Market Timing and the Cost of Equity

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Abstract: We find that firms that timed their external financing more in the past (i.e., that issued more capital when market conditions were good) have a lower expected cost of equity than those that timed their issuance less. This result is economically significant, and holds for numerous specifications. The benefits of market-timing activity are more pronounced for equity than for debt. These findings are consistent with the hypothesis that the gains from future market-timing activity are priced by current investors, and suggest that investors in the secondary market believe in the ability of firms to successfully time the market. We also find that the benefits of timing activity are enhanced for firms with a higher fraction of shares held by dedicated long-term investors, and are reduced for firms with shareholders that are more likely to time their own trades.

The literature suggests that managers time the issuance of equity to take advantage of favorable market conditions. For example, a survey by Graham and Harvey (2001) indicates that the amount by which a common stock is undervalued or overvalued by the market is the second most important factor that decides whether or not managers will issue equity. Similarly, there is now a fairly large body of empirical evidence that documents the prevalence of firms scheduling equity issuance at times of favorable stock market conditions to obtain "cheap equity funds."[1] Shleifer and Vishny (2003) propose that firms may use acquisitions to exploit equity overvaluation by exchanging stock for the real assets of another firm. This supports the idea that managers believe that they can create value for current shareholders by timing capital issuance. However, it is not known whether investors share this belief or whether managers are in fact successful in lowering the expected cost of equity capital through market timing. Investigating these issues should improve our understanding of the incentives of managers (particularly when they face different classes of shareholders with different horizons and degrees of sophistication), and should also help us to comprehend the process of price formation in financial markets. These issues thus have implications for the literature of both corporate finance and asset pricing.

The "market timing theory" relies on the idea that managers know more about the fundamental value of their firm than outside investors, and can thus detect temporary deviations from that fundamental value. Although the literature has long recognized the possibility of such deviations, no consensus has been reached as to whether extant shareholders can profit from these mispricings. If new investors react rationally and take the issuance of new capital as a signal that a firm is currently overvalued, then the price should immediately adjust. Managers and current shareholders will not be able to take advantage of this situation. However, if a

[1] See, among others, Ritter (1991), Speiss and Affleck-Graves (1995), Loughran and Ritter (1995), and Gompers and Lerner (2003).

significant fraction of investors are ready to buy the new capital at the inflated price, then managers will be able to transfer wealth from these new investors to current shareholders by timing their capital issuance. To the extent that current investors know or believe this to be the case, these gains from issuance should also be reflected in the equity valuation of the firm in the secondary market.

We empirically investigate these possibilities by examining the implied cost of equity. This approach follows the literature (for example, Kaplan and Ruback [1995], Claus and Thomas [2001], Fama and French [2002], Chava and Purnanandam [2007] and Pastor, Sinha, and Swaminathan [2008]). As noted by Pastor, Sinha, and Swaminathan (2008, p.2), "estimating expected returns using the implied cost of capital is increasingly popular in the finance literature." We obtain an estimate of the discount rate used by investors to price the expected earnings from firms' real activities (i.e., the *ex ante* cost of equity capital). If investors in the secondary market believe that a firm will obtain gains from future issuance activity (which are not recognized on the income statement), then discounting only the earnings from operational activity will generate an implied cost of equity that is lower than that of similar firms that do not have these expected gains. Equivalently, the price of firms that successfully time their issuance will be higher for a given level of expected operational earnings than the price of firms that do not time the market. As we discuss in section 2.2, focusing on the implied cost of equity capital offers several advantages in capturing the benefits expected by investors from market timing over alternatives such as *ex-post* returns and Tobin's *Q*.

We find that, controlling for different characteristics such as size, risk profile, and investment opportunities, the cost of equity is lower for firms that obtained external financing in the past when market conditions appeared to be good. This result suggests that investors in the secondary market believe in the market timing ability of managers. The effect is both statistically and economically significant. Our coefficient estimate suggests that the cost of equity capital for the firms in the top decile of the distribution in terms of market timing is approximately 32 basis points lower than that of those in the bottom decile. Under reasonable assumptions, this difference in the cost of equity capital is associated with a difference in firm value of approximately 6%.

Our main tests are based on the correlation between capital issuance and market conditions, which recognizes the possibility that both equity and debt issuance can be timed. There is extensive literature on equity timing, but the research on debt timing is more limited.[2] Previous studies (e.g., Flannery [1986], Wittenberg-Moerman [2008]) have suggested that long-term debt is subject to information asymmetry, which leaves the possibility that debt timing occurs. Lucas and McDonald (1990) predict that a stock price run-up usually precedes the issue of an informationally disadvantaged security such as equity or long-term debt. However, it can be argued that timing the market with a debt instrument is more difficult than timing it with equity, because debt is generally easier to price than equity (i.e., the main uncertainty regarding the future cash-flows is the probability of default) and because participants in the debt markets are usually sophisticated institutional investors. Consistent with this prediction, we find that the benefits of timing equity issuance are more pronounced than the benefits of timing debt issuance. However, we also find some support for the existence of limited benefit in debt timing.

Finally, we investigate some of the cross-sectional variations in the benefits from issuing capital when market conditions are favorable. We find that the benefits of market timing are greater for firms with a higher fraction of shares held by dedicated institutional investors. We

[2] We define debt timing as the issuing of debt when market conditions are good for the individual firm. This definition of debt timing is different from that in Baker, Greenwood, and Wurgler (2003), who consider the possibility that debt issuance is timed in relation to economy-wide variations in interest rates.

also examine whether there is a substitution of the perceived benefits between the market-timing activity of firms and that of shareholders. Consistent with this hypothesis, we find that the benefits of market timing by firms are reduced when there is a higher likelihood of market timing by informed shareholders. These results suggest that some investors are locked into firms and cannot easily sell to take advantage of temporary mispricings. In such cases, they rely on managers to time the issuance of capital to take advantage of these abnormalities. In contrast, when individual shareholders can directly time their trades to take advantage of mispricings, the financial benefits of firms issuing capital when the market conditions are good are reduced.

Our results complement those of past studies on market timing, which focus on two main themes.[3] The first is whether firms tend to issue more equity when market conditions are good.[4] Taken as a whole, this line of research supports the idea that there is a correlation between good market conditions and issuance. However, there is no consensus on whether this correlation reflects successful attempts by managers to exploit mispricings or whether it can be explained by other factors, such as time-varying investment opportunities. Our tests directly investigate this issue by examining the effect of the pattern of past issuance on the discount rate currently used to discount future expected earnings. The second related line of research examines whether equity is issued at the correct price during initial public offerings (IPOs) or seasoned equity offerings (SEOs).[5] The challenge of estimating abnormal returns from *ex post* data makes reaching a

[3] A third line of research (Baker and Wurgler (2002), Kayhan and Titman (2007), and Chang, Dasgupta, and Hilary (2006), among others) examines whether there is a relation between market timing and capital structure. Although this issue is potentially important and we briefly consider it in Section 5.2, it is not directly related to our research question.

[4] Loughran, Ritter, and Rydqvist (1994) and Pagano, Panetta, and Zingales (1998) document that initial public offerings (IPOs) coincide with high stock valuations. Taggart (1977), Asquith, and Mullins (1986), Korajczyk, Lucas, and McDonald (1991), and Jung, Kim, and Stulz (1996) similarly find that seasoned equity offerings (SEOs) coincide with high stock valuations.

[5] Among others, Ritter (1991), Loughran and Ritter (1995), Speiss and Affleck-Graves (1995), and Brav and Gompers (1997) document that equity issuers have low subsequent stock returns and high market-to-book issuers have even lower subsequent returns.

consensus on this issue even more difficult. Our approach bypasses this problem by using a residual income model that does not rely on *ex post* returns. Our approach is also different in that we consider the total amount of equity and debt issued (including private placements, stock mergers, treasury stocks, employee stock option exercises, stock grants, debt-to-equity conversions, exercise of warrants, and so forth). This is potentially important, because Takeuchi (2008) reports that SEOs are made by only slightly more than 5% of firms issuing positive net equity. Aside from investigating the average effect of market timing on the cost of equity, our study also examines the effect of differences in shareholders clientele. Specifically, we consider the effect of the presence of long-term dedicated shareholders and of the substitution between shareholder and firm market activity on the benefits of market timing, two issues that have not been extensively studied in the literature.

The rest of this paper proceeds as follows. Section 1 reviews the previous literature on market timing, SEOs, and the implied cost of equity. Section 2 develops our hypotheses. Section 3 presents the empirical setting. Section 4 describes the empirical results. Section 5 provides additional empirical analysis to better understand our main results. Section 6 concludes.

1. Previous literature

1.1 Market Timing Theory

The literature has long held that equity can suffer from temporary mispricings, and that managers may know more about equity valuation than outside shareholders. This does not, however, imply that managers can necessarily take successful advantage of these mispricings. Myers and Majluf (1984), for example, propose a model in which investors rationally infer from an issuance that equity is overpriced, which in turn can make managers of good firms hesitant to issue equity. If outside investors can infer the fundamental value of a firm from its issuance behavior, then the existence of mispricings should not have an effect on the timing of capital issuance. In contrast, the "market timing theory" argues that managers look at current conditions in both the debt and equity markets and opt for the means of financing that seems to be currently more favorable, or avoid issuing securities at all if the market conditions are entirely unfavorable. For example, Lucas and McDonald (1990) suggest analytically that the issuance of securities that are informationally sensitive (such as equity or long-term debt) should on average be preceded by abnormal positive stock returns. The main intuition is that managers who have private information that indicates that the firm is currently overvalued will immediately take advantage of the situation, whereas managers who know that their firm is undervalued will wait until the situation has been corrected before issuing capital.

Previous empirical studies have reported a positive correlation between good market conditions and equity issuance. For example, research suggests that high valuations coincide with initial public equity issuance (e.g., Loughran, Ritter, and Rydqvist [1994], Pagano, Panetta, and Zingales [1998], Pastor and Veronesi [2005]) and seasoned equity issuance (e.g., Taggart [1977], Marsh [1982], Asquith and Mullins [1986], Korajczyk, Lucas, and McDonald [1991], Jung, Kim, and Stulz [1996], Hovakimian, Opler, and Titman [2001]). Ikenberry, Lakonishok, and Vermaelen (1995) suggest that repurchases coincide with low valuations. Baker and Wurgler (2002) find that the proportion of equity in the firm capital structure increases after periods of high market valuation, and also find evidence of a long-lasting impact of market timing on capital structure, suggesting that capital structure is the cumulative outcome of past attempts to time the equity market.

More recent studies have challenged this view, and have suggested that the previously documented relation between market conditions and issuance activity may be spurious. For example, Schultz (2003) uses the premise that more firms issue equity at higher stock prices, even though they cannot predict future returns. His simulations suggest that median *ex post* underperformance by equity issuers will be significantly negative in event-time even if the *ex ante* expected abnormal returns are zero. Baker, Taliaferro, and Wurgler (2006) show that the pseudo market timing bias is too small to account for the predictive power of managerial variables.

1.2 Studies of SEO

A question related to market timing is whether SEOs are overvalued on average. Some studies support this position, but others dispute it. For example, Ritter (2003) provides a review of the literature related to this question, and reports the estimates of abnormal returns associated with a value-weighted portfolio of firms that issue SEOs given in various studies. The estimates are between 0.06 and -0.33 with a t-statistic of between 0.77 and -3.38. Pontiff and Woodgate (2008) report that share issuance exhibits a strong cross-sectional ability to predict *ex post* stock returns in the post-1970 period. At the aggregate level, Baker and Wurgler (2000) find that a period in which aggregate equity issuance (relative to total debt and equity issuance) is high is followed by a period of low stock market returns. These various results leave the possibility that firms issue equity at an inflated price, but Ritter (2003) concludes (p. 265) that "the conclusions regarding abnormal performance are hotly debated and sensitive to the methodology employed and the sample used." This debate is important and related to our study, but its resolution is not necessary for our research for at least two reasons. First, we do not focus on SEOs but instead consider the total amount of capital issued by firms, which gives us a much larger sample and a broader view than the studies that focus on SEOs alone. Second, we do not ask whether managers can expropriate from prospective shareholders in favor of current shareholders, but instead ask whether the price reflects this possibility. In other words, we ask whether managers can lower their cost of equity because a significant group of investors believes this to be the case. Finally, we note that all of the studies discussed by Ritter (2003) use *ex post* returns and complex procedures to address the significant econometric problems associated with this approach. As we explain in more detail below, our empirical design avoids many of these complexities.

2. Hypotheses development

2.1 Market-timing activity and firm value

Our study focuses on the perception of the success of market timing by investors in the secondary stock market. This question hinges to some extent on whether timing the issuance of capital results in a transfer of wealth from new investors to existing investors. If managers are fully rational, then capital markets are strongly efficient (i.e., they offer a fair price at any given time), and the strategy of issuing only when market conditions are good should not affect the value of the firm. In this scenario, a strong correlation between equity issuance and a high valuation is likely to simply reflect the need to finance more investments when profitable opportunities are plentiful. If markets are semi-strongly efficient (and do not incorporate the private information of managers), if there is no liquidity issuer (i.e., no firm that issues for reasons other than to take advantage of mispricings), and if investors and managers are fully rational, then the situation is similar: by issuing, the firm signals that the equity is overvalued and there is an immediate price correction.

However, if managers are rational and the market is semi-strongly efficient but there is a substantial portion of issuers who raise capital for reasons other than market timing, then equity prices may not fully adjust to reflect the private information held by managers about a possible overvaluation. If new investors are fully rational, then they will ask for a premium as compensation for this expected loss, and in so doing pay the fair price on average. Firms that issue for liquidity reasons have to pay a premium to issue, but firms that issue because of a temporary overvaluation are able to capture the benefit of this mispricing. This then transfers wealth to their current shareholders. However, this scenario assumes a pooling equilibrium between types of issuers. If this is true, then it seems unlikely that there is a separating equilibrium in terms of the expected cost of capital at the same time. We therefore do not expect that this scenario will reduce the *ex ante* cost of equity.

Alternatively, if managers are rational and if there is no noisy issuer, but there are some noisy traders that buy the new shares because, for example, market sentiment is high, then the private information held by managers may not be fully incorporated into the price. In this case, rational investors will abstain from buying the overpriced capital but quasi-rational investors will pay too high a price, thus allowing managers to transfer wealth to existing shareholders from the new shareholders. The difference between this scenario and the previous is that in the previous case, new shareholders are losing money in the acquisition of capital that is issued for market-timing purposes, but are compensated by earning a premium on capital issued for liquidity reasons. In this case, the cost is born *in fine* by the shareholders of the latter firms, and managers are able to create value for the current shareholders by timing the issuance of equity, although the average risk-adjusted return on the stocks issued by all firms is zero. In contrast, in the second scenario, the issued capital is overvalued on average, and the cost of the mispricing is born by the quasi-rational investors who buy the stocks.

Our scenarios so far have assumed that managers are rational and act in the best interests of the current shareholders. In this case, a correlation between security price and issuance can either increase the value of the firm (for example, if there are quasi-rational investors) or leave it unaffected (if every agent is rational). However, managers may believe that they have market-timing ability when this is not the case. In this case, a correlation between market conditions and equity issuance could lead to a reduction in the firm's value. This would be true if, for example, managers were to artificially constrain their financing decisions to foolishly try to take advantage of perceived mispricings and thus forgo projects with a net present value, or were to choose a sub-optimal capital structure.

This discussion suggests that the effect of market-timing activity on the value of a firm for its current shareholders can be positive, null, or negative. It is difficult to know *ex ante* which of these scenarios is the most likely. Previous research suggests that markets are not strongly efficient (e.g., Fama [1991]), and finds evidence for instances of irrational behavior by investors (e.g., Barberis and Thaler [2003]). This leaves the possibility that managers can use their private information to achieve superior returns. However, it remains unknown whether outside investors are able to adjust their behavior in response to this problem. Previous research indicates that there is a negative announcement effect for SEOs (e.g., Ritter [2003]), but it is difficult to estimate whether this adjustment is sufficient. In addition, Jung, Kim, and Stulz (1996) report that the announcement effect for firms with a high Tobin's q is indistinguishable from zero. This can be explained either by the fact that these firms have good investment opportunities, or that they are able to attract many irrational investors who do not rationally adjust their expectations. This uncertainty motivates our empirical analysis.

2.2 Market timing and the implied cost of equity

Ex post returns

Our discussion has so far focused on whether managers can create value for existing shareholders by timing the market. An approach to investigate this question would be to measure the link between market timing and *ex post* returns, either by examining the *ex post* returns after specific financing events, such as an SEO, or by relating measures of market-timing activity to a cross-section of firm returns. Both methods are potentially fruitful, and, as discussed in Section 1, have been explored in the literature. However, using *ex post* returns creates serious empirical challenges. First, the possibility of engaging in market timing relies on the existence of quasi-rational investors and information asymmetry between different classes of investors, but the properties of market equilibrium models with this complex setting are not well known.

Second, it is still debatable whether *ex post* returns are an appropriate proxy for a firm's cost of capital. As pointed out by Hail and Leuz (2006a, 2006b), Stultz (1999), and others, this proxy not only captures the differences in a firm's cost of capital, but may also include the shocks to a firm's growth opportunities, differences in expected growth rates, or changes in investors' risk aversion. As a result, using *ex post* returns to estimate expected returns requires the average realized returns over a long period. Nevertheless, Elton (1999) argues that realized returns may differ from expected returns, even over a long period. In addition, Fama and French (1997) conclude that expected returns estimated using *ex post* returns and asset-pricing models are imprecise because of the uncertainty of the factor premiums and imprecision in the factor loading estimates. Along the same lines, Brav, Lehavy and Michaely (2005) note that "realized returns, however, may not be a good proxy for expected returns. First, noise in realized returns is likely to be large (e.g., Blume and Friend [1973] and Sharpe [1978]). Second, realized returns may be poor estimates of expected returns if information surprises do not cancel out over the period of study (Elton [1999]). Third, realized returns may also be noisy and biased estimates of expected returns due to complex learnings effects."

Third, and relatedly, firms may have a very active financing policy, and in a given period may issue multiple securities and simultaneously buy back some of those previously issued. Many of these transactions are likely to be made for reasons unrelated to market timing, such as taxes, stock options, excess liquidity, and so forth. These overlapping and possibly contradictory transactions are likely to make *ex post* performance even more difficult to measure empirically.

Ex ante pricing

Given that it is difficult to evaluate whether the price of issued equity is correct or not, even on average, we ask a more straightforward question. Specifically, we investigate whether investors in the secondary equity market perceive that market-timing activity by firms creates value for existing shareholders. We do not investigate whether this perception is correct or not, as it may be in the interests of managers to behave in a way that is consistent with this belief, regardless of whether or not it is true. Although this perception is not directly observable, it should be incorporated in the price. In other words, firms that time the market should have a higher price (for a given level of profitability and risk from real operations). Equivalently, holding expected profitability and risk constant, the discount rate should be lower for firms that issue when market conditions are good. This does not imply that investors are able to systematically identify mispricings, but rather that they believe, correctly or not, that managers can and will exploit such situations.

We use the *ex ante* implied cost of capital to proxy for ongoing investors' expected gains from timing activity. This approach follows the literature of both finance (e.g., Friend, Westerfield and Granito [1978], Kaplan and Ruback [1995], Claus and Thomas [2001], Fama and French [2002], Brav, Lehavy and Michaely [2005], Chava and Purnanandam [2007] or Pastor, Sinha, and Swaminathan [2008]) and accounting (e.g., Gebhardt, Lee, and Swaminathan [2001], Easton [2004], Ohlson and Juettner-Nauroth [2005] and Hail and Leuz [2006a, 2006b]). It also has several advantages over alternative proxies for the cost of capital. For example, the market expectation of future cash flows, as proxied by analyst earnings forecasts, may be biased. However, holding these constant, we are able to investigate whether investors believe that there are gains to be made from market timing. This is an advantage over using Tobin's *Q*, for example, which would make beliefs about future earnings and discount rate difficult to disentangle because tests based on firm value may be systematically biased by market-timing firms different investment opportunities.

Using an *ex ante* measure also has two drawbacks. First, we assume that investors use the valuation model that the econometricians use to value stocks. If this is not true and the differences are systematically correlated with our treatment variables, this could lead to biased conclusions. Although it is likely that our model is mispecified to some degree, it is not immediately obvious why these errors should be systematically correlated with our proxies for market timing. Nevertheless, as discussed below, we use multiple specifications in our empirical analysis to mitigate this problem. Second, and perhaps more importantly, we assume that the analyst earnings forecasts are unbiased estimates of ongoing investors' expected future earnings, and that these earnings forecasts do not include the expected gains or losses from market-timing activity. This second point is potentially important if there are real costs associated with market timing that are not treated as an accounting expense. Our estimates are therefore of the perceived gains gross of any real costs associated with market-timing activity that are not captured in earnings forecasts. Conversely, our results should not be affected by the costs that are incorporated into accounting earnings (e.g., banking fees, tax expenses, etc.) if analysts incorporate these costs in their forecasts.

3. Data and Research Design

3.1 Sample Selection

Our sample selection starts from all firms in Compustat/CRSP merged file. Following the common practice, we exclude utility firms (the SIC code from 4900 to 4999) from the sample because they are heavily regulated. We also exclude financial firms (the SIC code from 6000 to 6999) because their capital structure is likely to be affected by factors different from the ones affecting non-financial firms (e.g., capital adequacy regulations). The key variables used in this study are the measures of market timing activity and the estimate of the cost of equity capital. To estimate the cost of equity, we match these firms to I/B/E/S database to obtain analysts' earnings forecasts and delete observations with insufficient data to estimate the cost of capital. As we discuss below, we use the average of four estimates of the cost of capital to mitigate model-specific measurement errors and require that all four estimates of the cost of capital must be available. We then delete observations missing the market timing measures (defined in Section 3.3). Finally, we eliminate the observations with missing control variables. This selection process results in a final sample of 24,740 firm-year observations (3,881 firms) from 1981 to 2004, for which we can obtain complete information regarding analyst earnings forecast and institutional holdings. This sample covers 43 industries (as defined by Fama and French [1997]).

3.2 Estimation of the Cost of Capital

As is discussed in Section 2.2, the implied cost of capital models make an explicit attempt to control for the effect of cash flows and growth. This represents an advantage compared with other alternative proxies, such as realized returns. Following Hail and Leuz (2006a and 2006b), we estimate the cost of capital as implied in current stock prices and analyst earnings forecasts based on four different models introduced by Claus and Thomas (2001) (denoted as CT), Gebhardt, Lee, and Swaminathan (2001) (denoted as GLS), Ohlson and Juettner-Nauroth (2005) implemented by Gode and Mohanram (2003) (denoted as OJ), and the modified PEG model of Easton (2004) (denoted as MPEG). The first two models are based on Ohlson's (1995) residual income valuation, whereas the latter two are based on the abnormal earnings growth valuation model of Ohlson and Juettner-Nauroth (2005). We follow the approach of Hail and Leuz (2006a) to correct for partial year discounting. The details of the cost of capital estimations are summarized in Appendix A.

As there is little consensus in the literature as to which models perform the best or how to evaluate the models (e.g., Botosan and Plumlee [2005], Gode and Mohanram [2003], Guay et al. [2003], and Easton and Monahan [2005]), we follow Hail and Leuz (2006a and 2006b) in using the average of the estimates from these four models as our measure of the cost of capital to mitigate the effect of measurement errors associated with one particular model. The estimates of the cost of capital are all highly positively correlated. The highest correlation is observed between the estimates obtained using the OJ and MPEG procedures (0.96), whereas the lowest correlation is observed between the estimates obtained with the GLS and MPEG procedures (0.55). As we discuss in Section 4.3, our results hold when we use any of these four models.

Given that analyst forecasts are a key input in these different valuation models, we explicitly control for short-term analyst forecast errors in our main specification. We also control for long-term earnings growth, because this variable is shown in the literature (e.g. LaPorta, [1996]) to be correlated with long-term analyst forecast errors. In addition, we explicitly control for long-term forecast errors in the robustness tests, and show later that our results are robust to the use of cruder models (such as earnings-to-price ratio or market-to-book ratios) that do not explicitly rely on analyst forecasts.

3.3 Estimation of market-timing activity

We measure the amount of market timing conducted by a firm as the covariance between its capital issuance and external market conditions. We define *MTCov* as the covariance between external financing (*EF*) and the market-to-book ratio (*MB*) in the past scaled by the average total assets. *EF* is the sum of net debt and equity issues for a given year. We follow Baker and Wurgler (2002) and Kayhan and Titman (2007) in defining net equity and net debt issues using balance sheet data.[6] Based on the accounting assumption that book equity is equal to the balance sheet retained earnings plus paid-in share capital, we define the net equity issuance as the change in book equity minus the change in retained earnings. We then define the net debt issuance as the change in total assets minus the change in retained earnings and net equity issuance. The

[6] The robustness check, as detailed in Section 4.3.2, indicates that defining debt and equity issuance using cash flow statements makes little difference. We prefer the measure constructed from balance sheets because there are fewer missing observations than if we use cash flow statement data.

market-to-book ratio (*MB*) is the average ratio for the same year of the quasi-market value of assets to the book value of assets, which proxies for market conditions. The intuition behind the use of this variable is that firm overvaluation is more likely to happen when market prices are high relative to the assets in place. If managers seek to take advantage of such overvaluations, then they will issue more capital in periods of high market prices. In our main tests, the covariance is estimated from year one (the first year that firms have non-missing stock price data in Compustat) to year t. Our measure is consistent with those in several previous studies (e.g., Chang, Dasgupta and Hilary [2006], Kayhan and Titman [2007]), but we perform several robustness checks in Section 4.3 to show that our results are not sensitive to the design choices we make to construct this variable. Note that this methodology relies on the aggregate amount of capital issued by firms, rather than focusing on special events such as IPOs or SEOs. This provides a more complete picture of capital issuance than focusing on SEO or IPO events, which are relatively rare events. For example, Takeuchi (2008) reports that firms making SEOs represent only 6% of firms with net increases in equity and 18% of firms with net increases in equity of more than 10% of assets in a given year.

To match the estimated cost of capital and our market-timing proxy, for each fiscal year *t* we estimate the cost of capital at month m+4 after the fiscal year-end (i.e., four months after the end of the fiscal year), because most U.S. firms announce their annual reports at the end of the fourth month after the fiscal year-end. To make sure that the information that we use to estimate *MTCov* is available to the market, we match the cost of capital estimate to the market-timing variables estimated using all of the historical data up to fiscal year t.

3.4 Model Specification and Control Variables

We investigate the effect of market timing on the estimated excess cost of equity capital by estimating the following regression model.

$$R^{*}_{i,t} - R_{f,t} = \alpha + \beta MTCov_{i,[1,t]} + \gamma_1 Beta_{i,t} + \gamma_2 Log(MV_{i,t}) + \gamma_3 Log(BM_{i,t}) + \gamma_4 Leverge_{i,t}$$
$$+\gamma_5 MMT_{i,t} + \gamma_6 Ferr_{i,t} + \gamma_7 Fltg_{i,t} + \gamma_8 IndRP_{i,t-1} + Year \;\; Dummies + \varepsilon_{i,t} \qquad (4)$$

$R^{*}_{\mathrm{i,t}}$ is the average of the four cost of capital estimates (i.e., CT, GLS, OJ, and MPEG), estimated at month +4 after the end of fiscal year t. R_f is the risk-free rate, measured by the yield of 10-year treasury bonds at the end of the fourth month after the fiscal year-end. *MTCov* is our previously defined measure of market timing. We use decile ranking to mitigate the effect of outliers and non-linearities in the data but, as explained in Section 3.5, our results are not sensitive to this design choice. A negative coefficient associated with *MTCov* (β) supports the hypothesis that investors believe that managers can create value by timing the market.

We include several control variables that may affect the cost of equity capital. We control for the sensitivity to market movements (*Beta*), measuring the beta by estimating the CAPM model for the period before month m+4. We use up to 60 monthly observations and require a minimum of 24 monthly observations. We expect the coefficient of *Beta* to be positive (i.e., $\gamma_1 > 0$). We also control for firm size book-to-market ratio, leverage, and price momentum, because Fama and French (1992) find that stock returns are negatively correlated with firm size, Botosan and Plumlee (2005) find a positive correlation between book-to-market and the *ex ante* cost of equity, and Modigliani and Miller (1958) argue that the cost of equity should increase as leverage increases. Firm size (*LogMV*) is measured as the logarithm of the market value of common equity, book-to-market equity (*LogBM*) is calculated as the logarithm of the ratio of the book value of equity to the market value of equity, and the leverage ratio (*Leverage*) is measured as the ratio of long-term debt to total assets at the end of fiscal year t. We expect γ_2 to be negative and γ_3 and γ_4 to be positive. Following Guay et al. (2003), we include price momentum (*MMT*) to mitigate biases in the cost of capital estimates driven by analyst sluggishness with respect to the information in past stock returns. We define *MMT* as the logarithm of one plus the compounded returns over the twelve months before month m+4. We expect γ_5 to be negative.

Following Hail and Leuz (2006a), we include analyst signed forecasts error (*Ferr*) (γ_6) to control for the potential effect of analyst bias on the cost of capital estimates. We define analyst forecast error as the actual earnings minus the consensus forecast for the forthcoming fiscal year, scaled by stock price. We expect γ_6 to be negative. We also include the analyst forecast of long-term earnings growth (*Fltg*) (γ_7) to control for a potential bias in the cost of capital estimate. This control is necessary because such bias would affect the various approaches that we use to estimate the cost of capital. First, Gebhardt, Lee, and Swaminathan (2001) point out that if the fixed reverting period (i.e., the assumption that the ROE of all firms reverts to the industry ROE in 12 years; see the appendix for details) is too short for growth firms, then the GLS estimates for growth firms will be underestimated. Including *Fltg* helps to control for this estimation bias. Secondly, Claus and Thomas (2001) find an optimism bias in analyst forecasts over the subsequent five years, which in turn could bias their cost of capital estimates. Including *Fltg* in the regressions helps to control for the potential effect of long-term analyst forecast optimism. Third, the OJ model assumes that short-term earnings growth decays asymptotically to a constant rate in the long run, and that the rate of decay also depends on this constant rate. As Gode and Mohanram (2003) point out, the OJ model overstates future earnings and, in turn, the cost of capital estimates for firms with a growth rate decay that exceeds the constant rate, and vice versa. Firms with higher short-term growth rates tend to have a higher growth rate decay, which suggests that the OJ model tends to overestimate the cost of capital for these firms. Including *Fltg* in the regressions helps to control for this bias. As the effect of growth is uncertain, we make no prediction regarding the regression coefficient of γ_7.

Previous studies (e.g., Gebhardt, Lee, and Swaminathan [2001]) suggest that industry is an important factor that determines the cost of capital. We therefore follow the literature (e.g., Dhaliwal et al. [2005]) and include the industry risk premium (*IndRP*) to control for the industry effect. *IndRP* is defined as the median risk premium, estimated in the previous year, of all firms in the 49 industries defined by Fama and French (1997). Finally, we include (but do not tabulate) year dummies to control for time-fixed effects. Given that the cost of equity is likely to vary systematically over time, controlling for overall time effects is important in our setting. To mitigate the influence of outliers, we take the log of the market value, the book-to-market ratio, and *MMT*. All of the other control variables are winsorized at the 1% level. Details of the construction of the variables are given in Appendix B.

4. Main Empirical Results

4.1 Descriptive statistics

Table 1 presents some descriptive statistics. The mean and median values of (R^*- R_f) are 5.38% and 4.80%, respectively, and are comparable to the values in the literature (e.g., Guay, Kothari, and Shu [2003]). The corresponding values for *MTCov* are 0.006 and 0.003, both of which are significantly different from zero (with untabulated t- and z-statistics equal to 9.61 and z = 24.12, respectively). The positive correlation between *EF* and *MB* implies that external financing and equity valuation are generally positively correlated on average, which is consistent with the presence of market-timing activity. Table 2 is a correlation table that shows that the univariate association between (R^*-R_f) and *MTCov* is negative and statistically significant (with a *p*-value equal to 0.00). However, given that market timing is correlated with firm characteristics that also affect the cost of capital, these univariate correlations are somewhat difficult to interpret. For example, there is also a positive relation between (R^*-R_f) and *Leverage* and a negative relation between *Leverage* and *MTCov*, which may confound the true relations between the different variables. A multivariate analysis (presented later) is applied to investigate these different relations more rigorously. Finally, the univariate correlations between our control variables and *Ravg* all have the predicted sign and are statistically different from zero.

Before directly investigating whether past market-timing activity reduces the expected cost of equity capital, we first investigate empirically whether past timing activity can predict future timing activity. To this end, we perform calendar year regressions of *MTCov* as estimated from t+1 to t+N on *MTCov* as estimated from 0 to t-1 for each of the t years in the sample. We consider the cases both in which N equals 5 and N equals 10. We start the regressions in 1970 and finish in 1995 when N equals 10 and 2000 when N equals 5. Specifically, we estimate:

$$MTCov_{i,[t+1,\, t+N]} = a + b\; MTCovt_{i,[1,t]} + e_i \,. \tag{5}$$

The results (untabulated) indicate that the coefficients of *MTCov* over period 0 to t are always positive, and are significant at the 5% level or below in 27 of the 31 years and at the 10% level or below in 30 of the 31 years when N equals 5.[7] When N equal 10, they are significant at the 1% level or below in 24 of the 26 years and at the 5% level or below in 26 of the 26 years. We thus conclude that past market-timing activity conveys important information about the future timing activity of a firm, and is therefore a reasonable proxy for this variable.

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[7] The p-value for the remaining year is 0.103.

4.2 Main results

Table 3 presents the results from our ordinary least-squares (OLS) estimation procedure. The t-statistics are based on standard errors that are corrected for heteroskedasticity. As the observations overlap, the statistical significance of our results may be inflated. To correct for this problem, we also allow for the clustering of observations by firms when we calculate our t-statistics. As explained in Section 4.3, we perform several robustness tests on our estimation method. The results in Table 3 indicate that firms that time the market more have a lower *ex ante* cost of equity capital, and that the effect is both statistically and economically significant. The coefficient of *MTCov* is negative, with a *t*-statistic of -3.88. The magnitude of the coefficient estimate suggests that the cost of equity capital of firms in the top decile of the *MTCov* distribution is 32 basis points lower than the cost of capital of firms in the bottom decile. Under reasonable assumptions, this difference in the cost of capital is associated with a difference of approximately 6% in firm value.[8] Most of the control variables are significant and have the expected sign. The coefficients of determination are reasonably high (41%). The variance inflation factors (VIF) are all below 4, suggesting that multi-collinearity is not an issue in our setting. This finding is consistent with the low pair-wise correlations reported in Table 2. These results support the hypothesis that market-timing activity transfers value from new investors to existing investors.

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[8] To see this, assume that a constant growth model holds and that the spread between the cost of equity and the permanent earnings growth rate is no greater than 5%, i.e., $V = \frac{E}{R^* - g}$. Denote V_H (R_H^*) and V_L (R_L^*) as the value (the cost of equity) for a firm with a high and a firm with a low *MTCov*, respectively. Assume that both companies have the same expected earnings and the same constant earnings growth rate of g. $\frac{V_H - V_L}{V_L} = \frac{R_L^* - R_H^*}{R_L^* - g}$, $R_L^* - R_H^*$ = 0.316%, and $R_L^* - g$ $\leq$ 5% suggest that $\frac{V_H - V_L}{V_L}$ $\geq$ 6.3%.

4.3 *Robustness checks*

In this section, we perform a series of sensitivity tests to ascertain the robustness of our main findings in Table 3. We check whether our results in Table 3 are robust to (1) the regression estimation procedure, (2) the definition of the proxy for market timing, (3) the estimation period for our timing variable, (4) the definition of the cost of equity, and (5) the choice of control variables. We report the results from these various robustness tests in Table 4. Only the results for *MTCov* are tabulated but, unless otherwise specified, we use all of the control variables included in model (4).

4.3.1 *Econometric specification*

Our main results in Table 3 are estimated using a standard OLS approach. As the decisions of firms and their returns are unlikely to be independent, there are likely to be severe cross-correlations in the residual terms of the regression in our pooled specifications. To ensure that the statistical significance of our results is not overstated, we perform several robustness checks on our estimation procedure. First, we follow the traditional approach described in Fama-McBeth (1973). Second, we estimate a modified version of the Fama-McBeth regression that is similar to that used by Baker and Wurgler (2002), in which we run the yearly regression based on the number of years since the IPO, rather than using calendar years.[9] Correspondingly, the standardized deciles ranks are assigned within each event year. Third, we re-estimate our model allowing for the clustering of observations by both firm and year (Cameron, Gelbach, and Miller [2006]).[10] The results in Panel A of Table 4 are consistent with those in Table 3. *MTCov*

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[9] We define the IPO year as the first year for which there is stock price information on the firm in Compustat. As there are very few firms recorded in Compustat for more than 36 years, we treat all firms present for more than 36 years as one group. The results do not change when we exclude firms listed for more than 36 years.

[10] The year fixed effects are removed to estimate these specifications.

remains significantly negative in all of the specifications, with a t-statistic of between -2.24 (in the Baker and Wurgler (2002) specification) and -3.48 (in the Fama-McBeth regression). Although these alternative econometric specifications do not change our conclusions, we prefer to use the specification reported in Table 3 as our main model because the cost of equity capital varies systematically over time. For example, Pastor, Sinha, and Swaminathan (2008) show that the implied cost of capital "is useful in capturing time variation in expected market returns." Our main specification allows us to control for year fixed effects, which is not possible with the three other specifications.

4.3.2 Estimation of MTCov

We next examine the robustness of our results to the definition of *MTCov*. First, we define *MTCov* in our main test as the within-year rank of the covariance between capital issuance (*EF*) and the market-to-book ratio (*MB*), scaled by the average. As a sensitivity check, we use three alternative specifications to ensure that our results are not driven by the choice of covariance deflator. In the first specification, we deflate the covariance between *EF* and *MB* by the average value of *EF*.[11] In the second specification, we calculate *MTCov* based on the simple correlation between capital issuance and the market-to-book ratio. In other words, we scale the covariance between *EF* and *MB* by the product of the variance of *EF* and *MB*, rather than scaling the covariance by the average value of assets. In the third specification, we use the raw measure of *MTCov* (rather than using a ranked measure).

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[11] When we calculate *MTCov* using the average *EF* as a deflator, we follow the literature (e.g., Baker and Wurgler (2002), Kayhan and Titman (2007)) and set the minimum value of *EF* to zero. In contrast, in our main specification we use negative values of *EF* to calculate *MTCov*. However, the results (untabulated) are similar regardless of whether we set the minimum value of *EF* to zero when using assets as a deflator or use negative values of *EF* when we use the average *EF* as a deflator. All of our tabulated results hold when we use EF as a deflator, usually with more significant t-statistics.

Second, our main tests are based on a measure of market timing that relates capital issuance to the price level (measured by the market-to-book ratio). However, one could argue that we should use the change in price instead of the price level. For example, Pastor and Veronesi (2005) report that the volume of an IPO is positively related to both the market-to-book ratio and returns, but that the relation is stronger for returns than for price level. To investigate this issue, we define the timing measure as the covariance between *EF* and the annual stock return between time 1 and t, deflated by the average assets.

Third, in our main test we define net equity issuance and net debt issuance using balance sheet data. As a robustness check, we define debt and equity issuance using the cash flow statements. Following Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), we redefine equity issuance as the sale of common and preferred stock less the purchase of common and preferred stock. Debt issuance is redefined as long-term debt issuance minus long-term debt reduction plus the change in current debt.

The results, in Panel B of Table 4, are consistent with those in Table 3. *MTCov* remains significantly negative in all of the specifications, with a *t*-statistic ranging between -2.09 (when we use the covariance between *EF* and returns rather than *MB*) and -5.28 (when we use the statement of cash flows to define *MTCov*).

4.3.3 Estimation period for MTCov

Next, we perform a sensitivity check on the estimation period for *MTCov*. First, firms may issue more capital when the cost is low by historical standards if the cost of equity capital is fluctuating over the long run but is fairly persistent over the short run (e.g., a 2- to 3-year horizon). Therefore, firms may have recently issued more capital (say, from t-2 to t) if the cost of equity capital at t is currently low (and was also low in more recent years). Our main findings may therefore reflect a correlation between a low current cost of capital and a recent amount of capital issuance, rather than establishing a consistent link between the expected cost of equity capital and the tendency to time the market. To address this issue, we increase the lag between *MTCov* and our estimates of the cost of equity capital by estimating *MTCov* from year zero to year t-3.

Second, there is an empirical trade-off between choosing longer periods to filter out random noise in the estimates and choosing shorter estimation periods that better addresses the possibility that *MTCov* may vary over time. In our main test, we estimate *MTCov* over the entire life of the firm before year t. As a robustness test, we estimate *MTCov* over a shorter interval using data from year t-9 to year t. Finally, we require at least 5 years of observation to measure *MTCov* in our main specification. We relax this assumption in a robustness check and set the requirement of only three years of data to estimate the variable. The results, in Panel C of Table 4, are consistent with those in Table 3: *MTCov* remains significantly negative in all specifications, with a t-statistic of between -3.50 and -4.39.

4.3.4 Estimation of R^*

Next, we perform a sensitivity check on the estimation of the cost of equity capital, the results of which are tabulated in Panel D of Table 4. First, the implied cost of capital estimate has the important advantage that it makes an explicit attempt to separate the cash flow effect from the discount rate effect. As analysts only provide short-term earnings forecasts but long-term growth forecasts (typically up to five years), the implied cost of capital models rely on simplified assumptions of the perpetual growth rates of earnings beyond analyst forecast horizons. However, these assumptions inevitably lead to measurement errors, which become a particular issue if the measurement errors in the perpetual growth rates are correlated with market-timing activity. To address this possibility, we allow the terminal value parameters in the implied cost of capital models to vary across firms. Specifically, in the GLS model, we group all of the firms into 20 equally sized portfolios in each fiscal year based on *MTCov*. For each portfolio, we regress the industry-adjusted return on equity (ROE) on its lagged variable to estimate the persistence of each portfolio's industry adjusted ROE. This procedure provides us with an estimate of the reverting time. In the CT and OJ models, we assume that the perpetual growth rate is proportionate to the analyst forecast of long-term growth over the next three to five years. We then calculate the average of the newly estimated cost of capital with the GLS, CT, OJ, and MPEG models. Our results are essentially unaffected, and *MTCov* remains significantly negative (with a t-statistic equal to -5.80).

Second, our main specification controls for short-term forecast errors and for the estimates of long-term growth. To further ensure that our results are not driven by a systematic error in the estimation of future earnings, we also control for long-term forecast error.[12] The addition of this variable reduces our sample size by approximately one third compared to our main specification. The long-term forecast error is significantly negative, but the *MTCov* remains significantly negative (with a t-statistic equal to –3.61).

Third, we decompose R^* between the four estimates of the cost of equity (GLS, CT, OJ, and MPEG). We perform this additional test because there is no general consensus on the optimal method to estimate the *ex ante* cost of equity, and we want to ensure that our results are

[12] Long-term earnings forecast error is defined as the actual EPS for year t+5 minus the corresponding analyst EPS forecast, scaled by the current price. Consistent with our cost of equity estimation, the analyst EPS forecast for year t+5 is computed by using the EPS forecast for year t+3 multiplied by $(1+Fltg)^2$. Alternatively, we control for the sum of the forecast errors from t+1 to t+5 (scaled by price), but the results (untabulated) are similar (the t-statistic for *MTCov* becomes -3.62.

not driven by any specific estimation procedure. The results in Panel D of Table 4 are consistent with those in Table 3: *MTCov* remains significantly negative, with a t-statistic ranging between -1.94 (when we use the MPEG specification to estimate the cost of equity capital) and -5.71 (when we estimate the cost of equity using the CT model).[13]

Finally, our main specification examines whether the price of firms that time the market in their capital issuance is higher relative to their assets in place and future earnings than the price of firms that do not time the market. As additional untabulated robustness tests, we also consider the earnings-price ratio or market-to-book ratio as the dependent variable.[14] We find that *MTCov* is positively associated with the market-to-book ratio (the t-statistic equals 2.60) and negatively associated with the earnings-price ratio (the t-statistic equals -6.51). In other words, firms that timed the market in the past have a high price relative either to their current earnings or to their assets in place. Although the earnings-price ratio and market-to-book ratio provide a crude estimate of the cost of equity, these two proxies do not rely on analyst forecasts, which provides further assurance that our results are not mechanically caused by systematic errors in the analyst forecasts.

4.3.5 Control variables

Finally, we perform several robustness checks on the control variables. First, our main proxy for market timing is based on the notion of over- or under-valuation, as determined by the firm's current market-to-book ratio relative to the ratio in surrounding years. Kayhan and

[13] The descriptive statistics in Table 1 indicate that the mean and median values of R^* are reasonably close to each other, which suggests that the distribution of the cost of equity is not severely skewed in our sample. Nevertheless, as a robustness test, we refine R^* as the log of (1+ R^*) minus the log of (1+R_f). The results (untabulated) are qualitatively similar.

[14] The market-to-book ratio is defined as (total assets – deferred taxes – common equity + market value of equity)/total assets, and the earnings-price ratio is defined as (net income/market value of equity).

Titman (2007) also hypothesize that managers judge whether or not their firm is over or undervalued based on the value of their firm's market-to-book ratio relative to that of other firms in the economy. To address this possibility, we include an additional variable, *PastMB,* which is defined in our main specification as the average market-to-book ratio. Kayhan and Titman (2007) interpret this measure of past investment opportunity as a proxy for long-term market timing. The results, in Panel E of Table 4, indicate that *MTCov* remains significantly negative, with a t-statistic equal to -6.39. *PastMB* is also significantly negative (with an untabulated t-statistic of -10.91), but the univariate correlation between *PastMB* and *LogBM* is predictably high (-0.53, untabulated).

Second, it could be argued that firms with highly volatile investment opportunities are likely to have a more dynamic financing policy to keep up with market conditions. To address this issue, we include a control for either equity return volatility or sales volatility. The results in Panel E of Table 4 indicate that our results are robust to the inclusion of either variable (the t-statistic for *MTCov* is -4.74 and -3.85, respectively). Untabulated results also indicate that our conclusions are not affected if we control for either the volatility of cash-flow (approximated by the sum of net income and depreciation) or earnings before interest, tax, depreciation, and amortization (EBITDA).

Third, Chang, Dasgupta, and Hilary (2006) argue that firms with greater analyst coverage have greater flexibility to issue capital when market conditions are good. To ensure that we are not capturing this effect, we include a control for analyst coverage (the log of the number of analysts). Analyst coverage is negatively associated with the cost of equity, but *MTCov* remains significantly negative (with a t-statistic equal to -3.94). Our conclusions also hold if we include an indicator variable that takes the value of one if the coverage is less than three analysts, and zero otherwise (untabulated results), or if we drop observations where the coverage is either lower than three or lower than five analysts (untabulated results in both cases). In addition, *MTCov* remains significantly negative (with a t-statistic equal to -4.14) if we control for analyst forecast dispersion.

Fourth, we also consider two alternative specifications. In the first, we add a control for the amount of external financing issued by the firm in the past to our usual control variables. Although a greater amount of past issuance increases the cost of equity (untabulated results), *MTCov* remains significant (with a t-statistic equal to -2.63). In the second specification, we control for financial distress (by adding Altman's (1968) Z-score to our specification) and for financial constraints (by adding the index of Kaplan and Zingales [1997]). *MTCov* remains significant with this specification (with an untabulated t-statistic equal to -4.01).

Finally, we include firm fixed effects in our main specification to control for any possible time-invariant omitted variables. The effect of market timing remains significant (with a t-statistic equal to -1.84 when we use the ranked version of *MTCov*, and -2.45 (untabulated) when we use the raw scaled covariance). In general, we conclude from the tests in this section that our conclusions are robust to various empirical choices.

4.4 Time-varying investment opportunities versus market timing

The results in Section 4.3 show a negative correlation between the expected cost of capital and the past tendency to issue capital when equity prices were high relative to existing assets. We interpret this link between high prices and capital issuance as a proxy for past market-timing activity. However, an alternative interpretation is that *MTCov* proxies for time-varying investment opportunities. As is discussed in the hypotheses development section, if this interpretation of *MTCov* were correct, then we would not expect the cost of equity to be reduced for firms with a stronger correlation between equity price and capital issuance. Nevertheless, we further investigate this possibility by conducting two additional empirical tests.

First, we define *MTCovSent* as the covariance between *EF* and market sentiment (*Sent*), scaled by the average *EF*. We use the measure of market sentiment recently proposed by Baker and Wurgler (2006).[15] Specifically, they create a market-sentiment index created by conducting a principal component analysis to form a linear combination of several individual measures of market sentiment, including the market trading volume, the dividend premium, the closed-end dividend discount, the amount of equity issuance, and the strength of the IPO market. We use a specification in which each component is first orthogonalized with respect to the macro-economic conditions. We expect a negative association between *MTCov_Sent* and the cost of equity. The advantage of using *MTCov_Sent* is that it provides a more direct link with equity mispricing. The drawback is that it removes all of the cross-sectional variation within periods.

Second, we decompose the market-to-book ratio into the part predicted by economic conditions and the part unexplained by economic conditions. To do so, we regress the market-to-book ratio on sales growth rate, return on assets, log of total assets, and two-digit SIC industry fixed effects. The regression is run on a yearly basis. We expect the predicted part of the ratio to be a better predictor of investment opportunities than the residual value, which is more likely to represent firm-specific information and mispricing. We then decompose our timing measure, *MTCov*, into a term of the covariance between *EF* and the predicted component of the market-to-book ratio (*MTCov_Pred*) and a term of the covariance between *EF* and the unexpected (residual) component of the market-to-book ratio (*MTCov_Resid*). Both covariance terms are scaled by

[15] We refer the interested reader to Baker and Wurgler (2006) for a more complete description of the estimation procedure for this index. We thank Jeffrey Wurgler for making the market sentiment data available at http://pages.stern.nyu.edu/~jwurgler/.

average total assets. We expect the benefits of the stronger relation between the market-to-book ratio and capital issuance to be concentrated in the unexplained part of the market-to-book ratio, rather than in the predicted part.

The results for these new specifications are reported in Table 5. Consistent with our prediction, we find that our measure of the covariance between market sentiment and *EF* is strongly negatively associated with the cost of equity (with a t-statistic equal to -5.88). Given that our measure of market sentiment is orthogonalized with respect to macro-economic conditions, it is unlikely that this correlation reflects variations in investment opportunities. Also consistent with our interpretation of the results based on market timing, we find that the covariance between *EF* and the residual market-to-book ratio is significantly negative (with a t-statistic equal to -2.56), whereas the covariance between *EF* and the predicted part of the ratio has essentially no relation with the cost of equity (with a t-statistic of -0.63). We also construct two additional measures of timing similar to *MTCov_Resid* and *MTCov_Pred*, but calculate them based on the scaled covariance between *MB* and either the predicted part of *EF* or the residual part of *EF*. Consistent with the results for *MTCov_Resid* and *MTCov_Pred*, we find in untabulated specifications that the scaled covariance between *MB* and the predicted part of *EF* has an insignificant effect on the cost of equity, but that the covariance between *MB* and the unexplained part of *EF* significantly reduces the cost of equity (with an untabulated t-statistic of -2.41).[16] These different results are consistent with our interpretations of the findings reported in Tables 3 and 4.

5. Additional empirical analysis

[16] We also consider the covariance between the unpredicted part of *EF* and the unpredicted part of *MB*. The interaction is negatively associated with the cost of equity, but is not significant at conventional levels. This lack of significance can probably be explained by noise in the estimation of the expected levels of *MB* and *EF*.

Having established that our main results are robust to various assumptions, we consider whether the identified effect is stronger for equity timing than for debt timing. We then investigate whether the benefits are more important for long-term investors. Finally, we examine whether there is a substitution between the market-timing activity of firms and that of shareholders.

5.1 Equity, debt, and capital market timing

Our main tests are based on the correlation between capital issuance and market condition. This approach considers both equity and debt issuance. The literature on equity timing is fairly developed, but that on debt timing is more limited. Previous studies (e.g., Flannery [1986], Wittenberg-Moerman [2008]) have suggested that long-term debt is subject to information asymmetry. Lucas and McDonald (1990) predict that a stock price run-up usually precedes the issue of an informationally disadvantaged security such as equity or long-term debt, which leaves the possibility that debt timing occurs. However, it can be argued that timing the market with debt is more difficult than with equity, because debt is generally easier to price debt than equity, and because participants in the debt markets are usually sophisticated institutional investors. Several studies (e.g., Graham and Harvey [2001], Baker, Greenwood and Wurgler [2003])[17] report empirical evidence to suggest that firms attempt to time their debt issuance with respect to interest movements. We also consider debt timing, but from a different perspective, focusing on debt timing with respect to firm misvaluation. To our knowledge, this has not been directly addressed previously in the literature. To investigate the issue, we form two new variables, *MTCov_E* and *MTCov_D*, that are analogs of *MTCov*. *MTCov_E* is the covariance between the market-to-book ratio and equity and convertible debt issuance, and *MTCov_D* is the

[17] Butler, Grullon, and Weston (2006) attribute the results in Baker, Greenwood, and Wurgler (2003) to a structural shift in monetary policy in the early 1980s, rather than a firm being successful at timing the market.

covariance between the market-to-book ratio and long-term debt issuance. We scale both covariances by the average amount of equity and long-term debt issued, and then re-estimate our main model using these two variables in place of *MTCov*.

The results, tabulated in Table 6, indicate that both *MTCov_E* and *MTCov_D* are negatively associated with the cost of equity. The t-statistic for *MTCov_E* equals -4.20 when *MTCov_D* is not included in the regression and -4.01 when it is included. The t-statistic for *MTCov_D* equals -1.89 when *MTCov_E* is not included in the regression and -1.41 when it is included. Both the magnitude and the statistical significance of *MTCov_E* are larger than those of *MTCov_D*. These results clearly support the notion that timing the issuance of equity reduces the cost of equity. They are more ambiguous with respect to the benefits of issuing long-term debt, but are somewhat consistent with the hypothesis that it has some advantages.

5.2 Long-term shareholders and the effect of market timing on the cost of capital

We investigate the impact of institutional holdings on the perceived benefit of market timing. We follow the approach of Bushee (1998) to define the dedicated institutional investors. This approach classifies institutions into three groups – transient, dedicated, and quasi-indexer – based on their past investment patterns in the areas of portfolio turnover, diversification, and momentum trading. Dedicated investors are institutions with large, long-term holdings that are concentrated in only a few firms.[18] These investors are in a strong position to take advantage of the market-timing activity of a firm. On the one hand, the size of their investment and their mandate make it difficult for them to directly take advantage of mispricings, even if they can identify these anomalies. However, on the other hand, their position within the firm gives them

[18] "Transient" institutional owners are institutions that hold small stakes in numerous firms and trade frequently in and out of stocks, generally basing their trades on a value proxy such as current earnings. "Quasi-indexers" use indexing or buy-and-hold strategies that are characterized by high diversification and low portfolio turnover.

enough clout to give managers more incentive to exploit uninformed investors if it is possible for those managers to do so. We therefore expect that firms in which dedicated long-term investors are more present will time the market more when they issue capital than firms in which such investors are less present. In other words, we expect *MTCov* to be a better measure of the sensitivity of issuance to mispricings (as opposed to a measure of changes in investment opportunities) for firms in which dedicated investors are more present than for firms in which they are less present. We thus expect that the association between *MTCov* and the cost of equity will be stronger in firms in which long-term investors are strongly represented. To test this prediction, we interact *MTCov* with *DedOwn*. *DedOwn* is defined as the percentage of dedicated institutional investors in the shareholding of the firm. Consistent with our prediction, the results in Table 7 indicate that the coefficient of *DedOwn*×*MTCov* is significantly negative (the t-statistic of the interaction term equals -2.27). All of the VIFs are below 5, which suggests that multi-collinearity is not a concern.

To further investigate the notion that *MTCov* is a better measure of the sensitivity of capital issuance to mispricings when long-term shareholders are more present, we estimate a model similar to that in Baker and Wurgler (2002) and Kayhan and Titman (2007). We regress the book leverage ratio (estimated at t) on *MTCov*, *DedOwn*, and the interaction between these two variables. We also include our other control variables (measured at t-1) and firm fixed effects. We find in untabulated results that the interaction term is significantly negative (with a t-statistic of -3.6), which is consistent with the idea that *MTCov* is more reflective of timing activity than of variations in investment opportunities in firms in which dedicated institutional investors are more present. *MTCov* is also significantly negative in this specification (with a t-statistic of -5.8).

5.3 Substitution in timing activity

Finally, we investigate whether there is a substitution between the benefits of market-timing activity of firms and that of shareholders. A mispriced security represents a timing opportunity for all market players with private information. Managers acting in the interest of existing shareholders can exploit the opportunity by timing equity issuance. Investors (including managers) who have access to private information can also time their trades to exploit the opportunity. However, when such opportunity is exploited by investors with private information on the secondary market, the private information is then incorporated into the stock price and the security price reverts to its true value, thus reducing the potential profitability from timing the equity issuance. We therefore expect a substitution between the two types of timing activity.

To investigate this hypothesis, we add *PIN* (the probability of informed trading) and its interaction with *MTCov* to our main specification. *PIN* is a firm-specific estimate of the probability that a particular trade order originates from a privately informed investor, and was introduced by Easley et al. (1996). Brown, Hillegeist, and Lo (2007) describe *PIN* as the unconditional expectation of the fraction of total daily trades that are based on private information. We use *PIN* to proxy for the extent of timing activity by investors on the secondary market.[19]

The results, reported in Table 8, are consistent with the idea that there is a substitution between market-timing activity by firms and informed trading by shareholders. The coefficient associated with the interaction between *MTCov* and *PIN* in Column (I) is significantly positive

[19] We obtain quarterly PIN estimate from Stephen Brown (userwww.service.emory.edu/~sbrow22) and use the average quarterly PIN in our test, but our results are robust to using the annual estimates of PIN between 1980 and 2001 from Soeren Hvidkjaer's website (www.smith.umd.edu/faculty/hvidkjaer/data.htm). We thank both authors for making their data available.

(the t-statistic equals 4.59).[20] In Column (II) of Table 6, we incorporate both the effect of dedicated institutional investors and of *PIN*, but our conclusions are not affected and both interactions remain significant (with a t-statistic equal to -1.71 and 3.87, respectively). These results and the results in Section 5.2 suggest that some investors are locked into some firms and cannot easily sell to take advantage of temporary mispricings. These investors rely on managers to time the issuance of capital and to take advantage of market abnormalities. In contrast, when individual shareholders can directly time their trades to take advantage of mispricings, the benefits of firms timing the market are reduced.

6. Conclusion

The literature has long suggested that managers time the issuance of equity to try to take advantage of favorable market conditions for the benefit of current shareholders. However, it is not known whether current investors share their belief in the feasibility of approach. We empirically investigate this issue by looking at the association between market timing and the implied cost of equity. To do so, we obtain an estimate of the discount rate used by investors to price expected earnings from the operational activities of firms to obtain an *ex ante* measure of the cost of equity. We then examine whether managers can lower their *ex ante* cost of equity by timing the issuance of external capital.

Our results are consistent with this hypothesis. We find that, controlling for various characteristics such as size, risk profile, or investment opportunities, the implied cost of equity is lower for firms that issued equity in the past when market conditions appeared to be good. The

[20] The VIF of *MTCov*×*PIN* is greater than 10, which suggests that multi-collinearity may be an issue. To reduce multi-collinearity, we first demean *PIN* and *MTCov*, and use the demeaned variables to compute interaction terms. The VIFs are reduced to below 4 and the coefficient estimate of *PIN*×*MTCov* is still significantly positive (the t-statistic equals 4.59).

results also indicate that the benefits of timing equity issuance are clearer than the benefits of timing debt issuance. This suggests that investors in the secondary market believe in the market -timing ability of managers. We also find that market timing is more important for firms with a higher fraction of shares held by dedicated institutional investors. Finally, we find that the benefits of market timing by firms are reduced when there is a higher likelihood of market timing by shareholders.

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Appendix A: Estimation of the Cost of Equity Capital

For ease of discussion, we first define the variables used in the following five models.

P_t^*	=	The market price of a firm's common stock at time *t*. We use the price at month +4 after the latest fiscal year-end to compute P_t^* because most U.S. firms announce their annual reports by the end of the fourth month after the fiscal year-end.
B_t	=	The book value of equity from the most recent available financial statement at time *t*.
$FEPS_{t+i}$	=	The median forecasted EPS from I/B/E/S or derived EPS forecast for the next *i* year at time *t*.
POUT	=	The forecasted dividend payout ratio. We use the ratio of the indicated annual dividends from I/B/E/S and $FEPS_{t+1}$ to measure the forecasted payout ratio. If $FEPS_{t+1}$ is negative, then we assume a return of assets of 6% to calculate earnings. *POUT* is winsorized to be within 0 and 1.

1. Gebhardt, Lee, and Swaminathan (2001)

$$P_t^* = B_t + \sum_{i=1}^{T-1} \frac{[FROE_{t+i} - R_{GLS}] \times B_{t+i-1}}{(1+R_{GLS})^i} + \frac{[FROE_{t+T} - R_{GLS}] \times B_{t+T-1}}{(1+R_{GLS})^{T-1} R_{GLS}}. \quad \text{(A-1)}$$

We use I/B/E/S analyst forecasts to proxy for the market expectation of a firm's earnings for the next three years. Thereafter, we measure the expectations of market earnings by assuming that the future return on equity declines linearly to an equilibrium return on equity from the fourth year to the *T-th* year. This equilibrium return on equity is measured by a historical, ten-year, industry-specific median return on equity. The return on equity (ROE) is calculated as the income available for common shareholders (Compustat data item #237) scaled by the lagged total book value of equity (Compustat data item #60). We classify all firms into the 48 industries defined by Fama and French (1997). Firm-year observations with a negative return on equity are excluded from our sample. The future book value of equity is estimated by assuming a clean surplus relation, that is, $B_{t+1} = B_t + EPS_{t+1} - DPS_{t+1}$. The future dividend, DPS_{t+i}, is calculated by multiplying EPS_{t+i} by *POUT*. We assume that $T = 12$. We use a numerical approximation program to solve for R_{GLS} that equates the right- and left-hand sides of (A-1) within a difference of \$0.001. As we estimate the cost of capital at month +4, to account for partial year discounting, we adjust the stock price at month +4 (P_t) by $(1+R_{GLS})^{4/12}$, that is, $P_t^* = P_t/(1+R_{GLS})^{4/12}$. A similar adjustment is also applied to other cost of capital models.

2. Claus and Thomas (2001)

$$P_t^* = B_t + \sum_{i=1}^{5} \frac{[FEPS_{t+i} - R_{CT} \times B_{t+i-1}]}{(1+R_{CT})^i} + \frac{[FEPS_{t+5} - R_{CT} \times B_{t+4}] \times (1+g_{lt})}{(R_{CT} - g_{lt})(1+R_{CT})^5}. \quad \text{(A-2)}$$

We use I/B/E/S earnings forecasts to estimate the abnormal earnings for the next five years. Earnings forecasts for the future fourth and fifth years are derived from earnings forecasts for the third year and the long-term earnings growth rate. If the long-term earnings growth rate is missing from I/B/E/S, then an implied earnings growth rate from EPS_{t+2} and EPS_{t+3} is used. The long-term abnormal earnings growth rate is calculated using the contemporaneous risk-free rate (the yield on ten-year Treasury bonds) minus three percent. The future book value of equity is also estimated by assuming a clean surplus relation. The future dividend, DPS_{t+i}, is calculated by multiplying EPS_{t+i} by the payout ratio, *POUT*. We use a numerical approximation program to R_{CT} that equates the right- and left-hand sides of (A-2) within a difference of $0.001.

3. Ohlson and Juettner-Nauroth (2005) implemented by Gode and Mohanram (2003)

$$P_t^* = \frac{E_t(EPS_{t+1})}{R_{OJ}} + \frac{E_t(EPS_{t+1})E_t[g_{st} - R_{OJ} \times (1 - POUT)]}{R_{OJ}(R_{OJ} - g_{lt})}, \qquad \text{(A-3)}$$

where g_{st} is the average of the short-term earnings growth rate implied in EPS_{t+1} and EPS_{t+2} and the analyst forecast of long-term growth rate. The implementation of this model requires that $EPS_{t+1} > 0$ and $EPS_{t+2} > 0$. g_{lt} is calculated using the contemporaneous risk-free rate (the yield on ten-year treasury bonds) minus three percent. We use a numerical approximation program to solve for R_{OJ} that equates the right- and left-hand sides of (A-3) within a difference of $0.001.

4. The Modified PEG ratio model of Easton (2004)

$$P_t^* = \frac{E_t(EPS_{t+1})}{R_{MPEG}} + \frac{E_t(EPS_{t+1})E_t[g_{st} - R_{MPEG} \times (1 - POUT)]}{R_{MPEG}^2}. \qquad \text{(A-4)}$$

We use a numerical approximation program to solve for R_{MPEG} that equates the right- and left-hand sides of (A-4) within a difference of $0.001. This model requires that $E_t(EPS_{t+2}) \geq E_t(EPS_{t+1}) \geq 0$.

Appendix B: Definition of the Variables

Variables	Definitions
R*	The average value of the four cost of capital estimates described in Appendix A. All of the cost of capital proxies are estimated at month m+4 after the fiscal year-end.
R_f	The risk free rate, measured as the yields of 10-year treasury bonds.
MTCov	The covariance between external financing and the market-to-book ratio from the first year a firm is featured in Compustat to the current year, scaled by the average historical total assets.
MTCov_Sent	The covariance between the external equity financing and the market sentiment index of Baker and Wurlger (2006) from the first year a firm is featured in Compustat to the current year, scaled by the average historical total assets.
MTCov_Pred	The covariance between external financing and the predicted market-to-book ratio obtained by regressing the market-to-book ratio on sales growth, log of total assets, ROA, and industry dummies, scaled by the average historical total assets.
MTCov_Resid	The covariance between the external financing and the market-to-book ratio regression residuals, obtained by regressing the market-to-book ratio on sales growth, log of total assets, ROA, and industry dummies, scaled by the average historical total assets.
MTCov_E	The covariance between external equity financing and the market-to-book ratio from the first year a firm is featured in Compustat to the current year, scaled by the average total assets.
MTCov_D	The covariance between external debt financing and the market-to-book ratio from the first year a firm is featured in Compustat to the current year, scaled by the average historical total assets.
Beta	The CAPM beta, estimated by the regression of monthly excess return on excess market returns using the previous 60 months' (at least 24 months') returns.
Log(MV)	The natural log of the market value of common equity at the previous fiscal year-end.
LogBM	The natural log of the book-to-market ratio measured at the previous fiscal year-end.
Leverage	The market-based leverage, measured as long-term debt, scaled by the sum of long-term debt and the market value of equity.
MMT	The natural low of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end.
Ferr	The analyst forecast error, measured as the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month +4 after the fiscal year-end.
Fltg	The analyst forecast of long-term earnings growth.
IndRP	The industry risk premium, measured as the median average risk premium of all firms in the same industry, as defined in Fama and French (1997), in the previous year.
PIN	The annual average quarterly estimate of the probability of informed trading from Stephen Brown's website.
DedOwn	The percentage of ownership by dedicated institutional investors. The definition of dedicated institutions is based on that in Bushee (1998).

Table 1 Descriptive statistics

Variables	N	Mean	Stdev	Q1	Median	Q3
R^*-R_f	24,740	5.377	3.246	3.283	4.795	6.798
$MTCov_{[1, t]}$	24,740	0.006	0.099	-0.009	0.003	0.020
Beta	24,740	1.139	0.577	0.763	1.082	1.444
LogMV	24,740	6.513	1.660	5.322	6.401	7.565
LogBM	24,740	-0.736	0.702	-1.146	-0.689	-0.264
Leverage	24,740	0.137	0.136	0.020	0.103	0.212
Price Momentum (*MMT*)	24,740	0.106	0.417	-0.116	0.109	0.334
Forecast error (*Ferr*)	24,740	-0.018	0.055	-0.020	-0.003	0.003
Long-term earnings growth forecast (*Fltg*)	24,740	0.163	0.072	0.117	0.150	0.200
Industry risk premium (*IndRp*)	24,740	5.225	1.534	4.244	5.130	6.098
Dedicated institutional ownership (*DedOwn*)	24,740	0.093	0.092	0.017	0.070	0.142
Probability of Informed Trading (PIN)	14,146	0.170	0.063	0.123	0.163	0.208

Ravg is the expected cost of equity minus the risk free rate. *MTCov* is the covariance between external financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *Beta* is the CAPM beta estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium. *PIN* is the annual estimate of the probability of informed trading from Hvidkjaer's website. *DedOwn* is the percentage of ownership by dedicated institutional investors.

Table 2 Correlations

Variable	R_{avg}-R_f	*MTCov*	*Beta*	*Log(MV)*	*Log(BM)*	*Leverage*	*MMT*	*Ferr*	*Fltg*	*IndRP*	*Dedown*
MTCov	-0.038										
	(0.000)										
Beta	0.073	0.077									
	(0.000)	(0.000)									
Log(MV)	-0.300	0.007	-0.087								
	(0.000)	(0.275)	(0.000)								
Log(BM)	0.294	-0.096	-0.081	-0.391							
	(0.000)	(0.000)	(0.000)	(0.000)							
Leverage	0.266	-0.106	-0.116	-0.147	0.472						
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)						
MMT	-0.353	0.049	-0.046	0.067	-0.225	-0.117					
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
Ferr	-0.356	0.032	-0.084	0.223	-0.201	-0.169	0.330				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
Fltg	0.101	0.103	0.316	-0.173	-0.373	-0.252	0.072	-0.023			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
IndRP	0.258	0.025	-0.011	-0.018	0.072	0.056	0.061	-0.027	-0.026		
	(0.000)	(0.000)	(0.081)	(0.005)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Dedown	-0.043	0.002	0.000	0.007	0.036	0.038	-0.025	0.026	-0.058	-0.015	
	(0.000)	(0.785)	(0.965)	(0.250)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.017)	
PIN	0.175	-0.002	-0.064	-0.734	0.274	0.088	0.071	-0.098	0.095	-0.011	0.067
	(0.000)	(0.785)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.191)	(0.000)

Ravg is the expected cost of equity minus the risk free rate. *MTCov* is the covariance between external financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *Beta* is the CAPM beta, estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium. *PIN* is the annual estimate of the probability of informed trading from Hvidkjaer's website. *DedOwn* is the percentage of ownership by dedicated institutional investors. The p-values for statistical significance are in parentheses**.**

Table 3 Main results

Dependent variable: $R^* - R_f$	Predicted Signs	OLS Regression (I)
***MTCov*$_{[1,t]}$**	**?**	**-0.316*** (-3.88)**
MTCov*$_{[1,t]}$*_EF	?	
Beta	+	0.198*** (4.40)
LogMV	-	-0.329*** (-14.28)
LogBM	+	0.709*** (12.09)
Leverage	+	3.505*** (14.04)
Price Momentum (*MMT*)	-	-1.882*** (-33.88)
Forecast error (*Ferr*)	-	-11.749*** (-18.68)
Long-term earnings growth forecast (*Fltg*)	?	7.193*** (14.26)
Industry risk premium (*IndRp*)	+	0.413*** (18.74)
Year Fixed Effects		yes
Adjusted R^2		0.41
N		24740

The t-statistics are based on standard errors adjusted for heteroskedasticity and clustering of observations at the firm level. $R^* - R_f$ is the expected cost of equity minus the risk free rate. *MTCov* is the covariance between external financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *Beta* is the CAPM beta estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium.

Table 4 Robustness checks

Panel A: Alternative econometric specifications.

Model Specification	Coefficient Estimate of the Market-Timing Measure (t-statistic)
Fama-McBeth Regression	-0.237*** (-3.48)
Modified Fama-McBeth (Baker-Wurgler 2002)	-0.144** (-2.24)
Clustering of observations by year and firm	-0.303*** (-3.06)

Panel B: Alternative definitions of *MTCov*

Definition of *MTCov*	Coefficient Estimate of the Market-Timing Measure (t-statistic)
Market timing measured as the correlation between capital issuance and the market-to-book ratio	-0.301*** (-3.94)
Market timing measured as the raw covariance of capital issuance and the market-to-book ratio, scaled by total assets	-0.697*** (-2.59)
Market timing measured as the covariance between capital issuance and the market-to-book ratio, scaled by average external financing	-0.371*** (-4.56)
Market timing measured as the scaled covariance between capital issuance and stock returns	-0.164** (-2.09)
Capital issuance (*EF*) based on the flow of the fund statement or cash-flow statement	-0.417*** (-5.28)

Panel C: Alternative estimation periods for *MTCov*

Alternative estimation period for *MTCov*	Coefficient Estimate of the Market-Timing Measure (t-statistic)
MTCov estimated from the IPO year to year t-3	-0.381*** (-4.39)
MTCov estimated from year t-9 to year t	-0.305*** (-3.50)
MTCov estimated over a minimum of 3 years	-0.249*** (-3.58)

Panel D: Alternative definitions of R^*

Alternative definition of R^*	Coefficient Estimate of the Market-Timing Measure (t-statistic)
Allowing the terminal value parameters to vary when calculating R^*	-0.428*** (-5.90)
Controlling for long-term forecast errors	-0.344*** (-3.61)
R^* measured using the GLS model	-0.219*** (-2.85)
R^* measured using the CT model	-0.509*** (-5.71)
R^* measured using the OJ model	-0.285*** (-3.11)
R^* measured using the MPEG model	-0.251* (-1.94)

Panel E: Alternative set of control variables

Model Specification	Coefficient Estimate of the Market-Timing Measure (t-statistic)
Controlling for *PastMB*	-0.520*** (-6.39)
Controlling for return volatility	-0.376*** (-4.74)
Controlling for sales volatility	-0.305*** (-3.85)
Controlling for analyst coverage	-0.318*** (-3.94)
Controlling for forecast dispersion	-0.309*** (-4.14)
Controlling for the average amount of capital issuance	-0.209*** (-2.63)
Controlling for financial distress and financial constraints	-0.326*** (-4.01)
Include firm fixed effects	-0.199* (-1.84)

Table 5 Time-varying investment opportunity and market timing

Dependent variable: $R^* - R_f$	Predicted Sign	(I)	(II)	(III)
MTCov_Sent $_{[1,t]}$	**-**	**-0.481*** **		
		(-5.88)		
MTCov_Resid $_{[1,t]}$	**-**		**-0.204***	
			(-2.56)	
MTCov_Pred $_{[1,t]}$	**0**			**-0.011**
				(0.63)
Beta	+	0.219***	0.202***	0.201***
		(4.84)	(4.25)	(4.23)
LogMV	-	-0.321***	-0.310***	-0.313***
		(13.98)	(13.07)	(13.08)
LogBM	+	0.704***	0.710***	0.716***
		(12.03)	(11.79)	(11.90)
Leverage	+	3.696***	3.731***	3.737***
		(14.79)	(14.37)	(14.40)
Price Momentum (*MMT*)	-	-1.905***	-1.910***	-1.905***
		(34.31)	(32.81)	(32.77)
Forecast error (*Ferr*)	-	-11.759***	-11.675***	-11.683***
		(18.68)	(17.67)	(17.67)
Long-term earnings growth forecast (*Fltg*)	?	7.351***	7.144***	7.006***
		(14.53)	(13.23)	(13.05)
Industry risk premium (*IndRp*)	+	0.405***	0.410***	0.408***
		(18.52)	(18.11)	(18.05)
Year Fixed Effects		yes	yes	yes
Adjusted R^2		0.41	0.41	0.41
N		24,740	23,290	23,290

The t-statistics are based on standard errors adjusted for heteroskedasticity and clustering of observations at the firm level. $R^* - R_f$ is the expected cost of equity minus the risk free rate. *MTCov_Sent* is the covariance between external financing and the market sentiment from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *MTCov_Pred* (*MTCov_Resid*) is the covariance between external financing and the part of the market-to-book ratio explained (unexplained) by firm-specific and industry dummies, scaled by the average historical external financing. *Beta* is the CAPM beta, estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium.

Table 6 Equity and debt timing

Dependent variable: $R^* - R_f$	Predicted Sign	(I)	(II)	(III)
$MTCov\_E_{[1,t]}$	**-**	**-0.325*****		**-0.309*****
		(4.20)		**(4.01)**
$MTCov\_D_{[1,t]}$	**?**		**-0.154***	**-0.114**
			(1.89)	**(1.41)**
Beta	+	0.197***	0.187***	0.199***
		(4.39)	(4.16)	(4.43)
LogMV	-	-0.332***	-0.321***	-0.332***
		(14.24)	(13.92)	(14.29)
LogBM	+	0.707***	0.710***	0.704***
		(12.05)	(12.04)	(11.99)
Leverage	+	3.514***	3.574***	3.511***
		(14.11)	(14.33)	(14.10)
Price Momentum (*MMT*)	-	-1.883***	-1.887***	-1.883***
		(33.89)	(33.92)	(33.88)
Forecast error (*Ferr*)	-	-11.771***	-11.746***	-11.759***
		(18.75)	(18.66)	(18.71)
Long-term earnings growth forecast (*Fltg*)	?	7.208***	7.082***	7.209***
		(14.30)	(14.04)	(14.29)
Industry risk premium (*IndRp*)	+	0.410***	0.412***	0.412***
		(18.65)	(18.64)	(18.69)
Year Fixed Effects		Yes	Yes	Yes
Adjusted R^2		0.41	0.41	0.41
N		24,740	24,740	24,740

The t-statistics are based on standard errors adjusted for heteroskedasticity and clustering of observations at the firm level. $R^* - R_f$ is the expected cost of equity minus the risk free rate. *MTCov_E* is the covariance between external equity financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical equity financing. *MTCov_D* is the covariance between external debt financing and the market-to-book ratio from the first year a firm is featured in Compustat to the current year, scaled by the average historical debt financing. *Beta* is the CAPM beta estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium.

Table 7 Dedicated institutional holdings, market timing, and the cost of equity

Dependent variable: $R^* - R_f$	Predicted Sign	Coefficient Estimate (t-statistic)
MTCov	-	-0.182*
		(1.79)
DedOwn*×*MTCov	**-**	**-1.556****
		(-2.27)
DedOwn	?	-0.323
		(-0.73)
Beta	+	0.199***
		(4.45)
LogMV	-	-0.326***
		(-14.20)
LogBM	+	0.716***
		(12.22)
Leverage	+	3.511***
		(14.07)
Price Momentum (*MMT*)	-	-1.882***
		(-33.90)
Forecast error (*Ferr*)	-	-11.712***
		(-18.62)
Long-term earnings growth forecast (*Fltg*)	?	7.169***
		(14.21)
Industry risk premium (*IndRp*)	+	0.414***
		(18.78)
Year Fixed Effects		Yes
Adjusted R^2		0.41
N		24,740

The t-statistics are based on standard errors adjusted for clustering of observations at the firm level. $R^* - R_f$ is the expected cost of equity minus the risk free rate. *MTCov* is the covariance between external financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *Beta* is the CAPM beta estimated by the regression of the monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium. *DedOwn* is the percentage of ownership by dedicated institutional investors.

Table 8 Substitution in timing activities

Dependent variable: $R^* - R_f$	Predicted sign	(I)	(II)
MTCov	-	-1.301***	-1.175***
		(5.03)	(4.61)
DedOwn*×*MTCov	**-**		**-1.333***
			(-1.92)
PIN*×*MTCov	**+**	**6.569***	**6.542***
		(4.59)	**(4.57)**
DedOwn	?		-0.784*
			(-1.67)
PIN	+	-4.820***	-4.754***
		(-5.00)	(-4.90)
Beta	+	0.175***	0.180***
		(3.84)	(3.94)
LogMV	-	-0.480***	-0.473***
		(-14.87)	(-14.71)
LogBM	+	0.411***	0.416***
		(6.47)	(6.58)
Leverage	+	3.829***	3.850***
		(14.29)	(14.38)
Price Momentum (*MMT*)	-	-1.893***	-1.892***
		(-28.16)	(-28.20)
Forecast error (*Ferr*)	-	-14.905***	-14.833***
		(-15.83)	(-15.79)
Long-term earnings growth forecast (*Fltg*)	?	6.641***	6.605***
		(11.30)	(11.23)
Industry risk premium (*IndRp*)	+	0.376***	0.379***
		(13.72)	(13.81)
Year Fixed Effects		Yes	Yes
Adjusted R^2		0.47	0.47
N		14,129	14,129

The t-statistics are based on standard errors adjusted for clustering of observations at the firm level. $R^* - R_f$ is the expected cost of equity minus the risk free rate. *MTCov* is the covariance between external financing and the market-to-book ratio from the first year a firm enters Compustat to the current year, scaled by the average historical external financing. *Beta* is the CAPM beta estimated by the regression of monthly excess return on excess market returns using the previous 60 months' returns. *LogMV* is the natural log of the market value of common equity at the previous fiscal year-end. *LogBM* is the natural log of the book-to-market ratio. *Leverage* is the ratio of long-term debt scaled by total assets. *MMT* is the natural log of one plus the compounded returns over the 12 months ending 4 months after the fiscal year-end. *Ferr* is the difference between actual earnings and the I/B/E/S consensus forecast for the forthcoming fiscal year, scaled by the stock price at month+4 after the fiscal year-end. *Fltg* is the analyst forecast of long-term earnings growth. *IndRP* is the industry risk premium. *PIN* is the annual estimate of the probability of informed trading from Hvidkjaer's website. *DedOwn* is the percentage of ownership by dedicated institutional investors.