of profitability is small for young firms, and the power of other potential determinants of capital structure, such as size, asset tangibility, and current market-to-book, diminishes sharply as firms age. To our knowledge the fragility of these effects has not been documented before. This is probably because their fragility is apparent only in IPO time.

Our second goal is to explain the results with some theory of capital structure. We consider three theories. The first is the tradeoff theory, which views market-to-book as an indicator of investment opportunities, risk, agency, or some other determinant of the optimal tradeoff between equity and debt. The second theory we consider is the pecking order of Myers (1984), which views market-to-book as an indicator of investment opportunities. The third theory of capital structure that we consider is based on market timing. This theory maintains that managers try to time their financing decisions to exploit what they perceive as market mispricing. This theory regards market-to-book, particularly the within-firm time-series variation in market-to-book, as an indicator of perceived market-timing opportunities.

We do not find support for an explanation based on the tradeoff theory. Transaction costs may prevent the continuous adjustment of capital structure as firm characteristics change over time. However, the tradeoff theory makes the clear prediction that temporary fluctuations in the market-to-book ratio - or anything else - should have temporary effects. We find that a very conservative estimate of the half-life of the weighted average market-to-book effect is ten years. That is, capital structure as of the year 2000 is strongly dependent upon variation in the market-to-book ratio from before 1990. If adjustment costs were so large relative to the costs of deviating from the optimum that adjustment takes more than a decade, the same costs would prevent market-to-book from having an effect in the first place!

We do not find support for an explanation based on the pecking order theory, either. In the pecking order, firms with a high market-to-book ratio that reflects growth or investment opportunities may exhaust their internal sources of funds, exhaust their debt capacity, and resort to outside equity to finance investment. These growth opportunities may even reduce the adverse selection problem of Myers and Majluf (1984). However, for this argument to work, the firm must have an urgent need for the proceeds. This does not appear to be the case in our sample. Transitory increases in market values lead to permanent increases in the level of cash balances, not investment.

We believe that the results are most consistent with a theory of capital structure based on market timing. This theory can be understood as a variant of the traditional pecking order theory. As in the traditional theory, managers have the incentive to time the market because they care more about ongoing shareholders than entering and exiting ones, or because they hold equity themselves. Also as in the traditional theory, there is no optimal capital structure. However, in the traditional theory managers are constrained by a rational expectations equilibrium. Under market timing, managers believe that they can successfully time the market. For example, at times they believe that investors overvalue equity and will underreact to the announcement of a new issue.

We formalize a market timing theory of capital structure at the end of the paper with a model based on Stein (1996). The model provides some intuition for the external finance weighted average measure that we use in the empirical work. We believe that the market timing model is more realistic than the rational expectations version and it does a better job of fitting our results and other evidence on market timing. The model predicts that unlevered firms are those that raised external finance – partly in response to perceived mispricing and partly in response to good investment opportunities – when their equity was highly valued. Levered firms will be those that raised funds when their equity was not highly valued. These predictions are consistent with the evidence described above.

It is worth noting that this market-timing theory of capital structure does not assume that capital markets actually *are* inefficient. The only requirement is that managers *believe* they are inefficient, and this proposition is virtually incontrovertible. Graham and Harvey (2001) find that sixty-seven percent of CFOs surveyed agreed that "the amount by which our stock is undervalued or overvalued was an important or very important consideration" in issuing equity. We discuss this survey and other evidence that suggests market timing, including the low returns following equity issues and high returns following repurchases, later in the paper.

The paper is organized as follows. Section II investigates the relationship between capital structure and the historical evolution of the market-to-book ratio. Section III considers explanations of this relationship based on the tradeoff theory of capital structure, the pecking order theory, and market timing. This section also reviews some related research on market timing. Section IV presents a model of capital structure outcomes based on market timing. Section V concludes.

II. Capital Structure and the History of the Market-to-Book Ratio

Prior research has documented that individual financing decisions depend on the market-to-book ratio. The fact that capital structure is by definition the cumulative outcome of prior financing decisions suggests that capital structure may retain some links to past values of market-to-book. We evaluate this hypothesis in this section. First, we introduce the data and summary statistics. Second, we relate the annual change in the equity-to-assets ratio to the market-to-book ratio and some other variables. This amounts to a study of the financing decisions that affect capital structure. Third, we develop summary measures of historical variation in the market-to-book ratio. Fourth, we relate the equity-to-assets ratio to these measures. Fifth, we consider various robustness checks.

a. Data and Summary Statistics

We work with a sample of firms that went public between 1968 and 1998. We require an IPO date for two reasons. The first reason is that the IPO is itself an important financing decision that is connected empirically to the market-to-book ratio. The second reason is that knowing the IPO date allows us to study the evolution of capital structure as firms mature.

The full sample includes 17,823 firm-year observations that have a known IPO date and sufficient Compustat data. We follow firms from the year of their IPO until Compustat data runs out. IPO dates are determined from data provided by Jay Ritter (covering 1968-1995 issues) and the Securities Data Company (covering 1970-1998 issues). We use the SDC data where information is not available in the Ritter data. The full sample excludes financial firms with an SIC code between 6000 and 6999, firms with a minimum book value of assets below $10 million, and firms without complete data on assets from the year of the IPO until the year the firm exits Compustat. We also exclude individual firm-year outliers for capital structure and the market-to-book ratio, as discussed below.

Table 1 reports summary statistics of capital structure, investment decisions (measured by the change in assets), and financing decisions. The variables are summarized in IPO time cross-sections, which hold the number of years since the initial public offering constant, and also in calendar time cross-sections. The sample of surviving firms is small at ten years after the IPO, so we stop there in our IPO-time tabulations. In the calendar time summary statistics and regressions, we include only firms that have been public for at least two years in order to get variation in the historical path of the market-to-book ratio.

We use the book value equity-to-assets ratio to measure capital structure in most of the empirical tests. We prefer the equity-to-assets ratio because it is easy to think about in relation to past equity issues, each of which may have been determined by past market valuations. The more commonly used debt-to-assets ratio would, of course, lead to identical but inverse results. We focus on book value because it facilitates an accounting decomposition of changes in the equity-to-assets ratio into retained earnings and net equity issues that we use later. A book value measure of capital structure also avoids any mechanical link between the market-to-book ratio and market value equity-to-assets.

We define the equity-to-assets ratio as book equity over total assets [Item 6]. We define book equity as total assets less total liabilities [Item 181] and preferred stock [Item 10] plus deferred taxes [Item 35] and convertible debt [Item 79]. When preferred stock is missing, it is replaced with the redemption value of preferred stock [Item 56]. We drop firm-year observations where the equity-to-assets ratio is negative.[1]

Table 1 shows that the average equity-to-assets ratio is relatively stable in both IPO time and calendar time. It declines slightly as firms age. This is indeed an age effect, not a survival effect; the equity-to-assets ratio for the subsample of firms that survives ten years falls by a similar five percentage points. It is interesting that the variation in the equity-to-assets ratio is about as large among ten-year-old firms as it is among one-year-old firms. There is little convergence within the first ten years.

The remaining columns report statistics for net investment as measured by the change in total assets and a decomposition of net investment into net equity issues [*e/A*], net internal finance [*(DE-e)/A*], and net debt issues [*d/A*]. Net equity issues are defined as the change in book

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[1] We consider market values of capital structure in a robustness check. Market values allow us to keep the observations with negative book equity-to-assets ratios since both the market value of equity and the book value of debt are always positive. The results turn out to be very similar to the book value results, indicating that neither these observations nor the market value measure of capital structure makes a difference. We also find that classifying convertible debt as equity is immaterial to the results.

equity minus the change in retained earnings [Item 36] divided by assets. Net internal finance retained from earnings is defined as the change in retained earnings divided by assets. Net debt issues are defined as the residual change in assets divided by assets.

The table shows that both net equity issues and net debt issues contribute to growth in assets in the first few years after the IPO. This is not a survival effect. However, the trend in internal finance is purely survival. Profitable firms tend to remain independent. As unprofitable firms exit through mergers, acquisitions and liquidations, the average profitability increases, even though the retained earnings of the survivors falls from six percent of assets to two percent. In calendar time, the noteworthy patterns are the apparent increases in equity issues and decreases in internal finance over the past ten or fifteen years. These numbers reflect the statistical dominance of the many newly public firms at the end of the sample, in addition to any real trends in the financing practices of established firms.

Table 2 presents summary statistics for four variables that Rajan and Zingales (1995) show to be related to capital structure in several developed countries. The four variables are market-to-book, asset tangibility, profitability, and size. Rajan and Zingales and Fama and French (2000) discuss potential theoretical roles for these variables.[2] We are focused on the market-to-book ratio in this paper. For now, we will simply mention that it may be related to investment opportunities, risk, and market mispricing, and we will leave interpretation to the next section. Regarding the other variables, tangible assets may be used as collateral and so are associated with higher leverage. Profitability is associated with the availability of internal funds and thus may be associated with less leverage under the pecking order theory. A related but simpler hypothesis is that this relationship arises from the indifferent or tax-advantaged retention

[2] We are mainly focused on the market-to-book ratio and so we regard the other Rajan and Zingales (1995) variables as controls. We report results using the Fama and French (2000) controls in a robustness check.

of earnings in a Modigliani and Miller environment. A third hypothesis is that profitable firms face more free cash flow problems in which case an effective governance structure might call for more leverage (Jensen (1986)). Finally, size may increase leverage if large firms are less likely to enter financial distress.

The four variables are defined as follows. The market-to-book ratio is defined as assets minus book equity plus market equity all divided by assets. Market equity is defined as fiscal year-end share price [Item 199] times shares outstanding [Item 25]. We drop firm-year observations where the market-to-book ratio is greater than ten.[3] Asset tangibility is defined as net plant, property and equipment [Item 8] divided by total assets. Profitability is defined as earnings before interest, taxes and depreciation [Item 13] divided by total assets. Firm size is measured as the log of net sales [Item 12].

The variables are lagged once so that, for example, the IPO+1 row in Table 2 summarizes the variables as of the IPO year. The market-to-book ratio declines steadily with firm age, while asset tangibility and firm size both rise with firm age. These patterns are also apparent in the survival sample, though surviving firms do tend to have higher sales and fixed assets to start with. As noted in the previous table with retained earnings, the increase in profitability from IPO+4 onward is purely a survival effect. Holding any sample of firms constant, profitability falls with age. The calendar-time trends on the other variables are generally the mirror image of the IPO-time trends, reflecting the characteristics of the many newly public firms at the end of our sample. These young firms tend to have higher market-to-book ratios, lower profits, and lower fixed assets than young firms in previous calendar periods.

[3] We report results without these exclusions in a robustness check.

b. Determinants of Changes in Capital Structure

We start our analysis of capital structure with an analysis of the financing decisions that explicitly affect capital structure. We divide the annual change in the equity-to-assets ratio into two components. The first is the active component due to net equity issues [*e/A*]. The second is a perhaps more passive component due to the retention of period earnings [*(DE-e)/A*]. Table 3 reports determinants of these changes in the equity-to-assets ratio. We regress one or the other component of changes in the equity-to-assets ratio to the determinants of capital structure in Rajan and Zingales (1995).

$$\left(\frac{\Delta E}{A}\right)_t = a + b\left(\frac{M}{B}\right)_{t-1} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t \qquad (1)$$

We run these regressions in IPO time. Fama-MacBeth calendar-time regressions yield no new conclusions here and are omitted.

Consistent with the results of Marsh (1982) and others, the market-to-book ratio has a strong influence on net equity issues. Firms with high market-to-book ratios issue more equity and repurchase less. For a one-year-old firm, a one-standard-deviation increase in market-to-book (1.42 from Table 2) increases net equity issues by 4.97 percentage points, which is 33 percent of one standard deviation (15.05 from Table 1) and 72 percent of the mean (6.86 in Table 1) in net equity issuance for firms of this vintage. Market-to-book is also an important determinant of equity issuance by older firms. For ten-year-old firms, the increase in net equity issuance due to a one standard deviation in market-to-book is 4.16 percentage points. Profitability also has a substantial and robust effect on net equity issuance. Firms with lower profits raise more equity. Asset tangibility and size appear much less important.

Table 3 also shows the impact of these variables on more passive components of capital structure changes due to retained earnings. The market-to-book ratio has a small and weak association with retained earnings. The effects of other three variables on retained earnings is actually opposite to their effects on net equity issues. For example, profitability has roughly twice as large an effect on increasing retained earnings as it has on decreasing equity issues.

To summarize, the important and consistent influences on the equity-to-assets ratio come from market-to-book, which increases net equity issues, and from profitability, which increases retained earnings more than it decreases net equity issues. Asset tangibility and size have opposite effects on net equity issues and retained earnings that roughly cancel out. Because these last two variables fail to explain changes, their explanatory power is likely to decline with firm age.

c. Historical Variation in the Market-to-Book Ratio

We use two measures of historical variation in market-to-book. The first is the maximum value of the market-to-book ratio between the firm's initial public offering and *t*-1 and is denoted M/B_{max} (we usually suppress the *t*-1 subscript). This measure captures a potentially important feature of past variation in market-to-book – the height of the highest "peak" ever achieved – into a single number. If financing decisions depend on the market-to-book ratio, an extreme value would be most likely to have persistent effects.

The second measure explicitly measures the interaction between external financing decisions and the market-to-book ratio. It is the "external finance weighted-average" market-to-book ratio. An intuitive motivation for this variable is that external financing events represent practical opportunities to change capital structure. We develop a more theoretical motivation in later sections. The weighted average is denoted M/B_{efwa} (we usually suppress the *t*-1 subscript) and defined as

$$\left(\frac{M}{B}\right)_{efwa,t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{\sum_{r=0}^{t-1} e_r + d_r} \cdot \left(\frac{M}{B}\right)_s \qquad (2)$$

where *e* and *d* denote net equity and net debt issues, respectively. This variable is a practical summary of the market-to-book ratios that prevailed when external finance decisions were being made. It takes high values for firms that raised external finance – equity *or* debt – when the market-to-book ratio was high. The variables *e* and *d* are as defined earlier. However, for purposes of this computation, we set the minimum annual amount of external finance to zero. This ensures that total external finance raised between the IPO and *t*-1 is positive and therefore that the weights are increasing in the amount of external finance raised in each period. We compute both measures using the time series of actual market-to-book ratios, and we drop firm-year observations where M/B_{efwa} exceeds 10 and M/B_{max} exceeds 20.[4]

Table 4 summarizes these measures of historical variation in market-to-book. The lagged value of market-to-book is included for comparison. At the IPO year, the three values are identical. With only one observation, the maximum, the average, and the lagged value are the same. The table indicates that the average M/B_{max} is not strictly increasing in IPO time. This happens when firms with high M/B_{max} values leave the sample. In IPO time, the table shows that M/B_{efwa} tends to decrease as firms age, though not quite as fast as market-to-book itself. This reflects the tendency of firms to raise more external finance when they are newly public and with high market-to-book ratios. For this same reason, the maximum and the weighted average are increasing in calendar time; the young firms at the end of our sample are raising external finance at historically high market-to-book ratios. Finally, the table also shows the correlations among these measures. They diverge as firms mature and the market-to-book ratio has time to vary.

[4] We report results without these exclusions in a robustness check.

d. Determinants of Capital Structure

Now we get to the heart of the empirical results and study determinants of the equity-to-assets ratio. First we evaluate the univariate explanatory power of three measures of the market-to-book ratio: $M/B_{t\text{-}1}$, M/B_{max}, and M/B_{efwa}. Then we evaluate the univariate explanatory power of the other three Rajan and Zingales (1995) variables. Finally we evaluate the significance of M/B_{efwa}, which turns out to be the most useful measure of the historical variation in market-to-book, in multivariate specifications.

Table 5 shows results for simple univariate regressions of the equity-to-assets ratio on measures of the market-to-book ratio.

$$\left(\frac{E}{A}\right)_{IPO+t} = a + b\left(\frac{M}{B}\right) + u_t \tag{3}$$

The left columns consider regressions that use $M/B_{t\text{-}1}$ as the independent variable. The middle columns use M/B_{max}. The right columns use M/B_{efwa}.

For one-year-old firms, $M/B_{t\text{-}1}$ (and the other measures, since all are identical in this row) explains 15 percent of the cross-sectional variation in capital structure. The economic significance is also substantial. A one-standard-deviation increase in $M/B_{t\text{-}1}$ (1.42 from Table 2) is associated with an increase in equity-to-assets of 8.33 percentage points. This explanatory power is short-lived, though. Ten years after the IPO, $M/B_{t\text{-}1}$ explains about 5 percent of the cross-sectional variation. This deterioration in explanatory power has gone unnoticed by prior authors, presumably because it is apparent only in IPO time.

M/B_{max} is a somewhat stronger and more robust determinant of capital structure outcomes than $M/B_{t\text{-}1}$. Ten years after the IPO, M/B_{max} has about twice the explanatory power of $M/B_{t\text{-}1}$.

The coefficients on this variable appear to decrease as firms age, but this in part reflects increases in the mean and standard deviation of M/B_{max}.

The strongest and most robust determinant among these three is the weighted average market-to-book, M/B_{efwa}. It consistently explains about 15 percent of the variation in capital structure as firms age. Mechanically, its explanatory power reflects the combined influence of three facts. First, changes in capital structure are more likely to be in the direction of equity when the market-to-book ratio is high, as we documented in Table 3. Second, these changes in capital structure are more pronounced around external financing events. Third, these changes are not subsequently reversed through recapitalization. As a result, M/B_{efwa} has a significant and persistent influence on capital structure outcomes. From this point forward we focus on M/B_{efwa} because it appears to do better than M/B_{max} at linking capital structure to historical variation in market-to-book.[5] None of our conclusions in Tables 6 through 10 are changed with M/B_{max} (Tables available from the authors).

To gauge whether an R-squared of 15 percent is large or small, we run univariate regressions of the equity-to-assets ratio on the other three variables suggested by Rajan and Zingales (1995).

$$\left(\frac{E}{A}\right)_{IPO+t} = a + bX_{t-1} + u_t \tag{4}$$

where X denotes asset tangibility, profitability, or size. We also construct the external finance weighted average of each of the variables to determine whether the M/B_{efwa} results arise in some mechanical way from the weighting scheme.

[5] We have also tried the simple average of past market-to-book, as opposed to the external finance weighted average. This variable performs as well as the maximum measure but not as well as the weighted average measure (Table available from the authors).

It turns out that an R-squared of 15 percent is quite large as these univariate regressions go, and only the weighted average market-to-book retains this level of explanatory power as firms age. The results are summarized graphically in Figure 1. The dashed lines trace out the explanatory power of $X_{t\text{-}1}$ and the solid lines trace out the explanatory power of X_{efwa}. Panel A traces out the explanatory power of M/B_{efwa} and $M/B_{t\text{-}1}$. As previously noted, the weighted average value retains an R-squared of about 15 percent while the explanatory power of the once-lagged value steadily diminishes.

Panel B traces out the univariate explanatory power of asset tangibility. (The coefficients are generally negative: More tangible assets are associated with higher leverage.) This variable is marginally useful at the IPO, then weakens further as firms age. This is as expected given the inconsistent effect of changes in asset tangibility on changes in capital structure that we noted earlier. Also, note that the weighted average performs almost exactly the same as the current value. This indicates that the results for the weighted average market-to-book do not arise as an artifact of the weighting scheme.

Panel C traces out the univariate explanatory power of profitability. (The coefficients are generally positive: Higher profits are associated with higher equity-to-assets.) Profitability starts with almost no power to explain variation in capital structure among IPO firms, but it gains influence sharply as firms age. Our earlier results indicate that this increase in explanatory power occurs because the positive effect of profitability on retained earnings is greater than its negative effect on net equity issues. So as time goes by and profitability varies across firms, differences in period retained earnings start to add up to differences in capital structure. Note that the weighted average measure of profitability does considerably better than the lagged value. As with the market-to-book ratio, we find that the path of profitability matters for capital structure outcomes.

This makes sense if firms prefer to retain earnings rather than pay them out. The weighted average includes not only recent profitability but also the effect of past profitability, explaining both current and past retained earnings.

Panel D considers the univariate explanatory power of firm size. (The coefficients are generally negative: Size is associated with higher leverage.) Like asset tangibility, however, the explanatory power of size goes to zero as firms age. For mature firms, size does not matter. Also like asset tangibility, the weighted average value performs about the same as the current value, again suggesting that the external finance weighting does not induce a spurious association.

The pictures in Figure 1 shed new light on the dynamics of capital structure. They do not control for interrelationships – we do that shortly – but they do hint at some general conclusions. When firms go public, their capital structure reflects a number of factors, including market-to-book, asset tangibility, and size. However, as they age, two influences come to dominate the path taken by capital structure: (1) the path taken by the market-to-book ratio and its influence on the composition of external finance; (2) the retention of earnings by profitable firms.[6]

One caveat is in order at this point. The evaluation of the time series patterns depends critically on how representative the surviving firms are. Our sample size at IPO+10 includes about seven hundred firms, which is only one-third of the sample size at IPO+1. However, we do find that all of the patterns in Figure 1 remain when we restrict attention to the sample of survivors alone. This indicates that survival bias does not drive the patterns in Figure 1.

[6] We have also created pictures like those in Figure 1 that include the determinants of capital structure in Fama and French (2000). Their variable ET/A (EBIT/A) performs like our variable EBITDA/A in Figure 1, Panel C. Their variables D/BE (dividends to book equity), D/ME (dividends to market equity), and Dp/A (depreciation to assets) are never important in univariate regressions. This is perhaps not surprising for our IPO sample. Their variables RD/A (research and development expense to assets) and RDD (a dummy for firms that report no research and development expense) have some univariate explanatory power that declines slightly as firms age, starting from an R^2 of 0.07 or 0.08 and then dropping to 0.05 or 0.06. Their variable log(*A*) (log of assets) performs like our variable log(*S*) in Figure 1, Panel D.

In Table 6 we consider multivariate regressions of the equity-to-assets ratio.

$$\left(\frac{E}{A}\right)_t = a + b_1\left(\frac{M}{B}\right)_{t-1} + b_2\left(\frac{M}{B}\right)_{efwa} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t \qquad (5)$$

The results clarify the interpretation of the M/B_{efwa} coefficient as reflecting the persistent influence of past market-to-book ratios. The improvement comes from the inclusion of M/B_{t-1}, which controls for the recent cross-sectional variation in the *level* of market-to-book. As the summary statistics indicate, this variation is substantial. What is left for M/B_{efwa} is the residual influence of past, within-firm variation in market-to-book.

Table 6 shows that M/B_{efwa} completely dominates M/B_{t-1} in terms of explanatory power. (The table skips the IPO + 1 specification because the two market-to-book variables are identical and therefore collinear at that point.) The table shows that as public firms age, the once-lagged value goes from having little incremental explanatory power to none at all, while the effect of M/B_{efwa} actually rises with firm age. To repeat, this indicates that historical within-firm variation in market-to-book, not current cross-firm variation, explains variation in capital structure outcomes.

As suggested by the univariate results, the effect of asset tangibility and size diminishes as firms age. On the other hand, the effect of profitability rises. Panel B performs Fama-MacBeth regressions in calendar time. Here, all of the variables except for the once-lagged value of market-to-book appear strong, but this masks the dynamics apparent in IPO time.

In Table 7 we consider multivariate regressions that also include the market-to-book value prevailing at the IPO, which we denote M/B_0. We compress the controls and their coefficients into vectors **x** and **k**.

$$\left(\frac{E}{A}\right)_t = a + b_1\left(\frac{M}{B}\right)_{t-1} + b_2\left(\frac{M}{B}\right)_0 + b_3\left(\frac{M}{B}\right)_{efwa} + \mathbf{x}'_{t-1}\mathbf{k} + u_t \qquad (6)$$

This goes another step further than the previous regressions in controlling for cross-firm variation in market-to-book. In this regression the first and second variables represent the "endpoints" of the market-to-book ratio. M/B_{efwa} is left to represent the variation in between, and how that variation relates to external finance.

Table 7 reports only the coefficients on M/B_{efwa}. The left columns control for M/B_{t-1} but not M/B_0. This is the same specification as in the previous table and is repeated for reference. The middle columns control for M/B_0 but not M/B_{t-1}. The coefficient on M/B_{efwa} is essentially unaffected. M/B_0 adds a significant but smaller amount of explanatory power (Table available from the authors), indicating that the dependence of capital structure on past market-to-book extends all the way back to the IPO value – the longest possible historical dependence for this variable.

The right columns of Table 7 summarize the main result of the paper. They control for both M/B_0 and M/B_{t-1}. Again, M/B_{efwa} is robustly significant in both IPO time and calendar time. The meaning of this result is striking. It says that two firms that start and end at the same market-to-book ratio, and are identical matches on other characteristics, can have statistically and economically different capital structure outcomes simply because their market-to-book ratios took different *paths* from start to end. The difference takes a particular form. Firms that raised external finance when their market-to-book ratios were high have lower leverage years later, and firms that raised external finance when their market-to-book ratios were low have higher leverage years later. This connects the results of Marsh (1982) and others to capital structure outcomes.

e. Robustness Checks

In Table 8 we consider a variety of robustness checks on the effect of M/B_{efwa}. In all cases the results are not substantially affected. The first row uses market values of the equity-to-asset ratio. The second row includes SIC-3 dummy variables. The effect diminishes slightly, but M/B_{efwa} remains economically and statistically important both within and across industries. The third row includes IPO year dummy variables. The fourth row includes five lags of profitability. This better controls for the possibility that M/B_{efwa} captures past profitability better than one lag of profitability. The fifth row includes a wider set of capital structure determinants used in Fama and French (2000) (see their Table 3). In addition to M/B_{t-1}, Fama and French include common dividends over assets, common dividends over book equity, depreciation over assets, a dummy if research and development expenditures are positive, research and development over assets, and size measured by the log of assets. We refer the reader to their paper for variable definitions. The sixth row includes market-to-book outliers. In the earlier tables we exclude firm-year observations where M/B_{t-1} or M/B_{efwa} was greater than 10 or M/B_{max} was greater than 20. The seventh row includes all firms, not just those with known IPO dates, and uses data back to 1950 from Compustat. To construct M/B_{efwa} and M/B_0 we assume that the IPO year is the year that the firm entered Compustat. The eighth row uses a Tobit estimation to account for the censored dependent variable.

III. Theoretical Explanations

The evidence in the previous section demonstrates that temporary fluctuations in the market-to-book ratio have a considerable effect on the equity-to-assets ratio. In this section we attempt to reconcile this puzzling fact with the tradeoff and pecking order theories of capital structure. We also propose a third theory in which managers attempt to time the market and permanently change capital structure in the process. This "market timing theory" shares several features with the pecking order but relaxes the rational expectations assumption.

a. Tradeoff Theory

Modigliani and Miller (1958) prove that capital structure is irrelevant in perfect and efficient markets. The tradeoff theory determines an optimal capital structure by adding various market imperfections, including taxes, costs of financial distress, and agency costs, but retains assumptions of market efficiency and symmetric information.

Some of the imperfections that lead to an optimal tradeoff are as follows. Higher taxes on dividends indicate more debt (Modigliani and Miller (1963) and Miller and Scholes (1978)). Higher non-debt tax shields indicate less debt (DeAngelo and Masulis (1980)). Higher costs of financial distress indicate more equity. Short of bankruptcy, senior debt can force managers to forgo profitable investment opportunities (Myers (1977)). Agency problems can call for more or less debt. Too much equity can lead to free cash flow and conflicts of interest between managers and shareholders (Jensen (1986)). Too much debt can lead to asset substitution and conflicts of interest between managers and bondholders (Fama and Miller (1972) and Jensen and Meckling (1976)). Harris and Raviv (1991) survey these and other possible influences on capital structure.

In addition, the optimal leverage ratio need not be constant. Under the tradeoff theory, firms adjust capital structure towards a target that may change with firm characteristics, investor characteristics, and the tax environment.

The market-to-book ratio can be connected to a number of different elements of the tradeoff theory. It is most commonly attached to costly financial distress as in Myers (1977), Rajan and Zingales (1995), Smith and Watts (1992), and Barclay, Smith, and Watts (1995). Firms with growth and investment opportunities have the most to lose when overhanging debt prevents new capital from being raised or leads to an inefficient bankruptcy negotiation during which some investment opportunities are forever lost.

Whatever the theoretical connection, the key prediction of the tradeoff theory is that capital structure eventually adjusts to changes in the market-to-book ratio. Though transaction costs may prevent continuous adjustment, the impact of past, temporary fluctuations in the market-to-book ratio should have a short life span. Indeed, if the cost of deviating from the optimum are so small that shifting capital structure back toward the optimum is not worthwhile, there would be no theoretical justification for market-to-book in the first place.

We test this prediction with a system of three regressions. The first regression looks at the effect of M/B_{efwa} on *current* capital structure at time t+1, controlling for other determinants measured at time t. This is simply a repetition of the regressions in Table 6. The second regression replaces current capital structure with *future* capital structure at time $t+t$, still using controls from time t. The third regression looks at the effect of M/B_{efwa} measured at time t on future capital structure, controlling for future characteristics measured at time $t+t$-1.

$$\left(\frac{E}{A}\right)_{t+1} = a_1 + b_{11}\left(\frac{M}{B}\right)_t + b_{21}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_t'\mathbf{k}_1 + u_{1,t+1} \qquad (7)$$

$$\left(\frac{E}{A}\right)_{t+t} = a_2 + b_{12}\left(\frac{M}{B}\right)_t + b_{22}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_t'\mathbf{k}_2 + u_{2,t+t}$$

$$\left(\frac{E}{A}\right)_{t+t} = a_3 + b_{13}\left(\frac{M}{B}\right)_{t+t-1} + b_{23}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_{t+t-1}'\mathbf{k}_3 + u_{3,t+t}$$

The tradeoff theory with adjustment costs allows capital structure to respond slowly to M/B_t. But eventually the past, temporary fluctuations captured in M/B_{efwa} measured at time t should no longer matter. In terms of the coefficients, b_{22} and b_{23} should be zero for capital structure measured in the distant future. The ratio of b_{22} to b_{21} and the ratio of b_{23} to b_{21} measure the *permanent* effect of temporary fluctuations in the market-to-book ratio. By simultaneously estimating equation (7), we can also put confidence intervals around the two ratios.

Table 9 reports the results. The columns on the left report Fama-MacBeth estimates and t-statistics for b_{21}, b_{22}, b_{23}, and b_{13}. We require that the set of firms is the same in all three regressions. In other words, to be included in the first regression, a firm must survive at least t years. As a result, the estimates of b_{21} change with t. The first and second columns show that this survival effect is small. The coefficients fall in a narrow range between 7.40 and 7.73. Note also that the first row matches the estimate for 1980 to 1999 reported in Panel B of Table 6. The next four columns document the persistence of the M/B_{efwa} effect: b_{22} and b_{23} both remain strongly significant for at least ten years.[7] The b_{23} coefficient is surprising. Its strength indicates that market-to-book variation from before 1990, for example, remains a strong determinant of capital structure outcomes in 1999. This is true controlling for the 1998 values of characteristics including market-to-book. Perhaps even more surprising is that b_{23} is over four times the size of the b_{13} coefficients reported in the next two columns. The historical path of market-to-book – even calculated with data over ten years old – is much more important than the current market to book.

The columns on the right report the fraction of the initial effect that remains after t years. For example, the ninth column shows the result of a simple division of the estimate of b_{22} by the estimate of b_{21}. About 62 percent of the initial effect is still apparent ten years later; by any practical definition, the effect is permanent. We also report a lower bound estimate of this ratio, calculated by drawing values of b_{21} and b_{22} from the joint distribution of the two estimates. We

[7] The standard errors on b_{23} are smaller than the standard errors on b_{22} because the correlation between $M/B_{efwa,t}$ and M/B_{t+t-1} is generally lower than correlation between $M/B_{efwa,t}$ and M/B_t.

can say with 95 percent confidence that at least half of the M/B_{efwa} effect lasts for ten years. The last two columns show similar results for the ratio of b_{23} to b_{21}.

In summary, the tradeoff theory cannot explain why temporary fluctuations in the market-to-book ratio have a permanent impact on capital structure. Under the tradeoff theory, temporary fluctuations should have at most a temporary effect. However, a conservative estimate of the half-life of the M/B_{efwa} effect is ten years. This adjustment is simply too slow to explain with adjustment costs. If adjustment costs are so large as to prevent a correction within ten years, it is not clear why they would not also prevent the effect in the first place.

b. Pecking Order Theory

In the pecking order theory described by Myers (1984), there is no optimal capital structure. To be more precise, if there is an optimum, the costs of deviating from it are insignificant in comparison to the cost of raising external finance. The costs of raising external finance arise because managers have more information about the prospects of the firm than outside investors do, and because investors know this. In Myers and Majluf (1984), outside investors rationally discount the firm's stock price when managers issue equity instead of riskless debt. To avoid this discount, managers avoid equity whenever possible.

The Myers and Majluf model predicts that managers will follow a pecking order, using up internal funds first, then using up risky debt, and finally resorting to equity if investment opportunities are many. If investment opportunities are few, firms retain profits and build up financial slack to avoid raising external finance in the future.

The potential theoretical connection between the pecking order and temporary fluctuations in market-to-book comes through investment opportunities.[8] With more investment opportunities than internal funds and debt capacity, managers may be forced to issue equity. If there is at least some symmetric information on investment opportunities, this also reduces the adverse selection problem. The key to reducing adverse selection is for the firm to have an immediate and visible plan to spend the proceeds. Choe, Masulis, and Nanda (1993) develop a model in this spirit, and Bayless and Chaplinsky (1996) find that equity issue announcement effects fall somewhat in hot issue markets. Whether this empirical result is changing investor sentiment or changing adverse selection is an open question, but a key ancillary prediction of the pecking order theory is that firms will raise as little external equity as possible, spending what they do raise in a reasonable time.

We test this prediction by examining cash balances, essentially repeating the previous analysis with the cash-to-assets ratio instead of the equity-to-assets ratio. The cash-to-assets ratio is defined as cash and short-term investments [Item 1] divided by total assets and expressed in percentage terms. As before, we run three regressions. The first regression looks at the effect of M/B_{efwa} on current cash balances, controlling for other determinants measured at time t. The second regression replaces current cash balances with cash balances τ years later, and the final regression uses controls measured at time $t+\tau$-1.

$$\left(\frac{C}{A}\right)_{t+1} = a_1 + b_{11}\left(\frac{M}{B}\right)_t + b_{21}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_t'\mathbf{k}_1 + u_{1,t+1} \quad (8)$$

[8] Another pecking order explanation is that the market-to-book ratio is a proxy for information asymmetry. When there is little asymmetric information, firms raise financial slack. While we cannot rule this explanation out empirically, casual observation and common sense suggest that information asymmetries are usually even worse when the market-to-book ratio is high. For example, young high-growth firms are likely to be more opaque, not less. Myers (1984) agrees, commenting that the concentration of stock issues at price peaks "is embarrassing to static tradeoff advocates…. [and] equally embarrassing to the pecking order hypothesis. There is no reason to believe that the manager's inside information is systematically more favorable when stock prices are 'high.'" (p. 586).

$$\left(\frac{C}{A}\right)_{t+t} = a_2 + b_{12}\left(\frac{M}{B}\right)_t + b_{22}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_t'\mathbf{k}_2 + u_{2,t+t}$$

$$\left(\frac{C}{A}\right)_{t+t} = a_3 + b_{13}\left(\frac{M}{B}\right)_{t+t-1} + b_{23}\left(\frac{M}{B}\right)_{efwa,t} + \mathbf{x}_{t+t-1}'\mathbf{k}_3 + u_{3,t+t}$$

The pecking order predicts that firms will raise as little equity as possible. As a result, temporary fluctuations in market-to-book captured by M/B_{efwa} should have a small and short-lived effect on cash balances. In terms of the coefficients, b_{21} should be small, and b_{22} and b_{23} should be even smaller.

Table 10 reports the results. The left columns report Fama-MacBeth estimates and t-statistics for b_{21}, b_{22}, and b_{23}. As before, we require that the set of firms is the same in all three regressions. As a result, the estimates of b_{21} change with t. The results indicate that this survival effect is larger for the cash-to-assets ratio than for the equity-to-assets ratio. As the sample is limited to survivors, the coefficient drops from 2.79 to 1.19. For the full sample, about 37 percent (2.79 from Table 10 divided by 7.46 from Table 9) of the impact of M/B_{efwa} is explained by larger cash balances. The impact is necessarily less than 100 percent because debt issues raise cash balances and equity issued in the context of mergers do not. The fact that over a third of the M/B_{efwa} effect appears in cash balances seems inconsistent with the pecking order theory, but of course firms may have immediate plans to spend these excess cash balances. The next four columns suggest otherwise: b_{22} and b_{23} both remain statistically significant for at least ten years.

The columns on the right report the fraction of the initial effect that remains t years later. The point estimates indicate that, on average, the entire initial effect lasts for ten years. We can say with 95 percent confidence that about 46 percent of the M/B_{efwa} effect is permanent.

As a final check, we look at investment. Here, investment is defined as the growth in non-cash assets. Non-cash assets are defined as total assets less cash and short-term investments.

We look at the effect of M/B_{efwa} measured at time t on investment t years later, controlling for market-to-book measured at $t+t$-1.

$$\frac{\Delta(A-C)_{t+t}}{(A-C)_{t+t-1}} = a_3 + b_1\left(\frac{M}{B}\right)_{t+t-1} + b_2\left(\frac{M}{B}\right)_{efwa,t} + u_{t+t} \tag{9}$$

The pecking order predicts that the extra equity raised when market-to-book is high will be used immediately or be earmarked for investment in the near future. Therefore temporary fluctuations in market-to-book that increase cash balances should also increase future investment. In terms of the coefficients, b_2 should be positive. The fact that cash balances do not fall with t suggests that this will not be the case. Indeed, Table 11 shows that b_2 is reliably negative for ten years.[9] Contemporaneous levels of the market-to-book ratio have a strong effect on investment, but temporary fluctuations do not have a lasting impact. The evidence on cash balances and investment suggest two possibilities. Either firms raise more cash than they plan to invest or firms often change their plans. Neither supports the pecking order. Situations where investment requirements are uncertain are precisely where the pecking order predicts delayed financing - managers should wait until the uncertainty is resolved to obtain equity at better terms.

In summary, the pecking order theory appears to be unable to explain why temporary fluctuations in the market-to-book ratio have a permanent impact on capital structure. Under the pecking order, growth opportunities can reduce adverse selection, reducing the cost of issuing new equity. However, implicit in the adverse selection argument is a plan to spend the proceeds, and the results indicate that external finance associated with variation in the market-to-book ratio leads to permanently, not temporarily, higher cash balances and lower investment. In general, our results are consistent with Helwege and Liang (1996). They find that the probability of

[9] A negative coefficient suggests that past returns, which are captured by including M/B_{efwa} as well as M/B_{t-1} (a proxy for Tobin's Q), are positively related to investment as in Morck, Shleifer, and Vishny (1990).

raising external finance is unrelated to the internal funds deficit, and that firms that could have obtained bank loans often choose to issue equity instead.

c. Market Timing Theory

We develop a market timing theory that shares several features with the pecking order theory. As in the pecking order theory, there is no optimal capital structure. Or, if there is an optimum, the perceived benefits of market timing swamp the costs of deviating from this optimum. As in the pecking order theory, managers are motivated by a concern for ongoing shareholders. The point of departure is as follows. In the pecking order theory, managers realize that in a rational expectations equilibrium they cannot fool new investors. In the market timing theory, managers may conclude that their stock is overvalued or undervalued *and* that outside investors will underreact to issue or repurchase announcements. This underreaction leaves some room to exploit the perceived mispricing and thereby benefit ongoing shareholders.

Although market-timing incentives derive primarily from a concern for ongoing shareholders, agency considerations or overconfidence may also play a role. For example, when equity is undervalued, career concerns and empire building may cause a reluctance to return capital or to increase leverage. Alternatively, overconfidence that the perceived mispricing is real may increase the response of market-timing-motivated financing decisions to perceived opportunities. Gervais, Heaton, and Odean (2000) consider the effects of managerial overconfidence in a related context.

The market timing theory suggests simple and, in our opinion, more realistic explanations for the empirical facts. Managers issue equity when they believe it is overvalued and repurchase equity or issue debt when they believe it is undervalued. Since beliefs about valuation are likely to be highly correlated with the market-to-book ratio, net equity issues will be positively related to market-to-book, which is what we (and prior authors) find. Since there is no optimal capital structure, managers need not reverse these decisions when the firm appears to be correctly valued. This leaves temporary fluctuations in market-to-book to have permanent effects on capital structure, which is consistent with our evidence. Since market timing gains depend on the amount of overvalued equity issued, managers will issue as much as they can when they think it is overvalued, even if they have no special use for the excess proceeds. A natural place to store the excess proceeds is in cash, which is consistent with our evidence.

It is important to point out that the market timing theory we describe does *not* require that the market actually be inefficient. It does not ask managers to successfully predict stock returns. The critical assumption is that managers *believe* that they can time the market. On this, consider the statement made by Microsoft President Steve Ballmer on September 23, 1999. He said that "there is such an overvaluation of technology stocks, it is absurd. I would put our company in that category, most technology stocks in that category." He later added, "I used to believe in the theory of perfect markets, but I no longer believe that." It is not difficult to find other statements in which managers make public pronouncements on market valuations – though statement is extraordinary in that it points out overvaluation in his own firm.

The market-timing interpretation of our results is complemented by prior evidence on market timing more generally. The evidence comes in three categories: surveys of managers, analyses of actual financing decisions, and analyses of long-run returns following equity issues and repurchases.

In the survey by Graham and Harvey (2001), CFOs essentially admit to trying to time the equity market. (The survey is anonymous.) Sixty-seven percent of those that have considered issuing common stock report that “the amount by which our stock is undervalued or overvalued” was an important consideration. Sixty-three percent agreed that “if our stock price has recently risen, the price at which we can sell is ‘high.’” Fifty-one percent of the respondents considered issuing convertible debt because “our stock is currently undervalued,” and fifty-eight percent viewed them as “an inexpensive way to issue ‘delayed’ common stock.” This last finding supports the view of convertibles as backdoor equity, to be issued when managers cannot get a good price for straight equity (Stein (1992)). Overall, CFOs indicate that contemporaneous equity prices are more important than nine out of ten other potential factors in the decision to issue common stock, and more important than all four other potential factors in the decision to issue convertible debt. The findings suggest that the skepticism in market efficiency expressed by Ballmer is widespread and has major consequences for financing patterns.

Studies of actual finance decisions are consistent with the survey evidence. Marsh (1982) concludes that British firms “are heavily influenced by market conditions and the past history of security prices in choosing between equity and debt. Indeed, these factors appeared to be far more significant in our model than, for example, other variables such as the company’s existing financial structure” (p. 142). Taggart (1977) finds a similarly strong result using U.S. flow of funds data. A number of studies document a strong relationship between the market-to-book ratio and the propensity to issue equity, which we confirm. Korajczk, Lucas, and McDonald (1991) and Jung, Kim, and Stulz (1994) document this relationship in U.S. data, and Loughran, Ritter, and Rydqvist (1994) find it in a number of other countries. Pagano, Panetta and Zingales (1998) find that the IPO decisions of Italian firms depend on the industry market-to-book ratio. Since both investment and profitability decrease soon after the offering, they infer that the IPO is timed more to take advantage of current equity prices than to finance profitable growth.

Investors do seem to recognize these market-timing motives. They discount shares of equity issuers and boost the shares of repurchasers (Asquith and Mullins (1986), Ikenberry, Lakonishok, and Vermaelen (1995), and Smith (1986)).

In earlier work these announcement effects were taken as support for the rational expectations assumption in the pecking order theory. More recent research suggests that the announcement effects are too small by a substantial margin. For example, after the announcement effect is accounted for, equity issuers have low subsequent returns in Stigler (1964), Ritter (1991), Loughran and Ritter (1995), Speiss and Affleck-Graves (1995), and Brav and Gompers (1997), and high market-to-book issuers earn even lower returns. Repurchasers have high subsequent returns in Ikenberry, Lakonishok, and Vermaelen (1995), and low market-to-book repurchasers have even higher returns. LaPorta (1996) and LaPorta, Lakonishok, Shleifer and Vishny (1997) attribute a substantial portion of the returns associated with market-to-book to irrational investor expectations.

In an efficient market, the low idiosyncratic returns of the high market-to-book equity issuers necessarily reflect lower risk. Fama (1998) and Eckbo, Masulis and Norli (2000) make this case. However, Shleifer (2000) replies that it “strains credulity” to suggest that real investors view IPOs as especially good hedges against risk. One way to sidestep the debate comes from recognizing that managers have incentives to exploit any overvaluation, idiosyncratic or market-wide. Consistent with an ability to time the market component of overvaluation, Baker and Wurgler (2000) find that a high share of new equity in aggregate new equity and debt issues predicts low returns on the market as a whole. Indeed, when the aggregate “equity share in new issues” is in its top historical quartile, the next year’s market return is on average negative, which they argue is inconsistent with any efficient market explanation.

The evidence from stock returns remains controversial, but the survey evidence seems impossible to dispute. In any case, market efficiency is not a directly related issue. The crucial assumption of the market timing theory is that managers *attempt* to time the market. The survey evidence shows that they do.

IV. A Model of Capital Structure Under Market Timing

In this section we use the Stein (1996) model of capital budgeting, designed for managers who believe that capital markets are inefficient, to build a theory of capital structure outcomes that fits the evidence. It also indicates conditions under which the external finance weighting scheme is most appropriate. There are three elements to the theory. (1) Capital structure outcomes are mechanically equal to the sum of past financing decisions. (2) Financing decisions are motivated by attempts to time the market. (3) As in the pecking order, the costs of deviating from optimal capital structure are small compared to the costs of debt-for-equity and equity-for-debt recapitalizations. Therefore financing decisions are not subsequently reversed.

As an accounting identity, book-value capital structure can be decomposed into a historical sequence of finance decisions. In particular, the equity-to-assets ratio can be decomposed into past net equity issues and past retained earnings.

$$\frac{E_t}{A_t} \equiv \sum_{s=0}^{t} \frac{e_s}{A_t} + \sum_{s=0}^{t} \frac{\Delta E_s - e_s}{A_t} \tag{9}$$

where E is the portion of total assets financed by equity, A is total assets, and e is equity issuance net of repurchases. This separates the capital structure outcome into a sum of active decisions about new finance and a sum of passive retained earnings. The second element is relatively exogenous at each time s. Managers cannot change capital structure after the fact with realized earnings. Dividends are empirically persistent (Lintner (1956)), but in principle they could be lumped into either term.

Equation (9) suggests how a theory of net equity finance decisions can lead to a theory of capital structure outcomes. We consider a theory of net equity finance decisions motivated by market timing. In our version of the Stein model, managers choose the level of investment *I* and the level of equity issues *e* in each period. The investment produces cash flow with a present value of *f*(*I*), which is increasing and concave in investment. For simplicity, we do not distinguish here between investment and external finance. They are one and the same. The perceived benefit of issuing equity *e* is proportional to its perceived mispricing, *p*-*p**. The cost of issuing equity $c_1(e)$ is convex and u-shaped around zero equity. This captures the notion that investors react to changes (not levels) in capital structure, recognizing market-timing motives and partially correcting mispricing.

We also consider the case of a cost function $c_2(e, I)$. The cost is u-shaped around zero, as in the previous case. However, this cost function incorporates the evidence from Choe, Masulis, and Nanda (1993) and Bayless and Chaplinsky (1996) that announcement effects are somewhat lower in hot issue markets when investment opportunities appear to be higher. This evidence suggests the condition that the cross-partial derivative of c_2 with respect to *e* and *I* is negative. In other words, the u-shape tilts to the right. A rational interpretation of this condition is that the adverse selection problem is reduced when investment opportunities are higher. Investors will then correct for mispricing by a smaller amount when the firm has a good use for the proceeds. An alternative interpretation of the cross-partial condition is that investor sentiment is correlated with investment opportunities and exuberant investors simply let their guard down in hot markets. Both interpretations are consistent with the existing evidence.

The manager puts all of this together in an objective function.

$$\max_{e,I} \sum_s d^s \left[f(I_s) - I_s + (p_s - p^*)e_s - c(e_s, I_s) \right] \tag{10}$$

Case 1: $c(e,I) = c_1(e)$

Case 2: $c(e,I) = c_2(e,I)$

where d is a constant discount factor. Because there is no optimal capital structure and because investors react to changes in equity and not levels, investment and financing decisions are separable across time. In Case 1, with no target capital structure and no interaction between investment and the cost of issuing equity, the two decisions are also separable at each point in time. In Case 2, the decisions are separable at each point in time only if there is symmetric information on the ideal level of investment. In this situation, manipulating actual investment does not influence the cost of raising equity. For ease of exposition, we assume that this assumption holds, and that managers choose the optimal level of investment. Without this assumption, managers will invest more when equity is mispriced, or perhaps just claim to need more funds and hold the excess as cash balances.

In this model, the total equity accumulated depends on temporary fluctuations in market prices. In Case 1, total equity raised is a function of average mispricing. In Case 2, total equity raised depends on overvaluation, investment opportunities and the interaction between the two. The first order conditions are as follows.

$$\text{Case 1: } \tfrac{d}{de} c_1(e_s) = p_s - p^* \tag{11}$$

$$\text{Case 2: } \tfrac{d}{de} c_2(e_s, I_s) = p_s - p^*$$

In Case 1, the convexity of the cost function means that equity raised is increasing in mispricing. The derivative of equity e with respect to mispricing p-p^* is equal to the inverse of c_{ee}. In Case 2, equity is increasing in both mispricing and the level of investment. The derivative of equity e with respect to investment I is equal to $-c_{eI}$ divided by c_{ee}. This expression is positive because the slope of the cost function is decreasing in investment. Where the shape of the cost function satisfies an additional assumption - that its convexity as well is its slope is decreasing in investment, or $\frac{d}{dI}c_{ee}$ is less than zero - the cross derivative of equity with respect to mispricing and investment is unambiguously positive. Where this assumption holds, one way to capture this interaction is to weight past perceptions of mispricing with external finance. This outlines a possible theoretical foundation for the external finance weighted-average market-to-book ratio.

V. Conclusion

Many corporate financing decisions depend on market valuations. Firms tend to issue equity instead of debt when market value is high, relative to book value and past market values, and repurchase equity when market value is low. These relationships are robust enough to be counted among the stylized facts of corporate finance.

In this paper we use these old facts to produce a new fact: Capital structure depends strongly on past market valuations as measured by past market-to-book ratios. The mechanics of this relationship are simple. Capital structure is the cumulative outcome of past financing decisions. Past financing decisions depend strongly on past market valuations. Therefore capital structure depends strongly on past market valuations.

Empirically speaking, the most useful way to summarize past market valuations seems to be the external finance weighted average market-to-book ratio. This is a weighted average of past market-to-book ratios where the weights are the corresponding levels of external finance – equity plus debt. We find that the weighted average is strongly positively related to the equity-to-assets ratio, even controlling for contemporaneous levels of market-to-book. In other words, temporary fluctuations in value can induce permanent changes in capital structure.

The tradeoff and pecking order theories of capital structure offer potential explanations for our main finding, but both theories fail to deliver on key ancillary predictions. An ancillary prediction of the tradeoff theory is that the influence of temporary fluctuations in market-to-book should disappear. However, a very conservative estimate of the half-life of this influence is ten years. An ancillary prediction of the pecking order is that firms only raise external finance when they have plans for the proceeds. However, the extra cash raised when market values are temporarily high increases cash balances to a level that is maintained for at least a decade.

We develop a theory of capital structure based on market timing that offers a realistic explanation of all of these facts. Managers issue equity when they believe it is overvalued and repurchase equity or issue debt when they believe it is undervalued. Since there is no optimal capital structure, managers need not reverse these decisions in later periods when they believe that the firm is correctly valued. This means that temporary fluctuations in valuation have permanent effects on capital structure. Since market-timing gains depend on the amount of overvalued equity issued, managers may issue more equity than they need, storing the excess in cash balances.

Other evidence also points to a market timing theory of capital structure outcomes. For example, the long-run stock returns following equity issues and repurchases suggest that financing decisions are timed to take advantage of temporary mispricing.

It is worth noting, however, that the market timing theory developed here does *not* assume that capital markets actually are inefficient. The only requirement is that managers try to time the market. This proposition is hard to dispute given the survey evidence of Graham and

Harvey (2001). They find that two-thirds of CFOs agree that "the amount by which our stock is undervalued or overvalued was an important or very important consideration" in issuing equity. Market timing appears to be a real and important influence on capital structure outcomes.

VI. References

Asquith, Paul and David W. Mullins, 1986, Equity issues and offering dilution, Journal of Financial Economics 15, 61-89.

Baker, Malcolm and Jeffrey Wurgler, 2000, The equity share in new issues and aggregate stock returns, Journal of Finance 55, 2219-2257.

Barclay, Michael J., Clifford W. Smith, Jr., and Ross L. Watts, 1995, The determinants of corporate leverage and dividend policies, Journal of Applied Corporate Finance 7, 4-19.

Bayless, Mark and Susan Chaplinsky, 1996, Is there a window of opportunity for seasoned equity issuance? Journal of Finance 51, 253-78.

Brav, Alon, and Paul A. Gompers, 1997, Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture capital and nonventure capital-backed companies, Journal of Finance 52, 1791-1822.

Choe, Hyuk, Ronald Masulis, and Vik Nanda, 1993, Common stock offerings across the business cycle: Theory and evidence, Journal of Empirical Finance 1, 1-31.

DeAngelo, Harry, and Ronald Masulis, 1980, Optimal capital structure under corporate and personal taxation, Journal of Financial Economics 8, 3-29.

Eckbo, B. Espen, Ronald A. Masulis, and Oyvind Norli, 2000, Seasoned public offerings: Resolution of the 'new issues puzzle', Journal of Financial Economics 56, 251-292.

Fama, Eugene F., 1998, Market efficiency, long-term returns, and behavioral finance, Journal of Financial Economics 49, 283-306.

Fama, Eugene F., and Kenneth R. French, 2000, Testing tradeoff and pecking order predictions about dividends and debt, working paper, University of Chicago.

Gervais, Simon, J.B. Heaton, and Terrance Odean, 2000, Capital budgeting in the presence of managerial overconfidence and optimism, working paper, University of California at Davis.

Graham, John R., and Campbell R. Harvey, 2001, The theory and practice of corporate finance: Evidence from the field, Journal of Financial Economics 60, forthcoming.

Harris, Milton, and Arthur Raviv, 1991, The theory of capital structure, Journal of Finance 39, 127-145.

Helwege, Jean, and Nellie Liang, 1996, Is there a pecking order? Evidence from a panel of IPO firms, Journal of Financial Economics 40, 429-458.

Ikenberry, David, Josef Lakonishok, and Theo Vermaelen, 1995, Market underreaction to open market share repurchases, Journal of Financial Economics 39, 181-208.

Jensen, Michael C., 1986, Agency costs of free-cash-flow, corporate finance, and takeovers, American Economic Review 76, 323-329.

Jensen, Michael, and William Meckling, 1976, Theory of the firm: managerial behavior, agency costs and ownership structure, Journal of Financial Economics 3, 305-360.

Jung, Kooyul, Yong Cheol Kim, and Rene M. Stulz, 1996, Timing, investment opportunities, managerial discretion, and the security issue decision, Journal of Financial Economics 42, 159-185.

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.

La Porta, Rafael, 1996, Expectations and the cross-section of stock returns, Journal of Finance 51, 1715-1742.

La Porta, Rafael, Josef Lakonishok, Andrei Shleifer, and Robert Vishny, 1997, Good news for value stocks: further evidence on market efficiency, Journal of Finance 52, 859-874.

Lintner, John, 1956, The distribution of incomes among dividends, retained earnings, and taxes, American Economic Review 46, 97-113.

Loughran, Tim, and Jay Ritter, 1995, The new issues puzzle, Journal of Finance 50, 23-51.

Loughran, Tim, Jay Ritter, and Kristian Rydqvist, 1994, Initial public offerings: international insights, Pacific-Basin Finance Journal 2, 165-199.

Marsh, Paul, 1982, The choice between equity and debt: An empirical study, Journal of Finance 37, 121-44.

Miller, Merton H., and Myron S. Scholes, 1978, Dividends and taxes, Journal of Financial Economics 6, 333-364.

Modigliani, Franco, and Merton H. Miller, 1958, The cost of capital, corporation finance, and the theory of investment, American Economic Review 48, 655-669.

Modigliani, Franco, Merton H. Miller, 1963, Corporate income taxes and the cost of capital: A correction, American Economic Review 53, 433-443.

Morck, Randall, Andrei Shleifer, and Robert Vishny, 1990, The stock market and investment: Is the market a sideshow? Brookings Papers on Economic Activity 2, 157-215.

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

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

Myers, Stewart C., and Nicholas S. 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, 27-64.

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

Ritter, Jay, 1991, The long-run performance of initial public offerings, Journal of Finance 42, 365-394.

Shleifer, Andrei, 2000, Inefficient markets: An introduction to behavioral finance, (Oxford UP).

Smith, Clifford W., 1986, Investment banking and the capital acquisition process, Journal of Financial Economics 15, 3-29.

Smith, Clifford W., and Ross L. Watts, The investment opportunity set and corporate financing, dividend, and compensation policies, Journal of Financial Economics 32, 263-292.

Speiss, D. Katherine, and John Affleck-Graves, 1995, Underperformance in long-run stock returns following seasoned equity offerings, Journal of Financial Economics 38, 243-267.

Stein, Jeremy C., 1992, Convertible bonds as backdoor equity financing, Journal of Financial Economics 32, 3-21.

Stein, Jeremy C., 1996, Rational capital budgeting in an irrational world, Journal of Business 69, 429-455.

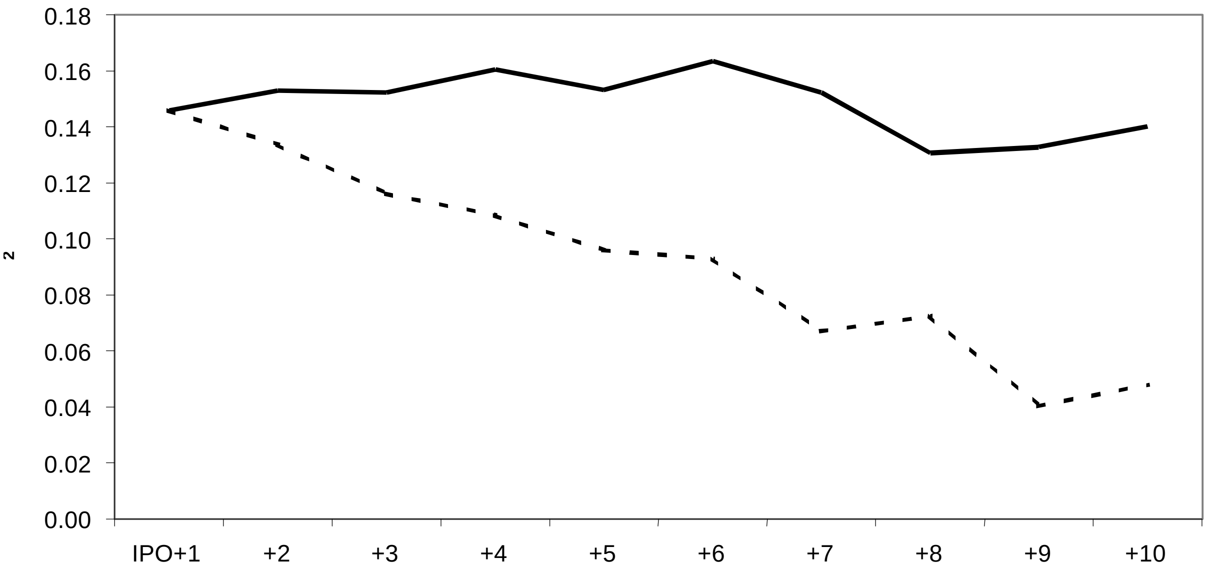
Stigler, George J., 1964, Public regulation of the securities markets, Journal of Business 37, 117-142.

Figure 1. The explanatory power of determinants of capital structure as public corporations age. R-squared for OLS regressions of the equity-to-assets ratio on determinants of capital structure.

$$\left(\frac{E}{A}\right)_{IPO+t} = a + bX_{t-1} + u_t$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. Each determinant of the equity-to-assets ratio is defined in two ways. The dashed line uses the year *t*-1 value. The solid line uses an external finance weighted-average value from the IPO year through year *t*-1. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The market-to-book ratio is defined as assets minus book equity plus market equity all divided by assets. Fixed assets intensity is defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens.

a. *M/B* (dash = *t*-1 value; solid = external finance weighted average of IPO through *t*-1 values)



b. *PPE/A* (dash = *t*-1 value; solid = external finance weighted average of IPO through *t*-1 values)

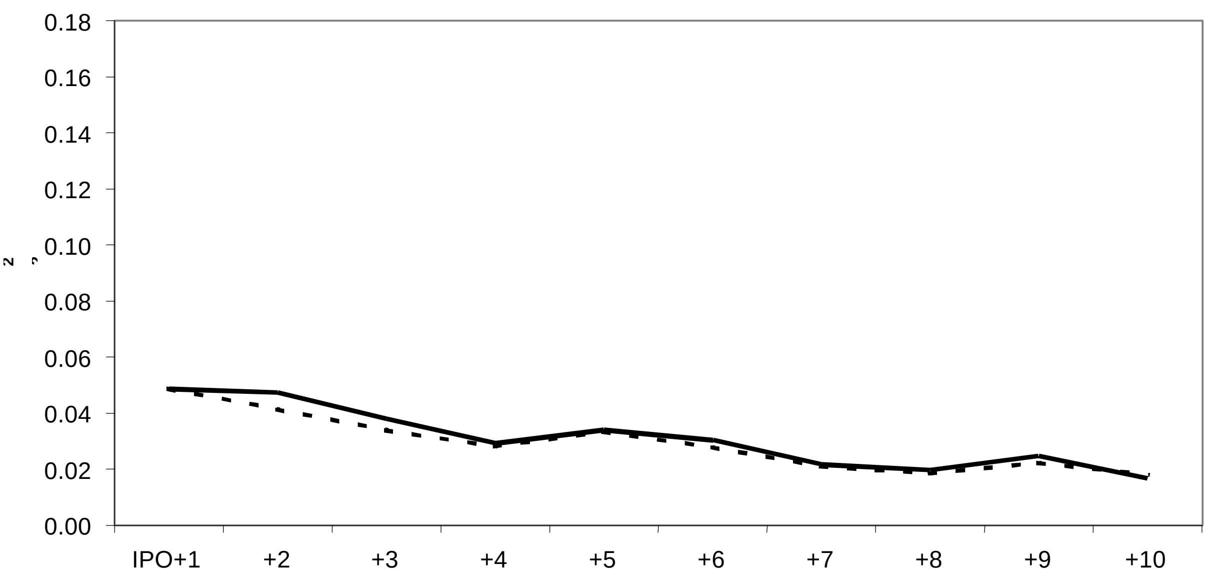
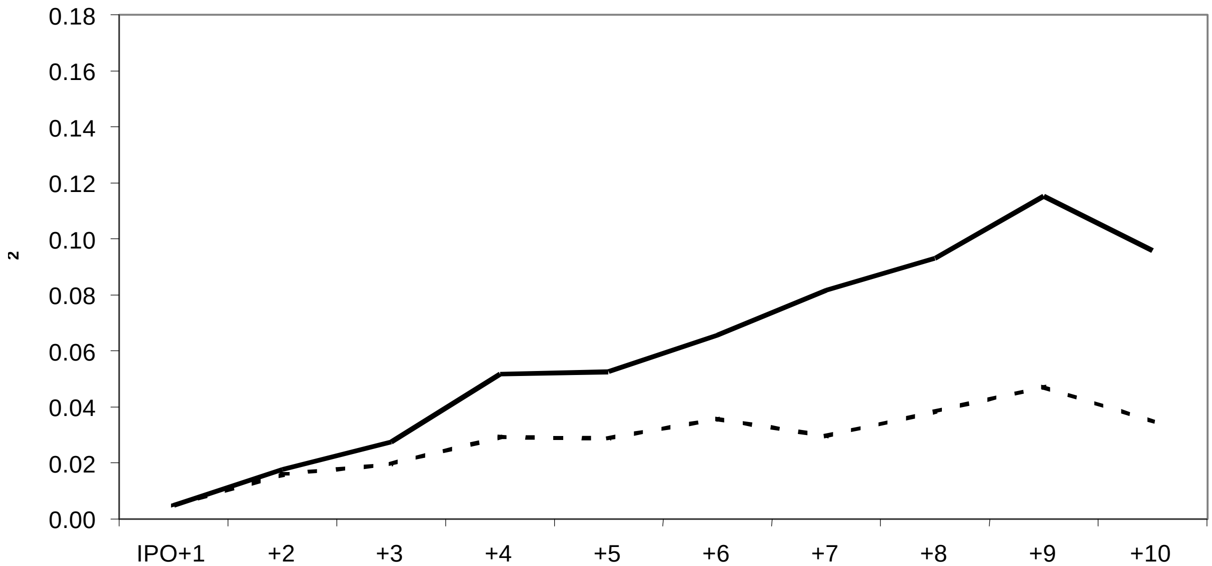


Figure 1 (continued). The explanatory power of determinants of capital structure as public corporations age. R-squared for OLS regressions of the equity-to-assets ratio on determinants of capital structure.

$$\left(\frac{E}{A}\right)_{IPO+t} = a + bX_{t-1} + u_t$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. Each determinant of the equity-to-assets ratio is defined in two ways. The dashed line uses the year *t*-1 value. The solid line uses an external finance weighted-average value from the IPO year through year *t*-1. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The market-to-book ratio is defined as assets minus book equity plus market equity all divided by assets. Fixed assets intensity is defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens.

c. *EBITDA/A* (dash = *t*-1 value; solid = external finance weighted average of IPO through *t*-1 values)



d. *log(S)* (dash = *t*-1 value; solid = external finance weighted average of IPO through *t*-1 values)

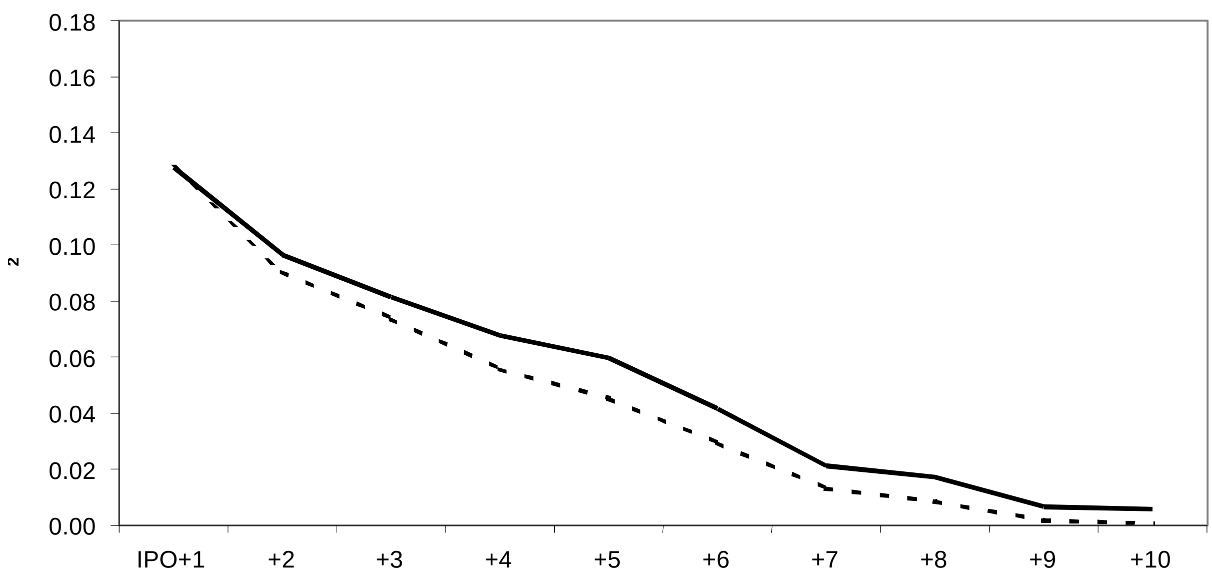


Table 1. Summary statistics of capital structure, investment decisions, and financing decisions. Means and standard deviations of the equity-to-assets ratio, the change in assets, and components of the change in assets. The equity-to-assets ratio is defined as book equity divided by assets. Investment is defined as the change in assets divided by assets. Investment is financed by three sources. Investment financed by new equity issues is defined as the change in book equity minus the change in retained earnings divided by assets. Investment financed by retained earnings is defined as retained earnings divided by assets. (This quantity plus the previous quantity equals the change in the equity-to-assets ratio.) Investment financed by debt issues is defined as the change in debt in current liabilities plus the change in long-term debt divided by assets. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. Panel A shows data in time relative to the IPO. Panel B shows data in calendar time.

		E/A_t (%)		$\Delta A/A_t$ (%)		e/A_t (%)		$(\Delta E\text{-}e)/A_t$ (%)		d/A_t (%)	
Year	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Panel A. IPO time											
IPO + 1	2,354	55.05	(21.85)	20.13	(22.97)	6.86	(15.05)	2.49	(15.02)	10.78	(15.93)
IPO + 2	2,700	54.06	(21.72)	23.05	(23.55)	8.67	(16.26)	4.44	(13.48)	9.95	(15.86)
IPO + 4	1,958	52.98	(21.39)	11.23	(45.34)	3.69	(18.26)	1.81	(15.77)	5.73	(26.61)
IPO + 6	1,362	52.66	(20.67)	8.60	(22.20)	3.22	(11.53)	1.47	(16.33)	3.91	(16.07)
IPO + 8	960	51.91	(20.38)	8.93	(20.66)	1.96	(8.34)	2.68	(13.49)	4.28	(16.51)
IPO + 10	723	51.44	(20.04)	9.71	(20.98)	2.55	(9.95)	2.08	(12.70)	5.08	(15.91)
Panel B. Calendar time											
1970-1974	799	53.28	(17.90)	13.10	(15.51)	1.54	(5.24)	4.49	(6.21)	7.06	(12.43)
1975-1979	1,571	49.49	(17.48)	11.04	(16.06)	0.90	(3.78)	4.50	(6.20)	5.64	(13.40)
1980-1984	1,620	51.86	(18.82)	10.31	(19.01)	2.96	(8.02)	3.20	(9.27)	4.15	(13.19)
1985-1989	2,743	53.91	(20.65)	9.14	(26.61)	2.57	(9.93)	1.93	(12.35)	4.64	(22.12)
1990-1994	4,136	53.84	(20.81)	6.94	(22.84)	2.89	(10.87)	1.27	(13.68)	2.78	(17.16)
1995-1999	6,954	53.02	(21.69)	9.55	(31.38)	4.23	(15.43)	0.33	(17.87)	4.99	(21.77)

Table 2. Summary statistics of potential determinants of capital structure. Means and standard deviations for lagged measures of the market-to-book ratio, fixed assets, profitability, and firm size. The market-to-book ratio is defined as assets minus book equity plus market equity all divided by assets. Fixed assets are defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. Panel A shows data in time relative to the IPO. Panel B shows data in calendar time.

		M/B_{t-1}		PPE/A_{t-1} (%)		$EBITDA/A_{t-1}$ (%)		$log(S)_{t-1}$	
Year	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Panel A. IPO time									
IPO + 1	2,354	2.33	(1.42)	28.54	(22.67)	15.36	(13.69)	4.53	(1.40)
IPO + 2	2,700	2.01	(1.37)	30.91	(23.03)	14.25	(13.88)	4.60	(1.37)
IPO + 4	1,958	1.69	(1.19)	33.00	(23.04)	13.09	(13.28)	4.90	(1.36)
IPO + 6	1,362	1.52	(1.05)	33.65	(22.71)	13.35	(12.34)	5.04	(1.33)
IPO + 8	960	1.43	(0.94)	34.76	(22.85)	13.93	(11.03)	5.10	(1.35)
IPO + 10	723	1.44	(1.05)	35.39	(22.21)	14.51	(11.83)	5.24	(1.35)
Panel B. Calendar time									
1970-1974	799	1.70	(1.15)	35.49	(21.25)	15.82	(9.41)	3.87	(0.83)
1975-1979	1,571	0.99	(0.41)	35.94	(20.70)	16.36	(8.69)	4.35	(0.93)
1980-1984	1,620	1.39	(0.88)	36.52	(20.56)	15.79	(9.34)	4.72	(1.13)
1985-1989	2,743	1.50	(0.84)	34.12	(21.64)	14.17	(11.88)	4.87	(1.28)
1990-1994	4,136	1.64	(1.09)	34.07	(22.86)	13.76	(11.54)	5.22	(1.40)
1995-1999	6,954	1.88	(1.30)	31.52	(23.32)	12.53	(13.81)	5.46	(1.50)

Table 3. Determinants of changes in the equity-to-assets ratio. OLS regressions of changes in the equity-to-assets ratio on the market-to-book ratio, fixed assets, profitability, firm size, and the level of external finance.

$$\left(\frac{\Delta E}{A}\right)_t = a + b\left(\frac{M}{B}\right)_{t-1} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t$$

The change in the equity-to-assets ratio is divided into two components. In Panels A, the change in the equity-to-assets ratio is due to net equity issues, defined as the change in book equity minus the change in retained earnings divided by assets. In Panel B, the change in the equity-to-assets ratio is due to period retained earnings defined as retained earnings divided by assets. The market-to-book ratio is defined as assets minus book equity plus market equity all divided by assets. Fixed assets intensity is defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. T-statistics are shown in braces.

		M/B_{t-1}		PPE/A_{t-1} (%)		$EBITDA/A_{t-1}$ (%)		$log(S)_{t-1}$		
Year	**N**	**b**	**t(b)**	**c**	**t(c)**	**d**	**t(d)**	**e**	**t(e)**	**R^2**
Panel A. Net equity issues (e/A_t)										
IPO + 1	2,354	3.50	[11.17]	0.02	[1.84]	-0.33	[-7.38]	-0.74	[-3.68]	0.19
IPO + 2	2,700	3.06	[11.11]	0.01	[1.15]	-0.24	[-8.56]	-0.94	[-5.44]	0.16
IPO + 4	1,958	3.63	[7.25]	0.01	[0.35]	-0.27	[-4.20]	-0.68	[-2.33]	0.14
IPO + 6	1,362	3.58	[5.43]	0.01	[0.30]	-0.33	[-2.91]	-0.15	[-0.57]	0.17
IPO + 8	960	2.78	[4.84]	0.02	[1.54]	-0.22	[-3.72]	-0.73	[-2.82]	0.13
IPO + 10	723	3.96	[3.89]	0.01	[0.90]	-0.31	[-2.47]	-0.22	[-0.68]	0.23
Panel B. Retained earnings ($(\Delta E\text{-}e)/A_t$)										
IPO + 1	2,354	0.02	[0.07]	-0.01	[-1.37]	0.65	[11.69]	0.75	[3.87]	0.38
IPO + 2	2,700	0.44	[1.83]	-0.01	[-0.94]	0.60	[13.74]	0.61	[3.28]	0.33
IPO + 4	1,958	0.64	[1.11]	0.02	[0.62]	0.44	[5.80]	0.66	[2.86]	0.15
IPO + 6	1,362	-0.60	[-0.84]	-0.01	[-0.47]	0.58	[4.86]	0.44	[1.54]	0.19
IPO + 8	960	0.55	[0.87]	-0.02	[-1.28]	0.45	[5.73]	0.34	[1.03]	0.15
IPO + 10	723	0.17	[0.19]	-0.03	[-1.70]	0.57	[4.90]	0.81	[2.04]	0.26

Table 4. Summary statistics of measures of the market-to-book ratio. Means, standard deviations and pairwise correlations for three measures of the market-to-book ratio. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets.. The second is the maximum market-to-book ratio between the IPO year and year *t*-1. The third is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. Panel A shows data relative to the IPO. Panel B shows calendar time data.

		Summary statistics						**Correlations**					
		M/B_{t-1}		M/B_{max}		M/B_{efwa}		$M/B_{t-1}, M/B_{max}$		$M/B_{t-1}, M/B_{efwa}$		$M/B_{max}, M/B_{efwa}$	
	N	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Corr**	**pval**	**Corr**	**pval**	**Corr**	**pval**
Panel A. IPO time													
IPO + 1	2,354	2.33	(1.42)	2.33	(1.42)	2.33	(1.42)	1.00	(0.00)	1.00	(0.00)	1.00	(0.00)
IPO + 2	2,700	2.01	(1.37)	2.49	(1.64)	2.14	(1.34)	0.85	(0.00)	0.89	(0.00)	0.92	(0.00)
IPO + 4	1,958	1.69	(1.19)	2.66	(1.82)	1.95	(1.20)	0.67	(0.00)	0.74	(0.00)	0.88	(0.00)
IPO + 6	1,362	1.52	(1.05)	2.71	(1.84)	1.83	(1.08)	0.64	(0.00)	0.76	(0.00)	0.86	(0.00)
IPO + 8	960	1.43	(0.94)	2.68	(1.92)	1.69	(1.00)	0.59	(0.00)	0.73	(0.00)	0.83	(0.00)
IPO + 10	723	1.44	(1.05)	2.69	(1.92)	1.63	(0.96)	0.58	(0.00)	0.74	(0.00)	0.83	(0.00)
Panel B. Calendar time													
1970-1974	799	1.70	(1.15)	2.42	(1.58)	1.85	(1.18)	0.76	(0.00)	0.86	(0.00)	0.89	(0.00)
1975-1979	1,571	0.99	(0.41)	2.13	(1.55)	1.24	(0.69)	0.42	(0.00)	0.64	(0.00)	0.81	(0.00)
1980-1984	1,620	1.39	(0.88)	2.27	(1.50)	1.44	(0.87)	0.59	(0.00)	0.89	(0.00)	0.74	(0.00)
1985-1989	2,743	1.50	(0.84)	2.50	(1.60)	1.71	(0.93)	0.56	(0.00)	0.74	(0.00)	0.75	(0.00)
1990-1994	4,136	1.64	(1.09)	2.64	(1.79)	1.82	(1.05)	0.62	(0.00)	0.77	(0.00)	0.79	(0.00)
1995-1999	6,954	1.88	(1.30)	2.96	(1.91)	2.09	(1.23)	0.68	(0.00)	0.78	(0.00)	0.85	(0.00)

Table 5. Capital structure and the market-to-book ratio. OLS regressions of the equity-to-assets ratio on the market-to-book ratio.

$$\left(\frac{E}{A}\right)_{IPO+t} = a + b\left(\frac{M}{B}\right) + u_t$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. The market-to-book ratio is defined in three ways. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets.. The second is the maximum market-to-book ratio from the IPO year to year *t*-1. The third is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. Time *t* is defined relative to the IPO. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. T-statistics are shown in braces.

		M/B_{t-1}			M/B_{max}			M/B_{efwa}		
Year	**N**	**b**	**t(b)**	$\mathbf{R^2}$	**b**	**t(b)**	$\mathbf{R^2}$	**b**	**t(b)**	$\mathbf{R^2}$
IPO + 1	2,354	5.87	[20.18]	0.15	5.87	[20.18]	0.15	5.87	[20.18]	0.15
IPO + 2	2,700	5.80	[18.85]	0.13	4.94	[16.04]	0.14	6.35	[20.19]	0.15
IPO + 3	2,356	5.89	[15.74]	0.12	4.47	[12.49]	0.14	6.55	[16.85]	0.15
IPO + 4	1,958	5.93	[13.38]	0.11	4.35	[12.94]	0.14	7.13	[17.40]	0.16
IPO + 5	1,645	5.48	[11.34]	0.10	4.27	[12.15]	0.14	7.03	[15.12]	0.15
IPO + 6	1,362	6.00	[11.26]	0.09	4.11	[10.34]	0.13	7.73	[15.73]	0.16
IPO + 7	1,141	5.07	[10.77]	0.07	3.84	[9.66]	0.12	7.61	[14.03]	0.15
IPO + 8	960	5.85	[8.40]	0.07	3.36	[7.17]	0.10	7.37	[9.92]	0.13
IPO + 9	807	4.40	[4.43]	0.04	2.82	[4.94]	0.07	8.17	[10.90]	0.13
IPO + 10	723	4.19	[4.93]	0.05	3.39	[7.29]	0.11	7.82	[8.97]	0.14
IPO + (1-5)	11,013	5.79	[15.90]	0.12	4.78	[14.76]	0.14	6.59	[17.95]	0.15
IPO + (6-10)	4,993	5.10	[7.96]	0.06	3.50	[7.88]	0.11	7.74	[11.91]	0.14

Table 6. Determinants of capital structure. OLS and Fama-MacBeth regressions of the equity-to-assets ratio on the market-to-book ratio, fixed assets, profitability, and firm size.

$$\left(\frac{E}{A}\right)_t = a + b_1\left(\frac{M}{B}\right)_{t-1} + b_2\left(\frac{M}{B}\right)_{efwa} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. The market-to-book ratio is defined in two ways. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets. The second is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. Fixed assets intensity is defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. Panel A shows data relative to the IPO. Panel B shows calendar time data. T-statistics are shown in braces.

		M/B_{t-1}		M/B_{efwa}		PPE/A_{t-1} (%)		$EBITDA/A_{t-1}$ (%)		$log(S)_{t-1}$		
Year	**N**	b_1	$t(b_1)$	b_2	$t(b_2)$	**c**	**t(c)**	**d**	**t(d)**	**e**	**t(e)**	R^2
Panel A. IPO time												
IPO + 2	2,700	0.59	[1.08]	4.40	[7.83]	-0.12	[-7.12]	0.29	[8.08]	-5.28	[-18.38]	0.27
IPO + 4	1,958	0.53	[0.80]	5.84	[10.01]	-0.11	[-5.62]	0.31	[6.87]	-4.61	[-14.29]	0.26
IPO + 6	1,362	-0.44	[-0.59]	7.53	[10.85]	-0.12	[-5.19]	0.33	[6.70]	-4.02	[-10.83]	0.26
IPO + 8	960	-0.25	[-0.23]	7.14	[6.82]	-0.11	[-4.03]	0.40	[5.66]	-2.97	[-6.51]	0.20
IPO + 10	723	-3.09	[-2.52]	9.95	[8.06]	-0.11	[-3.34]	0.35	[4.67]	-1.99	[-3.55]	0.20
Panel B. Calendar time												
1980-1989	4,363	-2.51	[-2.10]	8.92	[13.49]	-0.11	[-6.49]	0.52	[5.67]	-2.01	[-15.52]	0.26
1990-1999	11,090	-0.37	[-1.15]	6.01	[13.50]	-0.08	[-5.61]	0.32	[16.75]	-3.67	[-16.44]	0.22
1980-1999	15,453	-1.44	[-2.21]	7.46	[14.59]	-0.10	[-8.41]	0.42	[8.18]	-2.84	[-12.42]	0.24

Table 7. Determinants of capital structure. OLS and Fama-MacBeth regressions of the equity-to-assets ratio on the market-to-book ratio, fixed assets, profitability, and firm size.

$$\left(\frac{E}{A}\right)_t = a + b_1\left(\frac{M}{B}\right)_{t-1} + b_2\left(\frac{M}{B}\right)_0 + b_3\left(\frac{M}{B}\right)_{efwa} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t$$

We only report b_3. The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. The market-to-book ratio is defined in three ways. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets. The second is the market-to-book ratio in the IPO year. The third is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. Fixed assets intensity is defined as net property, plant, and equipment divided by assets. Profitability is defined as operating income before depreciation divided by assets. Firm size is defined as the log of net sales. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens. Panel A shows data relative to the IPO. Panel B shows calendar time data. T-statistics are shown in braces.

	M/B_{efwa} controlling for M/B_{t-1}				M/B_{efwa} controlling for M/B_0				M/B_{efwa} controlling for both			
Year	**N**	**b_3**	**$t(b_3)$**	**R^2**	**N**	**b_3**	**$t(b_3)$**	**R^2**	**N**	**b_3**	**$t(b_3)$**	**R^2**
Panel A. IPO time												
IPO + 2	2,700	4.40	[7.83]	0.27	2,430	5.29	[9.22]	0.27	2,430	4.56	[5.61]	0.27
IPO + 4	1,958	5.84	[10.01]	0.26	1,668	6.71	[10.96]	0.28	1,668	6.84	[7.84]	0.28
IPO + 6	1,362	7.53	[10.85]	0.26	1,125	7.35	[11.10]	0.26	1,125	8.02	[8.68]	0.26
IPO + 8	960	7.14	[6.82]	0.20	749	6.21	[6.98]	0.21	749	5.86	[4.63]	0.21
IPO + 10	723	9.95	[8.06]	0.20	551	6.88	[7.10]	0.21	551	10.51	[7.15]	0.23
Panel B. Calendar time												
1980-1989	4,363	8.92	[13.49]	0.26	3,151	6.18	[13.74]	0.29	3,151	7.61	[17.10]	0.29
1990-1999	11,090	6.01	[13.50]	0.24	9,438	5.44	[17.84]	0.27	9,438	5.64	[10.47]	0.27
1980-1999	15,453	7.46	[14.59]	0.22	12,589	5.81	[20.91]	0.25	12,589	6.62	[16.21]	0.25

Table 8. Robustness checks. OLS and Fama-MacBeth regressions of the equity-to-assets ratio on the market-to-book ratio, fixed assets, profitability, and firm size. Other independent variables are included as indicated.

$$\left(\frac{E}{A}\right)_t = a + b_1\left(\frac{M}{B}\right)_{t-1} + b_2\left(\frac{M}{B}\right)_0 + b_3\left(\frac{M}{B}\right)_{efwa} + c\left(\frac{PPE}{A}\right)_{t-1} + d\left(\frac{EBITDA}{A}\right)_{t-1} + e\log(S)_{t-1} + u_t$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. The market-to-book ratio is defined in three ways. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets. The second is the market-to-book ratio in the IPO year. The third is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. There are four types of robustness checks described in the text. The first set (market value *E/A*) use alternative variable definitions. The second set (SIC-3 dummies, IPO year dummies, Five *EBITDA/A* lags, Fama-French (2000) controls) add additional controls. The third set (outliers included, mature firms included) use larger initial samples. The fourth set (Tobit) uses an alternative estimation approach. Panel A shows data for a set of firms that went public eight years earlier. Panel B shows calendar time data for the full sample. T-statistics are shown in braces.

	M/B_{efwa} controlling for M/B_{t-1}				*M/B_{efwa} controlling for M/B_0*				*M/B_{efwa} controlling for both*			
Year	**N**	**b_3**	**$t(b_3)$**	**R^2**	**N**	**b_3**	**$t(b_3)$**	**R^2**	**N**	**b_3**	**$t(b_3)$**	**R^2**
Panel A. IPO time: IPO + 8 years												
Market Value *E/A*	980	8.63	[7.15]	0.36	767	12.95	[9.21]	0.33	767	7.55	[4.90]	0.36
SIC-3 Dummies	960	5.06	[4.36]	0.43	749	4.68	[4.10]	0.45	749	3.96	[2.60]	0.45
IPO Year Dummies	960	6.23	[5.41]	0.24	749	5.36	[5.46]	0.24	749	4.61	[3.29]	0.24
Five *EBITDA/A* Lags	939	7.13	[6.24]	0.15	744	5.99	[6.38]	0.14	744	5.76	[3.98]	0.14
FF (2000) Controls	960	6.16	[5.76]	0.24	749	5.84	[5.74]	0.24	749	4.92	[3.65]	0.24
Outliers Included	964	7.20	[7.27]	0.20	753	5.78	[7.24]	0.21	753	5.87	[4.96]	0.21
Mature Firms Included	2,682	5.91	[8.62]	0.17	1,660	4.54	[6.07]	0.18	1,660	6.27	[5.80]	0.18
Tobit	960	7.14	[8.31]	-	749	6.21	[7.40]	-	749	5.86	[5.02]	-
Panel B. Calendar time: 1979-1998												
Market Value *E/A*	15,970	6.46	[15.17]	0.38	13,048	11.07	[26.61]	0.39	13,048	5.17	[9.39]	0.41
SIC-3 Dummies	15,453	5.99	[14.80]	0.51	12,589	4.29	[13.46]	0.54	12,589	5.41	[12.74]	0.55
IPO Year Dummies	15,453	7.63	[14.80]	0.25	12,589	6.04	[18.67]	0.28	12,589	6.98	[15.76]	0.29
Five *EBITDA/A* Lags	9,277	7.41	[13.56]	0.24	7,189	5.75	[9.01]	0.25	7,189	6.67	[10.50]	0.25
FF (2000) Controls	15,430	6.61	[13.95]	0.29	12,569	4.90	[20.45]	0.30	12,569	5.54	[16.91]	0.30
Outliers Included	15,520	7.23	[13.32]	0.22	12,650	5.28	[19.33]	0.24	12,650	6.23	[14.53]	0.25
Mature Firms Included	36,567	7.35	[21.12]	0.18	23,266	5.38	[18.59]	0.19	23,266	6.78	[18.10]	0.19
Tobit	15,453	7.46	[14.59]	-	12,589	5.81	[20.91]	-	12,589	6.62	[16.21]	-

Table 9. Temporary changes in the market-to-book ratio and the long-run effect on capital structure. Fama-MacBeth regressions of current and future equity-to-assets ratios on the market-to-book ratio, fixed assets, profitability, and firm size.

$$\left(\frac{E}{A}\right)_{t+1} = a_1 + b_{11}\left(\frac{M}{B}\right)_t + b_{21}\left(\frac{M}{B}\right)_{efwa,t} + c_1\left(\frac{PPE}{A}\right)_t + d_1\left(\frac{EBITDA}{A}\right)_t + e_1 \log(S)_t + u_{1,t+1}$$

$$\left(\frac{E}{A}\right)_{t+t} = a_2 + b_{12}\left(\frac{M}{B}\right)_t + b_{22}\left(\frac{M}{B}\right)_{efwa,t} + c_2\left(\frac{PPE}{A}\right)_t + d_2\left(\frac{EBITDA}{A}\right)_t + e_2 \log(S)_t + u_{2,t+t}$$

$$\left(\frac{E}{A}\right)_{t+t} = a_3 + b_{13}\left(\frac{M}{B}\right)_{t+t-1} + b_{23}\left(\frac{M}{B}\right)_{efwa,t} + c_3\left(\frac{PPE}{A}\right)_{t+t-1} + d_3\left(\frac{EBITDA}{A}\right)_{t+t-1} + e_3 \log(S)_{t+t-1} + u_{3,t+t}$$

The equity-to-assets ratio is defined as book equity divided by total assets expressed in percentage terms. The persistence of the market-to-book effect is measured by a ratio of coefficients: b_{22} divided by b_{21} or b_{23} divided by b_{21}. For each t from 1 to 10, we run a set of three regressions for each year t starting t years prior to 1980 and ending s years prior to 1999 and record 20 sets of three coefficients. Only firms that survive t years are included so that each set of coefficients is calculated with the same sample of firms. A lower bound estimate (LB) for the ratio of the coefficients is calculated for the five-percent level of significance by drawing from the joint distribution of the two means.

	$M/B_{efwa,t}$ effect on E/A						*M/B_{t+t-1} effect on E/A*		*Coefficient ratios and lower bounds*			
Year	**b_{21}**	**$t(b_{21})$**	**b_{22}**	**$t(b_{22})$**	**b_{23}**	**$t(b_{23})$**	**b_{13}**	**$t(b_{13})$**	**b_{22}/b_{21}**	**$LB_{p=0.05}$**	**b_{23}/b_{21}**	**$LB_{p=0.05}$**
t+1	7.46	[14.59]	7.46	[14.59]	7.46	[14.59]	-1.44	[-2.21]	1.00	-	1.00	-
t+2	7.58	[13.26]	6.86	[10.97]	6.10	[16.91]	0.28	[0.52]	0.90	0.86	0.81	0.75
t+3	7.73	[14.41]	6.45	[10.91]	5.86	[14.13]	0.83	[1.78]	0.83	0.78	0.76	0.70
t+4	7.71	[14.09]	6.04	[10.35]	5.85	[12.93]	0.93	[1.95]	0.78	0.72	0.76	0.68
t+5	7.73	[14.45]	6.21	[11.56]	5.73	[12.55]	1.20	[2.55]	0.80	0.74	0.75	0.66
t+6	7.69	[13.84]	6.10	[10.95]	5.75	[11.29]	0.96	[1.85]	0.79	0.73	0.75	0.65
t+7	7.60	[15.77]	5.90	[12.46]	5.54	[11.94]	1.31	[2.44]	0.78	0.70	0.74	0.64
t+8	7.40	[16.15]	5.77	[9.79]	5.37	[13.71]	1.26	[2.01]	0.78	0.68	0.73	0.63
t+9	7.45	[15.40]	5.20	[8.20]	5.17	[17.10]	1.29	[1.76]	0.70	0.57	0.69	0.59
t+10	7.56	[15.80]	4.68	[9.05]	5.08	[20.70]	1.24	[1.50]	0.62	0.51	0.67	0.59

Table 10. Temporary changes in the market-to-book ratio and the long-run effect on cash balances. Fama-MacBeth regressions of current and future cash ratios on the market-to-book ratio, fixed assets, profitability, and firm size.

$$\left(\frac{C}{A}\right)_{t+1} = a_1 + b_{11}\left(\frac{M}{B}\right)_t + b_{21}\left(\frac{M}{B}\right)_{efwa,t} + c_1\left(\frac{PPE}{A}\right)_t + d_1\left(\frac{EBITDA}{A}\right)_t + e_1 \log(S)_t + u_{1,t+1}$$

$$\left(\frac{C}{A}\right)_{t+t} = a_2 + b_{12}\left(\frac{M}{B}\right)_t + b_{22}\left(\frac{M}{B}\right)_{efwa,t} + c_2\left(\frac{PPE}{A}\right)_t + d_2\left(\frac{EBITDA}{A}\right)_t + e_2 \log(S)_t + u_{2,t+t}$$

$$\left(\frac{C}{A}\right)_{t+t} = a_3 + b_{13}\left(\frac{M}{B}\right)_{t+t-1} + b_{23}\left(\frac{M}{B}\right)_{efwa,t} + c_3\left(\frac{PPE}{A}\right)_{t+t-1} + d_3\left(\frac{EBITDA}{A}\right)_{t+t-1} + e_3 \log(S)_{t+t-1} + u_{3,t+t}$$

The cash ratio is defined as cash and short-term investments divided by total assets expressed in percentage terms. The persistence of the market-to-book effect is measured by a ratio of coefficients: b_{22} divided by b_{21} or b_{23} divided by b_{21}. For each t from 1 to 10, we run a set of three regressions for each year t starting s years prior to 1980 and ending s years prior to 1999 and record 20 sets of three coefficients. Only firms that survive t years are included so that each set of coefficients is calculated with the same sample of firms. A lower bound estimate (LB) for the ratio of the coefficients is calculated for the five-percent level of significance by drawing from the joint distribution of the two means.

	$M/B_{efwa,t}$ effect on C/A						*Coefficient ratios and lower bounds*			
Year	**b_{21}**	**$t(b_{21})$**	**b_{22}**	**$t(b_{22})$**	**b_{23}**	**$t(b_{23})$**	**b_{22}/b_{21}**	**$LB_{p=0.05}$**	**b_{23}/b_{21}**	**$LB_{p=0.05}$**
t+1	2.79	[8.09]	2.79	[8.09]	2.79	[8.09]	1.00	-	1.00	-
t+2	2.47	[6.50]	2.76	[10.02]	2.56	[9.57]	1.12	0.96	1.03	0.81
t+3	2.20	[5.44]	2.44	[7.56]	2.33	[7.58]	1.11	0.91	1.05	0.77
t+4	1.87	[4.24]	1.98	[4.85]	2.21	[7.51]	1.06	0.79	1.20	0.88
t+5	1.85	[4.17]	1.73	[3.73]	2.11	[7.08]	0.93	0.58	1.15	0.83
t+6	1.68	[4.01]	1.43	[2.54]	1.93	[5.53]	0.85	0.35	1.13	0.74
t+7	1.56	[3.27]	1.49	[3.04]	1.80	[4.74]	0.95	0.54	1.13	0.70
t+8	1.33	[2.76]	1.51	[3.14]	1.72	[4.25]	1.14	0.71	1.31	0.78
t+9	1.28	[2.60]	1.36	[2.70]	1.77	[4.09]	1.06	0.55	1.39	0.75
t+10	1.19	[2.46]	1.20	[2.65]	1.58	[3.72]	1.01	0.46	1.36	0.63

Table 11. Temporary changes in the market-to-book ratio and the long-run effect on investment. Fama-MacBeth regressions of current and future investment on the market-to-book ratio.

$$\frac{\Delta(A-C)_{t+t}}{(A-C)_{t+t-1}} = a_3 + b_1\left(\frac{M}{B}\right)_{t+t-1} + b_2\left(\frac{M}{B}\right)_{efwa,t} + u_{t+t}$$

Investment is defined as the change in non-cash assets divided by lagged non-cash assets expressed in percentage terms. The market-to-book ratio is defined in two ways. The first is the market-to-book ratio in year *t*-1, defined as assets minus book equity plus market equity all divided by assets. The second is a weighted average market-to-book ratio from the IPO year to year *t*-1. The weights are the amount of external finance raised in each year. External finance is defined as net equity issues plus net debt issues. Where this is negative, the weight is set to zero. The full sample includes 17,823 firm-year observations that satisfy known IPO date, data availability, non-financial industry, asset, and market-to-book screens.

		M/B_{t-1}		M/B_{efwa}		
Year	**N**	**b_1**	**$t(b_1)$**	**b_2**	**$t(b_2)$**	**R^2**
t+1	15,299	14.67	[12.45]	-3.49	[-5.03]	0.10
t+2	12,755	13.39	[12.92]	-3.43	[-7.46]	0.09
t+3	10,715	13.60	[11.61]	-2.74	[-5.10]	0.09
t+4	9,075	12.69	[9.97]	-2.40	[-5.68]	0.08
t+5	7,744	12.72	[8.93]	-2.07	[-3.40]	0.08
t+6	6,669	11.92	[8.68]	-1.76	[-3.29]	0.08
t+7	5,805	11.68	[8.24]	-2.00	[-3.66]	0.07
t+8	5,040	12.05	[7.83]	-2.08	[-3.78]	0.08
t+9	4,376	12.22	[7.12]	-1.82	[-4.36]	0.09
t+10	3,773	11.18	[6.41]	-1.15	[-1.88]	0.08