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ABSTRACT

We study how stock market mispricing might influence individual firms' investment decisions. We find a positive relation between investment and a number of proxies for mispricing, controlling for investment opportunities and financial slack, suggesting that overpriced (underpriced) firms tend to overinvest (underinvest). Consistent with the predictions of our model, we find that investment is more sensitive to our mispricing proxies for firms with higher R&D intensity suggesting longer periods of information asymmetry and thus mispricing) or share turnover (suggesting that the firms' shareholders are short-term investors). We also find that firms with relatively high (low) investment subsequently have relatively low (high) stock returns, after controlling for investment opportunities and other characteristics linked to return predictability. These patterns are stronger for firms with higher R&D intensity or higher share turnover.

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The market efficiency hypothesis states that security prices always fully reflect available information. Over the last decade that paradigm has come under attack. Shleifer (2000), Barberis and Thaler (2001), and Hirshleifer (2001) summarize three related strands of literature. First, theoretical work argues that arbitrage has limited effectiveness. Second, experimental evidence shows that agents hold beliefs that are not completely correct and/or make choices that are normatively questionable. Finally, empirical work documents phenomena where prices almost certainly deviate from fundamental value.

This body of evidence in support of behavioral finance naturally raises the question as to whether mispricing in the stock market has consequences for the real economy. Without such an impact, these behavioral anomalies may just represent an interesting sideshow.

An obvious starting point for such a line of inquiry is to ask whether market inefficiencies impact managerial decisions. Baker and Wurgler (2002) show that when a firm's stock price is high, the firm is more likely to issue equity rather than debt. This behavior has a large, persistent effect on firm capital structure.

An interesting related question is whether deviation from fundamentals can influence firms' investment policy. Stein (1996) examines firm investment in the presence of market inefficiencies. In his analysis, Stein shows that the mechanism through which market inefficiencies affect investment decisions are different depending on whether the managers have long or short horizons.

If managers have long horizons and discount project cash flow at the true cost of capital (i.e. based on fundamental risks), a manager can issue overvalued stock or buy back undervalued equity consistent with Baker and Wurgler (2002). Investment decisions may change as a result of this capital structure decision. Stein shows that equity-dependent firms will have investment that is more sensitive to non-fundamental variations in stock prices than firms that are not liquidity constrained. When stock prices are above fundamentals, rational managers of equity-dependent firms find it more attractive to issue equity. By contrast, when stock prices are below fundamental values, managers of equity-dependent firms do not invest, because for them investment requires the issuance of stock at too low of a price. In summary, stock price valuations can affect investment through an *equity-issuance* channel. According to this theory irrational fluctuations in a firm's stock market price are an important determinant of investment for the subset of firms that are equity-dependent, but are a sideshow for firms that are not. The real effect of investors' sentiment is to enable good (i.e. positive net present value) projects that otherwise would not occur.

Baker and Wurgler (2002)'s evidence on the timing of equity issues is consistent with the importance of such a mechanism but does not provide direct evidence that deviation from fundamentals can affect a firm's real investment decision. Baker, Stein, and Wurgler (2003) do directly test Stein (1996) and find evidence that stock prices have a stronger influence on the investment of firms that need external equity to finance their investments.

This literature concludes that stock market mispricing has an impact on firm's investment through equity-decision. In this paper we ask a complementary question, whether there is an alternative direct channel that affects investment decisions that is not linked to equity issuance decisions. Stein (1996) provides a positive theoretical answer to this question. In his paper Stein also studies the case where managers have short horizons. In that circumstance, managers discount project cash flows at the actual conditional expected return on the firm's assets. Since markets are inefficient, this will not necessarily be the cost of capital as predicted by a model of fundamental risks. As Stein points out, one way of thinking about this situation is that a short-horizons manager is interested in maximizing the current stock price and thus must cater to any misperceptions investors may have.

In this paper we test this alternative (and complementary) *catering* channel through which deviation from fundamentals may affect investment decisions directly. If new investment projects are evaluated at the current stock market price, for example as in the practice of using "multiples" to evaluate new projects, and if there is enough asymmetry of information regarding project quality, a rational manager may find it optimal to invest in projects with negative NPV *even when the project is not financed with equity issues.* Firms with ample cash or debt capacity may have an incentive to waste resources when their stock price is overpriced and to forgo positive investment opportunities when their stock price is undervalued. Thus mispricing may affect investment without working through an equity channel as in Baker, Stein, and Wurgler (2003).

We believe that this alternative mechanism has the potential to be quite important since retained earnings are the overwhelming source of finance (see Mayer (1988) and Rajan and Zingales (1995), for example). Froot, Scharfstein, and Stein (1994) claim that "Indeed, on average, less than two percent of all corporate financing comes from the external equity market." More recently, Mayer and Sussman (2003) analyze the source of financing of large investments for U.S. companies. They find that most large investments are financed by new debt and retained earnings. Because seasoned equity offerings are rarely used to finance investments, we believe it is important to assess whether firms change their investment policies depending on the valuation of their stock even if they are not issuing equity to finance these investments.

Furthermore, this alternative mechanism has very different implications for the types of investments chosen. Managers with long horizons make efficient investment decisions by assumption. Alternatively, if stock market valuation affects investment decision through a *catering* channel, managers may take investment that have negative net present value (and avoid investment that has positive net present value) as long as this strategy increases stock price in the short-run.

We first build on the intuition in Stein's short-horizons model in order to develop a very simple framework in which to analyze the optimal investment decision of a manager of a mispriced company that maximizes shareholders' wealth. This framework allows us to generate some testable empirical predictions. For example, we show that misallocation of investment capital is more likely to occur when the expected duration of mispricing is long and shareholders have short investment horizons.

The challenging task in testing the hypothesis that stock market mispricing affects investment decision is to find a good proxy for mispricing. Our analysis critically depends on identifying situations where firms are mispriced. The problem with that identification is the classic joint hypothesis problem of Fama (1970). Predictable movements in price may just as well be a result of compensation for risk as a consequence of bias in investors' expectations.

We therefore rely on three different proxies for stock mispricing – discretionary accruals, net equity issuances/repurchases, and price momentum. Several papers provide evidence that these variables are good predictors of subsequent returns. Thus, we use these variables to measure the extent to which a stock is "mispriced." The literature's justification of why these three variables might be related to mispricing relies on different conjectures as to how investors form beliefs and different hypotheses explaining deviations from market efficiency. For this reason, we analyze the impact of each one of these measures separately and then study the overall impact when combined together into a summary "mispricing metric" produced from a firm-level vector autoregression.

Our first proxy, discretionary accruals, attempts to measure the extent to which the firm has abnormal non-cash earnings. Firms with high discretionary accruals have relatively low stock returns in the future (see Teoh, Welch, and Wong (1998a, 1998b), Sloan (1996)) suggesting that they are overpriced. One possible explanation for this relation is that discretionary accruals may measure the extent of earnings manipulation. For example, if investors are not sophisticated enough, a manager facing lower than expected sales could book a high level of accounts receivable today in order to keep stock prices high. Evidence shows that, though investors focus on earnings, they fail to distinguish between the accrual and cash flow components (see Hand (1990) and Maines and Hand (1996)).

Several papers present evidence on stock price drift following seasoned equity issues, repurchases, dividends initiations (see Ikenberry, Lakonishok and Vermaelen (1995), Loughran and Ritter (1997), and Michaely et al. (1995)). This evidence is interpreted as evidence of investors' underreaction to news or events. Recently, Daniel and Titman (2001) construct a measure of net equity issuance that combines firm's equity issuance and repurchase activity with dividend initiation and omission. They show that firms with high net equity issuance in the past five years have subsequent low stock returns in the next year suggesting that they are overpriced. Based on this evidence, we use net equity issuance in the past five years as our second mispricing proxy.

Our third measure exploits the firm and industry momentum documented by Jegadeesh and Titman (1993) and Moskowitz and Grinblatt (1999). According to this research, yearly excess returns at either the firm or industry level exhibit positive serial correlation. Also, Jegadeesh and Titman (1993, 2001) document long-term reversal of momentum profits. A portion of this literature has interpreted momentum as overreaction to private information, implying long-run negative autocorrelation. This interpretation explains the serial correlation of excess returns as a firm's stock price moving away from its fundamental price (overreaction). Consistent with this interpretation, we use lagged momentum as our third proxy for mispricing.

Our main test estimates firm-level investment on the mispricing proxies described above, controlling for investment opportunities, measured by Tobin's Q. Using Tobin's Q may be problematic in this context for several reasons. First, measured Q may itself be a function of the bubble (see Abel and Blanchard (1986) and Gilchrist, Himmelberg and Huberman (2002)). If managers indeed respond to stock market mispricing and Q reflects in part some of the deviations from fundamentals, the coefficients on our mispricing proxies are biased downward. Therefore even if we do not find a significant relation between our mispricing proxies and investment, we cannot conclude that the market is a sideshow, because some of the effect of mispricing may be captured by Tobin's Q. Similarly, if we do find a positive and significant relation between our mispricing proxies and investment, our coefficients in all likelihood understate the effect.

Second, the existence of measurement error in Tobin's Q further complicates our our analysis if our mispricing variable is a good indicator of unobserved investment opportunities. Therefore, we explicitly address this problem through the use of several potential solutions suggested by previous research.

We find a positive relation between all of these three mispricing proxies and firm investment. Our results are robust to several alternative specifications as well as to corrections for measurement error in our measure for investment opportunities, Tobin's Q. In agreement with the predictions of our model, we also find that firms with higher R&D intensity and share turnover have investment that is more sensitive to all three types of mispricing.

We summarize these results by estimating a firm-level vector autoregression (VAR) which includes our three mispricing proxies as well as estimates of CAPM beta. The VAR's forecasts of future returns and risks produces a mispricing metric. We find that investment moves positively with this measure. Overall, these results provide evidence that our mispricing proxies and firm investment are positively correlated. But they do not provide direct evidence that overpriced firms take investment projects that have negative net present values. To address this point, we analyze the relationship between investment and future stock returns. If firms are misallocating resources due to market misvaluation, abnormal investment should predict risk-adjusted returns. We estimate cross-sectional regressions of future monthly stock returns on current investment, controlling for investment opportunities (Tobin's Q) and financial slack. We find that firms with high (low) investment have low (high) stock returns, after controlling for investment opportunities and other characteristics linked to return predictability.

The paper is organized as follows. The next section reviews the literature. In section II we motivate our empirical work by detailing a simple model of firm investment. We describe the data and report the results in section III. Section IV concludes.

I Related literature

Researchers have long known that stock prices contain information about real investment. A broader question concerns the exact nature of this relation. Perhaps the best known description of that relation is "Q" theory. Brainard and Tobin (1968) and Tobin (1969) propose that a firm will invest until $Q = 1$ where Q is defined as the ratio between the stock-market valuation of existing real capital assets and their current replacement cost. That theory explicitly depends on "the values of existing capital goods, or of titles to them, to diverge from their current reproduction cost." Clearly, that divergence can be due to mispricing.

In most of the subsequent theoretical literature, researchers assume that financial markets are efficient. In particular, models by Abel (1980) and Hayashi (1982) focus on marginal adjustment costs that prevent Q from equaling 1. Thus investment should be related to the firm's marginal Q. If asset pricing is rational, the stock market appropriately values the average Q of this out-of-steady-state outcome. As a consequence, a majority of empirical research explains investment with Tobin's Q. To the extent that the relation between Q and investment is weak, most researchers have looked to the twin problems of asymmetric information and agency without abandoning the efficient market hypothesis. See Stein (2001) for a survey of this literature.

However, several researchers have deserted the efficient markets assumption in this context. Abel and Blanchard (1986) argues that stock market inefficiencies might explain the weak performance of Q-theory. If markets are inefficient, deviation from fundamental values is random error that smears information in average Q concerning a firm's marginal investment opportunities. This skepticism concerning the equivalence of price and fundamentals has no real consequences. Abel and Blanchard (1986) presumes that managers ignore this noise and invest optimally. Only the econometrician is inconvenienced.

Some researchers have considered the possibility that inefficient capital markets may actually affect corporate investment policies. The literature on this topic has provided mixed evidence. Merton and Fisher (1984) show that investment decisions should respond to stock price changes, even when the stock market fluctuates irrationally. They also provide evidence that stock prices can forecast aggregate investment expenditures. Barro (1990) shows that stock market variables retain significant predictive power for investment, even after controlling for contemporaneous and lagged values of after-tax corporate profits. Morck, Schleifer, and Vishny (1990) also find that returns can predict growth rates of investment. However, when they control for lagged growth rates of profits and sales as reasonable proxies for fundamentals, the predictive power disappears. They conclude that "the market may not be a complete sideshow, but nor is it very central." Blanchard, Rhee, and Summers (1993) reach a similar conclusion using different proxies for fundamentals and the stock market.

Chirinko and Schaller (2001) find different results using aggregate Japanese data. They argue for a bubble in Japanese equity markets during the period 1987-89 that boosted business fixed investment by approximately 6-9%. Their findings are consistent with the hypothesis that the additional investment was financed with equity. As described above, Baker, Stein, and Wurgler (2003) test the proposition in the model of Stein (1996) that the investment of equity-dependent firms will respond more to the stock market than the investment of less-constrained firms. To measure equity dependence, they use the "KZ" index in Kaplan and Zingales (1997). Using Tobin's q as a proxy for equity value, they confirm their hypothesis that the sensitivity of investment to variation in stock market price is greater for equity-dependent firms.

II Investment decisions

In this section we follow Stein (1996) and provide intuition as to why stock price deviations from fundamental value may have a direct effect on the investment policy of the firm. The particular aspect of his model we exploit does not require that the firm issue equity to finance investments.

Because the empirical evidence shows that firms generally do not finance new investments with equity issues we think this is a sensible avenue to explore.

Consider a firm that uses capital, K at time 0 to produce output. K is continuous and homogenous with price c. The true value of the firm at time t is $V(K)$. The market value of firm at time t is $V^{mkt}(K) = (1 + \alpha_t)V(K)$ where α_t measures the extent to which the firm is mispriced. The firm misvaluation depends on some level of mispricing α and on the probability that the quality of the investment project is fully revealed. This discovery process follows a Poisson process with mean arrival rate $p \in (0, +\infty)$. Therefore, $\alpha_t = \alpha e^{-t}$.

We assume that shareholders may have short horizons. Specifically, each shareholder j will need liquidity at some point in time, $t+u$, where u is distributed according to a Poisson process with mean arrival rate $q_j \in [0, \infty)$. A small q_j suggests that particular shareholder is a long-term shareholder that intends to sell his stocks many years after the initial investment. A short-term investor has a large q_j.[1]

Define shareholder j's expected level of income at time t as

$$Y_j^t \equiv \int_{u=0}^{\infty} (1 + \alpha e^{-pt}) q e^{-q_j t} V(K) dt - (K - K_0)c \tag{1}$$

Current shareholders' expected level of income is a weighted average of the share price before and after the true value of the company is revealed.[2] Equation (1) shows that the expected level of income of the shareholders will depend on how likely the shareholder is to receive a liquidity shock before the true value of the company is incorporated into stock prices. Assume that managers maximize the wealth of the average existing shareholder. Denote q as the mean arrival rate of the mean shareholder. The larger q is (more impatient investors on average), the higher the weight on the informationally-inefficient share price. The larger p is (a firm with projects of shorter maturity), the higher the weight on the share price under symmetric information. The FOC of the manager's problem is the following:

[1]We assume that the manager is rational, maximizes shareholders' wealth, and that the shareholders are myopic. This assumption is equivalent to the assumption in Stein (1996) that managers are myopic. Also, Stein (1988) and Shleifer and Vishny (1990) model myopia.

[2]For simplicity, we normalize the number of shares to 1.

$$V'(K) = \frac{c}{\gamma} \tag{2}$$

where $\gamma \equiv 1 + \frac{\alpha q}{q+p}$. The optimal investment level, K^* when there is no mis-pricing ($\alpha = 0$) satisfies $V'(K^*) = c$. When the firm is overpriced (α is high), the manager invests more than K^*. Even if the marginal value from the investment is lower than the cost of investing, the market's tendency to overvalue the investment project may more than compensate for the loss from the value-destroying investment. In other words, the overvaluation of the project more than compensates for the "punishment" the market imposes on the firm at time when the firm becomes correctly priced.

The incentive to overinvestment increases with the expected duration of the mispricing (small p) and decreases with the horizon of the average shareholder (high q). Intuitively, if current overvaluations are expected to last and if investors are short-term, managers increase investment to take advantage of the mispricing.

Similarly, underinvestment occurs when firms are underpriced. If the market is pessimistic about the value of the firm (α is negative), the manager will invest too little. The level of investment will be lower as the expected duration of the mispricing (small p) increases and/or the horizon of the average shareholder (high q) shortens.[3]

III Empirical analysis

A Data

Most of our data comes from the merged CRSP-COMPUSTAT database, made available to us through Wharton Research Data Services. Our sample includes firms over the period 1963-2000. We ignore firms with negative accounting numbers for book assets, capital, or investment. When explaining investment, we study only December fiscal year-end firms to eliminate the usual problems caused by the use of overlapping observations. We drop firms with sales less than 10 million, and extreme observations (details in the appendix).

[3]Our modeling of the expected duration of mispricing is quite stylized. A more in-depth analysis of the interaction between asymmetrric information and mispricing, as modeled in a previous version of the paper, is available upon request.

We intersect the initial sample with the Zacks database. That database provides analyst consensus estimates of earnings one, two, and five years out. We use the Spectrum database to calculate the percentage of shares outstanding owned by institutions. Table 1 reports summary statistics for our sample of firms.

B Methodology

Throughout the paper, we estimate linear models of firm investment. A very large previous literature has studied the properties of that central firm decision.[4] Our typical specification regresses firm investment on a proxy for mispricing, on a proxy for Tobin's Q, and on firm cash flow, controlling for firm (f_i) and year (γ_t) fixed effects:

$$\frac{I_{i,t}}{K_{i,t-1}} = f_i + \gamma_t + b_1\alpha_{i,t} + b_2 Q_{i,t-1} + b_3 \frac{CF_{i,t-1}}{K_{i,t-2}} + \varepsilon_{i,t} \tag{3}$$

The dependent variable is individual firms' investment-capital ratios ($\frac{I_{i,t}}{K_{i,t-1}}$) where investment, $I_{i,t}$, is capital expenditure and capital, $K_{i,t-1}$, is beginning-of-year net property, plant, and equipment. Tobin's Q, $Q_{i,t-1}$ is beginning of period market-to-book.

Market value of assets equals the book value of assets plus the market value of common stock less the sum of book value of common stock and balance sheet deferred taxes. $CF_{i,t-1}/K_{i,t-2}$ equals the sum of earnings before extraordinary items and depreciation over beginning-of-year capital.

Our analysis critically depends on identifying situations where firms are mispriced (α). The problem with that identification is the classic joint hypothesis problem of Fama (1970). Predictable movements in price may just as well be a result of compensation for risk as a consequence of bias in investors' expectations. The model of market equilibrium is what distinguishes those two possibilities: one researcher's anomaly is another researcher's risk factor.

As a consequence, we identify mispricing in the capital markets using three different measures. These measures operate through different channels: firm opaqueness / information distortion, slow incorporation of information, and overreaction to firm stock performance. The key characteristic that all three measures have in common is that they are linked to cross-sectional

[4] See Stein (2001) for a recent summary of that literature.

patterns in average returns that are not well explained by asset-pricing models.

C Discretionary accruals and investments

Accruals represent the difference between a firm's accounting earnings and its underlying cash flow. For example, large positive accruals indicate that earnings are much higher than the cash flow generated by the firm. Our first proxy relies on the evidence that firms that have atypically high accruals have low subsequent stock returns. Accruals ($ACCR_{i,t}$) are measured by

$$ACCR_{(i,t)} = \Delta NCCA - \Delta CL - DEP$$

where $\Delta NCCA$ is the change in non-cash current assets. ΔCL is the change in current liabilities minus the change in debt included in current liabilities and minus the change in income taxes payable. DEP is depreciation and amortization. See Sloan (1996) for more discussion of earning accruals.

The differences between earnings and cash flow arise because of accounting conventions as to when, and how much, revenues and costs are recognized. Within those conventions, managers have discretion over accruals adjustments and may use them in order to manage earnings.[5] In principle, if investors can detect earnings manipulation, higher accruals should not affect the stock price. However, a large body of evidence shows that though investors focus on earnings, they fail to distinguish between the accrual and cash flow components (see Hand (1990) and Maines and Hand (1996)).

In order to distinguish earning-manipulation from the non-discretionary component of accruals, the literature has focused on discretionary accruals, defined as those accruals which are abnormal given firm characteristics, relative to the past tendencies of the firm, and/or compared with other firms in the same industry. Several papers show a strong correlation between discretionary accruals and subsequent stock returns, suggesting that firms with high discretionary accruals are overpriced firms relative to otherwise similar firms.

For example, Sloan (1996) finds that those firms with relatively high (low) levels of abnor-

[5] For example, a manager can modify accruals by delaying recognition of expenses after cash is advanced to suppliers, by advancing recognition of revenues with credit sales, by decelerating depreciation, or by assuming a low provision for bad debt.

mal accruals experience negative (positive) future abnormal stock returns concentrated around future earning announcements. Teoh, Welch, and Wong (1998a, 1998b) find that firms issuing secondary equity and IPO firms who have the highest discretionary accruals have the lowest abnormal returns. More recently, Chan, Chan, Jegadeesh, and Lakonishok (2001) also investigates the relation between discretionary accruals and stock returns. Confirming previous results, they find that firms with high (low) discretionary accruals do poorly (well) over the subsequent year. Most of the abnormal performance is concentrated in the firms with very high discretionary accruals.

We use this past evidence on the correlation between discretionary accruals and stock returns to justify the use of discretionary accruals as our first mispricing proxy. We construct this component of accruals using the cross-sectional adaptation developed in Teoh, Welch, and Wong (1998a, 1998b) of the modified Jones (1991) model. Specifically, we estimate normal accruals for each firm in a given year by estimating the following cross-sectional regression for the firm's two-digit SIC code peers (i.e. excluding the firm under consideration),

$$NORMALACCR_{jt} = \beta_0 \left(\frac{1}{TA_{j,t-1}} \right) + \beta_1 \left(\frac{\Delta SALES_{j,t}}{TA_{j,t-1}} \right) + \beta_2 \left(\frac{PPE_{j,t}}{TA_{j,t-1}} \right) + \epsilon_{j,t}$$

We then apply these estimates to the firm under consideration.[6]

$$NORMALACCR_{it} = \widehat{\beta}_0 \left(\frac{1}{TA_{i,t-1}} \right) + \widehat{\beta}_1 \left(\frac{\Delta SALES_{i,t} - \Delta A/R_{i,t}}{TA_{i,t-1}} \right) + \widehat{\beta}_2 \left(\frac{PPE_{i,t}}{TA_{i,t-1}} \right)$$

Note that as in Teoh, Welch, and Wong (1998a, 1998b), before applying the estimates, we first subtract the increase in accounts receivable from sales to allow for the manipulation of credit sales. We then compute discretionary accruals by subtracting normal accruals from total accruals,

$$DACCR_{i,t} = \frac{ACCR_{i,t}}{TA_{i,t-1}} - NORMALACCR_{i,t}$$

We have also estimated discretionary accruals using the approach of Chan, Chan, Jegadeesh,

[6] We require that a firm has 25 two-digit SIC code peers.

and Lakonishok (2001). All our results are substantially the same when we use this alternative measure as well as when we replace contemporaneous observations with lagged versions of either measure.

We estimate the basic regression:

$$\frac{I_{i,t}}{K_{i,t-1}} = f_i + \gamma_t + b_1 DACCR_{i,t} + b_2 Q_{i,t-1} + b_3 \frac{CF_{i,t-1}}{K_{i,t-2}} + \varepsilon_{i,t} \tag{4}$$

Column (1) of Table 2, Panel A displays the results of regression (4). Controlling for investment opportunities and cash flow, firms with high discretionary accruals invest more. The coefficient of investment on discretionary accruals measures 0.1266 with an associated t-statistic of 7.32. Firms with abnormally soft earnings invest more than the standard model would indicate. This effect is economically important. A typical (one-standard deviation) change in a typical firm's level of discretionary accruals is associated with roughly a two percent change in that firm's investment as a percentage of capital. Recall that Abel and Blanchard (1986) suggests that mispricing may smear the information in Q concerning investment opportunities. This possibility actually works against us finding any independent effect of discretionary accruals. If Q is correlated with mispricing, the coefficient of discretionary accruals underestimates the effect of mispricing on investment.

There are several potential problems in our baseline regression that might undermine the interpretation of the results. The most obvious arises from the fact that the disappointing performance of our measure of Q, even if consistent with the results in the rest of the literature, suggests that this measure may be a poor proxy for true marginal Q.[7]

The existence of measurement error in Tobin's Q is a problem in our analysis if our mispricing variable is a good indicator of unobserved investment opportunities. For example, one

[7] Several papers have address this issue and found different results. For example, Abel and Blanchard (1986) construct aggregate marginal Q and find little support for the view that the low explanatory power of average Q is because it is a poor proxy for marginal Q. Similarly, Gilchrist and Himmelberg (1995) exploit Abel and Blanchard's technique at the level of the individual firm. Though their marginal Q series seems to perform better than Tobin's Q, their qualitative results are not very different from the previous literature. Of course, their results critically depend on the quality of the alternative measure used. In a recent paper, Erickson and Whited (2000) point out that the alternative measures generally used in the literature may also be flawed by similar errors-in-variables problems and suggest an alternative solution. Erickson and Whited use a measurement error-consistent generalized method of moments estimator that relies on information in higher moments of Q. With this estimator, they find that the accepted results in the previous literature (low explanatory power of Tobin's Q and high explanatory power of cash flow) disappear.

may argue that firms with high discretionary accruals may have very profitable growth options that their average Q only partially reflects. These firms should invest more. Empirically, the existing evidence suggests the opposite: firms with soft earnings are firms with poor growth opportunities. Teoh, Welch, and Wong (1998b) document that firms with high discretionary accruals tend to be seasoned equity issuers with relatively low post-issue net income. Chan, Chan, Jegadeesh, and Lakonishok (2001) show that in general firms with high discretionary accruals subsequently have a marked deterioration in their cash flows. Based on these findings, we think that it is hard to argue that the average Q for this type of firm systematically understates marginal Q.

Even if we cannot think of any plausible reason why abnormal non-cash earnings should be correlated with investment opportunities, we feel it is important to address measurement errors problems in our proxy for investment opportunities. We take several different approaches. First, we include in our baseline regression analysts' consensus estimate of future earnings. As long as analysts' forecasts are a good proxy for expected future profitability, this variable should be a good proxy for marginal Q: controlling for average Q, higher marginal Q should be positively correlated with higher expected future profitability. This correction is along the lines of the previous literature that has focused on obtaining better measures of Q. Columns (2) through (4) add the ratio of consensus analyst forecast of cumulative firm profitability over assets one, two, and five years out to our baseline specification. The one-year earnings forecast has a positive effect on investment decision. The effect is small, but statistically significant at the five percent level. A one-standard deviation change in one-year earning forecast is associated with roughly a .5 percent change in that firm's investment to capital ratio. This suggests that this non-financial measure of future profitability has some information, even when we control for Tobin's Q, as suggested by previous findings (Bond and Cummins, 2000). However, the coefficient on discretionary accruals actually increases from .1266 to .1586. Moreover, the estimate is measured with close to the same precision, even though the sample is cut almost in half due to data limitations.

In Column (4) of Table 2-A we add both one- and two-year profitability estimates to our baseline regression. Discretionary accruals continues to be quite significant. In Column (5) of Table 2-A we add one-, two-, and five-year profitability forecasts. Interestingly, all three forecasts are significant at the five percent level or better.[8] Discretionary accruals remain economically and statistically significant.

We also follow Abel and Eberly (2001) and use the mean long-term consensus earning forecast as an instrument for Q. This variable is a good instrument as long as it is not correlated with the measurement error in Tobin's Q. We report the results in Column (5). The magnitude and statistical significance of the discretionary accruals coefficient is similar to our previous results when we use instrumental variables estimation.[9]

The second way to deal with the measurement error problem is to follow the approach of Erickson and Whited (2000, 2002). Those papers exploit the information contained in higher moments to generate measurement-error consistent GMM estimators of the relation between investment and Q.[10] As in Erickson and Whited (2000), we find that using this estimator increases the coefficient on Q by an order of magnitude.[11] However, the coefficient on discretionary accruals remains economically and statistically significant. Those results are available on request.

Another potential problem with our baseline regression is that we measure average Q at the beginning of the year in which we measure the firm's investment. It may be the case that over the year the firm's investment opportunities change and as a consequence our discretionary accruals measure is picking up this change in investment opportunities.

Therefore, in column (6) of Table 2-A, we add to the baseline specification, end-of-period $Q_{i,t}$. Controlling for the change in Q over the investment period has no effect on our result. Investment opportunities as measured by end-of-period Tobin's Q are not statistically significant and the estimated coefficient is 1/5 of that on $Q_{i,t-1}$ in the baseline regression. Moreover, the estimated coefficient on discretionary accruals and the statistical significance of that estimate

[8]One might be initially surprised by the negative coefficient on $E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$. However since earnings estimates are for cumulative earnings from $t-1$ to t, the negative coefficient indicates that consensus one-year earnings two years from now has a relatively smaller impact on investment than consensus one-year earnings one-year from now. In that light, the result seems reasonable.

[9]Also, the coefficient on Tobin's Q increases and the coefficient on cash flow decreases as in Abel and Eberly (2001) despite the sample restrictions.

[10]As in Erickson and Whited (2000) we only use the estimator in those cross-sections that satisfy the identifying assumptions concerning the information in higher moments.

[11]We thank Toni Whited for providing the Gauss code implementing their estimator.

do not change.

Our controls for investment opportunities may be inadequate if there is a lag between when a firm has investment opportunities and when the actual investment is measured. These lags may be for such superficial reasons as accounting practices or due to more fundamental sorts of frictions. The next two specifications include lags of Q in response. In column (7), we add Q_{t-2} to the specification in column (6). Though lagged investment opportunities explain firm investment, discretionary accruals still have a positive and significant effect on firm investment. Column (8) adds Q_{t-3} to our specification. This variable is not significant and our results do not change. We conclude that the timing of our Tobin's Q variable is not an issue.

Another objection to our results is that if discretionary accruals are correlated with lagged financial slackness, then our variable may picking up the fact that financially constrained firms have less financial slack to invest. Of course, firms with high discretionary accruals are those firms where earnings are not backed by cash flow. Firms with high discretionary accruals have in general little financial slack. However, to take care of this concern we augment our baseline regression with contemporaneous, two-years lag and three-years lag of our cash flow variable, $CF_{i,t-1}/K_{i,t-2}$ as well as with measures of the cash stock. The results (unreported) are robust to this modification. One possible reason for firms to manipulate earnings is in order to meet bond covenants; our results are also robust to including leverage as an additional explanatory variable.

There might be some concern that the relation between discretionary accruals and investment is hardwired. For example, firms with multi-year investment projects may pay for investment in advance. When doing so, firms will book future investment as a pre-paid expense, a current asset. As a consequence, current investment and discretionary accruals (the prepaid expense) will exhibit a positive correlation. Presumably such a tactic would be an industry-wide practice, controlled for by the intercept in regression estimating normal accruals. Nevertheless, we re-estimated the regression (4) measuring normal accruals using only accounts receivables in the definition of accruals. In that regression (not reported) the coefficient associated with discretionary component of accounts receivable remained economically and statistically significant.

We conclude that this hardwired link is not driving our result. [12]

Previous literature provides additional tests of our hypothesis based on sub-sample and cross-sectional evidence. We explore these implications in Table 2, Panel B. Chan, Chan, Jegadeesh, and Lakonishok (2001) as well as D'Avolio, Gildor, and Shleifer (2001) point out that the ability of discretionary accruals to predict negative stock returns is concentrated in the top 20% of firms ranked on accruals. In column (1) of Table 2-B, we add a dummy, $HIGHDACCR_{i,t}$, to our baseline discretionary accruals specification. The dummy takes the value of one if the firm is in the top 20% of firms based on discretionary accruals and zero otherwise. This dummy is significant at the five percent level of significance.

Teoh, Welch, and Wong (1998) show that firms issuing equity who have the highest discretionary earnings have the lowest abnormal returns. In column (2) of Table 2-B, we interact our discretionary accruals variable with a dummy, $HIGHEQISSUE_{i,t}$, that takes the value one if the firm has an equity issuance value in the top 25 percent. We find that the variable is statistically significant with an associated t-statistic of 2.84. We explore the relation between equity issuance/repurchase activity and investment more fully in the next section.

Column (3) of Table 4-B reports our baseline discretionary accruals specification with our sample restricted to only Internet firms. We define Internet stocks as all the firms that were included in the ISDEX Internet Stock Index. We identified 107 firms that belonged to the Index, thus we have only 121 firm-years observations. As a consequence, though the point estimate of the coeffcient on discretionary accruals is of the same order of magnitude as the estimate for the whole sample, the estimate for the Internet sample is extremely imprecise.

D'Avolio, Gildor, and Shleifer (2001) argue that in recent years the marginal investor may have become less sophisticated providing more incentives to distort earnings. In particular, they show that the mean discretionary accruals for the top decile has been increasing over the past twenty years, more than doubling since 1974. Mean discretionary earnings for the top

[12] Hribar and Collins (2002) argue that the Jones method is potentially flawed as it calculates accruals indirectly using balance sheet information rather than directly using income statement information. In particular, they point out that the presumed equivalence between the former and the latter breaks down when nonoperating events such as reclassifications, acquisitions, divestitures, accounting changes, and foreign currency translations occur. Hribar and Collins show that these "non-articulating" events generate non-trivial measurement error in calculations of discretionary accruals. Unfortunately, the necessary income-statement accruals information is only available after 1987. Fortunately, our results still hold even when we restrict the analysis to a sub-sample of firms that do not have such non-articulation events or when we use income statement accruals in a post-1987 sample.

decile was close to 30% in 1999. As a consequence, we re-estimate our baseline specification for the firm-years in the subperiod 1995-2000 in column (4) of Table 2-B. Consistent with the D'Avolio, Gildor, and Shleifer (2001) hypothesis, the estimated coefficient on discretionary accruals is roughly a third bigger, moving from 0.1127 to 0.1507. Though we are left with only a quarter of the number of observations, the estimate is statistically significant at the one percent level of significance. In column (5), we restrict the sample further, to only those firm-years in the subperiod 1998-2000. Consistent with the hypothesis that manipulating earnings has become more effective, we find that the coefficient on discretionary accruals is almost 25% higher than in the baseline regression.

Finally, in the last four columns of Table 2-B we split the sample in accordance with the cross-sectional implications of our model. In particular, our model suggests that the greater the expected duration of mispricing, the greater the incentive to overinvest (underinvest) when overpriced (underpriced). We use firm R&D intensity to proxy for firm transparency based on the simple assumption that the resolution of all valuation uncertainty (which would necessarily eliminate any mispricing) takes longer for R&D projects than for the typical project. Column (6) re-estimates our baseline regression for those firms below the median value of R&D intensity. Note that we calculate medians yearly in order to isolate pure cross-sectional differences across firms. Column (7) shows the results for the sub-sample of firms with R&D intensity above the median. Consistent with our model, we find economically important variation across the two sub-samples. Firms that engage in a lot of R&D invest more when they have a lot of discretionary accruals. The sensitivity of these firms' investment to discretionary accruals, .2428, is almost four times as large as the sensitivity of firms that we argue are relatively more transparent.

Our model also suggests that the incentive to overinvest or underinvest is stronger for those firms with short-term investors. We use firm share turnover to proxy for the relative amount of short-term investors trading a firm's stock. We measure turnover as the average, in December_{t-1}, of the daily ratio of shares traded to shares outstanding at the end of the day. Column (8) re-estimates our baseline regression for those firms each year with turnover below the yearly median, while column (9) reports the regression results for above-the-median firms. We find that the coefficient on discretionary accruals for high-turnover firms is .0413, 30% higher than the corresponding coefficient for firms with low turnover.

D Equity issuance and investment

A substantial literature documents two important facts. First, that firms tend to time equity issues, repurchases, and dividends initiations. Second, that equity market timing is successful on average as equity issuers (repurchasers) have low (high) subsequent returns.[13] This empirical evidence suggests that equity issuance activity is a good predictor of subsequent returns.

Indeed, Daniel and Titman (2001) construct a measure of net equity issuance that combines firm's equity issuance, repurchase activity, dividends initiation (omission). They show that firms with high net equity issuance in the past five years have subsequent low stock returns in the next year suggesting that they are overpriced.

Based on this evidence, we use net equity issuance in the past five years as our second mispricing proxy. This variable is positively correlated with discretionary accruals (0.1180) and the correlation is economically significant. The correlation confirms the results of the previous literature that firms that issue equity are more likely to have higher discretionary accruals (Teoh, et al.). However, the correlation is low enough that it is plausible to think of these two variables as two alternative ways of measuring mispricing. We analyze them separately here, and combine them later on.

Following Daniel and Titman (2001), we construct a measure of a firm's equity issuance / repurchase activity, $EQISSUE_{i,t}$, over a five-year period.[14] They construct their measure to also capture the evidence in Michaely, Thaler, and Womack (1995) showing that abnormal returns are high (low) for five years subsequent to dividend initiations (omissions). We define $EQISSUE_{i,t}$ as the log of the inverse of the percentage ownership in the firm one would have at time t, given a one percent ownership of the firm at time $t-5$, assuming full reinvestment of

[13]See, for example, Asquith and Mullins (1986), Korajczyk, Lucas, and McDonald (1991), Ikenberry, Lakonishok and Vermaelen (1995), Loughran and Ritter (1997), and Baker and Wurgler (2000, 2002).

[14]We also measured the same variable over a one-year period and produced similar results. Note that set our $EQISSUE_{i,t}$ variable equal in absolute magnitude to Daniel and Titman (2002)'s n' variable but opposite in sign in order to facilitate interpretation. Thus firms issuing equity have a positive $EQISSUE$.

all cash flows,

$$EQISSUE_{i,t} = \log(\frac{ME_{i,t}}{ME_{i,t-5}}) - r_{i,t-5:t},$$

where $N_{i,t}$ is the number of shares outstanding at time t, $ME_{i,t}$ is the market value of equity at time t, and $r_{i,t-5:t}$ is the log stock return from $t-5$ to t. Therefore our measure includes equity issues, employee stock options plans, share repurchase, dividends, and other actions that pay cash out of the firm, or trade ownership for cash or services (e.g., stock options plans).

Our specification is the following:

$$\frac{I_{i,t}}{K_{i,t-1}} = f_i + \gamma_t + b_1 EQISSUE_{i,t} + b_2 Q_{i,t-1} + b_3 \frac{CF_{i,t-1}}{K_{i,t-2}} + \varepsilon_{i,t} \tag{5}$$

Column (1) of Table 3, Panel A displays the results of regression (5). Controlling for investment opportunities and financial slack, firms that are net equity issuers over the past five years invest more. The coefficient of investment on the equity issuance activity measure, b_1, measures 0.0259 and is statistically significant at the one percent level of significance. The economic importance of the effect seems on the order of magnitude as before. A typical (one-standard deviation) change in a firm's equity issuance indicator is associated with roughly a two percent change in that firm's investment as a percentage of capital.

Unlike the discretionary accruals measure, where it is hard to think of alternative stories generating a link with investment, one expects issuance activity to be tied to investment. Of course, our regressions acknowledge the direct link by controlling for investment opportunities and financial slack. However, these controls are now crucial. Specifically, it very important to rule out that $EQISSUE_{i,t}$ is correlated with Q's measurement error. Thus, the remaining columns in Table 3-A repeat the robustness checks we did with our previous variable.

In columns (2) through (4) of Table 3-A, we add analysts' expectations of future profitability. Recall that these variables are designed to pick up variation in future investment opportunities not picked up by Tobin's Q. Consistent with our expectations that $EQISSUE_{i,t}$ may proxy for unobserved investment opportunity, the coefficient on $EQISSUE_{i,t}$ becomes smaller when we include analysts' consensus earning forecasts. However, we still find that controlling for investment opportunities, firms that are expected to underperform (overperform) benchmarks have investment that is too high (low).

In column (5) we instrument Q with the mean long-term consensus earning forecast. The magnitude and statistical significance of the $EQISSUE_{i,t}$ coefficient is similar to our previous results when we use instrumental variables estimation. Finally, our results are robust to using the Erickson and Whited (2000, 2002) measurement-error consistent estimator.

In columns (6) through (8) we control for future and past values of Q. Q_t and Q_{t-2} are statistically significant, though with the wrong sign. However, the coefficient on our equity issuance indicator is essentially unchanged. The effect remains economically and statistically significant. Table 3, Panel B reports the results from sub-sample analysis. Column (1) of Table 3-B restricts the sample to those firm-years in the subperiod 1995-2000 while column (2) restricts the sample to those firm-years in 1998-2000. We find that the effect is still strong in the longer subperiod. In the shorter subperiod, the effect disappears. As before, we split the sample in accordance with the cross-sectional implications of our model.

Column (3) re-estimates our baseline regression for those firms below the median value of R&D intensity while column (4) re-estimates the regression for firms above the median value of R&D intensity. Firms with less R&D activity have a weaker relation between equity issuance and equity issuance activity. Firms involved in more R&D activity have a stronger relation between investment and equity issuance activity. In columns (5) and (6), we split the sample based on share turnover. Consistent with our model, firms with a relatively high amount of share turnover have a coefficient on equity issuance activity, .0493, that is twice as large as firms with a relatively low amount of share turnover.

E Price momentum and investment

One problem with the previous two proxies of mispricing is that managers affect discretionary accruals, equity issuance, and investment. Our results indicates that there is correlation between investment and both discretionary accruals and equity issuance, but they can hardly say anything about the direction of the causality. While high discretionary accruals may cause suboptimal investment decision, managers may decide to manipulate accruals to be able to invest more. In fact, the model presented in Section II shows that initial mispricing causes suboptimal investment that in turn causes more mispricing.

Our next measure of mispricing suffers less from the reverse causality problem because it is not directly chosen by the manager, and more generally reflects investors' sentiments. Our next measure exploits the firm and industry momentum phenomenon documented by Jegadeesh and Titman (1993) and Moskowitz and Grinblatt (1999). Yearly excess returns at either the firm or industry level exhibit positive serial correlation. Also, Jegadeesh and Titman (1993, 2001) document long-term reversal of momentum profits. For example, Jegadeesh and Titman (2001) find that *cumulative* profits reach 12.17 percent after one year and then steadily decline to -0.44 percent after five years. Similar patterns exist in industry returns.

Several conflicting theories have been offered to explain momentum and reversal. According to Daniel, Hirshleifer and Subrahmanyan (1998), investor overconfidence results in overreaction to private information, implying long-run negative autocorrelation. Barberis Shleifer and Vishny (1998) assume that investors are subject to a conservatism bias and representativeness heuristic. Thus in their model investors underreact to earnings, causing short-lag positive autocorrelations. However, when investors observe trends of rising earnings, representativeness causes them to switch to overreaction, resulting in long-lag negative autocorrelation. In Hong and Stein (1999), there are two types of investors: investors who focus only on fundamentals and ignore the market price and investors who focus only on market price and follow price trends. The first group causes underreaction, the second group induces overreaction.

These three different theories agree that momentum is a mispricing phenomenon, but disagree on whether serial correlation of excess returns is consistent with stock prices slowly moving towards their fundamental price (underreaction) or stock prices moving away from their fundamental price (overreaction). The evidence is mixed as to which explanation best describes the data. For this reason, this measure is the weakest of our three. The interpretation of our result depends on which description is appropriate. Nonetheless, we think it is interesting to investigate the relation between momentum and investment decisions. That is because this measure is tied more directly than the previous two measures to investor sentiment uncorrelated with managerial decisions. In fact, the correlation between this measure and the previous two is positive, but not very high (14 percent with $DACCR$ and 21 percent with $EQUISSUE$).

We use lagged firm and industry momentum as our final indicator of firm mispricing. Firm lagged momentum ($MOM_{i,t-1}$) is the cross-sectionally demeaned (using the universe of all CRSP stocks) stock return over the period January$_{t-1}$ to November$_{t-1}$. Industry lagged momentum ($IMOM_{t-1}$) is the cross-sectionally demeaned (using the universe of all CRSP stocks) industry return over the period January$_{t-1}$ to November$_{t-1}$.

We lag momentum for two reasons. The first is so that our Q variable will incorporate any news concerning future returns and/or cash flows contained in the price run-up. More importantly, we interpret momentum as a characteristic predicting future mispricing. Firms that are winners and losers are the firms that investors typically overreact to. Momentum firms have negative stock returns in the years following the initial year of positive stock return performance. This is in contrast to our other mispricing measures. We identify firms with extreme $DACCR_{i,t}$ and $EQISSUE_{i,t}$ as the firms which are typically currently mispriced.

Our specification is:

$$\frac{I_{i,t}}{K_{i,t-1}} = f_i + \gamma_t + b_1 MOM_{i,t-1} + b_2 IMOM_{i,t-1} + b_3 Q_{i,t-1} + b_4 \frac{CF_{i,t-1}}{K_{i,t-2}} + \varepsilon_{i,t} \qquad (6)$$

Column (1) of Table 4, Panel A displays the results of regression (6). Controlling for investment opportunities and financial slack, firms experiencing price momentum invest more. The coefficient of investment on firm momentum, b_1, measures 0.0282 with an associated t-statistic of 7.3. A similar response occurs for the industry momentum variable. The coefficient of investment on industry momentum, b_2, is 0.0468. Thus, firms in price momentum industries invest more than the standard model would indicate. This coefficient is statistically significant; the associated t-statistic is 3.9.

A typical (one-standard deviation) change in a firm's price momentum is associated with roughly a three percent change in that firm's investment as a percentage of capital.[15] One percent movements in investment ratios are associated with typical moves in a firm's industry

[15] These results relate to those of Morck, Shleifer, and Vishny (1990). That paper predicts three-year investment growth using lagged CAPM alphas over a three-year period. These alphas do a good job predicting investment alone. However, in a horse race with future fundamentals, CAPM alphas have little additional explanatory power. High alphas are related to high stock returns, our variable. However, we compare momentum to the level of stock market valuation, Q. Thus the variable we pit against momentum contains expectations of all future firm profitability. Morck, Shleifer, and Vishny's control variables are purely accounting ones and therefore are realizations of these expectations, and then only one year out.

momentum.

These results are consistent with at least two alternative explanations. First, if momentum firms are overpriced firms as in Daniel, Hirshleifer and Subrahmanyan (1998) our result is consistent with the story that overpriced firms invest more than otherwise identical firms. Alternatively, if momentum is evidence of underreaction (e.g., Hong, Lim, and Stein, 2000), our result may suggest that firms (at least those that are not cash constrained) invest optimally, ignoring the market's underreaction. Unfortunately, it is hard to distinguish between these two cases.

Furthermore, there is more concern than with our previous variables that momentum is correlated with our benchmark variables. First, price momentum may just reflect information concerning the firm's profitability and/or degree of financial constraints not contained in Q or $\frac{CF}{K}$. One could argue that sensitivity of investment to stock returns may indicate financial constraints being binding. More simply, firms with high stock returns may have very profitable growth options that their average Q only partially reflects. These firms should invest more. For example, it is possible that the market has information about the firm that the manager does not have. Dow and Gorton (1997) model the investment decisions of rational managers under this hypothesis. In equilibrium, stock prices convey information to managers that they use to allocate investment capital optimally. In their model rising stock prices cause higher investment and the resulting investment allocation is efficient. So far, we are not able to separate our model from this particular alternative interpretation. We address this possibility later in the paper.

Our response to these alternative interpretations is to point out that we find an effect not only at the firm level but also at the industry level. It is harder to argue that entire industries are financially constrained or have systematic differences between average and marginal Q.

The rest of Table 4-A estimates regressions with the same alternative specifications and control variables as before. In columns (2), (3), and (4) we add the consensus analyst's estimates of future earnings. Both momentum variables remain economically and statistically significant.[16] In column (5) when we instrument Q with analyst's long-term estimates of future earnings we

[16]The fact that in the final specification, which includes forecasts one, two, and five years out, the coefficient on firm momentum is over fifty percent higher than the baseline is mostly due to sample selection requirements due to using the five-year forecast.

instead find that the momentum coefficient increases by roughly 40 percent and the industry momentum coefficient increases by 100 percent.[17] Also, columns (6),(7), and (8) show that the timing of when we measure Q does not matter for our results. Finally, our results are robust to using the Erickson and Whited (2000, 2002) measurement-error consistent estimator as well.

In Table 4, Panel B we explore some of the cross-sectional findings in the literature concerning momentum. Various studies have shown that momentum is stronger for losers than for winners. Column (1) repeats the regression for firms experiencing negative momentum while column (3) estimates the relation among winner firms. Recall that the coefficient on firm momentum was 0.0282 in our baseline specification. The estimate for firms with negative momentum is twice as large, 0.0564, while the estimate for winning firms is 0.0188. Both estimates are significant at the one percent level of significance.

In an attempt to distinguish between the overreaction and the underreaction hypothesis we rely on the finding of Lee and Swaminathan (2000). They find that overreaction patterns are more pronounced for losers with low turnover and for winners with high turnover. In columns (2) and (4) we interact firm momentum and turnover for loser firms and winner firms respectively. In column (2), the coefficient on the interaction term is negative and statistically significant at the ten percent level of significance. This result is consistent with Lee and Swaminathan (2000). In column (4) the coefficient on the interaction term is 0.0034 with an associated t-statistic of 1.55. Though not statistically significant, the result is in line with Lee and Swaminathan's result that winners overreact more when turnover is high.

Column (5) of Table 4-B reports our baseline momentum specification with our sample restricted to only Internet firms. The coefficient of interest is an order of magnitude higher for these firms. This estimate is statistically significant at the one percent level. This result is very strong despite the limited number of observations and is in contrast to the weak corresponding evidence concerning the sensitivity of Internet firms' investment to discretionary accruals. We think that this result is quite reassuring, since at least for this sample of firms it is hard to claim that momentum is evidence of underreaction. And it is difficult to interpret this subsample evidence as consistent with the Dow and Gorton (1997) model. Recall that their model argues

[17]In this sample we find, consistent with Abel and Eberly (2001), that the coefficient of Q becomes one order magnitude bigger, but the cash-flow coefficient does not change significantly.

that market returns are a signal from informed investors to managers to allocate investment efficiently. Most researchers would agree that much of the return volatility of Internet stocks was due to uninformative noise trading.

Column (6) of Table 4-B restricts the sample to those firm-years in the subperiod 1995-2000 while column (7) restricts the sample to those firm-years in 1998-2000. We find that the effect is stronger in these two subperiods. As before, we split the sample in accordance with cross-sectional implications of our model. Column (8) re-estimates our baseline regression for those firms below the median value of R&D intensity while column (9) re-estimates the regression for firms above the median value of R&D intensity. The results are consistent with our model's conclusions. The momentum effect on investment is stronger for firms that engage in a lot of R&D. The coefficients on firm and industry momentum are more than twice as large for those firms that we argue are relatively opaque. Columns (10) and (11) report the sample split based on firm turnover. This split is not as successful as there is little or no difference in the coefficients on momentum for the two types of firms.

F Combining all three measures into a mispricing metric

Our final measure uses the three variables in a firm-level vector autoregression (VAR) in order to create a mispricing metric. This metric has the advantage that the information in the three variables used in previous sections is used simultaneously. More importantly, the ability of each of our measures to predict stock returns is measured at the price level. This is important as even if all variables predict one-period returns with the same magnitude, those variables which are more persistent have a larger price-level impact. Finally, the VAR lets us control for risks so that mispricing is explicitly dependent on a model of market equilibrium.

A detailed description of the specification and the results of the VAR is contained in the appendix. We use this mispricing metric in our investment regressions and estimate the basic regression:

$$\frac{I_{i,t}}{K_{i,t-1}} = f_i + \gamma_t + b_1 MISPRICING_{i,t} + b_2 Q_{i,t-1} + b_3 \frac{CF_{i,t-1}}{K_{i,t-2}} + \varepsilon_{i,t} \quad (7)$$

Column (1) of Table 5 displays the results of regression (7). Controlling for investment opportunities and financial slack, firms that are overpriced invest more. The coefficient of investment on our mispricing metric, b_1, measures 0.2124 with an associated t-statistic of 7.37. Firms whose current price is high relative to the CAPM invest more than the standard model would indicate. This effect is economically important. A typical (one-standard deviation) change in a typical firm's level of discretionary accruals is associated with roughly a four percent change in that firm's investment as a percentage of capital.

This finding is robust to using alternative specifications. In columns (2) through (4) of Table 5, we add analysts' expectations of future profitability. We hope these variables pick up variation in future investment opportunities not picked up by Tobin's Q. Though the coefficient on $MISPRICING_{i,t}$ is smaller, we still find that controlling for investment opportunities, firms that are "overpriced" ("underpriced") invest more (less). In column (5) we follow our previous specification and we instrument Tobin's Q with analysts' expectations of long-term profitability. Our coefficient is still positive, but become insignificant. However, our mispricing variable is measured with error and it is correlated with our instrument (the correlation is 25%). Therefore, the conditions that analysts' expectations of long-term profitability is a good instrument are violated. In principle, we would need to find another instrument for mispricing to solve the problem. In columns (6) through (8) of Table 5, we include end-of-period Q as well lags of Q. Neither the point estimate nor the precision of that estimate is affected by these additional controls.

We also estimated a version of Panel B of Tables 2, 3, and 4 using our composite mispricing proxy. That table is available upon request. We find that we are unable to reject the hypothesis that the sensitivity of investment to mispricing varies with R&D intensity. The coefficient on mispricing for firms with R&D intensity below the median is 0.2294 while for firms with higher R&D intensity, the coefficient is 0.1725. However the split based on share turnover lines up with the prediction of our model. The coefficient on mispricing for relatively high share turnover firms is 0.2183 while the coefficient on mispricing for relatively low share turnover firms is 0.1251.

The results in Table 5 are robust to varying the characteristics used to predict future returns and risks in the VAR. For example, using a long (1928-2000) panel, Cohen, Polk, and Vuolteenaho (2002) argue that mispricing relative to the CAPM is not an important factor in determining the prices of high and low BE/ME stocks if CAPM risk is measured using long-horizon covariances of cash-flow fundamentals. Our short panel precludes such an approach. Moreover, one might also be worried that BE/ME is too correlated with Tobin's Q causing collinearity in regressions of investment on Q and mispricing measures derived from BE/ME. Therefore we repeat the analysis in Table 5 but manually set the ability of BE/ME to predict returns equal to zero. Those results are qualitatively similar; mispricing explains investment after controlling for investment opportunities and financial slack.[18]

In summary we find that our mispricing metric explains investment in a manner consistent with our model. This finding is comforting as many alternative explanations as to why our three proxies come in individually do not obviously extend to this composite measure.

G Efficient or inefficient investment?

So far, we have found a consistently strong positive correlation between our measures of mispricing and investment. According to the model, the positive correlation is due to the fact that over-priced firms take investment projects that have negative net present values. Similarly, underpriced firms forego investment projects with positive net present value. While the empirical results are consistent with inefficient allocation of resources in equilibrium, there are other potential explanations.

First, it is possible that equity-dependent firms with good investment opportunities manage earnings (i.e. generate high discretionary accruals) to manipulate their stock price, facilitating investment. The investment allocation in this case is efficient and temporary mispricing helps financially constrained firms make investments that they otherwise would not be able to make. This interpretation, though plausible, is not consistent with the previous findings that show that firms with abnormally soft earnings actually have relatively poor operating performance in subsequent years.

Another potential explanation for our results is outlined in Dow and Gorton (1997). In that model, when the market has information that managers do not have, it is efficient for managers to make investment decisions taking into account stock prices. While this story does not explain

[18] Mispricing continues to explain investment if we manually set the ability of both momentum and BE/ME to predict returns equal to zero.

the relation between discretionary accruals and investment as discretionary accruals are set by the manager, the Dow and Gorton explanation may partially explain why firms with high equity issues and/or high stock returns invest more.

Finally, our mispricing proxies may instead represent rational heterogeneity in discount rates. In this alternative explanation, firms with high discretionary accruals and high equity issuance have low discount rates. It is hard to reconcile this explanation with our results relating investment and price momentum at the firm or industry level as those characteristics are associated with relatively higher realized returns.

One way we can provide additional evidence distinguishing our model from these alternative explanations is to measure the relation between investment and future stock returns. In our model there is a negative relation between investment and subsequent risk-adjusted returns as firm business investment is linked to the market's misvaluation of the firm's equity.

We estimate cross-sectional regressions of monthly stock returns including investment, Tobin's Q and a control for cashflow sensitivity:[19]

$$R_{i,t} = a_t + b_{1,t} \ln \frac{I_{i,t-1}}{K_{i,t-2}} + b_{2,t} \ln Q_{i,t-1} + b_{3,t} \frac{CF_{i,t-1}}{K_{i,t-2}}, \tag{8}$$

where returns are measured in percent. The regression identifies cross-sectional variation in returns that is correlated with investment, controlling for investment opportunities and financial slack, thus tying together return predictability and investment behavior.[20]

As in Fama and MacBeth (1976), we average the time-series of b_t's and report both the mean and the standard error of the mean estimate. Column (1) of Table 6 shows the result of estimating equation (8). The coefficient on investment is -0.1579 with an associated t-statistic of 3.96. Consistent with our model, firms that overinvest (underinvest) on average have returns that are low (high).

Note that identification is easier in this framework. In our previous investment regressions,

[19]We are not the first looking at the relation between investment and returns. Titman, Wei, and Xie (2001) show that firms that spend more on capital investment relatively to their sales or total assets subsequently have negative benchmark-adjusted returns. See also Baker, Stein, and Wurgler (2003).

[20]Unlike the previous sample which used only December year-end firms, we use all available data as long as there is a five-month lag between the month in which we are predicting returns and the fiscal year-end so that the regression represents a valid trading rule. As in the previous sample, we eliminate firms with negative investment and/or otherwise extreme accounting ratios.

controls for marginal profitability were crucial in order to isolate variation in investment linked to mispricing. In these return regressions, we need only control for risk. Column (2) of Table 6 includes three firm characteristics that are associated with cross-sectional differences in average returns: firm size (market capitalization), firm book-to-market equity, and firm momentum. These characteristics are arguably proxies for risk. As in previous literature, each characteristic predicts returns with a positive coefficient. More importantly, these controls do not subsume the investment effect as the relevant coefficient only drops two basis points and remains quite statistically significant.

One nice feature of the Fama-MacBeth approach is that the resulting time series of coefficients is simply a time series of realized returns on a portfolio. In results not shown, we have benchmarked the coefficient time series related to abnormal investment to the CAPM as well as to other asset-pricing models. In all cases, abnormal returns remain negative and statistically signficant.

Our model predicts that this effect will be stronger for firms facing a greater degree of information asymmetry and/or short-term investors. In columns (3) through (6) we test these predictions by splitting the sample based on R&D intensity and share turnover. Column (3) of Table 6 re-estimates the relation between investment and subsequent stock returns for those firms with below-median R&D each year while column (4) re-estimates the relation using only those firms whose R&D is above the median each year. The effect is nearly two and a half times stronger for high R&D firms. The ability of investment to predict cross-sectional differences in returns is not statistically significant for low R&D firms. A full-sample regression (not shown) which interacts investment with a dummy for above-median R&D documents that the difference between the two coefficients on investment in columns (3) and (4) is statistically significant at the one percent level.

Column (5) of Table 6 re-estimates the full regression for those firms with below-median share turnover while column (6) re-estimates the relation using above-median share turnover firms. Our model predicts that the effect will be stronger for those firms with above-median turnover. The results in those two columns are consistent with our model. The coefficient on investment is eighty percent higher for firms with high turnover. Firms with low share turnover have a coefficient on investment that is not statistically significant from zero. A full-sample regression indicates that the difference between the two coefficients is statistically significant.

Of course, it is always possible that we are not appropriately controlling for risk. Perhaps all of the predictive power of investment is due to cross-sectional variation in discount rates.[21] However, it is hard to explain why variation in those discount rates is primarily found in firms with above-median R&D and above-median turnover.

The next two columns split the sample according to firms' Kaplan and Zingales index (1997). Kaplan and Zingales (1997) classify firms into discrete categories of financial constraint, and then use an ordered logit regression to relate their classifications to accounting variables (using the 49 firms in the Fazzari, Hubbard, and Petersen (1986) sample of low dividend manufacturing firms with positive real sales growth). As in Lamont, Polk, and Saá-Requejo (2001), we construct a KZ index using their regression coefficients and five accounting ratios. The KZ index is higher for firms that are more constrained. The five variables, along with the signs of their coefficients in the KZ index, are: cash flow to total capital (negative), the market to book ratio (positive), debt to total capital (positive), dividends to total capital (negative), and cash holdings to capital (negative). We provide additional information in the appendix.

We split the sample according to firms' degree of financial constraints in order to distinguish our model, where unconstrained firms may invest in negative NPV projects when overpriced, from other models, where financially constrained firms are able to invest more efficiently when overpriced. Column (7) estimates the relation between investment and subsequent stock returns for below-median KZ firms; column (8) estimates the relation for above-median KZ firms. Though the coefficient of returns on investment is higher for firms with above-median KZ index, the difference is not statistically significant. The investment of unconstrained firms still predicts negative future returns. This effect is economically and statistically strong.

The final regression in column (9) adds our previous mispricing proxies, discretionary accruals and equity issuance, to the right-hand side. If the ability of these two proxies to explain investment actually works through a mispricing channel rather than a profitability channel then

[21] Other papers find similar results at the aggregate or industry level. Cochrane (1991) finds that investment has significant forecasting power for aggregate stock returns. Lamont (2000) documents that planned investment has substantial forecasting power at both the aggregate and industry level. Both authors argue that their findings are consistent with variation in discount rates.

we should see the coefficient on investment move closer to zero. This is exactly what happens. Recall that the coefficient on investment for the full sample was -0.1372. After the inclusion of our two mispricing proxies, that coefficient drops by almost fifty percent to -0.0702. In fact the coefficient is now no longer significant at the five percent level. This result brings the analysis full circle, linking the previous investment-Q regressions with these return predictability regressions in a manner consistent with our model.[22]

IV Conclusions

We present a simple framework that shows that a firm's investment decision is affected by the market (mis)valuation of the company even if new investment projects are not financed by new equity. In the model managers with private information about the quality of the firm's investment may invest inefficiently on behalf of shareholders. The reason is that the investment decision serves as a signal of firm value and can be used to manipulate stock prices to shareholders' advantage. If firms are mispriced, inefficient investment can be predicted with ex-ante variables.

In the empirical part of the paper we show that variables which predict relatively low stock returns are positively correlated with investment, controlling for investment opportunities and financial slack. In particular we show that a typical change in one of our "mispricing proxies" results in roughly a two to four percent change in the firm's investment as a percentage of capital. This relation is robust to formally measuring mispricing using the output from a firm-level VAR. Our model predicts that these sensitivities should be greater, the greater the degree of asymmetric information between firms and investors. We find that is generally the case as the effect is weaker for firms with relatively low R&D intensity. Our model also predicts that

[22]A potential problem with this result is that if Q is measured with error, the regression coefficients may be biased. We tried to apply the Erickson and Whited (2002) high-order moment estimators to our larger, longer sample. However, use of these estimators requires first passing a test of the model's two identifying assumptions: i) Q predicts future returns, controlling for other variables and ii) the residuals in a linear regression of Q on these control variables are skewed. Even for the simplest specification in column (1), we are unable to reject the null hypothesis implied by the model's identifying assumptions for half of the cross sections. For the other specifications which include book-to-market equity as a control variable, more than 75% of the cross-sections fail the Erickson-Whited identification test. In both cases, OLS estimates are statistically insignificant for the cross sections that pass the Erickson-Whited identification test. This suggests that any failure to reject the null hypothesis using their estimator on those cross section may simply be due to a lack of power.

the effects should be stronger for firms with short-term investors. We find that this is generally the case as the effect is stronger for firms with relatively high share turnover.

The thrust of these results are generally consistent with Baker, Stein, and Wurgler (2003) and Chirinko and Schaller (2001) as sentiment affects real investment. However our results differ in the fact that in our paper, the influence of sentiment on real investment works through a *catering* rather than an *equity-issuance* channel.

We also show that patterns in the cross-section of average returns are consistent with those patterns in investment. Firms with high (low) investment have low (high) subsequent stock returns, controlling for investment opportunities and other characteristics linked to return predictability. As in our model, this relation is stronger for firms with above-median R&D intensity or above-median turnover. We argue that these findings represent evidence that mispricing in the capital markets may have significant consequences for the real economy. Our paper focuses on one important capital allocation decision. Similarly, one can study other corporate decisions such as hiring employees or engaging in acquisition activity within this context. For example, Shleifer and Vishny (2001) argue that the cost of equity is a strong determinant of merger activity.

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Table 1:

Summary Statistics

The data comes from both the merged CRSP-COMPUSTAT database and the Zacks database. Investment, $I_{i,t-1}$, is capital expenditure (COMPUSTAT item 128). Capital, $K_{i,t-1}$, is net property, plant, and equipment (COMPUSTAT item 8). We define discretionary accruals, $DACCR_{i,t}$, as the difference between realized accruals and normal accruals as forecast by the modified Jones (1991) model, where normal accruals are computed by a simple regression of total accruals on non-credit sales growth and capital across all firms with the same two-digit SIC code. See the appendix for details. Our measure of equity issuance activity, $EQISSUE_{i,t}$, captures equity issues, share repurchases, dividends, and other actions that pay cash out of the firm, or trade ownership for cash or services (e.g., stock options plans) over the period $t-5$ to t. Lagged firm momentum, $MOM_{i,t-1}$, is the cross-sectionally demeaned (using the universe of all CRSP stocks) stock return over the period January$_{t-1}$ to November$_{t-1}$. Lagged industry momentum, $IMOM_{i,t-1}$, is the cross-sectionally demeaned (using the universe of all CRSP stocks) industry return over the period January$_{t-1}$ to November$_{t-1}$ using the two-digit SIC classification. Tobin's Q, $Q_{i,t-1}$, is defined as the market value of assets divided by the book value of assets, $A_{i,t-1}$ (COMPUSTAT item 6). A firm's market value of assets equals the book value of assets plus the market value of common stock less the sum of book value of common stock (COMPUSTAT item 60) and balance sheet deferred taxes (COMPUSTAT item 74). Cash flow, $CF_{i,t-1}/K_{i,t-2}$, equals the sum of earnings before extraordinary items (COMPUSTAT item 18) and depreciation (COMPUSTAT item 14) over beginning of year capital which we define as net property, plant, and equipment (COMPUSTAT item 8). One-year expected profitability, $E_{t-1}[EARN_{i,t}]/A_{i,t-1}$, is the median analyst year $t-1$ forecast of earnings in year t divided by the book value of assets in year $t-1$. Two-year expected profitability, $E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$, is the median analyst year $t-1$ forecast of earnings in years t and $t+1$ divided by the book value of assets in year $t-1$. Five-year expected profitability, $E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$, is the median analyst year $t-1$ forecast of earnings in years t through $t+4$ divided by the book value of assets in year $t-1$. $R\&D_{i,t-1}/A_{i,t-1}$ measures R&D intensity (R&D expense (COMPUSTAT item 46) over the book value of assets). Share turnover, $TURN_{i,t-1}$ is the average, in December $_{t-1}$, of the daily ratio of shares traded to shares outstanding at the end of the day. $BE/ME_{i,t}$ is firm book-to-market equity (described in the appendix). $KZ_{i,t}$ is Kaplan-Zingales index of financial constraints, defined in the appendix

	Mean	Std. Dev.	Min	Max	Obs.
$I_{i,t}/K_{i,t-1}$	.31543318	.40981705	.000055	9.8948135	53585
$DACCR_{i,t}$	0.0037146	0.1735791	-1.901459	1.466965	48340
$EQISSUE_{i,t}$	.34047265	1.2368979	-8.5319862	16.595188	37761
$MOM_{i,t-1}$	.02231656	.8655887	-3.3779354	19.338051	53585
$IMOM_{i,t-1}$	.03217884	.89540824	-3.5319417	4.8756251	53585
$Q_{i,t-1}$	1.5613214	1.5692514	.074246	82.470253	53585
$CF_{i,t-1}/K_{i,t-2}$	.46286134	1.1810156	-9.9966278	9.9881659	53585
$S_{i,t-1}$	1017.1091	3938.6659	10.002	160883	53585
$A_{i,t-1}$	1277799.8	5897335.8	1878	3.281e+08	53585
$E_{t-1}[EARN_{i,t}]/A_{i,t-1}$	.04385347	.13160954	-6.1592259	13.147612	25249
$E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$	.07059737	.08605749	-3.8495162	2.0628276	24278
$E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$	1.746586	3.7817765	-2.403513	120.72811	20628
$R\&D_{i,t-1}/A_{i,t-1}$	.04555467	.07023887	0	2.051975	24153
$TURN_{i,t-1}$	1.4973921	2.3476327	0	252.16142	27834
$BE/ME_{i,t-1}$	0.975	0.992	0.100	47.287	106,960
KZ	-0.118	2.239	-4.999	46.843	90132

Table 2:

Discretionary accruals and Firm Investment

The dependent variable is the proportion of investment over beginning of year capital. High discretionary accruals, $HIGHDACCR_{i,t-1}$, is a dummy equal to one if the firm has discretionary accruals in the top 20th percentile, and zero otherwise. High equity issuance activity, $HIGHEQISSUE_{i,t-1}$, is a dummy equal to one if the firm has equity issuance in the top 25th percentile, and zero otherwise. For a description of all the other variables see the legend of Table 1. Panel A shows the results for the entire sample. All columns are OLS regressions with the exception of column (5) that reports an IV regression where we instrument Tobin's Q, $Q_{i,t-1}$ with five-year expected profitability (as described in Table 1). In Panel B Columns (1) and (2) show results for the whole sample. Column (3) shows the results only for internet stock firms. Internet stock firms are defined as the firms that have been included in the ISDEX (Internet Stock Index). Column (4) shows results for the firm-years in the subperiod, 1995-2000. Column (5) shows results for the firm-years in the subperiod, 1998-2000. Column (6) shows results for the firms that have below-median R&D intensity. Column (7) shows results for those firms that have above-median R&D intensity. Column (8) shows results for those firms that have below-median firm share turnover. Column (9) shows results for those firms that have above-median firm share turnover. We calculate medians on a year by year basis. All regressions include firm and year fixed effects. The standard errors reported in parentheses are corrected for clustering of the residual at the year level. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$DACCR_{i,t}$	0.1266***	0.1586***	0.1555***	0.1678***	0.1303***	0.1200***	0.0762***	0.0705***
	(0.0173)	(0.0200)	(0.0224)	(0.0251)	(0.0249)	(0.0180)	(0.0153)	(0.0170)
$Q_{i,t-1}$	0.0576***	0.0532***	0.0493***	0.0449***	0.1404***	0.0661***	0.0564***	0.0571***
	(0.0077)	(0.0097)	(0.0091)	(0.0091)	(0.0233)	(0.0054)	(0.0055)	(0.0056)
$CF_{i,t-1}/K_{i,t-2}$	0.0725***	0.0659***	0.0680***	0.0706***	0.0454***	0.0754***	0.0695***	0.0703***
	(0.0079)	(0.0081)	(0.0087)	(0.0086)	(0.0154)	(0.0085)	(0.0103)	(0.0099)
$E_{t-1}[EARN_{i,t}]/A_{i,t-1}$		0.1082***	0.1147	0.6140***				
		(0.0288)	(0.1662)	(0.2348)				
$E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$			0.1670	-0.5106				
			(0.2781)	(0.3976)				
$E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$				0.0136***				
				(0.0035)				
$Q_{i,t}$						0.0089	0.0079	0.0040
						(0.0064)	(0.0055)	(0.0058)
$Q_{i,t-2}$							-0.0105**	-0.0076
							(0.0042)	(0.0058)
$Q_{i,t-3}$								-0.0043
								(0.0040)
Observations	48340	23229	22354	18678	18982	46099	39010	35669
R-squared	0.5054	0.5974	0.6063	0.6232	0.0296	0.4420	0.4393	0.4393

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$DACCR_{i,t}$	0.1127***	0.0874***	0.1071	0.1507***	0.1390***	0.0655*	0.2428***	0.0317	0.0413*
	(0.0187)	(0.0173)	(0.7567)	(0.0242)	(0.0534)	(0.0389)	(0.0335)	(0.0261)	(0.0246)
$Q_{i,t-1}$	0.0574***	0.0576***	0.0116	0.0490***	0.0352***	0.1122***	0.0456***	0.0324***	0.0590***
	(0.0077)	(0.0077)	(0.0173)	(0.0119)	(0.0095)	(0.0125)	(0.0084)	(0.0049)	(0.0071)
$CF_{i,t-1}/K_{i,t-2}$	0.0725***	0.0724***	0.0879	0.0473***	0.0238	0.0910***	0.0575***	0.0635***	0.1299***
	(0.0079)	(0.0079)	(0.1098)	(0.0074)	(0.0148)	(0.0173)	(0.0122)	(0.0147)	(0.0219)
$HIGHDACCR_{i,t}$	0.0100**								
	(0.0049)								
$DACCR_{i,t} * HIGHEQISSUE_{i,t}$		0.0605***							
		(0.0213)							
Observations	48340	48340	113	12933	6534	11473	11455	12288	12216
R-squared	0.5054	0.5055	0.6439	0.6103	0.7446	0.5649	0.5755	0.3853	0.4531

Table 3:

Equity issuance and Firm Investment

The dependent variable is the proportion of investment over beginning of year capital. High discretionary accruals, $HIGHDACCR_{i,t-1}$, is a dummy equal to one if the firm has discretionary accruals in the top 20th percentile, and zero otherwise. High equity issuance activity, $HIGHEQISSUE_{i,t-1}$, is a dummy equal to one if the firm has equity issuance in the top 25th percentile, and zero otherwise. For a description of all the other variables see the legend of Table 1. In Panel A we report the results for the entire sample. All columns are OLS regressions with the exception of column (5) that reports an IV regression where we instrument Tobin's Q, $Q_{i,t-1}$ with five-year expected profitability (as described in Table 1). In Panel B, Column (1) we report the results for the firm-years in the subperiod, 1995-2000. Column (2) shows results for the firm-years in the subperiod, 1998-2000. Column (3) shows results for the firms that have below-median R&D intensity. Column (4) shows results for those firms that have above-median R&D intensity. Column (5) shows results for those firms that have below-median firm share turnover. Column (6) shows results for those firms that have above-median firm share turnover. We calculate medians on a year by year basis. All regressions include firm and year fixed effects. The standard errors reported in parentheses are corrected for clustering of the residual at the year level. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$EQISSUE_{i,t}$	0.0259***	0.0166***	0.0162***	0.0164***	0.0183***	0.0287***	0.0264***	0.0266***
	(0.0030)	(0.0033)	(0.0032)	(0.0043)	(0.0043)	(0.0032)	(0.0032)	(0.0033)
$Q_{i,t-1}$	0.0454***	0.0491***	0.0452***	0.0453***	0.0461***	0.0540***	0.0593***	0.0603***
	(0.0040)	(0.0055)	(0.0046)	(0.0064)	(0.0125)	(0.0059)	(0.0054)	(0.0055)
$CF_{i,t-1}/K_{i,t-2}$	0.0789***	0.0493***	0.0526***	0.0639***	0.0727***	0.0789***	0.0805***	0.0795***
	(0.0119)	(0.0098)	(0.0114)	(0.0146)	(0.0106)	(0.0121)	(0.0122)	(0.0120)
$E_{t-1}[EARN_{i,t}]/A_{i,t-1}$		0.3281***	0.4055***	0.4920***				
		(0.0831)	(0.0840)	(0.0921)				
$E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$			-0.0374	-0.1021				
			(0.1597)	(0.1993)				
$E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$				0.0021				
				(0.0038)				
$Q_{i,t}$						-0.0126**	-0.0113**	-0.0119***
						(0.0050)	(0.0047)	(0.0048)
$Q_{i,t-2}$							-0.0165***	-0.0162***
							(0.0039)	(0.0048)
$Q_{i,t-3}$								0.0004
								(0.0036)
Observations	37761	17283	16631	14220	14451	36212	35366	34867
R-squared	0.409	0.571	0.578	0.548	0.100	0.415	0.419	0.424

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)
$EQISSUE_{i,t}$	0.0187***	0.0026	0.0210***	0.0279***	0.0224***	0.0493***
	(0.0055)	(0.0062)	(0.0039)	(0.0057)	(0.0039)	(0.0092)
$Q_{i,t-1}$	0.0566***	0.0517***	0.0534***	0.0432***	0.0177***	0.0283***
	(0.0063)	(0.0032)	(0.0104)	(0.0066)	(0.0056)	(0.0047)
$CF_{i,t-1}/K_{i,t-2}$	0.0403***	0.0245	0.0974***	0.0646***	0.0874***	0.1572***
	(0.0138)	(0.0245)	(0.0135)	(0.0158)	(0.0228)	(0.0257)
Observations	8346	4327	8631	8558	11784	11301
R-squared	0.563	0.668	0.454	0.543	0.328	0.406

Table 4:

Momentum and Firm Investment

The dependent variable is the proportion of investment over beginning of year capital. For a description of this and all the other variables see the legend of Table 1. Panel A reports results for the whole sample. All columns are OLS regressions with the exception of column (5) that reports an IV regression where we instrument Tobin's Q, $Q_{i,t-1}$ with five-year expected profitability (as described in Table 1). In Panel B, Columns (1) and (2) show results for the sample of firms that have negative momentum. Columns (3) and (4) show results for the sub-sample of firms that have positive momentum. Column (5) shows the results only for internet stock firms. Internet stock firms are defined as the firms that have been included in the ISDEX (Internet Stock Index). Column (6) shows results for the firm-years in the subperiod, 1995-2000. Column (7) shows results for the firm-years in the subperiod, 1998-2000. Column (8) shows results for the firms that have below-median R&D intensity. Column (9) shows results for those firms that have above-median R&D intensity. Column (10) shows results for those firms that have below-median firm share turnover. Column (11) shows results for those firms that have above-median firm share turnover. We calculate medians on a year by year basis. All regressions include firm and year fixed effects. The standard errors reported in parentheses are corrected for clustering of the residual at the year level. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MOM_{i,t-1}$	0.0282***	0.0356***	0.0381***	0.0461***	0.0700***	0.0262***	0.0282***	0.0276***
	(0.0032)	(0.0050)	(0.0052)	(0.0065)	(0.0106)	(0.0030)	(0.0034)	(0.0034)
$IMOM_{i,t-1}$	0.0126***	0.0057**	0.0042*	0.0073**	0.0113***	0.0137***	0.0147***	0.0135***
	(0.0025)	(0.0024)	(0.0024)	(0.0030)	(0.0404)	(0.0026)	(0.0022)	(0.0023)
$Q_{i,t-1}$	0.0532***	0.0508***	0.0460***	0.0419***	0.1345***	0.0606***	0.0467***	0.0476***
	(0.0068)	(0.0084)	(0.0069)	(0.0063)	(0.0241)	(0.0055)	(0.0051)	(0.0054)
$CF_{i,t-1}/K_{i,t-2}$	0.0732***	0.0642***	0.0662***	0.0696***	0.0561***	0.0755***	0.0675***	0.0678***
	(0.0081)	(0.0083)	(0.0089)	(0.0092)	(0.0144)	(0.0087)	(0.0097)	(0.0093)
$E_{t-1}[EARN_{i,t}]/A_{i,t-1}$		0.1071***	0.0805	0.5430**				
		(0.0275)	(0.1603)	(0.2216)				
$E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$			0.2221	-0.4319				
			(0.2669)	(0.3733)				
$E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$				0.0132***				
				(0.0035)				
$Q_{i,t}$						0.0060	0.0055	0.0020
						(0.0056)	(0.0048)	(0.0050)
$Q_{i,t-2}$							-0.0061	-0.0026
							(0.0040)	(0.0054)
$Q_{i,t-3}$								-0.0052
								(0.0036)
Observations	53585	25249	24278	20290	20628	51045	43008	39255
R-squared	0.495	0.603	0.611	0.630	0.070	0.495	0.442	0.444

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$MOM_{i,t-1}$	0.0564***	0.0366***	0.0188***	0.0176**	0.2358*	0.0340***	0.0348**	0.0157***	0.0339***	0.0215***	0.0204***
	(0.0084)	(0.0074)	(0.0048)	(0.0086)	(0.1228)	(0.0065)	(0.0147)	(0.0056)	(0.0057)	(0.0049)	(0.0037)
$IMOM_{i,t-1}$	0.0111***	0.0112***	0.0165***	0.0136***		0.0060	0.0024	0.0046**	0.0170***	0.0094***	0.0115***
	(0.0032)	(0.0029)	(0.0033)	(0.0029)		(0.0051)	(0.0137)	(0.0027)	(0.0049)	(0.0022)	(0.0032)
$Q_{i,t-1}$	0.0733***	0.0336***	0.0397***	0.0342***	0.0271	0.0489***	0.0364***	0.1153***	0.0443***	0.0250***	0.0531***
	(0.0089)	(0.0046)	(0.0050)	(0.0060)	(0.0173)	(0.0111)	(0.0064)	(0.0143)	(0.0066)	(0.0038)	(0.0078)
$CF_{i,t-1}/K_{i,t-2}$	0.0660***	0.0880***	0.0863***	0.1144***	0.0536	0.0434***	0.0206	0.0918***	0.0558***	0.0672	0.1259***
	(0.0093)	(0.0126)	(0.0121)	(0.0241)	(0.0830)	(0.0075)	(0.0169)	(0.0199)	(0.0119)	(0.0124)	(0.0195)
$MOM_{i,t-1} * TURN_{i,t-1}$		-0.0035*		0.0034							
		(0.0018)		(0.0022)							
Observations	30216	15232	23369	12602	121	14069	7136	12086	12067	13957	13877
R-squared	0.539	0.487	0.646	0.451	0.671	0.610	0.746	0.558	0.579	0.469	0.440

Table 5:

Mispricing and Firm Investment

The dependent variable is the proportion of investment over beginning of year capital. $MISPRICING_{i,t}$ is the mispricing metric derived from the firm-level VAR model of Table 8 and described in the text. All the other variables are described in the legend of Table 1. All columns are OLS regressions with the exception of column (5) that reports an IV regression where we instrument Tobin's Q, $Q_{i,t-1}$ with five-year expected profitability (as described in Table 1). All regressions include firm and year fixed effects. The standard errors reported in parentheses are corrected for clustering of the residual at the year level. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$MISPRICING_{i,t}$	0.2124***	0.1535***	0.1464***	0.1542***	0.0936	0.2102***	0.2229***	0.2221***
	(0.0288)	(0.0312)	(0.0275)	(0.0278)	(0.0620)	(0.0286)	(0.0294)	(0.0296)
Q_{t-1}	0.0390***	0.0394***	0.0398***	0.0383***	0.0703***	0.0376***	0.0437***	0.0440***
	(0.0048)	(0.0043)	(0.0047)	(0.0075)	(0.0216)	(0.0062)	(0.0060)	(0.0059)
CF_{t-1}/K_{t-2}	0.0909***	0.0652***	0.0611***	0.0641***	0.0667***	0.0910***	0.0914***	0.0914***
	(0.0146)	(0.0083)	(0.0080)	(0.0108)	(0.0175)	(0.0146)	(0.0146)	(0.0146)
$E_{t-1}[EARN_{i,t}]/A_{i,t-1}$		0.3145***	0.4774***	0.4610***				
		(0.0955)	(0.1344)	(0.1626)				
$E_{t-1}[EARN_{i,t+1}]/A_{i,t-1}$			-0.0984	-0.1310				
			(0.1814)	(0.2105)				
$E_{t-1}[EARN_{i,t+4}]/A_{i,t-1}$				0.0060				
				(0.0062)				
Q_t						0.0026	-0.0009	-0.0004
						(0.0051)	(0.0058)	(0.0057)
Q_{t-2}							-0.0209***	-0.0169**
							(0.0052)	(0.0068)
Q_{t-3}								-0.0084
								(0.0071)
Observations	23347	12914	12520	10787	10923	23347	23347	23347
R-squared	0.460	0.587	0.608	0.576	0.108	0.460	0.461	0.461

Table 6:

Investment and future stock returns

The table reports the results from Fama-MacBeth cross-sectional monthly stock return regressions. The independent variables include investment over beginning of year capital, Tobin's Q, cash flow, book-to-market equity, firm size, price momentum, discretionary accruals, and equity issuance. For a description of the variables see the legend of Table 1. Columns (1), (2), and (9) show results for the whole sample. Column (3) shows results for the firms that have below-median research and development intensity. Column (4) shows results for those firms that have above-median research and development intensity. Column (5) shows results for the firms that have below-median firm share turnover. Column (6) shows results for those firms that have above-median firm share turnover. Column (7) shows results for the firms that have below-median values of the Kaplan-Zingales index of financial constraints, defined in the appendix. Column (8) shows results for those firms that have above-median values of the KZ index. Standard errors are reported in parentheses. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
intercept	1.1561***	3.2108***	2.7542***	3.9667***	1.9802***	3.0249***	2.7679***	3.7459***	3.7119***
	(0.3109)	(0.6949)	(0.7680)	(0.8771)	(0.6625)	(0.7845)	(0.6639)	(0.7248)	(0.7449)
$\ln I_{i,t-1}/K_{i,t-2}$	-0.1579***	-0.1372***	-0.1058	-0.2489***	-0.0670	-0.1151***	-0.1182***	-0.1624***	-0.0702*
	(0.0399)	(0.0342)	(0.0794)	(0.0887)	(0.0417)	(0.0491)	(0.0451)	(0.0417)	(0.0385)
$\ln Q_{i,t-1}$	-0.4161***	0.3061***	0.2219	0.1909	0.3818**	-0.0970	0.2946	-0.0307	0.1055
	(0.1067)	(0.1131)	(0.2723)	(0.2355)	(0.1882)	(0.1664)	(0.2008)	(0.1663)	(0.1355)
$\ln CF_{i,t-1}/K_{i,t-2}$	0.0714*	0.0179	0.0310	-0.1420	-0.0266	0.0193	-0.0089	0.0413	-0.0089
	(0.0389)	(0.0318)	(0.1315)	(0.1737)	(0.0640)	(0.0512)	(0.0733)	(0.1030)	(0.0404)
$\ln ME_{i,t-1}$		-0.1900***	-0.1447***	-0.2351***	-0.0901**	-0.1755***	-0.1400***	-0.2488***	-0.2044***
		(0.0474)	(0.0514)	(0.0588)	(0.0451)	(0.0518)	(0.0440)	(0.0518)	(0.0525)
$\ln BE/ME_{i,t-1}$		0.3541***	0.5003***	0.2643	0.2888***	0.1681	0.3443**	0.2199**	0.1625*
		(0.0762)	(0.1815)	(0.1893)	(0.1183)	(0.1033)	(0.1518)	(0.0995)	(0.0867)
$\ln MOM_{i,t-1}$		0.9665***	0.8603***	0.7332***	0.7992***	1.2381***	0.9160***	0.9153***	0.7033***
		(0.1840)	(0.2472)	(0.2457)	(0.2115)	(0.2066)	(0.1977)	(0.1939)	(0.2036)
$DACCR_{i,t-1}$									-0.6917***
									(0.2678)
$EQISSUE_{i,t-1}$									-0.1814
									(0.1490)

Appendix

A. Description of the Data

Investment (I_t) is capital expenditure (COMPUSTAT item 128). Capital (K_{t-1}) is net property, plant, and equipment (COMPUSTAT item 8). Q_{t-1} equals the market value of assets divided by the book value of assets (COMPUSTAT item 6). Market value of assets equals the book value of assets plus the market value of common stock less the sum of book value of common stock (COMPUSTAT item 6) and balance sheet deferred taxes (COMPUSTAT item 74) in year t-1. Cash flow (CF_{t-1}) equals the sum of earnings before extraordinary items (COMPUSTAT item 18) and depreciation (COMPUSTAT item 14) over beginning of year capital. Sales (COMPUSTAT item 12) is net sales. One-year expected profitability ($E_{t-1}[ROA_t]$) is the median analyst year t-1 forecast of earnings in year t divided by the book value of assets (COMPUSTAT item 6). Two-year expected profitability ($E_{t-1}[ROA_{t+1}]$) is the median analyst year t-1 forecast of earnings in year t+1 divided by the book value of assets (COMPUSTAT item 6) in year t-1. Five-year expected profitability ($E_{t-1}[ROA_{t+4}]$) is the median analyst year t-1 forecast of earnings in year t+4 divided by the book value of assets (COMPUSTAT item 6) in year t-1. R&D intensity is R&D expense (COMPUSTAT item 46) over the book value of assets (COMPUSTAT item 6). We ignore firms with negative accounting numbers for book assets, capital, or investment. We drop those firms with extreme values for the accounting ratios we study as those observations probably represent data errors.

We construct this component of accruals using the cross-sectional adaptation developed in Teoh, Welch, and Wong (1998a, 1998b) of the modified Jones (1991) model. Accruals ($ACCR_t$) equal the change in accounts receivable (COMPUSTAT data item 2) plus the change in inventories (COMPUSTAT data item 3) plus the change in other current assets (COMPUSTAT data item 68) minus the change in accounts payable (COMPUSTAT data item 70) minus the change in other current liabilities (COMPUSTAT data item 72) minus depreciation (COMPUSTAT data item 178). A model of normal accruals is first computed by a regression of total accruals on sales growth (the change in COMPUSTAT data item 2) and capital (COMPUSTAT data item 8) across all firms with the same two-digit SIC code, but excluding the firm under consideration). We require at least 25 observations for these estimates.

$$NORMALACCR_{jt} = \beta_0 \left(\frac{1}{TA_{j,t-1}} \right) + \beta_1 \left(\frac{\Delta SALES_{j,t}}{TA_{j,t-1}} \right) + \beta_2 \left(\frac{PPE_{j,t}}{TA_{j,t-1}} \right) + \epsilon_{j,t}$$

We then apply these estimates to the firm under consideration.

$$NORMALACCR_{it} = \widehat{\beta}_0 \left(\frac{1}{TA_{i,t-1}} \right) + \widehat{\beta}_1 \left(\frac{\Delta SALES_{i,t} - \Delta A/R_{i,t}}{TA_{i,t-1}} \right) + \widehat{\beta}_2 \left(\frac{PPE_{i,t}}{TA_{i,t-1}} \right)$$

Note that as in Teoh, Welch, and Wong (1998a, 1998b), before applying the estimates, we first subtract the increase in accounts receivable (the change in COMPUSTAT data item 12) from sales to allow for the manipulation of credit sales. We then compute discretionary accruals by subtracting normal accruals from total accruals,

$$DACCR_{i,t} = \frac{ACCR_{i,t}}{TA_{i,t-1}} - NORMALACCR_{i,t}$$

Following Daniel and Titman (2002), we construct a measure of a firm's equity issuance / repurchase activity, $EQISSUE_{i,t}$, over a five-year period. We define $EQSSUE_{i,t}$ as the log of the inverse of the percentage ownership in the firm one would have at time t, given a one percent ownership of the firm at time $t-5$, assuming full reinvestment of all cash flows,

$$EQISSUE_{i,t} = \log(\frac{ME_{i,t}}{ME_{i,t-5}}) - r_{i,t-5:t},$$

where $N_{i,t}$ is the number of shares outstanding at time t, $ME_{i,t}$ is the market value of equity at time t, and $r_{i,t-5:t}$ is the log stock return from $t-5$ to t.

We compute book-to-market equity, $BE/ME_{i,t}$. Book equity is defined as stockholders' equity, plus balance sheet deferred taxes (COMPUSTAT data item 74) and investment tax credit (data item 208) (if available), plus post-retirement benefit liabilities (data item 330) (if available) minus the book value of preferred stock. Depending on availability, we use redemption (data item 56), liquidation (data item 10), or par value (data item 130) (in that order) for the book value of preferred stock. We calculate stockholders' equity used in the above formula as follows. We prefer the stockholders' equity number reported by COMPUSTAT (data item 216). If neither one is available, we measure stockholders' equity as the book value of common equity (data item 60) plus the par value of preferred stock. (Note that the preferred stock is added at this stage because it is later subtracted in the book equity formula.) If common equity is not available, we compute stockholders' equity as the book value of assets (data item 6) minus total liabilities (data item 181), all from COMPUSTAT.

The price-to-book ratio used to form portfolios in May of year t is book common equity for the fiscal year ending in calendar year t-1, divided by market equity at the end of May of year t. We require the firm to have a valid past price-to-book ratio. Moreover, in order to eliminate likely data errors, we discard those firms with price-to-book ratio less than 0.01 and greater than 100. When using COMPUSTAT as our source of accounting information, we require that the firm must be on COMPUSTAT for two years. This requirement alleviates most of the potential survivor bias due to COMPUSTAT backfilling data.

The KZ index is: -1.001909*[(Item 18+Item 14)/Item 8]+.2826389*[(Item 6+CRSP December Market Equity-Item 60-Item 74)/Item 6]+3.139193*[(Item 9+Item 34)/(Item 9+Item 34+Item 216)] -39.3678*[(Item 21+Item 19)/Item 8]-1.314759*[Item 1/Item 8]. Item numbers refer to COMPUSTAT annual data items. Data item 8 is lagged.

B. Mispricing Metric

Let $z_{i,t}$ be a vector of firm-specific state variables describing a firm i at time t. The first element of the vector is the firm's market-adjusted annual stock return, $r_{i,t}$. The second element of the vector is the yearly measure of the firm's systematic risk according to the CAPM, $\beta_{i,t}$, while other firm characteristics that predict future risks and returns make up the rest of the elements in $z_{i,t}$. An individual firm's state vector is assumed to follow a linear law:

$$z_{i,t} = \Gamma z_{i,t-1} + u_{i,t}$$

The linear nature of the VAR easily generates forecasts of the state, $E_t[z_{i,t+j}] = \Gamma^j z_{i,t}$. Define $e1' \equiv [1\ 0\ ...\ 0]$ and $e2' \equiv [0\ 1\ ...\ 0]$. At a particular point in time, we take the VAR's forecasts for J future cross-sections of returns, $e1'\Gamma^j z_{i,t}$, and risks, $e2'\Gamma^j z_{i,t}$, and run a cross-sectional regression of forecasted returns on forecasted risks, period by period.

$$e1'\Gamma^j z_{i,t} = a + be2'\Gamma^j z_{i,t} + e_{i,t+j}$$

We then compound the residuals from the J cross-sectional regressions into a mispricing metric, $MISPRICING_{i,t} = \prod_{j=1}^{J}(1 + e_{i,t+j})$. In theory, for each year of the sample we should predict returns and risk into the infinite future; in practice, any impact to $MISPRICING_{i,t}$ is negligible after 15 years.

In estimating the VAR coefficient matrix, we follow Vuolteenaho (2002) and use weighted least squares, deflating the annual data for each firm by the number of firms in the corresponding cross-section. We calculate standard error estimates correcting for clustering of the residual at the year level.

We consider the following parsimonious specification of the VAR. The vector contains the stock return, $r_{i,t}$; the market return beta measured over the previous 12 months, $\beta_{i,t}^{short}$; the market return beta, $\beta_{i,t}^{long}$, measured using at least 36 and as many as 60 of the previous months; log book-to-market equity, $BE/ME_{i,t}$; as well as our previous measures $DACCR_{i,t}$ and $EQISSUE_{i,t}$. All variables are market-adjusted, i.e. cross-sectionally demeaned. The appendix describes how we calculate book-to-market equity. Note that we use forecasts of future 12-month return betas as our measure of risk so that return forecasts exactly correspond to risk forecasts. However we also include a more precise three to five year estimate of beta to help us forecast that risk. Finally, we include four lags of the stock return in the vector, $z_{i,t}$, in order to measure the long term effect of our third variable, lagged momentum, on stock returns.[23]

Table A.1 reports the result of the VAR. The model variables include the market-adjusted stock return, $r_{i,t}$ (the first element of the state vector z); the market-adjusted 12-month beta, $\beta_{i,t}^{short}$ (the second element), the market-adjusted beta, $\beta_{i,t}^{long}$, estimated using from 36 to 60 months of data, the market-adjusted log of the firm book-to-market equity, $lnBE/ME_{i,t}$; market-adjusted discretionary accruals, $DACCR_{i,t}$; and market-adjusted equity issuance activity, $EQISSUE_{i,t}$. We find that point estimates of the coefficients on the lagged stock return, log book-to-market equity, and discretionary accruals are economically large and have the same sign as previous research. Due to the severe data restrictions required in order to measure discretionary accruals,

[23]We also estimated the VAR excluding four lags of stock returns and all the results reported in Table 9 are essentially the same.

only the coefficient on discretionary accruals is statistically significant at conventional levels, with a t-statistic of -2.41. The coefficient on book-to-market is close to being marginally statistically significant (t-statistic of 1.64). However the point estimates for book-to-market as well as the lagged stock return are similar to estimates from longer periods where we do not include discretionary accruals. The ability of the equity issuance variable to predict subsequent stock returns is subsumed by the other variables in the VAR.

The coefficients on lagged returns may help answer the question as to whether momentum profits reverse. Though the coefficients on returns three to five years in the past are large and jointly similar to the coefficient on the lagged stock return, in a test not reported we cannot reject the hypothesis that the coefficients are jointly equal to zero. This result suggests that overall the reversal of momentum profits is not significant. One possible explanation for this is as suggested by the corresponding theories, momentum may measure overreaction in some cases and underreaction in others, therefore for the overall sample we do not find that momentum profits reverse in a statistically significant way.

The remaining columns in Table document the predictability of each element in the VAR. Our measure of risk, $\beta_{i,t}^{short}$, is forecastable using both lagged own values as well as lagged values of $\beta_{i,t}^{long}$. Interestingly, firms with relatively high levels of discretionary accruals have relatively lower betas over the subsequent year. As is well-known, firms' book-to-market ratios are persistent. Other strong results include market-adjusted returns being positively related to subsequent market-adjusted discretionary accruals.

The one-period predictability of market-adjusted stock returns in combination with the estimates relating current characteristics to future characteristics generates a mispricing measure for each firm at each point in time. Figure 1.A plots the histogram of these estimates. The average mispricing is about 1.64%. The standard deviation is approximately 18.65%. As one might guess, the distribution of the estimates is right-skewed.

Table I.A: Firm-level VAR of risk and return

For a detailed description of the variables see the legend of Table 1. The standard errors reported in parentheses are corrected for clustering of the residual at the year level. Coefficients starred with one, two, and three asterisks are statistically significant at the ten, five, and one percent level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	r_t	$\beta^{12}_{i,t}$	$\beta^{36-60}_{i,t}$	$B/ME_{i,t}$	$DACCR_{i,t}$	$EQISSUE_{i,tt}$
$r_{i,t-1}$	0.0241	-0.2905***	0.0019	0.0872***	-0.0031	-0.1542*
	(0.0243)	(0.0100)	(0.0059)	(0.0283)	(0.0023)	(0.0264)
$\beta^{12}_{i,t-1}$	0.0056	0.0328**	0.0418***	-0.0057	0.0004	0.0051
	(0.0050)	(0.0141)	(0.0065)	(0.0040)	(0.0016)	(0.0117)
$\beta^{36-60}_{i,t-1}$	-0.0119	0.4110***	0.8006***	0.0161	-0.0067**	-0.0715*
	(0.0220)	(0.0447)	(0.0398)	(0.0198)	(0.0025)	(0.0411)
$lnBE/ME_{i,t-1}$	0.0365	-0.0347	-0.0213**	0.8746***	-0.0082***	-0.0556
	(0.0223)	(0.0322)	(0.0100)	(0.0217)	(0.0017)	(0.0347)
$DACCR_{i,t-1}$	-0.1021**	0.0042	-0.0016	-0.0081	0.0202***	0.6140***
	(0.0423)	(0.0637)	(0.0199)	(0.0267)	(0.0293)	(0.0872)
$EQISSUE_{i,t-1}$	-0.0021	0.0290	-0.0736***	0.1248***	-0.0064	0.5408***
	(0.0081)	(0.0822)	(0.0260)	(0.0084)	(0.0021)	(0.0691)
$r_{i,t-2}$	-0.0030	0.0369	0.0127	0.0729***	0.0225***	0.2398***
	(0.0221)	(0.0379)	(0.0153)	(0.0171)	(0.0052)	(0.0404)
$r_{i,t-3}$	-0.0166	0.0642	0.0255	0.0547**	0.0002	0.1722***
	(0.0171)	(0.0494)	(0.0167)	(0.0203)	(0.0019)	(0.0152)
$r_{i,t-4}$	-0.0160	0.0053	0.0098	0.0286**	-0.0039	0.2392***
	(0.0147)	(0.0240)	(0.0123)	(0.0106)	(0.0025)	(0.0293)
$r_{i,t-5}$	-0.0178	0.0571**	0.0025	0.0216*	-0.0100**	-0.2303***
	(0.0153)	(0.0270)	(0.0123)	(0.0118)	(0.0036)	(0.0325)
Observations	45440	45440	45440	45440	45440	45440
R-squared	0.005	0.057	0.749	0.704	0.028	0.552

Figure 1: Histogram of the mispricing metric