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Are Observed Capital Structures Determined by Equity Market Timing?

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Abstract

Contrary to Baker and Wurgler (2002), I find that the importance of historical average market-to-book ratios in leverage regressions is not due to past equity market timing. Although equity transactions may be timed to equity market conditions, they do not have significant long lasting effects on capital structure. Debt transactions exhibit timing patterns that are unlikely to induce a negative relation between market-to-book ratios and leverage. I also find that historical average market-to-book ratios have significant effects on current financing and investment decisions, implying that they contain information about growth opportunities not captured by current market-to-book ratios.

I. Introduction

Traditional theories of corporate financing explain firms' financing choices as either the result of the fundamental trade-offs between various costs and benefits of debt and equity (Modigliani and Miller (1963), Jensen and Meckling (1976), Myers (1977), Stulz (1990), Hart and Moore (1995), and Ross (1977)) or as the result of the pecking order in which firms prefer internal funds, then external debt, and, only as a last resort, external equity financing (Myers and Majluf (1984)).

The existing empirical evidence on capital structure is mixed. On one hand, studies of determinants of debt ratios generally support the notion that firms strive to maintain target capital structures. For example, observed leverage ratios relate to firm characteristics such as size, growth opportunities, collateral (liquidation) value of assets, and the marginal tax rate in a manner consistent with the predictions of trade-off theories.[1] The trade-off hypothesis is also supported by studies that report that the deviation from target leverage is an important determinant of the issuing (repurchasing) firm's debt/equity choice.[2] On the other hand, Shyam-

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[1] See, for example, Titman and Wessels (1988), Rajan and Zingales (1995), Graham (1996), and Chang and Dasgupta (2003).

[2] See, for example, Marsh (1982), Jalilvand and Harris (1984), Bayless and Chaplinsky (1990), MacKie-Mason (1990), and Hovakimian, Opler, and Titman (2001).

Sunder and Myers (1999) report that a simple pecking order model outperforms the target adjustment model in explaining the time-series variation in debt ratios.

Baker and Wurgler's (2002) recent study questions the ability of the traditional theories to explain the observed corporate capital structures. They report that historical market-to-book ratios, averaged using a weighting scheme where market-to-book ratios in years with higher external financing receive higher weights, have a statistically and economically significant impact on current capital structure. The authors argue that neither the trade-off nor the pecking order theory is consistent with the negative effect of long past market-to-book ratios on firm leverage. Instead, they contend that firms time their net equity issues to equity market conditions, and that the changes in capital structure induced by these issues persist because firms do not care to adjust their debt ratios toward the target in subsequent years. As a result, observed capital structures reflect the cumulative outcome of timing the equity market.

This paper does not question Baker and Wurgler's (2002) empirical results, but instead develops new evidence that allows the re-evaluation of their conclusions about firm behavior and capital structure policy. Specifically, I focus on the claim that the significant negative effect of historical market-to-book ratios on leverage reflects the long-term impact of past attempts to time the equity market.

I find no convincing evidence that equity market timing is responsible for the strong negative effect of long past market-to-book ratios on leverage. While my results suggest that equity issues are timed to periods of high market-to-book ratios, I also find that the effect of equity issues on leverage is economically small and short-lived. Equity repurchasers' timing patterns and their impact on leverage are even weaker. Debt issues have a significant long lasting effect on capital structure, but their timing is unlikely to induce a negative relation between the market-to-book ratio and leverage. Debt reductions also have a significant effect on leverage, but the changes in the market-to-book ratio around debt reductions are opposite to what the equity market timing implies and may induce a positive rather than a negative relation between the market-to-book ratio and leverage.

My results also show that cross-sectional differences in market-to-book ratios of firms issuing and repurchasing debt and equity dwarf the changes in market-to-book ratios experienced by these firms over time. Furthermore, these cross-sectional differences show strong persistence in time. For example, equity issuers' market-to-book ratios are significantly higher than debt issuers' ratios long before and long after the transaction. These results imply that the negative effect of market-to-book ratios on leverage and on the probability of debt versus equity choice documented in numerous earlier studies is primarily a cross-sectional rather than a time-series phenomenon and, therefore, is more likely to reflect cross-sectional differences in growth opportunities than market timing.[3]

I discuss and test an alternative hypothesis that the historical weighted average market-to-book ratio is related to target leverage because it contains information about growth opportunities not captured by the current market-to-book ratio. First, I find that the effect of the weighted average of past market-to-book ratios

[3]Myers (1977), Smith and Watts (1992), and Barclay, Smith, and Watts (1995) argue that firms with good growth opportunities (high market-to-book ratios) should have low target debt ratios to minimize the expected costs of underinvestment associated with debt overhang.

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on leverage remains significantly negative even after controlling for the cumulative effect of past net debt and net equity issues. This result is not consistent with the market timing hypothesis as, given the amounts of debt and equity issued in the past, the timing of these financing transactions should have no effect on the resulting leverage ratio. In contrast, if the weighted average market-to-book ratio is a measure of growth opportunities then its impact on observed debt ratios should remain negative regardless of past financing activity.

In addition, firms with a higher weighted average of past market-to-book ratios are more likely to issue equity in the current period, while firms with a lower weighted average of past market-to-book ratios are more likely to issue debt in the current period. I also find that higher historical weighted average market-to-book ratios are associated with higher current capital expenditures and higher current research and development expenses. These results are consistent with the hypothesis that the importance of historical weighted average market-to-book ratios are due to their association with current growth opportunities. If the negative relation between historical weighted average market-to-book ratios and current capital structure simply reflects past market timing, then historical weighted average market-to-book ratios should have no effect on current financing and investment decisions, once I control for the pre-decision leverage, market-to-book ratios, and other relevant factors. If, however, the importance of the historical weighted average market-to-book ratio is due to its association with current growth opportunities, then it should have a significant impact on current decisions.

I also show that a negative effect on current leverage, change in leverage, and debt versus equity issue choice can be obtained using a weighted average market-to-book ratio based on future rather than past market-to-book ratios and external financing. These results are consistent with the hypothesis that both the historical average and the average of future market-to-book ratios are proxies for long-term growth opportunities that change slowly over time. The results are not consistent with the hypothesis that the negative link between the weighted average market-to-book ratio and leverage is due to equity market timing since future market timing should have no direct effect on current leverage and current decisions to change the leverage.

Other recent studies reach similar conclusions. Welch (2004) shows that the patterns of equity issue timing practically disappear once dividend payments are subtracted from equity issues. Leary and Roberts (2005) find that the effect of an equity issue on leverage is erased within two to four years after the issue. They also find that the effect of external finance weighted average market-to-book ratios is higher for firms with higher security issuance/repurchase costs and conclude that the persistent effects of past market-to-book ratios on leverage are consistent with a dynamic optimizing behavior in the presence of leverage adjustment costs. Kayhan and Titman (2005) decompose Baker and Wurgler's (2002) market timing measure into a short-term component capturing yearly timing of financing transactions and a long-term component capturing the persistence in market-to-book ratios. They find that their yearly timing measure has a relatively weak and short-term effect on observed debt ratios and that the results in Baker and Wurgler (2002) are driven by the persistence in market-to-book ratios rather than timing.

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This study makes a number of distinct contributions that differentiate it from the studies cited above. First, the paper examines in detail the timing patterns of different types of corporate financing transactions and the interaction of the timing patterns with changes in leverage these transactions induce. This analysis allows me to conclude that only equity issues exhibit strong market timing patterns and that overall equity market timing is unlikely to induce a strong long lasting negative relation between market-to-book ratios and leverage.

Another contribution of the paper is that I extensively test and find support for an alternative hypothesis that historical weighted average market-to-book ratios are related to target leverage because they contain information about growth opportunities not captured by the current market-to-book ratio. Though Kayhan and Titman (2005) also discuss this hypothesis, they do not test it directly. Finally, the results about the effects of historical market-to-book ratios on current financing and investment decisions, developed in the course of testing this hypothesis, are new and interesting in their own right.

The paper proceeds as follows. Section II describes the data and variables, and replicates Baker and Wurgler's (2000) main results. Section III examines whether external financing transactions have long lasting effects on capital structure and whether these transactions are timed to equity market conditions. Section IV tests the hypothesis that the effects of the weighted average market-to-book ratios on leverage regressions are driven by their association with growth opportunities. Section V summarizes the findings.

II. Capital Structure and Past Market Valuations: Baseline Results

A. Variable Definitions and Baker-Wurgler Leverage Regressions

Before proceeding to the main tests, I first replicate the principal development from Baker and Wurgler (2002) on my sample. Table 1 presents results from the following ordinary least squares (OLS) regression of leverage with robust *t*-statistics reflecting standard errors adjusted for heteroskedasticity and clustering,[4]

$$\text{Leverage}_t = \alpha_0 + \alpha_1 \text{SIZE}_{t-1} + \alpha_2 \text{TNG}_{t-1} + \alpha_3 \text{PRF}_{t-1} + \alpha_4 \text{MB}_{t-1} + \alpha_5 \text{EFWAMB}_{t-1} + \varepsilon_t. \quad (1)$$

In (1), the dependent variable leverage is defined as debt over total assets (Compustat Annual Item 6), where debt is defined as (long-term debt (Item 9) + short-term debt (Item 34)). The independent variables include firm characteristics such as size,[5] asset tangibility (TNG),[6] profitability (PRF),[7] and market-to-book (MB),[8] which are used in numerous studies to proxy for factors believed to affect the corporate capital structure choice. The final variable, external finance

[4]The results are similar when Tobit regressions with double censoring are used.

[5]Firm size is measured as the natural logarithm of sales (Item 12).

[6]Asset tangibility is measured as net property, plant, and equipment (Item 8)/total assets.

[7]Profitability is measured as EBITDA (Item 13)/total assets.

[8]MB is defined as (total assets (Item 6)−book value of equity+market value of equity)/total assets, where market value of equity is (price (Item 25)×shares outstanding (Item 199)) and book value of equity is (total assets−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)).

weighted average market-to-book (EFWAMB), is introduced in Baker and Wurgler (2002) as a proxy for past equity market timing. It is defined as

$$\text{EFWAMB}_t = \sum_{s=1}^{t-1} \frac{e_s + d_s}{\sum_{r=1}^{t-1} e_r + d_r} \times \text{MB}_s, \quad (2)$$

where e and d denote net equity and net debt issued, respectively.[9] Net equity issued is defined as (change in book equity−change in retained earnings (Item 36)). Net debt issued is defined as change in debt. Following Baker and Wurgler (2002), negative weights in equation (2) are reset to zero.

TABLE 1

Determinants of Leverage

Variable	Coeff.	*t*-Stat.
Intercept	0.234**	31.1
Size	0.010**	9.4
Tangibility	0.200**	24.9
Profitability	−0.195**	−14.3
Market-to-Book	−0.007**	−4.5
EFWAMB	−0.042**	−20.1
R^2	0.176	
No. of Obs.	56,259	

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Size is the natural logarithm of sales (Item 12). Tangibility is measured as net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average market-to-book ratio. Robust *t*-statistics reflect standard errors adjusted for heteroskedasticity and clustering. Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively.

For a firm observed at time t, the EFWAMB is the weighted average of a time series of past market-to-book ratios, starting with the first observation available in the sample and ending with the market-to-book ratio at $(t-1)$. The weight for each year is the ratio of external financing in that year to the total external financing raised by the firm in years (1) through $(t-1)$. Thus, firms that issue securities when their market-to-book ratios are relatively high will tend to have high values of the EFWAMB.

Regression (1) is a replica of Baker and Wurgler's (2002) leverage regression in calendar time (Table III, Panel A, "All firms" row). However, my definition of debt is different from Baker and Wurgler's (2002) definition in two important ways.[10] First, I treat convertible debt as debt rather than as equity. Unlike Baker and Wurgler, most studies of capital structure (e.g., Fama and French (2002), Rajan and Zingales (1995)) include convertible debt in their measures of leverage. Also, Baker and Wurgler's treatment of convertible debt is not consistent as they add convertible debt into the book value of equity but not into the market value of equity and, therefore, artificially reduce the market-to-book ratios of firms with convertibles.

[9] $s = 1$ and $r = 1$ denote the first year the firm appears in the sample.

[10] Baker and Wurgler (2002) define debt as (total liabilities (Item 181)+preferred stock (Item 10)−deferred taxes (Item 35)−convertible debt (Item 79)).

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Second, my definition of debt excludes all other non-debt liabilities as in Rajan and Zingales (1995), who argue that a leverage ratio that includes total liabilities is not a good indicator of whether the firm is at risk of default in the near future, and that items like accounts payable are used for transactions purposes rather than for financing. Also, a significant portion of this paper is devoted to the analysis of debt and equity issues and repurchases. Studies that examine debt issues (e.g., Korajczyk and Levy (2003), Leary and Roberts (2005)) do not include non-debt liabilities in their analysis.

Overall, the results in Table 1 are similar to those in Baker and Wurgler (2002). Most importantly, the EFWAMB has a statistically significant negative effect on the observed debt ratio. Baker and Wurgler interpret this result as implying that observed capital structures reflect the cumulative outcome of past attempts to time the equity market. Other results are also consistent with findings of earlier studies of debt ratios. The R^2 is 0.176 and is close to the R^2 in Baker and Wurgler's (2002) calendar time regression (0.20).

B. Sample and Summary Statistics

The sample is drawn from the universe of firms that appears in Compustat between years 1983 and 2002. Following prior literature on capital structure, I exclude financial firms with SIC codes between 6000 and 6999. Firms with book value of assets less than $10 million or with missing values of relevant variables are also excluded. Following Baker and Wurgler and to minimize the influence of outliers, observations with a market-to-book ratio greater than 10, an EFWAMB greater than 10, or leverage ratios greater than one are dropped. In addition, the sample is trimmed at the highest and the lowest 1% of values of profitability. I also require that the EFWAMB is based on at least two years of market-to-book ratios. Using these criteria, I identify 56,259 firm-years covering corporate financing behavior from 1983 to 2002. Table 2 presents the summary statistics for firm size, market-to-book ratio, and other firm characteristics important for this analysis.

TABLE 2

Summary Statistics

Variable	Median	Mean
Leverage	0.240	0.248
Size	5.227	5.381
Tangibility	0.293	0.349
Profitability	0.126	0.118
Market-to-Book	1.211	1.534
EFWAMB	1.325	1.638
No. of Obs.	56,259	

The sample covers security issuance and repurchase behavior from 1983 to 2002. Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Size is the natural logarithm of sales (Item 12). Tangibility is measured as net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average market-to-book ratio.

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III. External Financing, Market Timing, and Capital Structure

Baker and Wurgler (2002) contend that the negative relation between the EFWAMB and current leverage (see Table 1) arises because firms time equity issues to periods of relatively high market-to-book ratios, thus inducing a negative relation between market-to-book ratios and leverage. Because firms do not subsequently adjust their leverage toward the target, the changes in leverage induced by equity market timing persist. As a result, long past market-to-book ratios have a negative effect on current debt ratios.

The hypothesis that the timing of long past equity issues determines the observed capital structures requires that these transactions are timed to market conditions, that they generate long lasting changes in capital structure, and that other transactions either exhibit timing patterns that reinforce the effects of equity issues or have no significant impact on leverage. In this section, I test these hypotheses.

A. Do Equity Transactions Have Long Lasting Effects on Capital Structure?

To see which security issues and repurchases generate long lasting changes in corporate capital structure, I follow Hovakimian (2004) and examine the patterns of changes in leverage ratios of firms that issue and repurchase equity and debt.

I define security issues and repurchases based on the same Compustat data I use to construct the EFWAMB, but screen out a large number of minor changes in debt and equity due to events, such as employee stock option exercises, which cannot be classified as true financing transactions.[11] Specifically, a firm is defined as issuing equity (debt) when net equity (debt) issued exceeds 5% of the pre-issue value of total assets. A firm is defined as repurchasing equity (debt) when net equity (debt) repurchased exceeds 5% of the pre-issue value of total assets. The 5% screen is used in a number of studies (Hovakimian, Opler, and Titman (2001), Korajczyk and Levy (2003)) that examine and confirm the accuracy of such a classification scheme. In addition, since my goal is to test whether external financing transactions generate significant long lasting effects on capital structure, it is natural to focus on relatively large transactions that are more likely to generate such effects. I examine the sensitivity of my results to changes in the 5% cutoff later in the paper.

Table 3 presents the mean and the median changes in leverage ratios at the time of the event $(-1, 0)$, and between pre- and post-event years $(-1, +3)$. Hovakimian (2004) reports that the effects of equity transactions on capital structure differ significantly across firms that simultaneously issue or repurchase debt and those that do not. Therefore, Table 3's results exclude firm-years with mixed debt and equity transactions. The reported significance levels for medians are based on the Wilcoxon signed rank test while the levels for means are based on the *t*-test.

The results in Table 3 reject the hypothesis that equity issues have significant long lasting effects on capital structure. The changes in leverage induced by eq-

[11] Without the screening, net equity issued is zero for less than 1% of the sample observations, while net debt issued is zero for only 7% of the observations.

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TABLE 3

Changes in Leverage in and after the Event Year

	−1 to 0			−1 to +3		
Transaction	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.
Equity issue	−0.022**	−0.012**	4,289	0.010**	0.000	2,934
Equity repurchase	0.008**	0.000**	1,403	0.038**	0.006**	989
Debt issue	0.083**	0.065**	10,224	0.063**	0.052**	7,162
Debt reduction	−0.077**	−0.070**	6,575	−0.086**	−0.086**	3,931

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Equity issues (repurchases) are instances when net equity issued (repurchased) exceeds 5% of total assets. Net equity issued (repurchased) is measured as the (change in book equity−change in retained earnings (Item 36)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). Debt issues (reductions) are instances when net debt issued (retired) exceeds 5% of total assets. Net debt issued (retired) is measured as the change in the book value of (long-term debt (Item 9)+short-term debt (Item 34)). Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively.

uity issues are small and transitory. The issuance of equity in year 0 significantly reduces the average issuer's debt ratio. However, this decline is economically small. The mean (median) decline in leverage between years −1 and 0 is −2.2% (−1.2%). Furthermore, the initial decline is offset by an upward trend in leverage in the post-issue years. The mean (median) change between years −1 and +3 is +1.0% (0.0%). In other words, the changes in leverage induced by equity issues are anything but persistent.[12] I also find that both the mean (0.008) and the median (0.000) changes in leverage induced by equity repurchases are economically trivial, but statistically significant.

In contrast to equity transactions, debt issues and reductions generate large and long lasting changes in leverage. The mean (median) change in leverage due to a debt issue is +8.3% (+6.5%). The mean (median) change due to a debt reduction is −7.7% (−7.0%). These changes persist for at least three years after the transaction. The mean (median) change between years −1 and +3 is +6.3% (+5.2%) for debt issues and −8.6% (−8.6%) for debt reductions.

Overall, these results imply that long-term changes in leverage are driven by debt transactions rather than by equity transactions. Even if firms do time equity issues, equity issue timing is unlikely to be the main determinant of the observed leverage ratios.

B. Do Firms Time Security Issues and Repurchases to Equity Market Conditions?

The finding that equity transactions have only short-term effects on capital structure does not necessarily mean that equity market timing cannot have long-term effects. Though Baker and Wurgler (2002) primarily discuss net equity issue timing, the weights in the EFWAMB are based on net total external financing and as such are affected by how debt transactions are timed relative to market-to-book ratios.

Equity issue and repurchase timing may induce debt transactions to be timed to equity market conditions. If net financing needs are not perfectly correlated

[12] Leary and Roberts (2005) also find that the negative effect of equity issues on leverage disappears within two to four years.

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with equity market conditions and firms raise equity only when the market-to-book ratio is high then firms in need of external funds will tend to raise debt when the market-to-book ratio is low. Similarly, if firms repurchase equity when the market-to-book ratio is low then firms with excess cash will tend to retire debt when the market-to-book ratio is high. Corporate financing transactions that are timed in this manner can potentially induce a negative relation between the market-to-book ratio and leverage.

In Table 4, I test which (if any) security issues and repurchases are timed to equity market conditions by comparing the market-to-book ratio at the beginning of the event year (MB(−1)) to five alternative benchmarks: the market-to-book ratio three years prior to the event year (MB(−3)); the market-to-book ratio three years after the event year (MB(+3)); the EFWAMB; the time-series equal-weighted average of the firm's historical market-to-book ratios, starting with the first year the firm appears in the sample through year −1 relative to the event (EWAMB); and the time-series average of the firm's market-to-book ratios based on all years that the firm appears in the sample (AMB). The idea is to test whether the market-to-book ratio right before the transaction is unusually high or low relative to the firm's own experiences before and after the event.

TABLE 4

Market-to-Book Ratios around the Year of Event

Variable	Equity Issue	Equity Repurchase	Debt Issue	Debt Reduction
MB(−1)	2.323	1.823	1.438	1.214
MB(−3)	2.222**	1.969**	1.518**	1.405**
MB(+3)	1.920**	1.862	1.369**	1.399**
EFWAMB	2.213**	1.897**	1.480**	1.397**
EWAMB	2.282**	1.960**	1.493**	1.399**
AMB	2.120**	1.875**	1.423**	1.390**

MB(t) is the market-to-book ratio in year t. The market-to-book ratio is (total assets (Item 6)−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average historical market-to-book ratio. The EWAMB is the equal-weighted average historical market-to-book ratio. AMB is the time-series average market-to-book ratio of the firm in my sample. Equity issues (repurchases) are instances when net equity issued (repurchased) exceeds 5% of total assets. Net equity issued (repurchased) is measured as the (change in book equity−change in retained earnings (Item 36)). Debt issues (reductions) are instances when net debt issued (retired) exceeds 5% of total assets. Net debt issued (retired) is measured as the change in the book value of (long-term debt (Item 9)+short-term debt (Item 34)). Values significantly different from MB(−1) at the 5% and 1% levels are marked * and **, respectively.

The results for equity issues are consistent with market timing. The pre-transaction market-to-book ratio MB(−1) of equity issuers is significantly higher than both the market-to-book ratio three years before the issue (MB(−3)) and the historical EWAMB, implying that firms tend to issue equity following increases in the market-to-book ratio. MB(−1) is also significantly higher than the EFWAMB, implying that the market-to-book ratios at the time of equity issuance tend to be higher than the average ratios associated with earlier security issues and repurchases by the same firm. Finally, an average equity issuer's market-to-book ratio exceeds both the market-to-book ratio three years after the issue (MB(+3)) and its AMB. These results imply that firms tend to issue equity when their market-to-book ratios are indeed unusually high.

The evidence on market timing of equity repurchases is weaker. The market-to-book ratios of equity repurchasers are lower than the benchmark ratios. How-

ever, the difference between market-to-book ratios in years −1 and +3 is not statistically significant.[13]

The mean pre-debt-issue market-to-book ratio is significantly lower than the market-to-book ratio three years prior to the issue or the EWAMB or the EFWAMB ratios. It is difficult, however, to argue that firms do not issue debt following increases in the market-to-book ratio when, in fact, almost half of debt issuers (49%) experience run-ups in market-to-book in years −3 through −1. In addition, unlike with equity issues, I do not observe a reversal of the pre-issue trend. The market-to-book ratios of debt issuers continue to decline after the issue. The market-to-book ratio in year +3 relative to the issue is significantly lower than the ratio in year −1. Furthermore, the pre-issue market-to-book ratio is also significantly higher than the AMB ratio of the firm. These results suggest that market-to-book ratios at the time of debt issuance are not particularly low by the issuing firms' standards, and that it is unlikely that the timing of debt issues is responsible for the strong negative relation between the market-to-book ratio and leverage.

Debt reductions are associated with market-to-book ratios that are significantly lower than each of my five benchmarks. While such a pattern may be consistent with some sort of timing, it can only induce a positive relation between the market-to-book ratio and leverage.

It is also interesting to note that the cross-sectional differences in market-to-book ratios of firms issuing and repurchasing debt and equity are much larger than the changes in the market-to-book ratio experienced by these firms over time. For equity issuers, for example, the difference between average market-to-book ratios in years −3 and −1 is 0.101. For debt issuers, this difference is −0.080. For comparison, in year −1 the average equity issuer's market-to-book ratio exceeds that of the average debt issuer by an economically and statistically significant 0.885.

These cross-sectional differences show strong persistence in time. In year −3, the difference between the mean market-to-book ratios of equity issuers and debt issuers is 0.704, which is statistically significant at 1%. In fact, in the seven years around the event (from year −3 to year +3), the lowest average market-to-book ratio of equity issuers (1.920 in year +3) is significantly higher than the highest average market-to-book ratio of debt issuers (1.518 in year −3). Similar patterns hold for all three time-series averages (AMB, EWAMB, and EFWAMB) in Table 4. For example, the EFWAMBs in each of the years −3 through +3 relative to equity issue are all significantly higher than the corresponding EFWAMBs around debt issues.

The finding that cross-sectional differences in market-to-book ratios are economically much more significant than changes in market-to-book ratios over time is important. It implies that the negative effect of market-to-book ratios on leverage is primarily a cross-sectional rather than a time-series phenomenon and, there-

[13]The insignificance of the post-repurchase run-up in market-to-book ratio is not necessarily inconsistent with Ikenberry, Lakonishok, and Vermaelen (1995). In fact, stock returns in my post-repurchase years are higher than the pre-repurchase returns, especially for value firms with low market-to-book ratios.

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fore, is more likely to reflect cross-sectional differences in growth opportunities than market timing.

C. Mixed Transactions

Table 5 reports the changes in leverage (Panel A) and the market-to-book ratios (Panel B) around mixed transactions when equity issues or repurchases are accompanied by debt issues or reductions that take place in the same Compustat year. The results are not consistent with the hypothesis that equity market timing induces a negative relation between market-to-book ratios and leverage. Whether accompanied by equity issues or repurchases, debt issues generate statistically and economically significant increases in leverage that persist for at least three years after the transaction. However, market-to-book ratios associated with these transactions are higher, in most cases significantly, than each of the five benchmarks presented in Panel B of Table 5. These patterns can induce a positive rather than a negative relation between market-to-book ratios and leverage.

TABLE 5

Mixed Transactions

Panel A. Changes in Leverage in and after the Event Year

	−1 to 0			−1 to +3		
Transaction	Mean	Median	No. of Obs.	Mean	Median	No. of Obs.
Debt issue and equity issue	0.067**	0.051**	3,384	0.067**	0.053**	2,281
Debt issue and equity repurchase	0.120**	0.092**	610	0.097**	0.082**	444
Debt reduction and equity issue	−0.145**	−0.131**	1,947	−0.101**	−0.110**	1,256
Debt reduction and equity repurchase	−0.073**	−0.068**	279	−0.055**	−0.062**	180

Panel B. Market-to-Book Ratios around the Year of Event

Variable	Debt Issue & Equity Issue	Debt Issue & Equity Repurchase	Debt Reduction & Equity Issue	Debt Reduction & Equity Repurchase
MB(−1)	1.854	1.720	1.715	1.315
MB(−3)	1.793**	1.716	1.758	1.476**
MB(+3)	1.491**	1.544**	1.648	1.610**
EFWAMB	1.806**	1.679	1.727	1.468**
EWAMB	1.782**	1.625**	1.740	1.463**
AMB	1.676**	1.620**	1.735	1.490**

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). MB(t) is the market-to-book ratio in year t. The market-to-book ratio is (total assets (Item 6)−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average historical market-to-book ratio. The EWAMB is the equal-weighted average historical market-to-book ratio. The AMB is the time-series average market-to-book ratio of the firm in my sample. Equity issues (repurchases) are instances when net equity issued (repurchased) exceeds 5% of total assets. Net equity issued (repurchased) is measured as the (change in book equity−change in retained earnings (Item 36)). Debt issues (reductions) are instances when net debt issued (retired) exceeds 5% of total assets. Net debt issued (retired) is measured as the change in the book value of (long-term debt (Item 9)+short-term debt (Item 34)). In Panel A, values significantly different from zero at the 5% and 1% levels are marked * and **, respectively. In Panel B, values significantly different from MB(−1) at the 5% and 1% levels are marked * and **, respectively.

Similarly, debt reductions produce significant long-term declines in leverage regardless of whether they are accompanied by equity issues or repurchases. Market-to-book ratios associated with debt reductions combined with equity issues are not significantly different from the five benchmarks. Market-to-book ratios of debt reductions combined with equity repurchases are significantly lower than any of the five benchmarks, implying a positive rather than a negative relation between market-to-book ratios and leverage.

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D. Robustness of the Results

The tests reported in Tables 3, 4, and 5 assume that different observations of the same financing event are independent. I also rerun the *t*-tests allowing for dependence in two different ways. First, I relax the assumption that financing transactions by the same firm are independent. For each firm, I calculate the mean changes in leverage and market-to-book ratios and then calculate the *t*-statistics using the cross section of firm-level means. Next, I relax the assumption that financing transactions by firms in the same industry are independent. For each industry, as defined by four-digit SIC codes, I calculate the mean changes in leverage and market-to-book ratios and then calculate the *t*-statistics using the cross section of industry-level means. While a few of the secondary results in Tables 3, 4, and 5 become insignificant, the key results and my conclusion that equity market timing is unlikely to have a significant long lasting effect on capital structure do not change under any of these alternative tests.

Although the 5% screen used to identify security issues and repurchases is used in many other studies, it is ad hoc. It is possible, for example, that larger transactions may be more carefully timed or that larger equity transactions may generate larger and more persistent changes in leverage. To see whether my results are robust to changes in the cutoff, I repeat the analysis after increasing it to 10%. This change causes a substantial decline in the number of security issues and repurchases. Thus, the market timing patterns for equity repurchases, equity repurchases accompanied by debt issues, and equity issues accompanied by debt reductions become insignificant. Other results remain qualitatively the same. To summarize, sensitivity analysis reinforces my conclusion that equity market timing is unlikely to generate a strong long lasting relation between historical market-to-book ratios and leverage.

E. Discussion of the Results

Both Baker and Wurgler (2002) and this paper find that the negative relation between the EFWAMB and leverage is very strong and robust. For this relation to be driven by equity market timing, the timing patterns of corporate financing transactions and their effects on leverage should be equally strong and robust. However, the analysis of changes in leverage and market-to-book ratios around corporate financing events fails to show convincingly that equity market timing is responsible for the strong negative effect of long past market-to-book ratios on leverage.

Transactions with strong timing patterns either have no significant lasting effect on leverage (equity issues and repurchases) or their effect on debt ratio implies a positive rather than a negative relation between the EFWAMB and leverage (debt reductions). Other transactions (debt issues) have strong long lasting effects on leverage, but show no strong equity market timing pattern. These results imply that past attempts to time the equity market are unlikely to have a significant effect on current capital structure.

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IV. Is the External Finance Weighted Average Market-to-Book Ratio Related to Growth Opportunities?

In this section, I discuss and test an alternative hypothesis that the historical market-to-book ratio is related to the current target debt ratio because it complements the current market-to-book ratio as a proxy for growth opportunities.

Baker and Wurgler (2002) argue that the persistent effects of past market-to-book ratios on leverage are hard to explain within the trade-off theory because they imply that "... temporary fluctuations in market-to-book ... should have temporary effects" (p. 3). What I suggest here is that temporary fluctuations in market-to-book ratios may have no effect at all on target leverage if these fluctuations are viewed by managers as noise.

An important premise of the market timing hypothesis is that managers believe that their shares are often mispriced. If so, then the market-to-book ratio at any point in time reflects both the firm's growth opportunities and the extent of misvaluation. For example, if an increase in the market-to-book ratio is driven by overvaluation, then the growth opportunities could be more modest and the target debt ratio could be higher than implied by the inflated market-to-book ratio. If the market corrects these valuation errors over time and if the set of future investment opportunities of the firm changes relatively slowly, then the firm's historical average market-to-book ratio could be a less noisy measure of its growth opportunities than the current market-to-book ratio.

A. Market Timing and Leverage

According to the market timing hypothesis, firms do not have target debt ratios. Therefore, the only reason observed debt ratios may relate to market-to-book ratios is because firms time their financing activities in such a way that net equity issuance increases with market-to-book while net debt issuance declines with market-to-book ratios. Other things being equal, high net equity issuance and low net debt issuance should result in low debt ratios. Hence, a negative relation between market-to-book ratios and leverage ensues.

This description implies that, holding the amounts of debt and equity issued in the past constant, the current leverage ratio should not depend on how well these issues were timed. Therefore, if the importance of the EFWAMB in leverage regressions in Table 1 is driven purely by past market timing, the EFWAMB should have no effect on leverage if the amounts of net equity and net debt issued in the past were controlled for in regression (1). In contrast, if the EFWAMB is a measure of growth opportunities and if firms with high growth opportunities prefer to have low debt ratios, then the observed debt ratios should be related to the EFWAMB even after controlling for past issuance activity.

I test these two hypotheses about the nature of the EFWAMB by introducing two additional variables into regression equation (1),

$$\text{(3)}\quad \text{Leverage}_t = \alpha_0 + \alpha_1 \text{SIZE}_{t-1} + \alpha_2 \text{TNG}_{t-1} + \alpha_3 \text{PRF}_{t-1} + \alpha_4 \text{MB}_{t-1} + \alpha_5 \text{EFWAMB}_{t-1} + \alpha_6 \text{EqIs}_{t-1} + \alpha_7 \text{DbIs}_{t-1} + \varepsilon_t.$$

In (3), EqIs is the cumulative net equity issued and DbIs is the cumulative net debt issued over the same time period used to calculate the EFWAMB,

$$\text{EqIs}_t = \sum_{i=1}^{t-1} e_i, \tag{4}$$

$$\text{DbIs}_t = \sum_{i=1}^{t-1} d_i. \tag{5}$$

Consistent with the findings in Table 3, the results in the first two columns of Table 6 show that the effect of net debt financing on leverage (0.188) is statistically and economically much stronger than the effect of net equity financing (−0.022). The results also show that the effect of the EFWAMB on leverage remains significantly negative even after controlling for the cumulative effect of debt and equity issues and repurchases on leverage. This result is not consistent with the market timing hypothesis as, controlling for the amounts of debt and equity issued in the past, the timing of these financing transactions should have no effect on the resulting leverage ratio.

TABLE 6

Determinants of Leverage

	All Observations		Non-Issuers	
Variable	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Intercept	0.238**	34.9	0.108**	7.2
Size	−0.001	−0.7	0.006**	2.7
Tangibility	0.176**	24.9	0.256**	11.5
Profitability	−0.149**	−12.4	−0.156**	−4.8
Market-to-Book	−0.005**	−3.4	0.014*	2.2
EFWAMB	−0.035**	−18.2	−0.048**	−7.5
Cumulative net equity issued	−0.022**	−9.2	0.061	0.5
Cumulative net debt issued	0.188**	40.5	0.018	0.1
R^2	0.340		0.181	
No. of Obs.	56,259		3,638	

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Size is the natural logarithm of sales (Item 12). Tangibility is measured as net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average market-to-book ratio. Cumulative net equity issued is the (net equity issued/total assets) cumulated over all years preceding the current year. Net equity issued is measured as the (change in book equity−change in retained earnings (Item 36)). Cumulative net debt issued is the (net debt issued/total assets) cumulated over all years preceding the current year. Net debt issued is measured as the change in the book value of (long-term debt (Item 9)+short-term debt (Item 34)). Robust *t*-statistics reflect standard errors adjusted for heteroskedasticity and clustering. Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively.

It is possible that linear specification (3) does not allow full control for the effects of financing activities on leverage. To strengthen control for the effect of net financing, I re-estimate regression (3) on a subsample of firms with very small amounts of net debt and net equity issued. Specifically, I limit the sample to observations with cumulative past net debt (equity) financing not exceeding 5% of assets. The last two columns of Table 6 present the results. The effects of both cumulative net debt issued and cumulative net equity issued on leverage are now insignificant, implying success in choosing a subsample where the effect of external financing on leverage is minimized. In such a subsample, the timing

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of the remaining financing transactions would be expected to have no effect on leverage since the transactions themselves are unimportant. However, the results show that the effect of the EFWAMB remains significantly negative, implying that it is due to factors other than market timing such as growth opportunities.

B. Determinants of Changes in Leverage

If the importance of the EFWAMB in leverage regressions in Table 1 is driven purely by past market timing, the EFWAMB should have no effect on incremental decisions to change the current capital structure once I control for the pre-decision leverage, market-to-book ratio, and other relevant factors. If, however, the importance of the EFWAMB is due to its association with growth opportunities, then it should have a significant impact on current financing and investment decisions.

The first column of Table 7 reports the estimation results of the following regression of changes in leverage on the set of independent variables in Table 1, plus the lagged leverage ratio as an additional regressor,

$$\begin{aligned}(6)\quad \Delta\text{Leverage}_t \;=\; & \alpha_0 + \alpha_1\text{SIZE}_{t-1} + \alpha_2\text{TNG}_{t-1} + \alpha_3\text{PRF}_{t-1} \\ & + \alpha_4\text{MB}_{t-1} + \alpha_5\text{EFWAMB}_{t-1} + \alpha_6\text{LEV}_{t-1} + \varepsilon_t.\end{aligned}$$

The dependent variable, $\Delta\text{Leverage}_t$, is the change in leverage in year (t), Leverage(t) − Leverage$(t-1)$. Because leverage is bounded between 0 and 1, firms with high leverage are more likely to experience declines in leverage, and firms with low leverage are more likely to experience increases in leverage. Lagged leverage is included to control for this effect. Note that Baker and Wurgler (2002) estimate a change in the leverage regression that is similar to the one in Table 7, except it does not include the EFWAMB as a regressor.[14]

The results imply that changes in leverage are positively related to asset tangibility and negatively related to market-to-book ratios, the EFWAMB, and lagged leverage. The statistically significant negative coefficient on the EFWAMB is inconsistent with Baker and Wurgler's timing hypothesis, according to which the effect of the EFWAMB rises because past financing transactions were timed and the effect of these past transactions on leverage was not offset by other transactions in subsequent years. The results in Table 7 establish the existence of a more direct channel via which the EFWAMB affects current capital structure. This direct negative effect of the EFWAMB cannot be explained by persistence in market-to-book ratios since I control for the most recent pre-issue market-to-book ratio. The results are consistent with the hypothesis that the EFWAMB proxies for growth opportunities and as such is negatively related to the target debt ratio.

The magnitude of the effect of the EFWAMB on change in leverage is relatively small. However, it is stronger than the effect of the current market-to-book ratio. More generally, relatively modest effects of all the independent variables in Table 7 are at least partially due to the fact that changes in leverage reflect both managerial choices and random unintended fluctuations in leverage. In Section IV.C, I test whether the EFWAMB affects managerial decisions regarding the form of financing.

[14] See Baker and Wurgler's (2002), Table II, Panel A, p. 10.

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TABLE 7

Determinants of Incremental Changes in Capital Structure

	ΔLeverage		Debt vs. Equity		
Variable	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Marginal Eff.
Intercept	0.029**	18.1			
Size	0.001*	2.5	0.058**	4.8	0.018
Tangibility	0.023**	13.1	0.037	0.4	0.012
Profitability	−0.013**	−2.9	0.054	0.2	0.017
Market-to-book	0.000	−0.5	−0.164**	−4.7	−0.052
EFWAMB	−0.003**	−4.6	−0.137**	−4.4	−0.043
Leverage (−1)	−0.120**	−40.4	0.730**	5.6	0.230
Industry leverage			0.769**	4.1	0.242
R&D intensity			−2.639**	−5.6	−0.832
Selling expenses			−0.106	−0.7	−0.033
NOLC			−0.326**	−3.8	−0.103
Return			−0.231**	−6.9	−0.073
MB > 1 indicator			−0.221**	−4.5	−0.066
Dilution indicator			0.036	0.9	0.011
R^2	0.050		0.183		
No. of Obs.	56,259		9,272		

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Size is the natural logarithm of sales (Item 12). Tangibility is net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by beginning-of-the-period total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average market-to-book ratio. Industry leverage is the median leverage for firms with the same four-digit SIC. R&D intensity is research and development expenses (Item 46)/sales. Selling expenses is selling and administrative expenses (Item 189)/sales. NOLC is net operating loss carryforwards (Item 52)/total assets. Return is the stock return in the year before the issue. MB > 1 indicator is set to one when the market-to-book ratio is greater than one. Dilution indicator is set to one when issuing equity dilutes EPS more than issuing debt does. Debt vs. equity choice regression includes year indicator variables, which are not reported. Robust *t*-statistics reflect standard errors adjusted for heteroskedasticity and clustering. Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively. For the debt vs. equity choice model, a pseudo-R^2 is reported instead of R^2.

C. Determinants of Debt versus Equity Choice

The second set of results in Table 7 is for the following probit regression, which models the choice between issuing debt and issuing equity and is estimated using only observations where either debt or equity is issued,

$$\begin{aligned}(7)\qquad D_t^* = {} & \alpha_0 + \alpha_1 \text{SIZE}_{t-1} + \alpha_2 \text{TNG}_{t-1} + \alpha_3 \text{PRF}_{t-1} + \alpha_4 \text{MB}_{t-1} \\ & + \alpha_5 \text{EFWAMB}_{t-1} + \alpha_6 \text{LEV}_{t-1} + \alpha_7 \text{ILEV}_{t-1} + \alpha_8 \text{RD}_{t-1} \\ & + \alpha_9 \text{EXP}_{t-1} + \alpha_{10} \text{NOLC}_{t-1} + \alpha_{11} \text{RET}_{t-1} + \alpha_{12} \text{DMB}_{t-1} \\ & + \alpha_{13} \text{DIL}_{t-1} + \sum \beta_t Y_t + \varepsilon_t.\end{aligned}$$

The dependent variable, D^*, in regression equation (7) is a latent continuous variable reflecting the propensity of a firm to issue debt rather than equity. Its observable counterpart is a binary indicator set to 1 for firms that issue debt and set to 0 for firms that issue equity. In addition to the variables I use in prior regressions, the independent variables in regression equation (7) include control variables used in earlier studies of debt versus equity choice. These control variables include the firm's pre-issue debt ratio (LEV) and industry median debt ratio (ILEV),[15] research and development intensity (RD),[16] selling and administrative

[15]Industry is defined based on the firm's four-digit SIC code.

[16]Item 46, scaled by sales.

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expenses (EXP),[17] net operating loss carryforwards (NOLC),[18] stock return in the pre-issue year (RET), book value dilution indicator (DMB),[19] EPS dilution indicator (DIL),[20] and year indicator variables (Y). In addition to the coefficient estimates and t-statistics, I also report the marginal effect of each independent variable on the probability of debt versus equity issuance, evaluated at the point of the sample mean.

Contrary to the hypothesis that the importance of the EFWAMB in leverage regressions (Table 1) simply reflects the cumulative effects of past market timing, the results in Table 7 show that the EFWAMB is an important predictor of the current choice between issuing debt or issuing equity. Specifically, the probability of debt issuance vis-à-vis equity issuance declines with the EFWAMB. The statistically significant negative coefficient estimate for the EFWAMB implies that managers of firms with a high EFWAMB are more likely to issue equity than issue debt when they seek external financing. This result is consistent with the hypothesis that the EFWAMB complements the most recent market-to-book ratio as a proxy for growth opportunities. The negative effect of the EFWAMB is economically significant. The marginal effect of the EFWAMB on the probability of debt issuance is −4.3%. The results for other independent variables are consistent with earlier studies.

D. Alternative Weighted Average Market-to-Book Ratios and Leverage

In this section, I re-estimate the leverage regression from Table 1 as well as the change in leverage and the debt versus equity choice regressions from Table 7 using the EFWAMB based on future rather than past market-to-book ratios and external financing. I define the future external finance weighted average market-to-book (FEFWAMB) as follows,

$$\text{FEFWAMB}_t = \sum_{s=t+1}^{t+n} \frac{e_s + d_s}{\sum_{r=t+1}^{t+n} e_r + d_r} \times \text{MB}_s. \tag{8}$$

My rationale for substituting the FEFWAMB for the EFWAMB in these regressions is simple. If growth opportunities change slowly, then both the historical average and the future average market-to-book ratios are proxies for long-term growth opportunities of a firm. As such, their effects on capital structure choice should be qualitatively similar. If, on the other hand, the EFWAMB reflects past market timing, then the FEFWAMB should reflect future market timing and have no effect on current leverage and current decisions to change the leverage.

[17] Item 189, scaled by sales.

[18] Item 52, scaled by total assets. NOLC may also proxy for the firm's non-debt tax shields, which reduce the tax advantage of debt financing and, therefore, lower the firm's target debt ratio (DeAngelo and Masulis (1980)).

[19] The book value dilution dummy is set equal to 1 when the firm's market-to-book ratio is greater than 1.

[20] The EPS dilution dummy is equal to 1 when issuing equity dilutes the firm's earnings per share more than issuing debt does. It is set to 1 when $\text{E/P} > r_d(1 - T_c)$, where E/P is the firm's earnings/price ratio (Item172/(Item199×Item25)), r_d is the yield on Moody's Baa rated debt, and T_c is the top marginal corporate tax rate.

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Table 8's results are consistent with the hypothesis that the weighted average market-to-book ratio is a proxy for investment opportunities. The coefficient estimate for the FEFWAMB is significantly negative. As in all of the regressions, I control for the most recent market-to-book ratio. Therefore, the effects of the EFWAMB and the FEFWAMB cannot be attributed to correlation between these time-series averages of market-to-book ratios and the current market-to-book ratio.[21] I conclude that the significant effect of a firm's time-series weighted average market-to-book ratio on its capital structure is unlikely to be due to equity market timing.

TABLE 8

Future EFWAMB and Capital Structure

	Leverage		ΔLeverage		Debt vs. Equity		
Variable	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Marginal Eff.
Intercept	0.214**	27.7	0.032**	19.9			
Size	0.012**	11.4	0.001**	4.8	0.069**	5.5	0.022
Tangibility	0.204**	24.4	0.024**	13.0	0.027	0.3	0.009
Profitability	−0.192**	−13.5	−0.011**	−2.3	0.136	0.5	0.043
Market-to-Book	−0.024**	−17.3	0.001**	2.7	−0.207**	−7.3	−0.065
FEFWAMB	−0.027**	−15.3	−0.008**	−16.4	−0.133**	−5.5	−0.042
Leverage (−1)			−0.129**	−41.2	0.867**	6.4	0.274
Industry leverage					0.776**	3.9	0.245
R&D					−2.263**	−4.5	−0.715
Selling expenses					−0.042	−0.3	−0.013
NOLC					−0.372**	−4.1	−0.117
Return					−0.211**	−6.5	−0.067
MB > 1 dummy					−0.221**	−4.3	−0.067
Dilution dummy					0.047	1.1	0.015
R^2	0.176		0.062		0.185		
No. of Obs.	51,251		51,251		8,598		

Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Size is the natural logarithm of sales (Item 12). Tangibility is net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by beginning-of-the-period total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The FEFWAMB is the external finance weighted average of future market-to-book ratios. Industry leverage is the median leverage for firms with the same four-digit SIC. R&D intensity is research and development expenses (Item 46)/sales. Selling expenses is selling and administrative expenses (Item 189)/sales. NOLC is net operating loss carryforwards (Item 52)/total assets. Return is the stock return in the year before the issue. MB > 1 indicator is set to one when the market-to-book ratio is greater than one. Dilution indicator is set to one when issuing equity dilutes EPS more than issuing debt does. Debt vs. equity choice regression includes year indicator variables, which are not reported. Robust *t*-statistics reflect standard errors adjusted for heteroskedasticity and clustering. Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively. For the debt vs. equity choice model, a pseudo-R^2 is reported instead of R^2.

E. Investment Regressions

If the EFWAMB is indeed a proxy for growth opportunities, then one can expect it to have a significant impact on corporate investment. However, Baker and Wurgler (2002) report that they find the relation between the EFWAMB and future investment to be negative.[22] In this section, I seek to reconcile my con-

[21] I also rerun the regressions in Table 8 with both the EFWAMB and the FEFWAMB on the right-hand side, which would ensure that the FEFWAMB is not simply a proxy for the EFWAMB. In these unreported regressions, both the EFWAMB and the FEFWAMB have significantly negative effects on the dependent variable.

[22] See Baker and Wurgler (2002), footnote 14, p. 26.

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clusions with this result by estimating a number of regressions of the following form,

$$(9) \quad \mathrm{INV}_t = \alpha_0 + \alpha_1 \mathrm{SIZE}_{t-1} + \alpha_2 \mathrm{TNG}_{t-1} + \alpha_3 \mathrm{PRF}_{t-1} + \alpha_4 \mathrm{MB}_{t-1} + \alpha_5 \mathrm{EFWAMB}_{t-1} + \alpha_6 \mathrm{SLACK}_{t-1} + \alpha_7 \mathrm{LEV}_{t-1} + \varepsilon_t.$$

The dependent variable in (9) is corporate investment scaled by total assets. The regressors include the set of variables I use in the leverage regression in Table 1 and two additional variables—financial slack and leverage.[23] I include the slack to control for the possibility that the EFWAMB may be related to current investment because successful past market timers may have accumulated substantial amounts of cash that can be used to finance current investment. Leverage is included to control for the possibility that successful past timers with low leverage might finance large investment projects by raising large amounts of new debt. Two of the regressors, the market-to-book ratio and profitability, are traditionally used in investment regressions (see Fazzari, Hubbard, and Petersen (1988)).

Table 9 presents the estimation results for regression (9) using three measures of corporate investment. The first set of results is for a regression of capital expenditures.[24] The second set of results is for a regression of research and development (R&D) expenses.[25] These results imply that both capital expenditures and R&D expenses increase with the EFWAMB. The coefficient estimates for the EFWAMB are significantly positive in both regressions. These results are consistent with the hypothesis that the EFWAMB contains information about growth opportunities and that this information is not reflected in other proxies for growth opportunities. The third set of results in Table 9 is obtained by measuring investment as change in total assets excluding cash and short-term investments as in Baker and Wurgler (2002). Consistent with their results, the effect of the EFWAMB is significantly negative.

To understand the sources of the differences between these results, I reestimate regression (9) measuring investment as change in current assets (excluding cash and short-term investments),[26] change in net fixed assets,[27] and change in gross fixed assets.[28] In these unreported regressions, I find the effect of the EFWAMB on change in current assets and change in net fixed assets to be significantly negative, but its effect on change in gross fixed assets to be insignificant. Thus, it appears that the negative effect of the EFWAMB on change in assets in Table 9 is driven by its negative effect on change in current assets and its positive effect on depreciation and amortization.[29]

To understand why the EFWAMB has a positive effect on capital expenditures but an insignificant effect on change in gross fixed assets, I also examine the effect of the EFWAMB on acquisitions and asset sales, which like capital expenditures affects the change in gross fixed assets. I find the effect of the EFWAMB

[23] Financial slack is defined as cash and short-term investments (Item 1), scaled by total assets.
[24] Item 128.
[25] Item 46.
[26] Item 4−Item 1.
[27] Item 8.
[28] Item 7.
[29] The difference between changes in gross and net fixed assets is due to depreciation and amortization.

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TABLE 9

Investment Regressions

	Capital Expenditures		Research & Development Expenses		Asset Growth	
Variables	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
Intercept	0.015**	8.5	0.027**	11.0	−0.022**	−5.1
Size	−0.003**	−9.3	−0.001*	−2.3	−0.003**	−5.1
Tangibility	0.126**	48.8	−0.020**	−12.5	0.035**	8.2
Profitability	0.107**	27.8	−0.117**	−21.5	0.395**	39.0
Market-to-Book	0.006**	13.7	0.005**	6.4	0.041**	25.9
EFWAMB	0.001**	2.8	0.011**	11.3	−0.022**	−14.4
Financial slack	0.016**	5.8	0.069**	13.7	0.092**	12.2
Leverage	−0.023**	−9.0	−0.035**	−14.3	−0.029**	−4.6
R^2	0.298		0.301		0.107	
No. of Obs.	55,248		55,932		55,466	

Capital expenditures is Item 128/total assets (Item 6). Research and development expenses is Item 46/total assets. Asset growth is change in total assets/total assets. Size is the natural logarithm of sales (Item 12). Size is the natural logarithm of sales (Item 12). Tangibility is measured as net property, plant, and equipment (Item 8)/total assets. Profitability is EBITDA (Item 13) divided by total assets. The market-to-book ratio is the (total assets−book value of equity+market value of equity)/total assets. Market value of equity is (price (Item 25)×shares outstanding (Item 199)). Book value of equity is (total assets (Item 6)−total liabilities (Item 181)−preferred stock (Item 10)+deferred taxes (Item 35)). The EFWAMB is the external finance weighted average market-to-book. Robust *t*-statistics reflect standard errors adjusted for heteroskedasticity and clustering. Financial slack is cash and short-term investments (Item 1), scaled by total assets. Leverage is (long-term debt (Item 9)+short-term debt (Item 34)) over assets (Item 6). Values significantly different from zero at the 5% and 1% levels are marked * and **, respectively.

on both acquisitions and asset sales to be insignificant. However, when I estimate probit regressions predicting the probability of an acquisition or a sale of assets, the results are consistent with the hypothesis that the EFWAMB is a proxy for growth opportunities. The probability of an acquisition increases with the EFWAMB, while the probability of an asset sale declines with the EFWAMB.

To summarize, the effects of the EFWAMB on capital expenditures, research and development expenses, and the probabilities of asset sales and acquisitions are consistent with the hypothesis that the EFWAMB contains information about growth opportunities. However, the incremental information in the EFWAMB does not appear relevant for determining the size of an acquisition or an asset sale. Finally, the EFWAMB has a negative effect on changes in current assets and a positive effect on depreciation. The latter might reflect higher past investment rates of firms with higher past market-to-book ratios.

F. Discussion

The preceding results show that the EFWAMB has a significant impact on current debt versus equity issue choice, current changes in leverage, current capital expenditures, and current research and development expenses. Furthermore, substituting the weighted average of future market-to-book ratios for the weighted average of past market-to-book ratios does not change the relation between the weighted average market-to-book ratio and capital structure. Could these results be induced by market timing?

One explanation, consistent with market timing, for the negative effect of the EFWAMB in Table 6 is that successful past timers (those with a high EFWAMB) may choose to issue equity and reduce their leverage to ensure that they can take advantage of market timing opportunities in the future. High leverage may ham-

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per the market timing ability of a firm by exhausting its debt capacity and forcing it to issue equity when it is in need of external financing in times of low market-to-book ratios. However, if firms choose low leverage to be able to time the equity market in the future, then it is no longer the case that firms do not care about their leverage ratios, and that low leverage is just an unintended consequence of opportunistic equity market timing.

Furthermore, I believe that the evidence is more consistent with the hypothesis that the EFWAMB proxies for growth opportunities. Specifically, it is not clear why a firm that was not a successful timer in the past (a firm with a low EFWAMB), would not want to improve its prospects for future timing by issuing equity and increasing its debt capacity, or why its past inability to time the market should preclude it from issuing equity if its current characteristics (e.g., current market-to-book ratio, leverage, and profitability) call for equity issuance.

In fact, I argue that, ceteris paribus, firms with a higher past EFWAMB would have a higher threshold for issuing equity than those with a low EFWAMB. A high value of EFWAMB implies that the firm is able to raise external financing when its market-to-book ratio is high. So, for a given value of the current market-to-book ratio, the higher the EFWAMB, the less likely it is that a firm's shares are significantly overvalued and, therefore, the less likely it is that a firm would issue equity. In other words, the effects of the EFWAMB in Table 7 will be positive if they are due to market timing.

Similarly, if the effects of the FEFWAMB in Table 8 are due to managers' expectations of future market timing opportunities, then holding current market-to-book ratios constant, firms with better future timing opportunities (i.e., higher FEFWAMB) should be less likely to issue equity now. In other words, the effect of the FEFWAMB on ΔLeverage and on debt versus equity choice in Table 8 should be positive rather than negative. To summarize, I believe that my results are unlikely to be due to market timing and that they are consistent with the hypothesis that the EFWAMB contains information about growth opportunities not captured by the current market-to-book ratio.

V. Conclusions

Baker and Wurgler's (2002) study questions the ability of the traditional trade-off and pecking order theories to explain the observed corporate capital structures. They report that historical market-to-book ratios have a statistically and economically significant impact on the current capital structure. Baker and Wurgler conclude that observed capital structures reflect the cumulative outcome of timing the equity market.

My findings question the main conclusions in Baker and Wurgler (2002). First, I find no evidence of significant equity market timing for debt issues and debt reductions. Second, while my results are consistent with market timing of equity issues and, to a lesser extent, of equity repurchases, I find that the effects of equity transactions on capital structure are small and transitory, implying that equity transaction timing is unlikely to be responsible for significant long lasting effects of market-to-book ratios on leverage. Third, the patterns of changes in the market-to-book and debt ratios around a number of transactions (e.g., debt

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reductions) are such that these transactions may induce a positive rather than a negative relation between market-to-book ratios and leverage.

Fourth, my evidence supports an alternative hypothesis that the EFWAMB is related to target leverage because it contains information about future growth opportunities. Specifically, I find that current financing and investment decisions are affected by the EFWAMB. Furthermore, substituting the weighted average of future market-to-book ratios for the historical weighted average in the leverage regression, I find that current leverage ratios are related to future weighted average market-to-book ratios. These results are inconsistent with the market timing explanation but are consistent with the hypothesis that market-to-book ratios averaged over time reflect slowly changing growth opportunities.

The paper develops a number of other interesting results. I find, for example, that cross-sectional differences in market-to-book ratios of firms issuing and repurchasing debt and equity dwarf the changes in market-to-book ratios experienced by these firms over time. Furthermore, in each of the seven years around the event examined in the paper, the average equity issuer's market-to-book ratio is significantly higher than that of the average debt issuer. These results imply that the negative effect of the market-to-book ratio on leverage is primarily a cross-sectional rather than a time-series phenomenon and, therefore, is more likely to reflect cross-sectional differences in growth opportunities than market timing.

To summarize, the results in this paper do not support the hypothesis that the significant long lasting effects of market-to-book ratios on capital structure reflect past equity market timing. My results are consistent with the hypothesis that the EFWAMB contains information about the firm's growth opportunities not captured by the current market-to-book ratio.

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