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Which Firms Follow the Market? An Analysis of Corporate Investment Decisions

Tor-Erik Bakke
University of Wisconsin, Madison

Toni M. Whited*
University of Wisconsin, Madison

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*Corresponding author. Business School, University of Wisconsin, 975 University Avenue, Madison, WI 53706. 608-262-6508. twhited@bus.wisc.edu. We would like to thank Alexander Ljungqvist and seminar participants at the University of Wisconsin for helpful suggestions.

Which Firms Follow the Market?
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Abstract

This paper examines whether firms extract information from their own stock price when making investment decisions. We use an errors-in-variables remedy to answer this question, which is appropriate because movements in the stock price in which the manager takes little interest can be treated econometrically as measurement error. We find that firm investment does not respond to measures of stock-market mispricing. We also find that only some firms' investment responds to market signals: those whose stock prices are informative and those that rely on outside equity financing. Interestingly, these firms' behavior changed little during the late 1990's.

1. Introduction

Does the stock market affect corporate investment decisions? Put differently, does a firm manager make real investment decisions solely on the basis of his expectation of how they will affect firm value, or does he in part base these decisions on external signals sent by the stock market? In a world of symmetric information, efficient capital markets, and no regulatory distortions, this question becomes uninteresting, because movements in asset prices simply reflect changes in underlying economic fundamentals. In other words, in this case the manager's expectation of the benefits of investment *is* the market expectation. However, the question has been of interest in finance and macroeconomics at least since Keynes' (1936) idea that "animal spirits" influence the real economy, precisely because many accept the notion that capital markets are not entirely efficient; that is, that non-fundamental factors do indeed affect a firm's stock price. The question is also of interest to monetary policy makers, because a link between the stock market and real economic activity opens the door for policy makers to influence the stock market.

The question has not been answered. History has provided clear associations between stock-market and investment fluctuations, such as during the late 1990s in the U.S. technology sector. However, history has also provided episodes in which investment has moved independently of the stock market, such as during the 1987 stock market crash, which had no effect on real investment. Similarly, the numerous papers that have tackled these issues have found conflicting evidence, some supporting a role for the stock market and some not.

This paper contributes to the answer to this puzzle along two dimensions. First, we use a novel technique to tackle the most difficult problem facing this literature: separating the stock market's influence on investment from the influence of fundamentals. Second, we use this technique to uncover the source of any potential response, by exploring cross-sectional heterogeneity in the stock-market response of investment.

The intuition behind our method for separating the effects of the stock market from the effects of fundamentals is simple. Suppose that the manager does indeed pay attention to stock-price "noise;" that is, stock-price movements that are unrelated to fundamental investment opportunities. Many researchers have noted that in this case an econometrician should observe a strong response of investment to Tobin's q: the stock-market's valuation of the capital stock divided by its replacement value. Our technique builds upon this idea with the observation that if an econometrician performs a signal extraction exercise on q, he should find little noise in q and a great deal of signal. Intuitively, this exercise finds a great deal of signal because the manager interprets stock-price movements unrelated to fundamentals as a signal not as noise. On the other hand, suppose the manager of an otherwise identical firm disregards the stock market and only follows cues from his own valuation of investment projects, perhaps because he believes that the market has inferior information. In this case the observed response of investment to q should be weak, and a signal extraction exercise should uncover a great deal of noise in q. This exercise finds a great deal of noise since the manager treats stock-price movements unrelated to fundamentals as noise not as signal. In sum, any econometric technique that can filter the noise out of q in a regression of investment on q will allow inference about whether the stock market matters for investment.

Our method is the errors-in-variables remedy in Erickson and Whited (2000). We pick this technique over other, more traditional remedies for three reasons. First, as explained in detail in Erickson and Whited (2000), other remedies require implausible assumptions. Second, Erickson and Whited (2000) demonstrate that this technique has good finite-sample properties in the case of cross-sectional investment regressions. Most importantly, this method allows us to perform a signal-extraction exercise on q, by providing an estimate of the ratio of signal to the sum of signal and noise for Tobin's q, a quantity we refer to hereafter as τ^2. An estimate near one implies that the manager views the stock price as very informative about investment opportunities. Conversely, an estimate near zero implies that the manager views the stock price as very uninformative about investment opportunities. Using this unit-free measure avoids the pitfalls, discussed below, that arise because of the multiple factors that can affect investment-q sensitivity.

Figure 1 fleshes out the intuition behind how we use τ^2 to examine whether the market matters for investment. The distance between points a and d represents the variance of an observed measure of Tobin's q. This variance can be decomposed in a variety of ways: The distance between points a and b represents the component that is due to fundamental investment opportunities, the distance between points b and d represents the component that is not due to fundamentals, and the distance between points b and c represents the portion of the non-fundamental component to which the manager reacts. It is this last "managerial-attention" component in which we are interested. An estimate of τ^2 measures the ratio of the distance between points a and c to the distance between points a and d; that is, the fundamental component plus the part of the noise component to which the manager responds, all expressed as a fraction of the total variance of observed q.

To examine the size of the managerial-attention component of q, we filter the effects of various proxies for price (un)informativeness out of observed q. If the managerial-attention component of q is small, then because this filtering removes undesirable noise from observable q, it will raise the estimate of τ^2 over the estimate obtained when using an unfiltered version of q. With reference to Figure 1, this filtering can be thought of as removing all or part of the distance from points c to d, which will clearly raise τ^2. Conversely, if the managerial-attention component of q is large, then this filtering removes important information from q, and the estimate of τ^2 will fall relative to the estimate obtained when using an unfiltered version of q. With reference to Figure 1, in this case filtering removes all or part of the distance between points b and c, thus lowering τ^2.

We use two measures of stock-market noise (or, conversely, price informativeness.) The first measure is price non-synchronicity. First proposed by Roll (1988), this measure is a decreasing function of the R^2 from a regression of a firm's stock return on its industry's return and the market return. The idea is that if a firm's stock return is weakly correlated with the market and industry returns, then the firm's stock price is more likely to reflect firm-specific information, which may be useful for investment decisions. The second measure is the standard deviation of analysts' earnings forecasts. As argued in Panageas (2005a), Diether, Malloy, and Scherbina (2002), and Gilchrist, Himmelberg and Huberman (2005), high dispersion of investor opinion combined with short-sale constraints can lead to an overvalued stock price. Therefore, firms with high dispersion have less informative stock prices.

With the Erickson-Whited estimators and indicators of price informativeness in hand, we examine cross-sectional heterogeneity in firms' responses to the market. We investigate heterogeneity along two dimensions: reliance on outside equity finance and price informativeness. Merton and Fisher (1984) introduce the idea that the response of investment to the stock market operates through an equity-financing channel. They argue that investment decisions should respond to stock price changes, even when the stock market fluctuates irrationally. For example, if a company's stock is overvalued, the manager can benefit existing shareholders by issuing equity. What the manager does with the proceeds is an open question. On one hand, the manager might view his firm's equity as excessively high, but nevertheless fail to perceive a change in the cost of capital. In this case, the manager can use the proceeds to increase the firm's cash stock. However, if the manager perceives equity overvaluation as lowering the cost of capital, it may be optimal for the firm to invest the proceeds of the issue. It is this latter mechanism in which we are interested.

Our results are interesting and intuitive. First, we replicate the result in Baker, Stein, and Wurgler (2003) that "equity-dependent" firms have a higher sensitivity of investment to q. Using the same data set, however, we also demonstrate that a more accurate method for sorting firms along the lines of equity dependence produces little relationship between investment-q sensitivity and equity dependence. Using our own method, however, we do uncover evidence that equity-dependent firms respond to the non-fundamental component of the stock price. Finally, we show that investment-q sensitivity is a poor metric for gauging the response of investment to the stock market.

Our second set of results reveals an interesting relationship between price informativeness and the stock-market response of investment. We find that only those firms with highly informative stock prices respond to market signals. Along this line, when we double-sort firms on the basis of price informativeness and equity dependence we find that only the equity dependent firms with informative stock prices react to the non-fundamental component of q. This result is consistent with a story in which firms glean information from stock prices. It is, however, inconsistent with a story in which firms only try to exploit what they perceive to be mispricing, because in that case we should have found the opposite result—that firms with high mispricing react to the non-fundamental component of q.

Next, we examine the bubble episode of the late 1990's. Interestingly, we find only small differences in the results during the bubble period. Although the equity dependent firms with highly informative stock prices respond to the information in the stock price, we also uncover limited evidence that they also react to market mispricing.

Finally, we examine the result in Chirinko and Schaller (2005) that the investment of growth firms responds more to mispricing than the investment of value firms. Although we do find that value firms ignore information in the stock price as well market mispricing, and although we do find that growth firms do not ignore the stock price, we do not find conclusively that growth firms incorporate stock price information into their investment decisions.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes and summarizes the data. Section 4 provides a review of the Erickson and Whited estimators and discusses their use in the current context. Section 5 presents the results, and Section 6 concludes. The Appendix contains the results of a Monte Carlo experiment designed to calculate finite-sample critical values for the t-tests used in the paper.

2. Related Literature

Traditional Q-theory, as in Hayashi (1982), contends that marginal q, which is a function only of the *manager's* expectations of future marginal profits, is a sufficient statistic for investment. Morck, Shleifer and Vishny (1990) elaborate on this basic idea, arguing that managers are better informed about the investment opportunities of the firm. Because investors may have smaller information sets than managers, no new knowledge about q or external equity costs is gained by observing market signals, and therefore stock market movements can be safely ignored. In addition, managers may be reluctant to issue equity to exploit low costs of equity that result from overvaluation of the company's shares. This reluctance could stem from the role of equity issuance as a signal that, in the spirit of Myers and Majluf (1984), can deflate an equity bubble and cause declines in market value. In support of these ideas, Morck, Shleifer and Vishny (1990) find that although returns can predict investment, this predictive power disappears once they control for fundamentals. Also, consistent with the irrelevance of stock markets for investment, Blanchard, Rhee, and Summers (1993) find evidence that although the stock market does not change investment, it can change the composition of external finance. More recently, Chirinko and Schaller (1996, 2001) tackle the problem by writing down an explicit model in which managers respond to fundamental investment opportunities but in which stock market bubbles can persist. Chirinko and Schaller (1996) find support of their null hypothesis that managers respond to fundamentals using U.S. data.

On the other hand, several influential papers find evidence that stock price movements do affect corporate investment. Empirical work in this vein starts with Merton and Fisher (1984), who, as noted above, argue that investment should depend on stock market signals. They argue that when stock prices are unduly depressed, management should shift funds away from investment projects and toward repurchasing underpriced equity. They also provide evidence that stock prices can forecast aggregate investment expenditures. Gilchrist, Himmelberg and Huberman (2005) estimate a panel VAR, finding that shocks to dispersion of investor opinion have predictive power for q, real investment, and net equity issuance. Because short-sale constraints imply that heterogeneous investor opinion leads to equity overpricing, they argue that these results imply that when stock prices are above their fundamental value, managers tend to issue more equity and increase investment. Similarly, Panageas (2005c) examines a VAR of several aggregate series, finding that positive shocks to investor sentiment boost aggregate investment. Polk and Sapienza (2005) find that proxies for corporate transparency and equity mispricing can explain investment even after controlling for q. Finally, Chirinko and Schaller (2001) reject the null hypothesis that managers ignore the market using Japanese data; and Chirinko and Schaller (2005) find that firms with high market-to-book ratios invest more than firms with low market-to-book ratios, even after controlling for a version of q that captures only fundamentals.

A series of recent papers concentrates on the sensitivity of investment to q as an indicator of management's response to stock market signals, some supporting the idea that investment responds to the stock market, and some not. This idea does have strong theoretical underpinnings. For example, Panageas (2005a) develops this idea in a dynamic investment model in which investors have heterogeneous beliefs and in which short sales are restricted. He shows that mispricing is embedded in q and that it is optimal for firms to respond to this mispricing. Panageas (2005b) demonstrates that investment followed q closely during a natural experiment with short sales constraints during the 1920's. Baker et al. (2003) build upon the idea in Bosworth (1975) and Stein (1996) that the stock market affects investment via equity financing. They interpret their findings of high investment-q sensitivity for equity-dependent firms as evidence of a story in which stock market mispricing causes these firms to issue (or repurchase) equity, using the proceeds for (or taking the funds away from) investment. Chen, Goldstein, and Jiang (2005) examine the relationship between measures of price informativeness and the sensitivity of investment to q. They find a positive relationship, interpreting it as evidence that managers glean information from stock prices when they make investment decisions.

All but three of these papers fail to model explicitly the deviation of market signals from fundamentals. This omission is especially serious in the context of tests based on investment-q sensitivity, which may be influenced by factors other than stock market signals. For example, classical q-theory implies that this sensitivity is due to the magnitude of physical adjustment costs, and Gomes (2001) shows that it can also be due to financial frictions. Therefore, it is impossible to isolate the effects of stock market signals unless one controls for adjustment costs and financial frictions, both of which are hard to observe.

Two of the papers that do distinguish market signals from fundamentals, Chirinko and Schaller (1996, 2001), identify the difference via estimation of a structural model. Although clever, this strategy relies on estimating an investment Euler equation derived under the assumption quadratic adjustment costs and perfect markets for external finance. A large amount of evidence has accumulated that these Euler equations are only correctly specified for a small subset of firms. See, for example, Whited (1992) and Love (2003). Therefore, as above, attempts to identify mispricing may pick up the effects of financial or real frictions. The third paper in this list, Chirinko and Schaller (2005) relies on the accuracy of a proxy for fundamentals. Because all proxies are just that—error-laden proxies, room for further research remains.

Our method shares with these papers an explicit modeling of the discrepancy between the stock market and fundamentals. However, we do not rely on being able to surmount the difficult task of finding a proxy for fundamentals; rather, we use the (testable) structure of an econometric model. Further, our method can be seen as extending this previous work to cases in which non-convex adjustment costs or financial frictions are important. Because our method is based on investment-q regressions, it is appropriate in the presence of financial frictions inasmuch as they are capitalized into q, as in Gomes (2001). It is also appropriate in the presence of alternative forms of adjustment costs, as in Abel and Eberly (2001), Caballero and Leahy (1996), and Caballero (1999). Finally, although our method is not without shortcomings we can, because the method is based on GMM estimation, use the usual test of overidentifying restrictions to detect any potential shortcomings important enough to distort inference.

3. Data and Summary Statistics

This section describes our data sources and basic data definitions. It then moves on to explain how we construct measures of price informativeness and equity-dependence. It concludes by presenting summary statistics.

3.1. Data Sources and Basic Definitions

The data come from three sources. The first is the combined annual, research, and full coverage 2005 Standard and Poor's COMPUSTAT industrial files. We select the sample by first deleting any firm-year observations with missing data. Next, we delete any observations for which total assets, the gross capital stock, or sales are either zero or negative. Then for each firm we select the longest consecutive times series of data and exclude firms with only one observation. Finally, we omit all firms whose primary SIC classification is between 4900 and 4999, between 6000 and 6999, or greater than 9000, because our model is inappropriate for regulated, financial, or public firms.

Our data on monthly and daily stock returns and volumes are from the 2005 CRSP tapes, and our data on analysts' earnings forecasts are from I/B/E/S. After merging these three data sources, and after deleting the top and bottom 1% of our regression variables, we are left with an unbalanced panel of firms with between 1683 and 2428 observations per year, with a sample period that runs from 1990 to 2004. We restrict our samples to these years, because it is only in these years that we have enough data for our econometric model to be identified.

Data variables from Compustat are defined as follows: book assets is Item 6; the gross capital stock is Item 7; investment is Item 128; cash flow is the sum of Items 18 and 14; equity issuance is Item 108 minus Item 115; total long-term debt is Item 9 plus Item 34; total dividends is Item 19 plus Item 21; cash is Item 1; research and development costs are Item 46; and sales is Item 12. The numerator of the market-to-book ratio is the sum of the market value of equity (Item 199 times Item 25) and total book assets minus the book value of equity (Item 60+Item 74), and the denominator is book assets. We also define a "macro q," as in Erickson and Whited (2005). The numerator is the market value of equity plus total long-term debt less inventories, and the denominator is the gross capital stock. Monthly turnover is computed using CRSP data and is defined as average share volume over shares outstanding. The debt overhang correction represents the current value of lenders' rights to recoveries in default and is computed following Hennessey (2004).

3.2. Measures of Price Informativeness

We construct our two measures of stock-price informativeness as follows. Our first measure is from Durnev, Morck, and Yeung (2004), who show that firm-specific variation in a stock return is increasing in the informativeness of the stock price. They measure idiosyncratic return variation as $\Psi \equiv \ln\left((1 - R_i^2)/\, R_i^2\right)$, in which R_i^2 is R^2 from the regression of firm-specific weekly returns on value-weighted market and value-weighted industry indices. The industry is defined at the three-digit SIC-code level. We hereafter refer to Ψ as price non-synchronicity.

As surveyed in Chen, Goldstein, and Jiang (2005) and Jin and Myers (2006), a large empirical literature has shown that this measure tends to reflect private information more than noise. Further, the seminal paper by Roll (1988) shows that public news is unrelated to this measure. Finally, Chen, Goldstein, and Jiang (2005) survey several papers that argue and show that stock-price co-movement is related to stock-price *un*informativeness.

Our second measure of stock-price informativeness is a commonly-used proxy for market mispricing. A measure of belief heterogeneity, this proxy is defined as the standard deviation of analysts' earnings-per-share forecasts from the Summary History file from I/B/E/S. This file is potentially less accurate than the Detail History file due to the presence of stale forecasts and coding errors. However, Diether, Malloy, and Scherbina (2002) report that both the Summary and Detail history files give very similar results, and consequently only report their results using the Summary data. In addition, we follow Diether, Malloy, and Scherbina (2002) by collecting yearly rather than quarterly earnings forecasts, as this choice results in a larger sample. Because I/B/E/S forecasts are reported monthly, and because the standard deviation of these forecasts grows as the forecast period lengthens, to construct an average standard deviation, we first scale each forecast by the square root of the number of months between the estimate and the earnings announcement date. We then average the scaled forecasts. Finally, we re-scale the standard deviation as a fraction of the capital stock instead of as a fraction of total shares. Our intent is to scale all of our variables by firm size, and the number of shares outstanding is an arbitrary number that does not necessarily measure the size of the firm.

Polk and Sapienza (2005) use R&D intensity as a measure of possible stock-market mispricing. However, we do not mostly because of serious simultaneity issues. Even when we tried to use this proxy for mispricing, our results are weak. Several authors have used share turnover as a proxy for mispricing. As argued in Stein (1996) and Panageas (2005a), stock market mispricing is most likely to affect firms whose investors have short-term horizons, a phenomenon that should manifest itself in high share turnover. However, the interpretation of share turnover is ambiguous, given the simple observation that the stock prices of liquid stocks are likely to be more informative than the prices of illiquid stocks. We therefore do not use this measure.

3.3. Measures of Equity Dependence

We use two previously formulated indices of equity dependence. Both have been used in other contexts, which mitigates concern over data mining. Following Baker, Stein, and Wurgler (2003), our first proxy for a firm's dependence on equity finance is the widely-used KZ index. This index comes from Kaplan and Zingales (1997), who examined the annual reports of the 49 firms in Fazzari, Hubbard, and Petersen's (1988) "constrained" sample, using this information to rate the firms on a financial constraints scale from one to four. They then ran an ordered logit of this scale on observable firm characteristics. Several authors have used these logit coefficients on data from a broad sample of firms to construct a "synthetic KZ index" in order to measure finance constraints. To the extent that firms follow a pecking order in which external debt is preferred to external equity, an index of finance constraints can easily be interpreted as an index of equity dependence.

Specifically, the KZ index is constructed as

$$-1.001909CF + 3.139193TLTD - 39.36780TDIV - 1.314759CASH + 0.2826389Q,$$

where CF is the ratio of cash flow to book assets, $TLTD$ is the ratio of total long-term debt to book assets, $TDIV$ is the ratio of total dividends to book assets, $CASH$ is the ratio of the stock of cash to book assets, and Q is the market-to-book ratio. By construction, the index isolates firms with low cash, low cash flow, and high debt burdens, all of which are characteristics one would associate with firms facing costly external finance. Following Baker, Stein, and Wurgler (2003), we exclude the Q term when computing the synthetic KZ index for each firm. As discussed in Kaplan and Zingales (1997), this index is constructed to measure the extent to which firms need external financing, but does not necessarily capture the cost of external financing.

The second measure of external finance constraints is from Whited and Wu (2006). Their index is constructed via the estimation of the Euler equation of a standard intertemporal investment model with convex adjustment costs. In this model, and in the absence of constraints, the marginal cost of investing today equals the opportunity cost of postponing investment until tomorrow. In the presence of constraints, a wedge appears between these two costs. The WW index is an estimated parameterization of this wedge. Specifically, it is:

$$-0.091CF - 0.062DIVPOS + 0.021TLTD - 0.044LNTA + 0.102ISG - 0.035SG. \quad (1)$$

Here, $DIVPOS$ is an indicator that is one if the firm pays dividends, and zero otherwise; SG is own-firm real sales growth; ISG is three-digit industry sales growth, and $LNTA$ is the natural log of book assets. Firms with a high WW index are small, have high debt burdens, and low cash flow. Also, they will be the slow-growing firms in fast-growing industries.[1] Because this index is a measure of the shadow cost of external finance, it captures both the need of constrained firms to go external for finance and the high cost or scarce availability of finance.

3.4. Summary Statistics

Summary statistics for the sample stratified into quartiles by the WW and KZ indices are in Table 1. These results essentially confirm the evidence in Whited and Wu (2006) that the KZ index captures some, but not all, of the characteristics typically associated with being financially constrained. For example, although high KZ firms pay few dividends, they appear to be investing approximately the same as their unconstrained counterparts, despite substantially lower values of Tobin's q. The KZ index also has difficulty capturing the notion of equity dependence. High KZ firms use much more debt than low KZ firms, they issue

[1] We also use size as a measure of equity dependence, inasmuch as small firms tend to be young, and young firms tend to rely more heavily on equity finance. The results from this exercise are almost identical to the results from using the WW index.

equity slightly less often than the lower KZ firms, and the size of issuance as a percent of total assets is nearly identical across the different KZ groups. In contrast, the firms with a high WW index are small, issue equity much more often and in greater quantities than the low WW firms. Further, in contrast to the even distribution of bond ratings across the four KZ quartiles, almost none of the high WW firms have bond ratings, and slightly less than half of the low WW firms do have bond ratings. This pattern reinforces the idea that the WW index captures equity dependence; that is, the need to rely on equity rather than debt as a source of external finance. Because the KZ index does not appear to identify equity dependent firms, in what follows we primarily rely on the WW index, except in cases in which we wish to compare our results to those in Baker, Stein, and Wurgler (2003).

Summary statistics for the sample stratified by our two measures of price informativeness are in Table 2. In dividing our sample into high-informativeness and low-informativeness groups, we sort on the basis of each informativeness measure and then discard the middle quintile. Price non-synchronicity increases with the WW index and decreases with cash flow and firm size. This third result is not surprising in that large firms are commonly thought of as more opaque than small firms. In contrast, investment, q, and share turnover vary little across the high and low price non-synchronicity groups. At first glance the results concerning investment and q point to no role for price informativeness in the investment decision. However, splitting a sample into two groups makes a great deal of rich variation within the two groups. Our measure of mispricing, in contrast, is increasing in both q and investment. It is also strongly related to share turnover and R&D intensity, both of which have also been argued to capture market mispricing. Our two informativeness measures are clearly uncorrelated with each other and therefore reflect different information.

4. Methodology

This section describes our methodology. First, we outline our econometric model. Second we discuss its applicability. Finally, we explain our testing procedure.

4.1. Econometric Model

Our testing strategy is based on the estimators in Erickson and Whited (2000, 2002). These estimators employ the structure of the classical errors-in-variables model. Applied to a single cross section, this model can be written as

$$y_i = z_i\alpha + q_i\beta + u_i, \tag{2}$$

$$x_i = \gamma + q_i + \varepsilon_i, \tag{3}$$

in which q_i is the true q of firm i, x_i is an estimate of its true q, and z_i is a row vector of perfectly measured regressors, whose first entry is 1. The regression error, u_i, and the measurement error, ε_i, are assumed independent of each other and of (z_i, q_i), and the observations within a cross section are assumed *i.i.d.* Note that the intercept in (3) allows for systematic bias in the measurement of true q.

Using the third and higher order moments of (x_i, y_i), the Erickson and Whited estimators provide consistent estimates of the slope coefficients, α and β, as well as the variances of the unobservable variables $(q_i, u_i, \varepsilon_i)$. These estimators are only identified if $\beta \neq 0$ and q_i is nonnormally distributed. Erickson and Whited (2002) develop a test of the null hypothesis that $\beta = 0$ and q_i is nonnormally distributed—a test we refer to hereafter as an "identification test." See Erickson and Whited (2000, 2002) for details. Because these estimators can only be applied to samples that are arguably *i.i.d.*, we obtain these estimates in two steps. First, we estimate τ^2 for each cross section of our unbalanced panel. Second, we pool these estimates via the procedure in Fama and MacBeth (1973). We do not include firm fixed effects in our regressions for two reasons. First, the resulting model almost never passes the identification test. Second, our OLS results are little changed by the inclusion of fixed effects, suggesting that the within-firm variation in investment and q mirrors the cross sectional variation.

Recently, Petersen (2005) has re-emphasized that Fama-Macbeth standard errors are often inappropriate in panel data. We deal with this issue by using a Monte Carlo study, described in the Appendix, to calculate the critical values for the t-statistics produced by using the Fama-Macbeth standard errors. We find that these critical values are well above the usual value of 1.96, instead ranging from 2.22 to 6.44. In our discussion of our results we deem a coefficient estimate significantly different from zero if its t-statistic exceeds the finite-sample critical value—not the asymptotic critical value.

4.2. Applicability of the Model

The interpretation of ε_i is important and worth further discussion, because if factors other than market noise or the manager's interpretation of market noise influence ε_i, our results might be due to these other factors, rather than the divergence of fundamentals from market signals. To organize our discussion, we start with a precise definition of "fundamentals." as marginal q—the manager's expectation of the future marginal products of capital. Classical q-theory predicts that investment should be a function of marginal q alone. Although marginal q is inherently unobservable, a series of links relates it to an observable proxy.

The first is the relation between marginal q and average q, which is the intrinsic value of the capital stock divided by its replacement value. If the firm is perfectly competitive and has linearly homogeneous technology, then marginal q equals average q. Clearly, if these assumptions are violated, then it difficult to interpret ε_i as the difference between fundamental and market value. However, several recent papers have shown theoretically and empirically that when marginal q does not equal average q, investment is a function of average q plus other variables. For example, Abel and Eberly (2001) and Cooper and Ejarque (2003) show that the presence of market power implies that investment is a function of average q and cash flow. Similarly, Hennessy (2004) shows that when a firm has outstanding debt, investment is a function of average q and a debt-overhang correction. Therefore, to deal with difficulty of interpreting ε_i that arises from the inequality of marginal and average q, we include cash flow and Hennessy's debt-overhang correction in our regressions. We also do not interpret the coefficient on cash flow as an indicator of external finance constraints because of the well-known difficulties in interpreting this coefficient. See Erickson and Whited (2000), Gomes (2001), and Moyen (2004).

At this point we can define average q as fundamental investment opportunities, as long as we include other appropriate regressors. This definition is bolstered by recent papers that have questioned the plausibility of convex capital-adjustment costs, the assumption which yields marginal q as a sufficient statistic for investment incentives. Caballero and Leahy (1996) and Caballero (1999) show that if there is a fixed cost of changing the capital stock, then relatively strong additional assumptions are needed to obtain a scalar measure of investment incentives; interestingly, the scalar measure so produced is average q. Also, Gomes (2001) develops a general equilibrium model with financial frictions in which average q is the more appropriate explanatory variable.

The next link between fundamental investment opportunities and an observable proxy is the equality between average q and Tobin's q, which is the financial markets' valuation of average q. A discrepancy between these two quantities can arise if stock market inefficiencies cause the manager's valuation of capital to differ from the market valuation. This is the interpretation on which we will focus.

However, numerous problems arise in estimating Tobin's q from accounting data that do not adequately capture the relevant economic concepts of market and replacement values. These problems admit a further interpretation of ε_i as literal measurement error. Nonetheless, we view this interpretation as unimportant, in light of the evidence in Erickson and Whited (2006) that none of the available algorithms for estimating Tobin's q improve measurement quality beyond the estimates produced directly from accounting data. This result arises because the cross-sectional variation in the estimated components of Tobin's q dwarfs any variation arising from imprecise measurement. Therefore, although literal measurement difficulties may exist, they are unlikely to be sufficiently important to alter our basic inferences.

4.3. Testing Strategy

Our parameter of interest is the population R^2 of equation (3), which we denote τ^2, and which under our assumptions can be written

$$\tau^2 = \frac{\text{var}\,(q_i)}{\text{var}\,(q_i) + \text{var}\,(\varepsilon_i)}. \tag{4}$$

In the context of a pure errors-in-variables model, a value of τ^2 close to unity implies that the proxy is quite informative about the manager's perception of investment opportunities. Conversely, a value close to zero implies the proxy is nearly worthless. In the context of trying to understand the relationship between investment and the stock market, the interpretation of τ^2 becomes more complex. The difficulty lies in two separate factors that can affect $\text{var}(\varepsilon_i)$, which we illustrate in Figure 1. One can think of the distance between points a and d as $\text{var}(q_i) + \text{var}(\varepsilon_i)$, and the distance between points c and d as $\text{var}(\varepsilon_i)$. In this diagram an increase in the deviation of the market value of the firm from its fundamental value is represented by a leftward shift in point b, and an increase in the manager's tendency to disregard market signals is represented by a leftward shift in point c. Clearly, both of these factors can affect $\text{var}(\varepsilon_i)$ and τ^2.

Our interest lies in measuring or approximating the distance between points b and c; that is, the "managerial attention" component of the non-fundamental part of q. To isolate this component we use a simple strategy based on the residuals from projecting observed q on our measure of price non-synchronicity and on our measure of mispricing. We consider the intuition behind using each of these measures in turn.

First, we consider Ψ, our measure of price non-synchronicity. Suppose the manager gleans information from the stock price and uses that information in making investment decisions. In that case regressing the effects of price non-synchronicity out of observed q should result in a residual that when used in an investment regression produces a lower τ^2 than observed q itself. Conversely, if the manager does not pay attention to the stock price, then regressing the effects of price non-synchronicity out of observed q should result in a residual that when used in an investment regression produces a higher τ^2 than observed q itself. We denote the estimate of τ^2 corresponding to the residual of the regression of q on Ψ as τ_i^2.

Next we consider the standard deviation of analysts' earnings estimates, which we denote as $SDEV$ hereafter for convenience. Suppose, as in Panageas (2005a), dispersion of investor opinion is capitalized into q and that this over-priced q influences managerial investment decisions. In that case regressing the effects of $SDEV$ out of observed q should result in a residual with a lower τ^2 than observed q itself. Conversely, if the manager does not pay attention to stock market mispricing, then regressing the effects of mispricing out of observed q should result in a residual with a higher τ^2 than observed q itself. We denote the estimate of τ^2 corresponding to the residual of the regression of q on $SDEV$ as τ_m^2.

For to test whether τ_m^2 and τ_i^2 are greater or less than τ^2, we create the two ratios, τ_m^2/τ^2 and τ_i^2/τ^2 and then test whether these ratios are significantly different from one. The finite-sample 5% two-sided critical value for this test calculated in the Appendix is 3.52. To summarize, an estimate of τ_m^2/τ^2 significantly less than one implies that firms react to mispricing when making investment decisions, and vice versa. An estimate of τ_i^2/τ^2 significantly less than one implies that firms react to information in the stock when making investment decisions, and vice versa.

Finally, it is worth emphasizing that measures of price non-synchronicity and mispricing need not be perfect. As shown in the Appendix, our tests have good power to detect the alternative hypotheses that τ_m^2/τ^2 and τ_i^2/τ^2 are either greater than or less than one, even when we measure price informativeness indirectly.

5. Results

This section is divided into two parts. The first contains a reexamination of the results in Baker, Stein, and Wurgler (2003). The intent here is to illustrate the pitfalls in focussing on investment-q sensitivity, as well as the importance of correctly identifying equity dependent firms. The second part examines firm heterogeneity along the lines of equity dependence and price informativeness. All sample splits are done on the basis of once-lagged variables to mitigate endogeneity concerns.

5.1. Investment-q Sensitivity

Table 3 replicates the results in Baker, Stein, and Wurgler (2003), who find that firms with high KZ indices have a higher sensitivity of investment to q, and who interpret this result as evidence that firms respond to stock market mispricing. The table is divided into two parts:

In the top panel all regression variables are deflated by total assets, as in Baker, Stein, and Wurgler (2003), and in the bottom panel all regression variables are deflated by the capital stock, as in Hennessy (2004), Fazzari, Hubbard, and Petersen (1988), and Erickson and Whited (2000). We present results from estimating (2) via OLS and from estimating (2) and (3) via the fourth-order estimator in Erickson and Whited (2000). This particular estimator performs best for estimating τ^2 in a Monte Carlo simulation in the appendix. We present not only our estimates of τ^2, τ_m^2/τ^2, and τ_i^2/τ^2, but also an estimate of the coefficient of determination of (2), which we denote as ρ^2.

As seen in the first column of Table 3, for the regressions in which we deflate all variables by assets, investment-q sensitivity increases strongly with the KZ index. This result is comforting inasmuch as it shows that our data are comparable to those used by Baker, Stein, and Wurgler (2003). The top part of Table 3 also illustrates that this general pattern remains when we estimate the regressions with the EW estimator. We take these results with a grain of salt, however, because in only two of our 15 cross-sections can we reject the null of no model identification.

As seen in the second part of Table 3, when we deflate the regression variables by the capital stock, the OLS estimates of the coefficient on q do not increase with the KZ index, but the GMM estimates do. What is of more interest in this part of the table, however, are the estimates of the ratios τ_m^2/τ^2, and τ_i^2/τ^2. We find an estimate of τ_m^2/τ^2 significantly greater than one for the third KZ quartile and an estimate of τ_i^2/τ^2 significantly greater than one for the second KZ quartile. In other words, the firms in the third KZ quartile ignore market mispricing, and the firms in the second KZ quartile ignore price non-synchronicity. All other estimates of these two quantities are insignificantly different from one. These results are hardly a confirmation that investment-q sensitivity is a good indicator of the extent to which firms use market signals to make investment decisions.

Before continuing, it is worth noting that the τ^2 estimates for the assets deflated regressions are much lower than those for the capital deflated regressions. This result implies the presence of more noise in the (assets-deflated) market-to-book ratio than in (capital-deflated)

Tobin's q, perhaps, as suggested by Erickson and Whited (2006), because the market-to-book ratio for the entire firm may not be a good indicator of investment opportunities for only one type of asset—property, plant, and equipment. Because the low estimates of τ^2 in the assets-deflated regressions make any comparisons between τ^2, τ_m^2/τ^2, and τ_i^2/τ^2 difficult, and because our capital-deflated regressions do pass the identification test, we restrict our attention on regressions deflated by the capital stock.

5.2. Firm Heterogeneity

Table 4 presents similar regressions for groups of firms sorted by the WW index. First, investment-q sensitivity appears to have little relationship to equity dependence, as measured by the WW index. This evidence reinforces the idea that investment-q sensitivity is likely to be affected by many more factors than equity dependence. Otherwise, we ought to have found some relationship between sensitivity and the WW index. The lack of any discernible relationship is likely the product of the confounding influences on sensitivity of technology and the cost of external finance. As in Table 3, the interesting part of this table is the estimates of τ^2, τ_m^2/τ^2, and τ_i^2/τ^2. First, τ^2 decreases sharply with the WW index. Because this result could be due either to a large non-fundamental component in the stock price or to less managerial attention to the nonfundamental component, we examine the ratios τ_m^2/τ^2 and τ_i^2/τ^2. We find that both ratios decrease monotonically in the WW index. Put differently, firms that do not rely on equity finance pay attention neither to price non-synchronicity nor to market mispricing, and these tendencies decrease with an increased reliance on equity finance. We reemphasize that this result provides more evidence that investment-q sensitivity is not a good measure of managerial attention to the stock price. Although this evidence suggests that equity-dependent firms pay more attention to market signals than firms that do not rely on equity finance, we do not find any estimates of these ratios that are significantly less than one. This result may, however, be a result of heterogeneity within the equity dependent firms.

Before examining this possibility, we look at the relationship between the informativeness of the stock price and the extent to which managers use information in the stock price to make investment decisions. Accordingly, we split the sample into quartiles based on our two measures of price informativeness. The results are in Table 5. First, we find that our estimates of τ^2 are monotonically increasing in Ψ and monotonically decreasing in $SDEV$. These results lend credence to the information content of Ψ and $SDEV$, inasmuch as we expect $\text{var}(\varepsilon_i)$ to decrease with Ψ and increase with $SDEV$. Interestingly, we find that the estimates of the ratios τ_m^2/τ^2 and τ_i^2/τ^2 increase monotonically with $SDEV$, with the estimate τ_i^2/τ^2 significantly greater than one for the highest $SDEV$ quartile. This result indicates that firms facing a great deal of potential mispricing have a greater tendency to ignore any information in the stock price. Similarly, we find that the estimates of the ratios τ_m^2/τ^2 and τ_i^2/τ^2 decrease monotonically with Ψ. Indeed, the estimate of τ_m^2/τ^2 is significantly greater than one for the lowest Ψ quartile, and the estimate of τ_i^2/τ^2 is significantly less than one for the highest Ψ quartile. This result confirms the general notion that firms whose stock prices contain more information tend to be those that react to that information. This evidence is also inconsistent with a story in which managers tend to exploit market mispricing to invest via cheap equity finance, because in that case we should have found that the estimates of τ_m^2/τ^2 decreased with $SDEV$. Finally, we find, if anything, a negative relationship between investment-q sensitivity and our measures of the tendency of firms to follow the market.

We now examine firm heterogeneity along both the dimensions of equity dependence and price informativeness. To do so we double-sort our sample by the WW index and by each of our measures of price informativeness. In particular, we remove the middle fifth of the distribution of each of our price informativeness measures and then split each of these subsamples in half at the median of the WW index. The results in Table 6 reinforce those in Tables 4 and 5. We find estimates of τ_i^2/τ^2 significantly greater than one in the high-$SDEV$/low-WW group and in the low-Ψ/low-WW groups. In other words, firms whose stock prices contain little information and who do not use equity finance pay little attention to the stock price when making investment decisions. We also find an estimate of τ_i^2/τ^2 significantly less than one for the high-Ψ/high-WW group, which indicates that equity dependent firms incorporate information from the stock price when making investment decisions, but only those whose stock prices are informative. This evidence is also consistent with the notion that firms glean information about the cost of capital from the stock price. In contrast, we never find an estimate of τ_m^2/τ^2 significantly less than one for any group of firms, although we do find an estimate greater than one for the low Ψ/low WW group. This last bit of evidence reinforces the point that managers do not pay attention to mispricing when they invest.

One concern with our sample splitting scheme is that some of the components of the WW index, such as sales growth, are clearly endogenous. To assuage this concern, we estimate the same models, but rather than using the WW index, we use firm size. Because firm size is not a choice variable for the manager in the short run, and because it is unlikely to depend on investment in any given cross section, we can regard it as exogenous. The results in Table 7 are similar to those in Table 6, but more striking. All of the estimates of the two ratios are less than one for the small firms, and the estimate of τ_i^2/τ^2 is significantly less than one for the high-Ψ/small and the low-$SDEV$/small groups. As in Table 6, the estimates of τ_m^2/τ^2 and τ_i^2/τ^2 are greater than one for the low Ψ/large firms and the high $SDEV$/large firms, again showing that firms that do not use equity finance and whose stock prices contain noise respond neither to market signals nor to market mispricing.

Table 8 is structured as Tables 6 and 7, but it examines the "bubble" years 1997 to 2000. Interestingly, our results are quite similar to those for the full sample. The low-$SDEV$/high-WW and the high-Ψ/high-WW groups produce estimates of τ_i^2/τ^2 significantly less than one. The estimate of τ_m^2/τ^2 is significantly less than one for the high-Ψ/high-WW group. This result is not evident in the full sample period and suggests a limited response of investment to market mispricing. Table 9 presents similar and, as above, more striking results for the sample split by size instead of the WW index.

This limited evidence of a response of investment to market mispricing is at first puzzling in light of the sharp increase in aggregate investment that accompanied the stock market bubble. During these years gross private investment increased by 8.4 percent per year, which is extraordinarily high in comparison to the post-war average of 1.8 percent per year.

Our empirical result can, however, be reconciled with the events in the macroeconomy. The behavior of firms within a category changed little, but more firms drifted into the equity-dependent category. Part of the explanation clearly lies in the stock market capturing improved real investment opportunities. Another part, however, is an increased dependence on equity finance. In our sample the incidence of firms issuing equity is 11 percent higher in the bubble years than in the full sample. The average size of an equity issue (as a fraction of total assets) is 37 percent higher in those years. Clearly, more firms depended on equity during this period, and therefore high stock prices afforded cheap financing, which in turn caused many otherwise unprofitable projects to be undertaken. The fact that more firms drifted into the equity dependent category does, nonetheless, seem to indicate some market timing. Investment opportunities clearly improved, but the boom should have also improved the availability of internal funds as well. Therefore, the migration of firms into the equity-dependent category during the boom does hint at a strong reaction to the boom.

Finally, we examine the result in Chirinko and Schaller (2005) that the investment of growth firms responds more to mispricing than the investment of value firms. Table 10 contains the results from our investigation, which consists of examining τ^2, τ_m^2/τ^2, and τ_i^2/τ^2 across groups of firms sorted on the book-to-market equity ratio. In the asset-pricing literature, this ratio is the standard measure of whether a firm can be defined as a growth or a value firm, with a high ratio indicating the latter and a low ratio indicating the former. Not surprisingly, we find that the τ^2 estimates for the growth firms are substantially lower than the τ^2 estimates for the value firms. We also find that the ratios are significantly greater than one for the value firms, but that they are not significantly less than one for the growth firms. This result, therefore, only confirms half of the results in Chirinko and Schaller (2005). The value firms ignore the market, but the growth firms neither follow nor ignore the market.

Before concluding, it is worth noting that we rarely reject the overidentifying restrictions from yearly estimates underlying the averages presented in Table 4. This result is important because possible misspecification of the model could lead to biased estimates of τ^2. However, the lack of rejections indicates that this possibility is not likely, especially in light of the evidence in Erickson and Whited (2000) that the test of overidentifying restrictions has good finite-sample power to detect even small amounts of misspecification.

6. Conclusion

This paper has attempted to see if firms follow the market; that is, if they look to their own stock price when making investment decisions. This question is of particular importance in light of recent debate among policy makers over whether central banks should try to target stock markets. This sort of targeting only makes sense if the stock market affects real economic activity, in particular, investment. Our innovation in examining this old question is using an errors-in-variables remedy to distinguish legitimate information about the firm embedded in the stock price from pure market noise. The intuition behind this idea is simple. If firms follow the market then stock-price movements unrelated to fundamentals are more likely to be used as a signal by the manager. In contrast, if the firm ignores the market, the manager is more likely to view these stock-price movements as noise. Consequently, to examine the relationship between the stock market and investment, we use the measurement-error-consistent estimators from Erickson and Whited (2000), which can distinguish the noise from the signal embedded in q.

This method is quite different from those that have been used previously; and, accordingly, the results are also different. We find that firms with more informative stock prices are more likely to follow to market. This result is driven in particular by firms that depend on outside equity for finance, which are more likely than their non-equity-dependent counterparts to use market signals in making investment decisions. In contrast, firms with less informative stock prices are less likely to follow the market. We do not find, however, that firms incorporate market mispricing of their stock into their investment decisions. This evidence is inconsistent with the hypothesis of market timing, which predicts that firms with more mispricing (high noise) should be more likely to follow the market. In addition, our results indicate that value firms are more likely to ignore market signals than growth firms.

Finally, we examine the bubble period of the late 1990s. Interestingly, even during this period only firms with informative stock prices use market signals, although we do uncover some evidence that these firms also time the market.

In short we do find that prices guide managers in their investment decisions, thereby uncovering a direct channel in which the stock market affects real decisions. Further, we find that this feedback primarily operates through an information-gathering mechanism rather than a market-exploitation mechanism. Our results that this effect is only found in firms that depend on outside equity finance firms indicates that firms may use the stock price as a signal concerning the cost of capital. The policy implications of thes findings are clear in that attempts to regulate the stock market should be those that enhance its production of information.

Appendix

In order to allay skepticism of empirical results that have been produced by unusual estimators on fairly small samples, we report a Monte Carlo simulation using artificial data similar to our real data, both in terms of sample size and observable moments. The specific purpose of these simulations is threefold. First, we wish to determine which of the Erickson and Whited GMM estimators is best for τ^2. Second, we wish to estimate the finite-sample two-sided 5% critical values for the t-statistics produced with the Fama-MacBeth standard errors. Third, we wish to ascertain whether our tests have power to detect mispricing and price non-synchronicity if our measures of these two phenomena are noisy.

For the first two goals we generate 10,000 simulated panels with a cross-sectional sample size equal to 336, the size of the smallest cross section in any of our estimations. We set the length of the panel equal to the length of our actual panel. We set the parameters β, ρ^2 and τ^2 approximately equal to the averages of the corresponding GMM estimates from Table 3. For brevity, we omit perfectly measured regressors, though this embellishment changes the Monte Carlo results little. Each observation is of the form (y_i, x_i), where we generate (y_i, x_i) according to (2)-(3) so that y_i and x_i have, on average over the simulation samples, first and second moments equal to, serial correlation comparable to, and higher-order moments comparable to, the corresponding average sample moments from our real data.

For the third-, fourth-, and fifth-order GMM estimators, Table 11 reports the mean value of an estimator, its mean absolute deviation (MAD) and the probability an estimate is within 20% of its true value. Table 11 shows that the fourth-order GMM estimator (GMM4) gives the best estimates of all parameters in terms of bias, MAD, and probability concentrations. The bottom part of the table gives the finite-sample critical values which range from 2.22 to 6.44.

For our second simulation we allow q_i (true unobserved q) to be a linear function of a "mispricing" variable, m_i, according to

$$q_i = m_i + v_i, \tag{5}$$

We set the coefficient of determination of 5 equal to 0.5. Our actual observed mispricing variable $\hat{m}_i$ is then a function of m_i, according to

$$\hat{m}_i = m_i + \hat{v}_i. \tag{6}$$

We allow the coefficient of determination of (6) to range from 0.2 to 0.8. We then generate 10,000 simulated panels and calculate the ratio τ_m^2/τ^2 under three alternative scenarios. In the first, dubbed "baseline," we set $m_i = 0$ in order to calculate the critical value for a 5% two-sided test of the null hypothesis that $\tau_m^2/\tau^2 = 1$. In the second, dubbed "no managerial attention," we generate the data under the assumption that only v_i determines investment. In the third, dubbed "managerial attention," we generate data under the assumption that the sum of m_i and v_i determine investment. For these last two simulations we count the fraction of the samples in which the estimate of τ_m^2/τ^2 exceeds the critical value from the first simulation. In the baseline simulation we find that the critical value for the null that $\tau_m^2/\tau^2 = 1$ is 3.52. We also find that our test has good power to detect managerial attention to mispricing. In the no-managerial-attention simulation, the fraction of the samples producing rejections of the null ranges from 0.41 to 0.73 as the coefficient of determination of (6) ranges from 0.2 to 0.8. In the managerial-attention simulation, the fraction of the samples producing rejections of the null ranges from 0.39 to 0.72.

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Table 1: Summary Statistics: Firms Sorted by Equity Dependence

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. The denominator of Tobin's q is the gross capital stock. The numerator is the sum of the market value of common equity and the book value of debt less the book value of inventories. The denominator of the market-to-book ratio is the book value of total assets. The numerator is the book value of total assets minus the book value of equity minus balance-sheet deferred taxes plus the market value of equity. Equity Issuance is the size of the equity issue as a fraction of total book assets, conditional on actually issuing. Issuance Incidence is the fraction of observations with positive equity issuance. Net Equity Issuance is issuance less share repurchases. Bond Rating is an indicator that takes the value of one if the firm has a bond rating. The total assets figures are in millions of 1997 dollars. Leverage is defined as the ratio of total long term debt to total assets. Overhang is the debt-overhang correction term from Hennessy (2004). The WW and KZ indices are indices of financial constraints from Whited and Wu (2006) and Kaplan and Zingales (1997), respectively. Tobin's q has been removed from the KZ index. For both indices higher numbers indicate a greater likelihood facing external finance constraints.

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Firms Sorted by Whited-Wu Index				
Investment/Capital	0.135	0.164	0.185	0.161
Investment/Assets	0.084	0.091	0.089	0.070
Tobin's q	2.915	3.179	3.780	4.105
Market-to-Book	1.736	1.741	1.781	1.910
Cash Flow/Capital	0.219	0.247	0.231	-0.031
Cash Flow/Assets	0.113	0.112	0.094	-0.008
Overhang/Capital	0.010	0.011	0.009	0.005
Overhang/Assets	0.005	0.005	0.004	0.002
Total Assets	6573.161	580.637	215.681	63.208
Leverage	0.209	0.205	0.186	0.146
Sales Growth	0.109	0.134	0.147	0.066
Dividends/Assets	0.022	0.016	0.008	0.004
Cash/Assets	0.079	0.108	0.150	0.200
Equity Issuance	0.015	0.026	0.041	0.072
Net Equity Issuance	-0.007	0.004	0.017	0.044
Issuance Incidence	0.089	0.132	0.187	0.232
Bond Rating	0.706	0.292	0.130	0.034
Whited-Wu Index	0.196	0.295	0.365	0.458
Kaplan-Zingales Index	-0.294	-0.075	0.177	0.341
Firms Sorted by Kaplan-Zingales Index				
Investment/Capital	0.146	0.200	0.156	0.142
Investment/Assets	0.084	0.083	0.084	0.083
Tobin's q	3.544	4.719	3.070	2.644
Market-to-Book	2.094	1.998	1.614	1.462
Cash Flow/Capital	0.269	0.252	0.085	0.059
Cash Flow/Assets	0.132	0.095	0.052	0.032
Overhang/Capital	0.003	0.002	0.008	0.022
Overhang/Assets	0.002	0.001	0.003	0.010
Total Assets	2600.803	1365.438	2242.282	1223.728
Leverage	0.101	0.070	0.175	0.400
Sales Growth	0.082	0.125	0.123	0.127
Dividends/Assets	0.035	0.006	0.006	0.004
Cash/Assets	0.127	0.198	0.126	0.087
Equity Issuance	0.024	0.049	0.046	0.035
Net Equity Issuance	-0.008	0.010	0.027	0.030
Issuance Incidence	0.077	0.192	0.186	0.184
Bond Rating	0.383	0.193	0.282	0.302
Whited-Wu Index	0.269	0.352	0.341	0.352
Kaplan-Zingales Index	-1.317	-0.069	0.349	1.185

Table 2: Summary Statistics: Firms Sorted by Measures of Noise

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. The denominator of Tobin's q is the gross capital stock. The numerator is the sum of the market value of common equity and the book value of debt less the book value of inventories. Share turnover is average monthly volume divided by shares outstanding. "Dispersion of Analysts' Estimates" is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). The total assets figures are in millions of 1997 dollars. The WW index is an index of financial constraints from Whited and Wu (2006), where a higher number indicates a greater likelihood both of needing external finance and facing costly external finance.

Noise Measure	Price Non-Synchronicity		Std. Dev. of Forecasts	
	Low	High	Low	High
Investment/Capital	0.159	0.163	0.141	0.189
Tobin's q	3.040	3.740	2.387	6.118
Cash Flow/Capital	0.190	0.141	0.121	0.122
Total Assets	3427.236	1231.676	1811.683	753.779
WW Index	0.076	0.169	0.145	0.179
Share Turnover	9.845	10.770	7.647	15.761
Price Non-Synchronicity	0.088	2.844	1.725	1.424
R&D/Capital	0.036	0.047	0.030	0.093
Dispersion of Analysts Estimates	0.007	0.010	0.000	0.027

Table 3: KZ-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. The KZ index is the index of financial constraints from Kaplan and Zingales (1997). Tobin's q has been removed from the KZ index. The first quartile are those firms classified as least likely to experience external finance constraints. needing external finance and facing costly external finance. "Capital Deflated" indicates that investment and cash flow are deflated by the gross capital stock and that "q" is Tobin's q. "Asset Deflated" indicates that investment and cash flow are deflated by total assets and that "q" is the market-to-book ratio. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Assets Deflated											
Quartile 1	0.002	0.195	0.247	0.107	0.044	0.026	1.401	0.207	0.373		
	(0.001)	(0.022)	(0.376)		(0.015)	(0.057)	(0.447)	(0.031)	(0.080)		
Quartile 2	0.008	0.204	-0.156	0.122	0.061	0.085	2.705	0.202	0.241		
	(0.001)	(0.014)	(0.387)		(0.015)	(0.037)	(1.080)	(0.011)	(0.031)		
Quartile 3	0.013	0.208	0.247	0.126	0.130	0.291	2.336	0.304	0.236		
	(0.001)	(0.016)	(0.263)		(0.030)	(0.033)	(0.824)	(0.024)	(0.063)		
Quartile 4	0.017	0.167	0.120	0.089	0.160	0.381	0.221	0.291	0.381		
	(0.003)	(0.025)	(0.082)		(0.039)	(0.078)	(0.226)	(0.064)	(0.048)		
Capital Deflated											
Quartile 1	0.006	0.069	-0.946	0.179	0.022	-0.037	-1.178	0.305	0.496	1.303	1.414
	(0.000)	(0.006)	(0.231)		(0.003)	(0.022)	(0.318)	(0.028)	(0.042)	(0.241)	(0.220)
Quartile 2	0.010	0.051	-1.237	0.203	0.025	0.005	-2.018	0.349	0.457	1.401	1.288
	(0.001)	(0.006)	(0.272)		(0.003)	(0.010)	(0.403)	(0.023)	(0.023)	(0.075)	(0.125)
Quartile 3	0.009	0.065	-0.438	0.140	0.034	0.085	-1.468	0.340	0.291	1.399	1.777
	(0.001)	(0.007)	(0.161)		(0.003)	(0.011)	(0.370)	(0.024)	(0.016)	(0.296)	(0.068)
Quartile 4	0.009	0.061	-0.201	0.123	0.051	0.052	-2.065	0.329	0.307	1.379	1.109
	(0.001)	(0.006)	(0.054)		(0.007)	(0.024)	(0.442)	(0.043)	(0.022)	(0.136)	(0.068)

Table 4: WW-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. The WW index is the index of financial constraints from Whited and Wu (2006). The first quartile are those firms classified as least likely to experience external finance constraints. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Quartile 1	0.004	0.124	0.065	0.193	0.022	-0.081	-0.320	0.254	0.699	2.051	1.472
	(0.001)	(0.019)	(0.060)		(0.004)	(0.042)	(0.154)	(0.026)	(0.091)	(0.322)	(0.213)
Quartile 2	0.008	0.075	-0.199	0.175	0.029	-0.087	-0.603	0.266	0.608	1.841	1.706
	(0.001)	(0.012)	(0.093)		(0.007)	(0.061)	(0.222)	(0.019)	(0.034)	(0.290)	(0.280)
Quartile 3	0.009	0.062	-0.530	0.172	0.030	-0.024	-0.945	0.350	0.431	1.417	1.092
	(0.000)	(0.008)	(0.100)		(0.002)	(0.011)	(0.191)	(0.023)	(0.027)	(0.222)	(0.085)
Quartile 4	0.008	0.046	-0.683	0.138	0.024	0.058	-0.791	0.285	0.379	0.995	1.068
	(0.000)	(0.005)	(0.127)		(0.003)	(0.016)	(0.154)	(0.019)	(0.040)	(0.017)	(0.118)

Table 5: Noise-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. "Dispersion of Analysts' Estimates" is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Dispersion of Analysts' Estimates											
Quartile 1	0.007	0.046	-0.413	0.162	0.020	0.020	-0.701	0.308	0.533	1.028	0.995
	(0.000)	(0.006)	(0.133)		(0.002)	(0.006)	(0.155)	(0.028)	(0.036)	(0.028)	(0.011)
Quartile 2	0.009	0.129	-0.212	0.146	0.059	-0.138	-0.653	0.253	0.432	1.138	1.243
	(0.001)	(0.013)	(0.141)		(0.014)	(0.051)	(0.236)	(0.021)	(0.056)	(0.098)	(0.103)
Quartile 3	0.009	0.058	-0.152	0.101	0.025	0.071	-0.325	0.214	0.475	1.033	1.292
	(0.001)	(0.006)	(0.107)		(0.003)	(0.006)	(0.160)	(0.015)	(0.034)	(0.176)	(0.178)
Quartile 4	0.010	0.076	-0.378	0.177	0.041	-0.103	-0.749	0.319	0.367	1.493	1.386
	(0.001)	(0.011)	(0.090)		(0.012)	(0.066)	(0.294)	(0.032)	(0.035)	(0.111)	(0.118)
Price Non-Synchronicity											
Quartile 1	0.009	0.049	-0.286	0.189	0.024	-0.023	-0.591	0.314	0.350	1.354	1.407
	(0.001)	(0.006)	(0.080)		(0.004)	(0.015)	(0.180)	(0.026)	(0.027)	(0.080)	(0.101)
Quartile 2	0.009	0.055	-0.276	0.178	0.023	0.021	-0.447	0.308	0.406	1.215	1.223
	(0.001)	(0.007)	(0.077)		(0.002)	(0.009)	(0.120)	(0.028)	(0.032)	(0.105)	(0.137)
Quartile 3	0.008	0.062	-0.323	0.150	0.031	0.019	-1.031	0.309	0.447	0.882	0.982
	(0.001)	(0.007)	(0.142)		(0.004)	(0.013)	(0.353)	(0.022)	(0.038)	(0.064)	(0.087)
Quartile 4	0.009	0.062	-0.495	0.154	0.025	0.048	-0.628	0.277	0.511	0.869	1.010
	(0.001)	(0.008)	(0.158)		(0.003)	(0.009)	(0.190)	(0.021)	(0.036)	(0.035)	(0.073)

Table 6: WW- and Noise-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. "Dispersion of Analysts' Estimates" (or $SDEV$) is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" (or Ψ) is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). The WW index is the index of financial constraints from Whited and Wu (2006). A high number indicates a greater likelihood of experiencing external finance constraints. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Dispersion of Analysts' Estimates											
Low $SDEV$, Low WW	0.007	0.126	0.037	0.116	0.055	-0.240	-0.479	0.196	0.614	1.256	1.346
	(0.001)	(0.020)	(0.089)		(0.017)	(0.117)	(0.196)	(0.026)	(0.041)	(0.072)	(0.218)
High $SDEV$, Low WW	0.005	0.096	-0.093	0.192	0.020	-0.046	-0.403	0.281	0.588	1.289	1.375
	(0.001)	(0.016)	(0.090)		(0.002)	(0.025)	(0.148)	(0.027)	(0.028)	(0.042)	(0.254)
Low $SDEV$, High WW	0.009	0.067	-0.587	0.118	0.033	0.074	-0.820	0.266	0.387	1.148	1.152
	(0.000)	(0.004)	(0.130)		(0.007)	(0.009)	(0.194)	(0.024)	(0.052)	(0.215)	(0.202)
High $SDEV$, High WW	0.009	0.046	-0.532	0.169	0.034	0.034	-0.611	0.394	0.269	1.000	1.065
	(0.001)	(0.005)	(0.132)		(0.004)	(0.008)	(0.146)	(0.033)	(0.025)	(0.014)	(0.083)
Price Non-Synchronicity											
Low Ψ, Low WW	0.004	0.111	0.041	0.206	0.044	-0.262	-0.188	0.274	0.347	1.699	1.635
	(0.002)	(0.027)	(0.085)		(0.020)	(0.162)	(0.222)	(0.039)	(0.024)	(0.176)	(0.158)
High Ψ, Low WW	0.007	0.104	-0.116	0.192	0.026	-0.066	-0.762	0.281	0.630	1.563	1.429
	(0.001)	(0.011)	(0.092)		(0.006)	(0.035)	(0.432)	(0.024)	(0.036)	(0.192)	(0.145)
Low Ψ, High WW	0.008	0.053	-0.593	0.162	0.044	0.059	-0.713	0.417	0.234	1.191	1.163
	(0.001)	(0.006)	(0.098)		(0.006)	(0.013)	(0.170)	(0.041)	(0.036)	(0.276)	(0.268)
High Ψ, High WW	0.009	0.055	-0.533	0.141	0.027	0.058	-0.824	0.296	0.340	0.786	1.032
	(0.001)	(0.005)	(0.157)		(0.003)	(0.006)	(0.188)	(0.028)	(0.028)	(0.016)	(0.092)

Table 7: Size- and Noise-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. "Dispersion of Analysts' Estimates" (or $SDEV$) is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" (or Ψ) is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). Size is calculated as total book assets. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Dispersion of Analysts' Estimates											
Low $SDEV$, Low Size	0.009	0.071	-0.438	0.128	0.027	0.074	-0.592	0.247	0.455	0.531	0.679
	(0.001)	(0.005)	(0.158)		(0.004)	(0.010)	(0.208)	(0.018)	(0.060)	(0.108)	(0.121)
High $SDEV$, Low Size	0.008	0.049	-0.614	0.160	0.032	0.031	-0.754	0.348	0.269	0.799	0.790
	(0.001)	(0.005)	(0.184)		(0.004)	(0.008)	(0.265)	(0.040)	(0.034)	(0.076)	(0.127)
Low $SDEV$, High Size	0.009	0.101	0.096	0.131	0.022	0.006	-0.100	0.180	0.584	1.115	0.888
	(0.002)	(0.014)	(0.090)		(0.009)	(0.067)	(0.118)	(0.030)	(0.042)	(0.053)	(0.100)
High $SDEV$, High Size	0.007	0.068	-0.103	0.193	0.018	-0.033	-0.274	0.328	0.436	1.327	1.266
	(0.001)	(0.010)	(0.085)		(0.005)	(0.033)	(0.295)	(0.031)	(0.035)	(0.033)	(0.059)
Price Non-Synchronicity											
Low Ψ, Low Size	0.008	0.056	-0.381	0.160	0.026	0.051	-0.577	0.323	0.355	0.715	0.762
	(0.001)	(0.005)	(0.267)		(0.003)	(0.007)	(0.320)	(0.031)	(0.028)	(0.085)	(0.111)
High Ψ, Low Size	0.009	0.060	-0.733	0.143	0.023	0.055	-0.933	0.286	0.427	0.547	0.621
	(0.001)	(0.006)	(0.232)		(0.002)	(0.005)	(0.282)	(0.020)	(0.046)	(0.075)	(0.162)
Low Ψ, High Size	0.005	0.078	0.032	0.179	0.025	-0.120	-0.304	0.307	0.539	1.107	1.321
	(0.001)	(0.017)	(0.098)		(0.006)	(0.051)	(0.177)	(0.034)	(0.041)	(0.035)	(0.054)
High Ψ, High Size	0.009	0.070	-0.120	0.211	0.021	-0.030	-0.501	0.306	0.655	0.970	0.945
	(0.001)	(0.010)	(0.105)		(0.004)	(0.028)	(0.254)	(0.027)	(0.027)	(0.035)	(0.075)

Table 8: WW- and Noise-Sorted Investment Regressions: The Bubble Years

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1997 to 2000. "Dispersion of Analysts' Estimates" (or $SDEV$) is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" (or Ψ) is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). The WW index is the index of financial constraints from Whited and Wu (2006). A high number indicates a greater likelihood of experiencing external finance constraints. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Dispersion of Analysts' Estimates											
Low $SDEV$, Low WW	0.007	0.101	0.204	0.112	0.011	0.094	0.158	0.125	0.773	1.593	1.474
	(0.001)	(0.021)	(0.107)		(0.009)	(0.077)	(0.136)	(0.030)	(0.395)	(0.134)	(0.191)
High $SDEV$, Low WW	0.006	0.071	-0.166	0.190	0.023	-0.110	-0.179	0.332	0.555	1.560	1.804
	(0.001)	(0.022)	(0.068)		(0.004)	(0.047)	(0.043)	(0.033)	(0.044)	(0.137)	(0.257)
Low $SDEV$, High WW	0.009	0.066	-0.467	0.129	0.030	0.089	-0.805	0.278	0.422	0.727	0.984
	(0.001)	(0.007)	(0.207)		(0.007)	(0.014)	(0.475)	(0.064)	(0.094)	(0.042)	(0.046)
High $SDEV$, High WW	0.007	0.048	-0.203	0.157	0.021	0.050	-0.250	0.367	0.348	0.887	1.001
	(0.000)	(0.007)	(0.149)		(0.003)	(0.007)	(0.238)	(0.053)	(0.042)	(0.245)	(0.369)
Price Non-Synchronicity											
Low Ψ, Low WW	0.008	0.045	0.046	0.192	0.027	-0.177	0.049	0.328	0.614	1.887	1.690
	(0.001)	(0.034)	(0.170)		(0.008)	(0.094)	(0.085)	(0.044)	(0.050)	(0.279)	(0.480)
High Ψ, Low WW	0.006	0.120	-0.038	0.208	0.028	-0.129	-0.166	0.297	0.588	1.888	1.680
	(0.001)	(0.011)	(0.058)		(0.008)	(0.083)	(0.020)	(0.016)	(0.019)	(0.312)	(0.221)
Low Ψ, High WW	0.008	0.056	-0.572	0.168	0.034	0.088	-0.360	0.429	0.331	0.948	0.907
	(0.001)	(0.010)	(0.137)		(0.010)	(0.022)	(0.240)	(0.086)	(0.104)	(0.265)	(0.231)
High Ψ, High WW	0.007	0.050	-0.084	0.112	0.018	0.052	-0.249	0.231	0.463	0.555	0.808
	(0.000)	(0.004)	(0.123)		(0.004)	(0.006)	(0.280)	(0.035)	(0.111)	(0.054)	(0.047)

Table 9: Size- and Noise-Sorted Investment Regressions: The Bubble Years

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1997 to 2000. "Dispersion of Analysts' Estimates" (or $SDEV$) is the standard deviation of analysts' earning estimates, rescaled as a fraction of the capital stock. "Price Non-Synchronicity" (or Ψ) is a measure of idiosyncratic volatility from Durnev, Morck, and Yeung (2004). Size is calculated as total book assets. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Dispersion of Analysts' Estimates											
Low $SDEV$, Low Size	0.010	0.068	-0.110	0.142	0.030	0.055	-0.037	0.296	0.421	0.723	0.777
	(0.001)	(0.006)	(0.212)		(0.008)	(0.029)	(0.281)	(0.012)	(0.083)	(0.138)	(0.090)
High $SDEV$, Low Size	0.007	0.052	-0.483	0.161	0.021	0.050	-0.630	0.356	0.347	1.095	0.932
	(0.000)	(0.005)	(0.043)		(0.002)	(0.004)	(0.159)	(0.038)	(0.035)	(0.551)	(0.155)
Low $SDEV$, High Size	0.007	0.089	0.081	0.120	0.018	0.006	-0.019	0.160	0.642	1.202	0.820
	(0.002)	(0.022)	(0.096)		(0.004)	(0.045)	(0.068)	(0.046)	(0.040)	(0.136)	(0.123)
High $SDEV$, High Size	0.007	0.054	0.035	0.218	0.024	-0.025	0.030	0.327	0.516	1.300	1.155
	(0.001)	(0.007)	(0.096)		(0.004)	(0.056)	(0.057)	(0.062)	(0.079)	(0.054)	(0.056)
Price Non-Synchronicity											
Low Ψ, Low Size	0.008	0.060	-0.698	0.167	0.027	0.079	-0.680	0.339	0.213	0.774	0.777
	(0.001)	(0.007)	(0.179)		(0.010)	(0.019)	(0.192)	(0.099)	(0.073)	(0.060)	(0.047)
High Ψ, Low Size	0.007	0.052	0.041	0.122	0.022	0.052	-0.151	0.274	0.373	0.473	0.556
	(0.001)	(0.004)	(0.201)		(0.004)	(0.011)	(0.366)	(0.020)	(0.079)	(0.077)	(0.085)
Low Ψ, High Size	0.007	0.059	0.003	0.204	0.020	-0.079	-0.133	0.343	0.505	0.915	0.906
	(0.001)	(0.014)	(0.147)		(0.004)	(0.056)	(0.093)	(0.030)	(0.062)	(0.046)	(0.018)
High Ψ, High Size	0.009	0.059	0.066	0.216	0.021	-0.053	-0.002	0.326	0.677	0.981	0.801
	(0.001)	(0.010)	(0.077)		(0.003)	(0.028)	(0.082)	(0.056)	(0.012)	(0.007)	(0.056)

Table 10: Value-Sorted Investment Regressions

Calculations are based on a sample of unregulated and non-financial firms from the annual 2005 COMPUSTAT industrial files. The sample period is 1990 to 2004. The sample is stratified by the market-to-book ratio, with the first quartile indicating those firms with the lowest market-to-book ratios. Overhang is the debt-overhang correction term from Hennessy (2004). ρ^2 is a measurement error consistent estimate of the regression coefficient of determination; τ^2 is the ratio of signal to the sum of signal and noise for the observable q-proxy, τ_i^2 is a version of τ^2 in which a measure of price non-synchronicity has been filtered out of the observable q-proxy; and τ_m^2 is a version of τ^2 in which a the standard deviation of analysts' earnings estimates has been filtered out of the observable q-proxy. Fama-MacBeth (1973) standard errors are in parentheses under the parameter estimates.

	OLS Estimates				GMM Estimates						
	q	Cash Flow	Overhang	R^2	q	Cash Flow	Overhang	ρ^2	τ^2	τ_i^2/τ^2	τ_m^2/τ^2
Quartile 1	0.006	0.050	-0.255	0.116	0.032	0.010	-0.895	0.336	0.280	1.196	1.061
	(0.000)	(0.007)	(0.089)		(0.005)	(0.017)	(0.270)	(0.036)	(0.035)	(0.075)	(0.041)
Quartile 2	0.010	0.052	-0.382	0.085	-0.004	0.080	-0.529	0.212	0.377	1.482	1.695
	(0.001)	(0.007)	(0.109)		(0.059)	(0.084)	(1.854)	(0.095)	(0.046)	(0.265)	(0.075)
Quartile 3	0.008	0.061	-0.119	0.079	0.036	0.027	-1.180	0.135	0.409	1.617	1.770
	(0.002)	(0.008)	(0.069)		(0.005)	(0.009)	(0.372)	(0.024)	(0.047)	(0.098)	(0.307)
Quartile 4	0.008	0.053	-0.129	0.069	0.020	0.046	-0.334	0.130	0.478	1.841	1.611
	(0.002)	(0.007)	(0.059)		(0.011)	(0.009)	(0.344)	(0.029)	(0.143)	(0.271)	(0.235)

Table 11: Monte Carlo Performance of GMM and OLS Estimators

Indicated expectations and probabilities are estimates based on 10,000 Monte Carlo samples of size 336. The samples are generated by

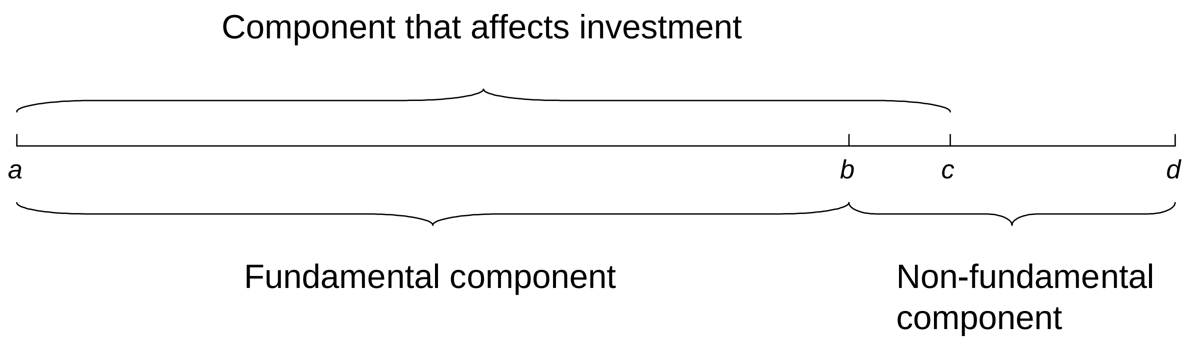
$$\begin{aligned} y_i &= q_i\beta + u_i \\ x_i &= \gamma + q_i + \varepsilon_i, \end{aligned}$$

in which q_i is distributed as a normal variable raised to the fourth power, and ε_i and u_i are chi-squared variables with one degree of freedom. GMMn denotes the GMM estimator based on moments up to order $M = n$. OLS denotes estimates obtained by regressing y_i on x_i.

True Values: $\beta = 0.04$, $\rho^2 = 0.356$, $\tau^2 = 0.420$.

	OLS	GMM3	GMM4	GMM5
$E(\hat{\beta})$	0.013	0.038	0.039	0.036
MAD($\hat{\beta}$)	0.027	0.003	0.003	0.005
P($\mid \hat{\beta} - \beta \mid \leq 0.2\beta$)	0.000	0.960	0.975	0.864
$E(\hat{\rho}^2)$	0.218	0.377	0.371	0.422
MAD($\hat{\rho}^2$)	0.178	0.069	0.047	0.071
P($\mid \hat{\rho}^2 - \rho^2 \mid \leq 0.2\rho^2$)	0.000	0.755	0.917	0.783
$E(\hat{\tau}^2)$	—	0.456	0.416	0.453
MAD($\hat{\tau}^2$)	—	0.053	0.044	0.049
P($\mid \hat{\tau}^2 - \tau^2 \mid \leq 0.2\tau^2$)	—	0.881	0.933	0.908
Finite Sample Critical Values				
t-test of $H_0 : \beta = 0$	—	2.222	2.451	2.142
t-test of $H_0 : \rho_2 = 0$	—	5.571	4.840	3.601
t-test of $H_0 : \tau_2 = 0$	—	5.508	6.437	4.894

Figure 1: Decomposition of the Variance of q



The distance between points a and d represents the variance of Tobin's q. The distance between points a and b represents the component that is due to fundamentals, the distance between points b and d represents the component that is due to non-fundamental factors, and the distance between points b and c represents the portion of the non-fundamental component to which the manager reacts.