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Abstract

Prior literature demonstrates that an increased trading activity of a firm's stock is associated with abnormal future stock returns (the high-volume return premium) and interprets this phenomenon as evidence that increased visibility generates reductions in cost of capital. Motivated by this interpretation, we investigate whether increased trading activity entails changes in real corporate actions. We document a positive relation between abnormal trading volume, future investment expenditures, and financing cash flows. This positive relation is not subsumed by the arrival of investment-related news or other corporate disclosures, nor by subsequent earnings information, and is concentrated among firms with high financial constraints and firms with lower levels of investor recognition.

JEL Classification: E22, G12, G14, M41

Keywords: trading volume, corporate investment, Financing cash flows, Investor recognition

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The Real Side of the High-Volume Return Premium *

Doron Israeli†, Ron Kaniel‡, and Suhas A. Sridharan§

March 25, 2020

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Prior literature demonstrates that an increased trading activity of a firm's stock is associated with abnormal future stock returns (the *high-volume return premium*) and interprets this phenomenon as evidence that increased visibility generates reductions in cost of capital. Motivated by this interpretation, we investigate whether increased trading activity entails changes in real corporate actions. We document a positive relation between abnormal trading volume, future investment expenditures, and financing cash flows. This positive relation is not subsumed by the arrival of investment-related news or other corporate disclosures, nor by subsequent earnings information, and is concentrated among firms with high financial constraints and firms with lower levels of investor recognition.

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1 Introduction

The *high-volume return premium*, first identified by Gervais et al. (2001), is a well-documented empirical phenomenon in which stocks that experience abnormally high trading volume over short periods, such as a week, experience abnormally high returns in the near future. Prior research posits that the high-volume return premium is a manifestation of Merton's (1987) investor recognition hypothesis (Gervais et al., 2001; Lerman et al., 2010; Kaniel et al., 2012), whereby an increase in a stock's trading volume is associated with an increase in a firm's visibility and a reduction in its cost of capital.[1] We examine whether firms increase their investment activity as a potential real consequence of such a decline in cost of capital. Since reductions in cost of capital should generally be associated with an increase in the NPV of investment projects that the firm is considering, a natural unexplored implication is that there should be a positive association between unexpected increases in a firm's trading volume and subsequent corporate investment activity.[2]

Using q-theory as a framework within which to examine the incremental explanatory power of abnormal trading volume for future corporate investment expenditures (Tobin, 1969; Hayashi, 1982; Abel and Eberly, 1994; Erickson and Whited, 2000), our analysis confirms this link: a one standard deviation increase in unexpected trading volume is associated with a 1.4% increase in annual investment expenditures.

We conduct a host of analyses to substantiate Merton's (1987) investor recognition hypothesis as the likely underlying driving force behind the relation we uncover. In doing so, we delve into both analyzing the mechanism facilitating the increased investment expenditures and ruling out alternative explanations that do not depend on the established relation, identified for example in Barber and Odean (2008), between unexpected increases in a firm's trading volume and its visibility.

We start by showing that, consistent with the idea that it takes time for the real effect of reduced cost of capital to manifest itself in heightened investment activity, the positive association between abnormal trading volume and subsequent annual investment is driven by corporate investments during fiscal quarters $t + 2$ to $t + 4$ following the quarter in which we observe the unexpected increase in a stock's trading volume. A one standard deviation increase in unexplained trading volume is associated with a 1.8% increase in quarters $t + 2$ to $t + 4$ investment expenditures. We further find that abnormal trading volume explains variation in changes in future investment expenditures.

We conduct several tests to help clarify the nature of the association between abnormal trading volume and subsequent corporate investment expenditures. First, we explore the relation of abnormal trading volume to subsequent financing cash flows. If firms experience a reduction in cost of capital following shocks to trading volume that facilitates greater investment, we should

[1] Barber and Odean (2008); Da et al. (2011); Hirshleifer and Teoh (2003); Lim et al. (2010) and others provide evidence of limited investor attention in various contexts and explore its consequences on stock pricing efficiency and corporate strategic behavior.

[2] For some projects a decrease in cost of capital may decrease NPV, but these are the rare exceptions.

also observe evidence of increased financing activities to accommodate that investment. We test this prediction directly and find evidence of a positive relation between abnormal trading volume and future net financing cash flows. This indicates that the increased investment is at least in part driven by the company raising additional capital or making fewer distributions of existing capital. Focusing more specifically on key sources of cash inflows from financing activities, we find evidence that abnormal trading volume is associated with increased cash inflows from long-term, but not short-term, debt issuances and increased cash inflows from equity-based financing activities.

To further clarify the mechanism through which firms are able to engage in additional investment in the year after experiencing a shock to trading volume, we also examine how firms' stock betas change after shocks to trading volume. We find evidence that firms experiencing shocks to trading volume also experience reductions in their stock betas. These results provide support to the explanation that shocks to trading volume are associated with reductions in cost of capital. Additionally, based on the observation that a reduction in a firm's cost of capital is expected to be more economically significant among firms with high financial constraints, we hypothesize that the positive relation is concentrated among financially constrained firms. Using the Kaplan and Zingales (1997) and Hadlock and Pierce (2010) indices to identify financially constrained firms, we find evidence that the positive relation between abnormal trading volume and future investment expenditures is concentrated among firms with high financial constraints.

Following Gervais et al. (2001), Lerman et al. (2010), and Kaniel et al. (2012), our hypothesis builds on the established relation between unexpected increases in a firm's trading volume and its visibility. We take several steps to bolster this foundation and rule out alternative interpretations for our findings. First, we confirm that our measure of abnormal trading volume is indeed unexpected and not contaminated by the arrival of information that relates to future investment or financing activities. We do this in several ways: first, by including controls for the amount of news that arrives in the volume measurement period; second, by re-estimating the volume-investment relation in subsamples without corporate disclosures and/ or macroeconomic news during the volume measurement period; third, by using mutual fund flows as an instrument for abnormal trading volume that is not related to firm fundamentals; and fourth, by including earnings announcement information as additional controls.[3] The significant positive relation between abnormal trading volume and investment persists in each of these analyses.

We further posit, based on Merton (1987), that the relation between abnormal trading volume and future corporate investment is concentrated among firms with lower levels of investor recognition. Using several proxies for investor recognition of a firm's stock, we find evidence consistent with this hypothesis. We also provide evidence suggesting that unexpected increases in a stock's

[3]While our measurement window (two weeks prior to the earnings announcement) is designed to avoid contamination by the release of earning news, we also consider specifications in which we add measures of earning surprise. While we find a relation between a measure of earnings surprise and subsequent investment, the relation between abnormal volume and subsequent investment is maintained with a similar magnitude.

trading volume drive the contemporaneous relation, documented in Lehavy and Sloan (2005), between changes in investor recognition and corporate investment activity. Moreover, we find that the positive relation between unexpected trading volume is stronger among firms with lower levels of investor recognition. The positive relation is robust to a host of control variables, controlling for measurement error in q, and also variation in how or when we measure abnormal trading volume.

Our findings on the link between abnormal volume and subsequent investment, in addition to tightening the prior hypothesized link between the *high-volume return premium* phenomenon and Merton's (1987) investment recognition explanation, contribute more broadly to a growing literature on the relation between observed asset pricing irregularities and corporate real activities. It is not immediately obvious that reductions in cost of capital arising from shocks to trading volume will lead to significant changes in investment activity. First, prior evidence supporting the Merton (1987) hypothesis is relatively silent on the magnitude of the observed reduction in cost of capital, and it is possible that such reductions are insufficiently large to generate observable changes in real corporate activities. Moreover, there is an active debate in the literature regarding the extent to which managers observe and respond to capital market irregularities in their real decision-making. If managers disregard or are not aware of shocks to trading volume and their corresponding impact on cost of capital, we will not observe a relation between unexpected volume and subsequent investment.

A common theme in the extant literature relating capital market phenomena to real activities is a focus on the mispricing of securities. Bakke and Whited (2010) find that mispricing does not affect investment, especially that of large firms and firms subject to mispricing. In contrast, Gilchrist et al. (2005) show that firms exploit periods of capital market bubbles by issuing new shares at inflated prices and increasing real investments. Warusawitharana and Whited (2016) find that misvaluation affects firm behavior primarily through financial decisions, as opposed to real decisions. Polk and Sapienza (2009) use discretionary accruals as a measure of mispricing and document a positive relation between abnormal investment and discretionary accruals. Van Binsbergen and Opp (2018) estimate the joint dynamic distribution of firm characteristics that have been linked to mispricing and real outcomes such as investment, and capital. Evaluating the counterfactual in the absence of anomalies they find that cross-sectional asset pricing distortions generate material real inefficiencies. Our study contributes to this literature by providing evidence that trading volume is a dimension of capital market activity that can serve as an important leading indicator of enhanced corporate investment activity that does not depend on the existence of mispricing.

The paper is organized as follows. In the next section, we describe the data and methodology. Section 3 presents our main findings. Section 4 presents a variety of robustness analyses, such as incroporating additional controls and using alternative measures and measurement windows of abnormal trading volume. Section 5 concludes.

2 Data and Methodology

To test our hypotheses we construct a comprehensive sample of firm-years from the intersection of Compustat and CRSP. Our sample spans the period from 1986 to 2015 and consists of 31,710 firm-year observations from 2,775 firms with share type code of 10 or 11. Our sample begins in 1986 because this is the first year in which firms were required to disclose cash flows from operating and financing activities in accordance with Statement of Financial Accounting Standards (SFAS) No. 95 (Hribar and Collins, 2002). Consistent with prior literature on corporate investment, we exclude financial firms (identified as those with SIC codes between 6000 and 6999) from our sample.[4] To avoid the undue effect of small firms, prior literature suggests several filters that we adopt in our data collection process. We eliminate firms with share price less than $5, firms with market value of equity or total assets less than $10 million, and firms with negative book value of equity (Livnat and Mendenhall, 2006; Campello and Graham, 2013; Barth et al., 2016).[5] We also require that firms have earnings announcement dates and one period ahead annual accounting data available on Compustat.[6]

We estimate the level of unexpected trading volume in a stock using a methodology that mirrors the market model approach to estimating abnormal returns (Karpoff, 1987; Grabbe et al., 1994; Garfinkel and Sokobin, 2006).[7] Following prior literature on the high-volume return premium which identifies abnormal volume using periods of a week or less (Gervais et al., 2001; Kaniel et al., 2012; Akbas, 2016), for each firm-year we estimate standardized unexpected volume (SUV) as the standardized prediction error from a regression of trading volume on the positive and negative parts of returns during week -2 (trading days [-11, -7]) prior to the annual earnings announcement.[8] The choice of time period over which to measure abnormal volume represents the balance of a tradeoff between two conflicting concerns: wanting to match our observation of abnormal volume to the start of the investment period while also avoiding major corporate news events. On one hand, we want our measurement of abnormal volume to be as close as possible to the start of the investment period. While technically the investment period begins with the start of the fiscal period, we expect that typically firms will shift focus to next period's investments only after the prior period's earnings have been announced. One important reason for this relates to access to capital; firms

[4] In section 4.4 we illustrate the robustness of our results to alternative sample constructions, including starting the sample period in 1974 and excluding utilities firms from our sample.

[5] Our inferences are the same if we do not apply these filters in our sample construction process.

[6] We construct our sample by first identifying all firm-years with annual earnings announcement dates. This generates a sample of 59,963 observations from 4,726 firms. Upon requiring non-missing financial information, and imposing restrictions on book and market value of equity as well as book value of assets the sample shrinks to 33,413 from 2,842 firms. The further restriction on share price yields the final sample of 31,710 firm-year observations from 2,775 firms.

[7] Focusing on the period around earnings announcements, Garfinkel and Sokobin (2006) propose that the reason abnormally high volume predicts post announcement drift is due to it being a proxy for difference of opinion. They argue that divergence in opinion is a risk factor and hence the premium is an artifact of increased risk. This alternative explanation is ruled out in Lerman et al. (2010).

[8] In Section 4.5 we explore alternative volume measurement windows and find that our inferences are the same.

needing external financing to fund their investments are likely to have to provide data on their most recent performance to their capital providers. Motivated only by this goal, one may conclude that the optimal time to measure abnormal volume would be around the earnings announcement period. On the other hand, we recognize the importance of measuring abnormal trading volume during periods not confounded by major corporate events such as earnings announcements (Gervais et al., 2001; Kaniel et al., 2012; Akbas, 2016). Hence, we identify the annual earnings announcement date for each firm-year and define our volume measurement window as the 5-day-period starting on day -11 and ending on day -7 relative to the annual earnings announcement date.

To measure SUV, we first estimate the following firm-year-specific regression using data from trading days [-61, -12] relative to the annual earnings announcement date:[9]

$$\log Vol_{i,k,t} = \alpha_{i,t,0} + \alpha_{i,t,1}|Ret_{i,k,t}|^{+} + \alpha_{i,t,2}|Ret_{i,k,t}|^{-} + \epsilon_{i,k,t} \tag{1}$$

In Equation (1), $Vol_{i,k,t}$ denotes one plus the dollar trading volume for firm i during day k relative to the year t earnings announcement date and log indicates the natural logarithm.[10] $|Ret_{i,k,t}|^{+}$ is equal to the absolute value of firm i's stock return during day k relative to the year t earnings announcement date when the return is positive and 0 otherwise. Similarly, $|Ret_{i,k,t}|^{-}$ is equal to the absolute value of firm i's stock return when the return is negative and 0 otherwise.[11] Using the coefficient estimates from Equation (1), we generate an estimate of expected trading volume for each of days [-11, -7] relative to the annual earnings announcement date:

$$E[\log Vol_{i,k,t}] = \hat{\alpha}_{i,t,0} + \hat{\alpha}_{i,t,1}|Ret_{i,k,t}|^{+} + \hat{\alpha}_{i,t,2}|Ret_{i,k,t}|^{-} \tag{2}$$

We define unexplained volume (UV) as the difference between observed volume and the expectation defined in Equation (2) for each of days [-11, -7] relative to the annual earnings announcement date:

$$UV_{i,k,t} = \log Vol_{i,k,t} - E[\log Vol_{i,k,t}] \tag{3}$$

The standardized unexplained volume (SUV) is obtained by summing daily UV measures and scaling the sum by the product of the standard deviation of residuals from Equation (1) and the square root of number of trading days in the estimation window:

$$SUV_{i,t} = \frac{\sum_{k=-11}^{-7} UV_{i,k,t}}{\sigma_{\epsilon}\sqrt{5}} \tag{4}$$

[9] We start from day −61 to avoid having the year's second to last earnings report period impact the estimates.

[10] Because some firm-year-day observations have 0 trading volume, we add 1 to the dollar volume when estimating this equation and computing the level of unexpected trading volume.

[11] We require at least thirty days of available trading data to estimate Equation (1). In Section 4.3, we modify Equation (1) to include additional control variables. We also change the window of measurement of standardized unexpected volume in Equation (4). Our inferences are unaffected by these modifications.

The resulting SUV measure does not appear to exhibit systematic serial or cross-sectional correlation. In untabulated analyses, we compute the average and median Pearson and Spearman correlation coefficients of SUV within firm and within year. For within-firm analyses, we find that the mean (median) Pearson and Spearman correlation coefficients are -0.023 and -0.018 (-0.016 and -0.009). For within-year analyses, we find that the mean (median) Pearson and Spearman correlation coefficients are 0.011 and 0.013 (0.008 and 0.007). These low correlation coefficients suggest that SUV is not systematically correlated over time for specific firms or across firms for specific years. Moreover, Panel A of Table 1 reports that SUV has mean and median estimates near zero. Coupled with the low within-firm and within-year correlation measures, this suggests that the empirical distribution of our SUV measure is close to that of white noise. [12]

We examine the relation between unexpected trading volume and future annual corporate investment activity within the framework of the q-theory model for corporate investment because of its substantial theoretical and empirical support (Tobin, 1969; Abel and Eberly, 1994; Hennessy et al., 2007; Julio and Yook, 2012; Campello and Graham, 2013). Specifically, we examine whether unexpected trading volume has incremental explanatory power for future corporate investment in the following regression:

$$INV_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 Q_{i,t} + \beta_2 SALE_{i,t+1} + \beta_3 CFO_{i,t+1} + \alpha_i + \alpha_t + \epsilon_{i,t+1} \tag{5}$$

In Equation (5), i indexes firms and t indexes years. $\text{INV}_{i,t+1}$ denotes corporate investment for firm i in year $t+1$, computed as the ratio of capital expenditures of firm i in year $t+1$ to total assets at the end of year t. Prior research shows that corporate investment is slow to evolve; thus, we expect the impact of shocks to volume on investment to manifest itself later in the fiscal year. To explore this implication and ensure that our annual investment results are not driven by incidental first-quarter investment, we also consider the cumulative investment expenditure during the fiscal quarters $t+2$, $t+3$, and $t+4$ relative to the unexpected trading volume measurement window ($\sum_{i=2}^{4}\text{INV}_{t+i}^{Q}$). We use the superscript Q to indicate quarterly investment; we sum quarterly investment over three quarters to generate a quasi-annual measure. By examining cumulative investment over three quarters during the latter part of the year, we aim to reinforce the idea that the overall changes in annual investment arising from shocks to trading volume are more likely to occur with a lag.

Figure 1 outlines the relative timing in our measurement of $\text{SUV}_{i,t}$ and the two investment variables. Consistent with prior research on the investment-q relation, $\text{Q}_{i,t}$ denotes Tobin's Q for firm i in year t and it is measured as the ratio of the market value of assets to the book value of assets at the end of fiscal year t. Equation (5) also includes contemporaneous sales ($\text{SALE}_{i,t+1}$)

[12] We use SUV as our primary measure of shocks to trading volume because it provides a firm-specific estimate of unexpected volume that is continuous and controls for the level of contemporaneous returns. Nevertheless, in section 4.3 we confirm that our inferences are the same when we use the more traditional binary measures of abnormal trading volume suggested by Gervais et al. (2001). Moreover, in untabulated analyses, we confirm that the high-volume return premium exists when using SUV as a measure of unexpected trading volume.

and cash flows from operations ($\text{CFO}_{i,t+1}$) as additional control variables, following the many antecedent studies that empirically document the sensitivity of investment to the availability of internal funding. Hubbard (1998), for instance, reports that these proxies for a firm's access to internal funds play an important role in explaining variations in corporate investment activity. We scale sales and cash flows from operations by end of prior period total assets (Julio and Yook, 2012; Barth et al., 2013; Larcker et al., 2013; Shroff, 2016). α_i and α_t denote firm and year fixed effects to control for firm and time invariant effects on corporate investment expenditures. Our main hypothesis predicts that β_0 will be positive; that is, SUV is positively associated with future annual corporate investment expenditures. We base our inferences on t-statistics computed using standard errors clustered by both firm and year.

Panel A of Table 1 provides descriptive statistics for the variables used in our analyses. All variable definitions appear in the appendix. The panel reveals that the mean and the median of our measure of unexpected trading volume, SUV, are positive but close to zero. The average (median) firm in our sample generates cash flows from operations that are 11.1% (10.4%) of total assets. The average (median) level of investment for firms in our sample is 7.1% (5.1%) of total assets. Panel B provides Pearson and Spearman correlation coefficients for key variables of interest. It reveals that, unconditionally, SUV and future annual investments are positively correlated.

3 Main Results

3.1 Unexpected trading volume and future corporate investment

3.1.1 The volume-investment relation

Column (1) of Table 2 presents summary statistics from estimation of Equation (5). Consistent with our main hypothesis, the coefficient on SUV is significantly positive. On average, a one standard deviation increase in SUV is associated with a 10 basis point increase in INV, which represents a 1.4% increase in investment as a percentage of total assets.[13] To make sure the volume effect manifests itself in periods after quarter $t+1$, we estimate Equation 5 using as a dependent variable the cumulative investment expenditure during the fiscal quarters $t+2$, $t+3$, and $t+4$ relative to the unexpected trading volume measurement window ($\sum_{i=2}^{4}\text{INV}^{Q}_{t+i}$). Results from estimating this modified regression, which appear in column (2), indicate that a one standard deviation increase in SUV is associated with 1.8% increase in investment expenditures over quarters $t+2$, $t+3$, and $t+4$. As expected, column (2) suggests that the effect of SUV on future corporate investment is concentrated in fiscal quarters $t+2$, $t+3$, and $t+4$, as it takes time to make new investment decisions and to implement them. Across both specifications we find evidence that

[13]We obtain the estimated 10 basis point average effect by multiplying the standard deviation of SUV (1.57) by the estimated coefficient on SUV (0.00064). To measure the effect as a percentage of total assets, we scale this the product by the average value of INV in our sample (0.071). This yields the estimated 1.4% effect.

unexpected increases in a stock's trading volume are positively associated with future corporate investment expenditures.

The coefficient estimates on different variables presented in Panel A of Table 2 are not directly comparable to one another because, as Panel A of Table 1 indicates, they have quite different mean values (and standard deviations). To facilitate the comparisons of coefficient estimates, we re-estimate the results from Panel A of Table 2 after standardizing each variable to have a mean of zero and a standard deviation of one. Summary statistics from this revised estimation appear in Panel B. As Panel B indicates, the association between unexpected volume and future corporate investment expenditures is economically significant (approximately 20% of the effect of Tobin's Q on future corporate investment), and it is larger for corporate investment expenditures measured over fiscal quarters $t+2$, $t+3$ and $t+4$. Taken together, the results in Table 2 suggest that there is a positive relation between unexpected increases in a stock's trading volume and future corporate investments and that the relation is both statistically and economically significant. [14]

Our primary analyses are conducted on a panel dataset that spans the period from 1986 to 2015. However, if the volume-investment relation that we document is indeed driven by the Merton (1987) visibility hypothesis one would expect that during periods of turmoil, such as the financial crisis, the investor recognition channel likely would play a secondary role. We test this possibility by allowing the coefficient on SUV to vary during the 2007-2009 financial crisis period. The results presented in Table 3 reveal a positive main effect of SUV on investment, whereby a one standard deviation increase in unexpected trading volume is associated with a 1.6% increase in annual investment, but an equivalent negative interactive effect between SUV and the crisis time period indicator. Overall, as conjectured, there is no relation between SUV and investment during the financial crisis period. To account for this important time variation in our tests, we include this interaction term (labeled as a "crisis interaction") in our subsequent analyses.

Our initial tests focus on examining the relation between unexpected trading volume and the level of next year's corporate investment expenditures. One potential concern with this approach is that the observed relation between SUV and the level of investment is an artifact of SUV being related to the "baseline" level of corporate investment, which can be relatively fixed over time, and not to changes in investments from year to year. Although, to some extent, we address this concern in our primary tests by including both firm and year fixed effects, we take one step further and also test our hypothesis using a changes specification of Equation (5). Specifically, we examine

[14] In estimating Equation (5), we follow prior research by measuring Q at the end of fiscal year t. However this could raise the concern that Q is measured prior to SUV, allowing SUV to incorporate more current market information and potentially biasing our analyses in favor of finding a significant association between SUV and investment. To mitigate this concern, we also explore measuring Q at the end of the SUV measurement period to ensure that it incorporates all available market information at the time SUV is measured. We find that our results are unchanged by using this alternative measurement of Q. For example, using standardized annual investment as the dependent variable, the coefficient estimate on standardized SUV is 0.01502 (t-stat = 3.58). When using the standardized cumulative investment over quarters $t+2$, $t+3$, and $t+4$ as the dependent variable, the coefficient estimate on standardized SUV is 0.01768 (t-stat = 3.91).

the relation between SUV and *changes* in annual investment expenditures, estimating the following equation:

$$\Delta INV_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 \Delta Q_{i,t} + \beta_2 \Delta SALE_{i,t+1} + \beta_3 \Delta CFO_{i,t+1} + \beta_4 SUV \times Crisis_t + \alpha_i + \alpha_t + \epsilon_{i,t+1} \quad (6)$$

In Equation (6), $\Delta \text{INV}_{i,t+1}$ denotes the change in firm i's annual investment from year t to year $t+1$. Analogously, $\Delta \text{SALE}_{i,t+1}$ and $\Delta \text{CFO}_{i,t+1}$ indicate the changes in SALE and CFO for firm i from year t to year $t+1$, and Δ $\text{Q}_{i,t}$ denotes the change in Q for firm i from year $t-1$ to year t. Crisis_t is an indicator variable equalling one during years 2007 to 2009 and zero otherwise. SUV remains as previously defined because by definition it represents an unexpected change in a stock's trading volume. Our main hypothesis predicts that β_0 will be positive; that is, SUV is positively related to changes in investment expenditures.

Panel A of Table 4 presents summary statistics from the estimation of Equation (6). Panel B presents results where all variables in Equation (6) are standardized. In both specifications, we find support for our main hypothesis. On average, a one standard deviation increase in SUV is associated with an 11 basis point increase in the annual change in corporate investment which corresponds to a modest 2.1% of the standard deviation of annual change in investment. Panel B also reveals that the magnitude of the relation between SUV and investment, when compared to those of the other control variables such as Q and CFO, is economically significant. For instance, the effect of SUV on changes in corporate investment expenditures is approximately 46% as large as the effect of changes in Tobin's Q and 40% as large as the effect of changes in CFO on changes in future corporate investment.[15] The results presented in Table 4 suggest that increases in unexpected trading volume are associated not only with the level but also with innovations in corporate investment activity.

3.1.2 Asymmetry in the volume-investment relation

In our primary tests, we examine the relation between unexpected trading volume and either the level or change of the next year's corporate investment expenditures. The results support our hypothesis that unexpected trading volume is positively associated with future corporate investment. Implicit in our hypothesis is the prediction that the positive association between a firm's stock volume and future corporate investment is asymmetric. Specifically, while we surmise unexpected increases in a firm's stock volume will lead to heightened future corporate investment, we do not expect abnormal decreases to result in lower future corporate investment. A synthesis of prior research hints at such asymmetry. Our hypothesis is rooted in Merton's (1987) conjecture regarding the link between visibility and cost of capital for which Gervais et al. (2001) provide empirical support by showing that stocks that experience abnormally high (low) trading volume over short periods experience abnormally high (low) returns in the near future. To the extent that

[15] As before, we also estimate a version of Equation (6) while measuring Q at the end of the SUV measurement period. Using this alternative, the coefficient estimate on standardized SUV is 0.02371 (t-stat = 4.03).

Merton's (1987) conjecture holds, these results suggest that the effect of abnormal trading volume on future investment is likely to be concentrated among incidences of high volume. Additionally, there is empirical evidence that corporate investment is partially irreversible, with reductions in investment being more costly than increases (Bloom, 2009; Caballero and Engel, 1999; Ramey and Shapiro, 2001). The partial irreversibility of investment would suggest that unexpected increases in trading volume are associated with higher investment, while unexpected decreases in volume might not similarly be associated with lower investment.

To more explicitly examine this asymmetry, we re-estimate Equations (5) and (6) using quintile indicators of SUV in the place of the level of SUV. Specifically, we form quintile ranks of SUV within each year of our sample and then construct a separate indicator variable for each level within the quintile rank. The results of this estimation are presented in Table 5. Panels A and B of Table 5 present results from the estimation of Equations (5) and (6), respectively, with quintile indicators of SUV. Consistent with our prediction, the findings suggest that the positive relation between unexpected trading volume and future corporate investment is concentrated among observations with the highest SUV quintile. Specifically, only observations with levels of SUV within the 5th quintile demonstrate significantly positive association with both levels of and changes in future corporate investment expenditures.

3.2 Unexpected trading volume and corporate financing activities

In this section, we provide empirical evidence in support of the idea that shocks to trading volume are associated with a reduction in the cost of capital that would facilitate greater access to capital and thus more investment activity. Directly estimating changes in cost of capital over fairly short periods is notoriously difficult and prone to measurement error. We circumvent this problem in two ways. First, we focus on measures that are likely to be associated with changes in cost of capital and on subsamples of firms that are most likely to be sensitive to changes in cost of capital. Second, we explore how systematic risk varies with shocks to trading volume; since cost of capital is directly increasing in the level of a firm's systematic risk, this approach offers an additional means of examining the potential link between shocks to volume and cost of capital.

3.2.1 Volume and financing cash flows

Our hypothesis implies that companies will respond to a reduction in cost of capital by either using existing cash on hand or seeking new capital to fund additional investment.[16] Our primary outcome variable measures the total amount of cash used for investment and does not distinguish between these two funding sources. In this subsection, we also examine directly the extent to which companies engage in additional financing activities following a shock to trading volume. We do so

[16] Enhanced use of cash on hand would in part be driven by the fact that with a lower cost of capital, raising external funds, if needed, becomes easier. This reduces the required cash buffer.

by estimating Equation (5) using several measures of cash flows from financing activities as the dependent variable. In this context, cash flows from financing activities include all exchanges of cash with debtholders or stockholders of the firm. Cash inflows from financing activities arise from new borrowings or equity issuances. Cash outflows from financing activities involve repayment of principal borrowings, the repurchase of shares outstanding, or dividend payments.[17]

We begin by examining the relation between SUV at time t and the level of net financing cash flows in year $t+1$ (CFF_{t+1}). We also examine the relation between SUV at time t and the change in net financing cash flows during year $t+1$. The results of these estimations appear in Table 6. Across all estimations, we find evidence of a positive relation between SUV_t and future financing activities. For example, when we estimate Equation (5) using CFF_{t+1} as the dependent variable, the results indicate that a one standard deviation increase in SUV is associated with a 58 basis point increase in net financing cash flows as a percentage of total assets. An increase in net cash flows from financing activities must necessarily arise from one of two possibilities: either that the company is raising additional external capital (increasing cash inflows) or that the company is making fewer distributions of existing internal capital (reducing cash outflows). We note that both scenarios represent mechanisms by which the manager can make more funds available for investment. If a manager makes fewer distributions and thus reduces financing cash outflows, she effectively has greater cash available for other endeavors, such as capital expenditures. This redistribution of internal funds is precisely the type of event we might expect when the internal cost of capital shifts. Thus, even a finding that the observed positive relation between SUV and CFF_{t+1} is driven by a reduction in the amount of financing cash outflows is consistent with the idea of a manager being able to use more funds for investment today.

To confirm that we are not capturing short-run changes in financing activity, we also explore the relation between SUV at time t and CFF during a quarter immediately after the observed shock to trading volume. Consistent with the view that firms cannot update their financing strategies so quickly following a shock to trading volume, in untabulated analyses, we find no evidence of a significant relation between abnormal trading volume and either the level or change in net financing cash flows during the quarter immediately afterwards. These results, taken together with the robust positive association between volume shocks and annual financing cash flows, support the view that shocks to volume impact financing activities over longer horizons.

To disentangle the precise nature of the observed increase in net financing cash flows after periods of abnormal trading volume, we further examine whether and to what extent there is an association between SUV and financing cash inflows. We first consider the overall level of financing cash inflows (CFFIN_{t+1}). Then, we decompose CFFIN_{t+1} into its three primary components:

$$CFFIN_{t+1} = CFFIN\_LTDEBT_{t+1} + CFFIN\_STDEBT_{t+1} + CFFIN\_STOCK_{t+1} \tag{7}$$

[17]In accordance with U.S. Generally Accepted Accounting Principles (GAAP), net financing cash flows reported in the Statement of Cash Flows does not include cash payments related to interest on borrowings.

In Equation (7), CFFIN_LTDEBT denotes the portion of financing cash inflows that arises from the issuance of long term debt. CFFIN_STDEBT indicates the portion of financing cash inflows that arises from changes in short term debt. CFFIN_STOCK represents the balance of CFFIN, which is largely related to equity transactions. We estimate a version of Equation (5) using each of these four measures of financing cash inflows as the dependent variable. The results from estimating these equations appear in Table 7. We find that SUV is positively associated with the overall level of financing cash inflows; a one standard deviation increase in SUV is associated with a 58 basis point increase in CFFIN, which represents a 4.6% increase in total financing cash inflows as a percentage of total assets.[18] Columns (2) and (4) of Table 7 also indicate that there is a positive association between SUV and cash inflows that arise from long-term debt issuances and equity transactions. These results suggest that, after experiencing a shock to trading volume, firms are able to secure more capital through long-term debt or equity financing. Taken together with our main results indicating increased investment in response to SUV, these results offer further support for the view that increases in trading volume are associated with reductions in cost of capital.

3.2.2 Volume and systematic risk

We hypothesize that the volume-investment link arises because abnormal trading volume is associated with a reduction in cost of capital. In this subsection, we provide support to this hypothesis by estimating shifts in stock betas. According to Merton's (1987) investor recognition hypothesis, an increase in a firm's visibility is associated with a reduction in that firm's cost of capital. Since it is impossible to reliably estimate cost of capital over short windows, we are unable to document this link directly. However, following Gervais et al. (2001), we note that a standard assumption in asset pricing models is that a firm's cost of capital will be increasing in its systematic risk (stock beta). Therefore, if a change in a firm's visibility is indeed associated with a change in its cost of capital, we should also expect to observe a change in that firm's stock beta. Following the methodology outlined by Gervais et al. (2001), we use monthly returns over twelve and nine month horizons to separately estimate stock betas for portfolios that comprise stocks of the top and bottom quintiles of SUV. We then examine how these betas evolve around an observed shock to trading volume. If firms experiencing large volume shocks do indeed enjoy a reduction in their costs of capital, we should observe a similar reduction in their stock betas. The results in Table 8 provide evidence in support of this inference.

Panels A and B of Table 8 present the betas of portfolios that comprise firms in the top and bottom quintiles of SUV, using monthly returns over twelve and nine month horizons, respectively.

[18]We obtain this estimate from an untabulated test in which we replicate column (1) of Table 7 without standardizing the variables. In the estimation, the coefficient on SUV is 0.003722 and is significantly different from zero at the 1% level. The estimated 58 basis point average effect arises by multiplying the standard deviation of SUV (1.57) by the estimated coefficient on SUV. To measure the effect as a percentage of total assets, we scale this product by the average value of CFFIN in our sample (0.128). This yields the estimated 4.6% effect.

As panel A indicates, on average, firms in the top quintile of SUV experience a 18.9% reduction in their betas (p-val. = 0.017) while the betas of firms in the bottom quintile of SUV remain statistically unchanged following a shock to trading volume. Panel B offers similar inference, where, unlike firms in the bottom quintile of SUV, those in the top quintile experience a 16% reduction in their betas (p-val. = 0.024). Consistent with our main hypothesis, these findings provide supportive evidence that a large shock to trading volume is accompanied by a significant reduction in a firm's cost of capital.

3.2.3 The effects of financial constraints

Prior literature provides evidence in support of the view that corporate investment expenditures are sensitive to the availability of capital necessary to execute those investments (Fazzari et al., 1988; Kaplan and Zingales, 1997; Baker et al., 2003; Farre-Mensa and Ljungqvist, 2017). The economic reasoning behind this view is as follows: if firms face capital market imperfections, external funding is not always available as a substitute for internal financing. As a result, corporate investment activity will vary with a firm's ability to secure financing. Due to the important role financial constraints play in corporate investment activity, we explore how the documented positive relation between SUV and future corporate investment expenditures varies with firms' financial constraints.

We hypothesize that the relation between abnormal trading volume and corporate investments is concentrated among firms with high financial constraints. To test this hypothesis we adopt two commonly used measures of financial constraints, the Kaplan and Zingales (1997) index (hereafter, the KZ index) and the Hadlock and Pierce (2010) index (hereafter, the HP index), and for each measure perform the following analyses. First, we augment Equation (5) with two additional variables: the actual tercile rank of a firm-year's financial constraint index level and the interaction of that rank variable with SUV. Because each measure is constructed such that higher values correspond to higher financial constraints, we expect that the coefficient on the interaction will be positive. Second, we estimate Equation (5) on three subsamples of our dataset, where each subsample comprises firm-year observations with the same tercile rank of the financial constraint index. According to our hypothesis, the relation between SUV and corporate investment is expected to be significantly positive within the subsample of firm-years with the highest financial constraints.

Panels A and B of Table 9 report the results of these analyses for the Kaplan and Zingales (1997) and Hadlock and Pierce (2010) indices, respectively. Column (1) of Panel A reveals that the interaction of KZt (the KZ index tercile rank) with SUV is positive and significant, indicating that the positive relation of unexpected volume to investment is concentrated among firms with higher levels of financial constraints as measured by the KZ index. Notably, the main effect on both SUV and the KZ index ranking are indistinguishable from zero and the sum of coefficient estimates on SUV and its interaction with KZt is positive. This finding suggests that, all else equal, for the same level of SUV, as KZt increases the relation between unexpected volume and future investment is stronger. Columns (2) to (4) provide coefficient estimates of Equation (5) that are obtained using tercile subsamples formed on the basis of the KZ index. In line with findings in column (1), the results indicate that the coefficient on SUV is significantly positive primarily in the tercile of firms facing the greatest financial constraints according to the KZ index.

The results reported in Panel B of Table 9, which incorporates the HP index as an alternative measure for identification of financially constrained firms, suggest similar inferences to those derived from Panel A. Panel B reveals that the interaction between HPt (the HP index tercile rank) and SUV is statistically significant and that the positive relation between SUV and future corporate investment is concentrated among firms with higher levels of financial constraints as measured using the HP index. Taken together, the analyses reported in Table 9 support the hypothesis that the relation between abnormal trading volume and corporate investment is concentrated among firms with high financial constraints.[19]

3.3 Alternative interpretations of the volume-investment relation

Our main analyses indicate that unexpected increases in a firm's trading volume are associated with heightened future corporate investment expenditures. Consistent with Merton's (1987) investor recognition hypothesis, we interpret this as support for the hypothesis that increased visibility is associated with reductions in cost of capital and increased investment opportunities for the firm. In this section, we conduct several tests to rule out the possibility of alternative interpretations of observed link between heightened trading volume and future corporate investment.

3.3.1 Volume and contemporaneous news

Our measure of unexpected trading volume, SUV, measures the portion of trading volume that is not correlated with contemporaneous stock returns. Our estimation of SUV effectively isolates trading that is not associated with cash flow-relevant information (to the extent that cash flow-relevant news should generate returns). If, on the other hand, there is relevant news that is not impounded in returns, that news could still be associated with SUV. This is particularly concerning if such news is indicative of future investment, as it would suggest that the relation between SUV and investment is merely driven by this correlated omitted variable. We take several steps to address this potentially correlated omitted variable problem and ensure that SUV is not driven by investment-related news.

First, using data from RavenPack, we construct a firm-specific measure of news arrival. This variable, $\text{NEWSCOUNT}_{i,t}$, is the logarithm of 1 + the count of news articles about firm i during

[19] A ccording to Table 9, our inferences regarding SUV are not sensitive to the index we use. However, we note that the two measures yield slightly different results. This is not surprising given the active debate in the literature regarding the appropriate way to identify financial constraints (Farre-Mensa and Ljungqvist, 2017).

the SUV measurement period (days -11 to -7 relative to the year t earnings announcement). [20] We include NEWSCOUNT$_{i,t}$ as an additional control in Equations (5) and (6) and present the results in Table 10. If our main findings are driven by the arrival of observable news about future investment that induced the higher SUV, adding a control for NEWSCOUNT$_{i,t}$ should subsume the positive association between SUV and future investment. We do not find this; in contrast, we observe that the positive association between SUV and future investment persists, in both levels and changes specifications, with NEWSCOUNT$_{i,t}$ as an additional control variable. In untabulated analyses, we define an alternate measure of media-based news arrival in which we measure the number of news articles relative to each firm's own past news arrival process. Specifically, we define a new measure where we standardize NEWSCOUNT$_{i,t}$ relative to the prior 30 weeks of news article counts for firm i, excluding the weeks of earnings announcements or weeks immediately following or preceding them. Our results remain unchanged with this alternative news arrival measure.

In addition to measuring the arrival of news through media articles, we also investigate the incidences of corporate disclosures during our SUV measurement window. By construction, our SUV measure does not coincide with the release of earnings news. However, it is possible that firms make other disclosures during the SUV measurement period that could generate the higher trading volume we observe. To address this possibility we identify the dates of a broad set of common corporate disclosures: management forecasts, dividend announcements, stock repurchase announcements, merger and acquisition announcements, and seasoned equity offerings. We then remove from our sample any firm-years where the measurement of SUV coincides with one or more of these disclosures. This leaves us with a reduced sample where observations of SUV do not coincide with any of these major corporate disclosures and thus can more confidently be interpreted as measures of unexpected volume. We re-estimate Equation (5) using this subsample and present our findings in columns (1) and (2) of Table 11. The results support our main inferences, as we find that thesignificant positive relation between SUV and future investment remains in this subsample.

Despite the broad nature of the set of corporate disclosures we exclude, it may still be possible that firms reveal material information about investment or financing activities during the SUV measurement period that leads to the observed higher trading volume. To even more directly rule out this possibility, we we use the U.S. Securities and Exchange Commission's Electronic Data Gathering, Analysis, and Retrieval (SEC EDGAR) database to download all Form 8-Ks and analyze the text of all such forms filed during the SUV measurement period. Hoberg and Maksimovic (2015) and Bodnaruk et al. (2015) define the following word list to identify discussion of corporate investing and financing activities: construction, expansion, acquisition, restructuring, expenditure, entry, growth, cash flow, investment, cash, finance, debt, stock, issue, raise, borrow, capital improvement, capital spend, capital project. We count the frequency of each term in this list for each Form 8-K filed during our SUV measurement window, and classify a firm as disclosing

[20] RavenPack data are only available from the year 2000 onwards. As such our sample size is reduced to 10,735 observations when we include measures from RavenPack.

investment or financing activity if any one of these terms appears in a given disclosure. We then exclude from our sample any firm-years that released Form 8-Ks containing investment or financing discussion during the SUV measurement period, and re-estimate our main regressions using this reduced sample. Columns (3) and (4) of Table 11 present summary statistics of these estimations and reveal that the significant positive relation between SUV and future investment persists in this subsample as well.

In addition to the arrival of corporate news, it is possible that the positive relation between trading volume and future investment is driven by unexpected changes in macroeconomic variables such as interest rates, unemployment, and inflation. We address this possibility in several ways. First, following Savor and Wilson (2014), we identify the arrival of macroeconomic news using scheduled FOMC interest rate announcement days and inflation/unemployment announcement days from the US Bureau of Labor Statistics. We then exclude from our sample any firm-years where these macroeconomic news arrivals coincide with the SUV measurement period, and re-estimate our regressions using this reduced sample. Columns (5) and (6) of Table 11 present summary statistics of these estimations and reveal that the significant positive relation between SUV and future investment persists in cases where no macroeconomic news was revealed. Additionally, in section 4.2, we include changes in gross domestic product (GDP) as additional control variable to accommodate the previously documented association between macroeconomic conditions and corporate investment.

To offer even more reassurance that our measurement of unexpected volume is not driven by the arrival of news, we reduce our sample by imposing all of the above sample restrictions simultaneously. We re-estimate Equation (5) using this sample and present the results in columns (7) and (8) of Table 11. That the positive relation between SUV and investment persists when excluding all corporate and macroeconomic disclosure simultaneously offers strong reassurance for the view that the positive relation between SUV and corporate investment is not driven by the arrival of news.

To corroborate this mosaic of evidence, we also follow a robust literature in using mutual fund flows as a potential source of trading volume shocks that are plausibly exogenous to corporate investment decisions (Ali et al., 2011; Coval and Stafford, 2007; Edmans et al., 2012; Frazzini and Lamont, 2008; Lou and Wang, 2018). We utilize the MFFlow variable proposed in Edmans et al. (2012), which estimates, for each stock, the trading induced by all mutual funds that have experienced extreme outflow shocks.[21] To accommodate extreme outflows, a fund is induced to essentially mechanically scale down existing positions, in contrast to moderate flow shocks that could be absorbed by internal cash or external liquidity providers. We begin by identifying each mutual fund's net investor outflow as reported in the CRSP Mutual Funds database. CRSP reports investor outflows on a quarterly basis; we identify investor outflows from the last quarter of each

[21] Extreme is defined as at least 5% of total assets. For details of the construction of MFFlow, see the Appendix of Edmans et al. (2012).

firm-year to merge these data into our annual panel. We allocate these outflows proportionally to each stock held by the fund, using fund holding data from Thomson Financial. This process allows us to estimate, for each fund-firm-year, the trading activity in individual stocks generated by each fund's investor outflow. Finally, by aggregating across all funds for each firm-year, we measure the total amount of trading activity induced by non-informational investor outflow from mutual funds.

Equipped with the firm-specific MFFlow measure, we use a two-stage estimation procedure to demonstrate that at least part of our documented SUV-investment relation can be explained by shocks to volume that are clearly exogenous to firms' fundamentals. First, we regress SUV on MFFlow and interpret the predicted values as the portion of unexpected volume that is explained by mutual fund flows that are exogenous to firms' fundamentals. We then use the predicted values from this first stage regression in place of (or in addition to) SUV in re-estimating of two versions of Equation (5). The results from these analyses appear in Table 12. We observe significantly positive coefficients on the predicted value of SUV, indicating that unexpected volume arising from exogenous mutual fund flows are associated with increased investment over the following year. We interpret these findings as supporting the view that non-fundamental shocks to trading volume are associated with heightened subsequent corporate investment. Taken together with the results in Tables 10 and 11, these findings indicate that the relation between SUV and future investment is not driven by the disclosure of news about investment or financing activities that may result in high trading volume.

3.3.2 Information in earnings announcements

By limiting the measurement window to days -11 to -7 prior to the earnings announcement, our estimation of SUV is designed to avoid potential contamination by the release of earnings news. Nonetheless, there may be a concern that our SUV measure captures the news conveyed in the upcoming earnings announcement. To address this concern, we construct two additional variables to capture the amount of new information revealed through the earnings announcement: the abnormal return during the earnings announcement period ($\text{EAAR}_{i,t}$) and the standardized unexpected earnings ($\text{SUE}_{i,t}$) of the earnings announcement. $\text{EAAR}_{i,t}$ is the abnormal return cumulated across days [-1,+1] relative to the year t earnings announcement date for firm i. $\text{SUE}_{i,t}$ is measured as the difference between the current year's Q4 earnings per share and the earnings per share from Q4 of the prior year, scaled by the standard deviation of this difference during the last eight quarters, including the current quarter:

$$SUE_{i,t} = \frac{EPS_{i,t} - EPS_{i,t-4}}{\sigma^{\delta EPS}} \tag{8}$$

where $\text{EPS}_{i,t}$ ($\text{EPS}_{i,t-4}$) denotes firm i's realized earnings per share in quarter t ($t-4$) and $\sigma^{\delta EPS}$ is the standard deviation of unexpected earnings, $\text{EPS}_{i,t}$ - $\text{EPS}_{i,t-4}$, over eight quarters. This model of SUE, which assumes that the earnings process follows a seasonal random walk without drift, has been widely used in prior literature (Chan et al., 1996; Barberis et al., 1998; Chordia and Shivakumar, 2006; Chordia et al., 2009). [22] Because the estimation of SUE requires earnings data from the past 11 quarters, we restrict our sample for these analyses to firm-years with at least 12 consecutive quarters of available EPS data.

Columns (1) and (2) of Table 13 present the results of estimating Equation (5) with the inclusion of additional controls for SUE and EAAR. All variables are standardized prior to estimation to facilitate a direct comparison of coefficient estimates. The results indicate that SUE is positively associated with future investment. However, this relation does not subsume that of SUV and investment; the coefficient on SUV is positive and of a similar magnitude to that in the base specification, and retains its significance across all specifications. In column (3) we include both additional earnings-announcement-period variables in a single regression. When included together, we find that SUV and SUE remain significantly positively related to future investment. In contrast, the relation between EAAR and corporate investment documented in column (2) weakens and even changes its sign (though it remains statistically indistinguishable from zero). We also note that the magnitude of the coefficient on SUV is also materially unaffected by the inclusion of the additional announcement-period controls. Overall, these results indicate that our main inferences are not driven by SUV serving as a proxy for information released during firms' earnings announcements.

3.3.3 The role of volume in the investor recognition-investment relation

We hypothesize that the relation between abnormal trading volume and future corporate investment is concentrated among firms with lower levels of investor recognition. This hypothesis relies on the assumed link between unexpected increases in trading volume and investor recognition of a firm's stock. Prior literature suggests that the underlying effect of an increase in unexpected trading volume is an increase in a firm's visibility (Gervais et al., 2001; Lerman et al., 2010; Kaniel et al., 2012). In this framework, the real effects of heightened trading volume, such as increased investment, should be concentrated among firms with lower levels of investor recognition.

Lehavy and Sloan (2005), who examine the relation between investor recognition and stock returns, show that corporate investment activities are positively related to contemporaneous changes in investor recognition of a firm's stock (measured as the change in breadth of institutional ownership). However, the underlying determinant of the relation between investor recognition and investment remains ambiguous. Accordingly, we first explore whether unexpected increases in trading volume in past period drive this previously documented contemporaneous relation between changes in investor recognition and corporate investment. We do so in two stages.

[22] Chan et al. (1996) justify the simple random walk model by citing the Foster et al. (1984) study that shows no significant difference between this simple model and more complex models in predicting future earnings.

First, we estimate a regression model that relates SUV to future changes in breadth:

$$DBREADTH_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 SUV_{i,t} \times Crisis_t + \alpha_i + \alpha_t + \epsilon_{i,t+1} \tag{9}$$

In Equation (9), $\text{DBREADTH}_{i,t+1}$ measures the change in breadth of institutional ownership, defined as the change in the number of Form 13F filers holding firm i's shares during year $t+1$ scaled by the total number of 13F filers at the end of year t (Lehavy and Sloan, 2005). As before, Crisis_t is an indicator variable equalling one during years 2007 to 2009 and zero otherwise, α_i denotes firm fixed effects, and α_t denotes year fixed effects.[23] From Equation (9) we obtain predicted values of changes in breadth ($\text{P\_DBREADTH}_{i,t+1}$) that are driven by variation in SUV and residual values ($\text{R\_DBREADTH}_{i,t+1}$) that capture the portion of changes in breadth that is unexplained by variation in SUV.

In the second stage, we use these predicted and residual values as independent variables in a regression of contemporaneous investment on changes in breadth:

$$\begin{aligned} INV_{i,t+1} = \beta_0 P\_DBREADTH_{i,t+1} + \beta_1 R\_DBREADTH_{i,t+1} + \beta_2 DBREADTH_{i,t} \\ + \sum_k \beta_k Controls^k_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t+1} \end{aligned} \tag{10}$$

In Equation (10), we control for change in breadth during the previous period ($\text{DBREADTH}_{i,t}$) as well as $\text{Q}_{i,t}$, $\text{SALE}_{i,t+1}$, and $\text{CFO}_{i,t+1}$ as previously defined. To account for distributional differences between the predicted and residual values from the first stage estimation, we standardize all variables before estimating the second stage regression. If an unexpected increase in a firm's trading volume is responsible for the previously documented contemporaneous relation between change in investor recognition and corporate investment, then the coefficient β_0 from Equation (10) will be positive and β_1 will not be statistically different from 0.

Table 14 presents the estimations of two versions of Equation (10). Column (1) (column (2)) presents results from estimating Equation (10) without (with) change in breadth during the previous period as a control. Consistent with the idea that variation in SUV drives the contemporaneous relation between changes in breadth and corporate investments, the coefficient estimate on $\text{R\_DBREADTH}_{i,t+1}$, which captures all variation in $\text{DBREADTH}_{i,t+1}$ that is not explained by SUV, is not statistically different from 0 in both specifications. In contrast, the coefficient estimate on $\text{P\_DBREADTH}_{i,t+1}$, which captures all variation in $\text{DBREADTH}_{i,t+1}$ that is explained by SUV from past period, is significantly positive. These findings suggest that only the portion of future DBREADTH that is related to SUV is relevant for explaining corporate investment expenditures. Taken together, Table 14 suggests that the relationship between investor recognition and corporate investment is mediated by SUV.

[23] In untabulated analyses, we also estimate a version of Equation (9) in which we exclude the crisis interaction and firm and year fixed effects. Our inferences are the same when we use this alternative specification in the first stage.

In light of the findings in Table 14, we further explore changes in investor recognition after shocks to trading volume by examining the association between SUV and subsequent Google search volume. Google search volume measures investor recognition that is different from breadth of institutional ownership. While breadth focuses on ownership and thus measures recognition by investors who have decided to purchase a stock, search volume measures recognition more broadly, potentially including investors who are aware of the firm but ultimately decide not to purchase its stock. As such, it provides a natural complement to our analyses of investor breadth.

We expect that firms experiencing a shock to trading volume will subsequently experience greater investor recognition. We test this by estimating the below regression:

$$GVol_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 SUV_{i,t} \times Crisis_t + \sum_k \beta_k Controls_{i,t}^k + \alpha_i + \alpha_t + \epsilon_{i,t+1} \qquad (11)$$

As before, $\text{SUV}_{i,t}$ is measured over week -2 (trading days -11 to -7) relative to the year t earnings announcement for firm i. Our goal in this analysis is to examine variations in Google search volume following a shock to trading volume, while avoiding the well-documented spikes in search activity that accompany earnings announcements (Drake et al., 2012). To obtain this, we define $\text{GVol}_{i,t+1}$ as the rank of weekly Google search volume for firm i in week $t+1$, which is defined as calendar week -1 relative to the year t earnings announcement. We use the subscript $t+1$ because this definition generates a measure of Google search volume that is roughly one week subsequent to the measurement of SUV.[24] Following Da et al. (2011), we measure Google search volume for each firm by searching for individual firm tickers appended with the word "stock" to ensure that we are measuring search by investors interested in financial information, as opposed to non-financial searches. We construct $\text{GVol}_{i,t+1}$ in week $t+1$ as a rank variable relative to the prior 20 weeks of search volume for a specific firm i. This is a necessary transformation as Google does not provide a consistent baseline to allow us to accurately interpret variation in the level of Google search volume over time. As before, Crisis_t is an indicator variable equalling one during years 2007 to 2009 and zero otherwise, α_i denotes firm fixed effects, and α_t denotes year fixed effects. As controls we include several variables documented by prior literature as being associated with the level of Google search volume: book-to-market ratio (BTM), market value of equity (MVE), institutional ownership (INSTOWN), stock returns during the volume measurement period (RET), and news article count during the volume measurement period ($\text{NEWSCOUNT}_{i,t}$). If shocks to trading volume are associated with more searches by investors, we expect to observe a positive β_0 coefficient in Equation (11).

The results from estimating Equation (11) appear in Table 15. In columns (1) and (2) we

[24] This construction of GVol will result in fully non-overlapping measurement of GVol and SUV for all firm-years where the earnings announcement occurs on Sunday, Monday, or Tuesday. For firm-years with earnings announcements on other days of the week, there will be some degree of overlap between the two measurement periods. We explore the sensitivity of our results to this overlap in columns (3) and (4) of Table 15.

present results estimated on a full sample of firm-year observations. We note that this full sample is still notably smaller than our original sample; this relates to the unavailability of Google search volume data prior to 2005. The results from this estimation indicate that a one standard deviation increase in SUV is associated with approximately a 2.72% increase in the rank of the next week's Google search volume relative to the prior 20 weeks. We also estimate Equation (11) on a subsample of firm-years where the year t earnings announcement is made on Sunday, Monday, or Tuesday in order to ensure that the measurement of GVol does not overlap with the measurement of SUV. As columns (3) and (4) of Table 15 indicate, the significant positive relation between SUV and subsequent Google search volume persists in this reduced sample with non-overlapping periods. In both samples, we note that the relation is robust to the inclusion of a control for the number of news articles released contemporaneously with the measurement of SUV. This suggests that the association between SUV and subsequent Google search volume is not subsumed by the arrival of firm-specific news during the volume mesurement period.

3.3.4 Additional tests of volume as a measure of investor recognition

We conduct two further tests to examine whether the relation between unexpected increases in trading volume and future corporate investment is concentrated among firms with lower levels of investor recognition. First, we use a firm's membership in major indices such as Standard and Poors (S&P) 500 and 1500 as a proxy for the level of investor recognition of a firm's stock. We modify Equation (5) to include indicator variables for membership in the S&P 500 and S&P 1500 indices. We then interact these indicator variables with SUV to examine how the relationship between SUV and investment changes when firms are also members of major indices. The results of this estimation appear in Table 16. In columns (1) and (2) we define the indicator $\text{SP500}_{i,t}$ to equal 1 when firm i is a member of the S&P 500 index in year t, and 0 otherwise. In column (1) we use annual investment as the dependent variable and find a negative but not significant coefficient on the interaction of SUV with SP500. Using summed t+2 to t+4 quarterly investment as the dependent variable, however, we find that this coefficient becomes significant at the 10% level of test. Thus, S&P 500 firms that experience a volume shock will experience a smaller subsequent increase in investment relative to firms with similar volume shocks that are *not* included in the S&P 500 index. Untabulated results reveal that the coefficient on SUV is significantly larger in magnitude than that of the interaction term, implying that the total effect of SUV is still significantly positive.

In columns (3) and (4) we explore the impact of membership in the S&P 1500 index as an alternative. The use of this index is constructive because our sample comprises 2,775 firms and the S&P 1500 index enables us to split the sample almost in half according to potential investor recognition as reflected by index inclusion. We continue to find that relative to firms not in the index, firms belonging to the S&P 1500 index experience notably smaller increases in subsequent investment following volume shocks. The mitigating effect of being in the S&P 1500 index appears across both dependent variables. Similar to columns (1) and (2), in both columns (3) and (4), the coefficients on the interaction terms are not so largely negative to subsume the main effect of abnormal trading volume on corporate investment. Untabulated analyses indicate that the overall effect of SUV on investment is still positive (though smaller) for firms belonging to S&P 1500 index.

In an additional test of the investor recognition channel, we use institutional ownership (defined as the percentage of shares owned by Form 13F filers) as a proxy for the level of investor recognition of a firm's stock. We expect that firms heavily owned by institutions enjoy greater levels of investor recognition and thus will experience smaller real benefits from unexpected volume shocks. To examine this, we estimate Equation (5) on three subsamples of our data, where each subsample comprises firm-year observations with the same tercile rank of the level of institutional ownership. As predicted, Table 17 shows that the coefficient estimate on SUV is significantly positive only among firms within the bottom two terciles of the level of institutional ownership. Taken together, these analyses provide support to our hypothesis, suggesting that the relation between SUV and future corporate investment is concentrated among firms with lower levels of investor recognition.

4 Additional analyses

4.1 Measurement error in Tobin's Q

Prior literature raises the concern that the use of Tobin's Q, which measures the average q, as a proxy for marginal q may introduce measurement error and bias to our coefficient estimators (Erickson and Whited, 2000). Erickson et al. (2014) introduce the higher-order cumulants estimator as a method for overcoming this measurement error. We adopt this methodology and re-estimate Equation (5) to ensure that our inferences are not an artifact of measurement error. Table 18 presents the results of this estimation approach, in which all variables have undergone a within transformation by firm and by year. Following Erickson et al. (2017) we present results using both four and five cumulants.[25] As shown in Table 18, the coefficient on SUV is positive and significant using either cumulant order. This table provides reassurance that our results are not driven by measurement error in q.

4.2 Additional controls

In Equation (5) we employ parsimony in the inclusion of control variables. To examine whether this parsimony inadvertently causes us to omit a correlated explanatory variable, we re-estimate this Equation with several additional control variables: leverage, GDP growth, momentum, stock returns during days [-11,-7] relative to the earnings announcement date, discretionary accruals, change in liquidity, and an alternative measure of Q.

[25] In untabulated analyses we confirm that our findings are robust to the choice of cumulant order.

We include leverage ($\text{LEV}_{i,t}$), defined as the book value of total debt outstanding divided by sum of book values of debt and equity, as a control given the substantial literature discussing the sensitivity of investment to firm's financing choices and constraints (Fazzari et al., 1988). Recent work by Julio and Yook (2012) reveals a positive association between the change in a firm's home country gross domestic product (GDP) and contemporaneous firm-level investment. Our sample is limited to U.S. firms, so we control for this effect by adding a variable that captures the change in U.S. GDP during year $t+1$ (Δ $\text{GDP}_{i,t+1}$). Contemporaneous research also suggests that momentum may have an effect on real firm activities (Van Binsbergen and Opp, 2018). To the extent that unexpected increases in a stock's trading volume are driven by momentum, this could serve as an alternative explanation for the findings in Table 2. We explore this possibility by including momentum ($\text{MOM}_{i,t}$) as an additional control. We include the stock return during days [-11, -7] relative to the earnings announcement date ($\text{RET}_{i,t}$) as a control for potential information being released over the SUV measurement period. The addition of $\text{RET}_{i,t}$ as a control helps us alleviate the concern that information released during days [-11, -7] drives both the observed increase in volume and the subsequent increase in firm investment. We include discretionary accruals ($\text{ACC}_{i,t}$) measured as outlined in Polk and Sapienza (2009), as a proxy for mispricing. Given the recent literature discussing the sensitivity of investment to equity mispricing (Polk and Sapienza, 2009), controlling for mispricing allows us to attribute any relation between SUV and corporate investment to capital market conditions that are orthogonal to mispricing. To examine the possibility that the effect of abnormal trading volume on investment is driven by improvements in stock market liquidity, we include a measure of changes in stock liquidity as an additional control. We measure a stock's liquidity using the FHT impact percent-cost proxy, which Fong et al. (2017) find to be the best representation of the transaction cost required to execute a small trade. [26]. Finally, since Peters and Taylor (2017) find that intangible capital is an important determinant of investment opportunities, we include a measure of Q, Q^{tot}, as an alternative proxy for Tobin's Q that considers a firm's intangible capital.

The results of re-estimating Equation (5) with these additional controls are presented in Table 19. We standardize all variables to have a mean of zero and a standard deviation of one. Consistent with prior literature, we observe a significantly negative relation between leverage and investment, and significantly positive relations between momentum, stock returns, Q^{tot} and corporate investment. Moreover, we do not find that any of these associations subsume the relation between SUV and future investment. The coefficient estimate on SUV remains statistically and economically significant regardless of the inclusion of one or all of these additional control variables. For example, columns (3), (4), (7), and (8) indicate positive relations between MOM, RET, Q^{tot} and future

[26] In untabulated analyses, we confirm that our inferences are unchanged if we use the Amihud (2002) illiquidity ratio or the Corwin and Schultz (2012) bid-ask spread estimator as an alternative measure of liquidity. However, we note that Fong et al. (2017) conclude that FHT is a superior measure of liquidity and thus document the results with the FHT measure.

investment but also reveal that the coefficient on SUV maintains its significance as well. Moreover, the magnitude of the relation between SUV and investment is more than twice as large as that of RET and is similar to that of Q^{tot}. In particular, we observe that Q^{tot} is positively related to investment, but including it as an alternative to Tobin's Q does not change the positive association between SUV and investment.

4.3 Alternative measures of unexpected trading volume

To assess the sensitivity of our analyses to research design choices in our estimation of SUV, we explore several alternate estimation methods of unexpected volume. First, we estimate two alternate versions of standardized unexpected volume in which we modify the estimation of expected volume in Equation (1). Upon initial assessment it may appear that SUV is sensitive to the measurement of expected volume; by perturbing this expectation we find that our results are not a function of a single expectation model. Second, we adopt an alternative process for identifying abnormal trading volume following Gervais et al. (2001) and Akbas (2016), and explore the sensitivity of our results to this alternative estimation process.

Our first two alternative SUV measures are generated by modifying Equation (1) in the process of estimating Equations (1) to (4) (recall, Equation (1) presents the model of expected volume). In our first alternative SUV measure, SUV_LAR, we add to Equation (1) a control for total lagged absolute return ($|Ret_{i,k,t-1}|$), and estimate the modified equation below:

$$\log Vol_{i,k,t} = \alpha_{i,t,0} + \alpha_{i,t,1}|Ret_{i,k,t}|^{+} + \alpha_{i,t,2}|Ret_{i,k,t}|^{-} + \alpha_{i,t,3}|Ret_{i,k,t-1}| + \epsilon_{i,k,t}$$

This additional explanatory variable allows us to form an expectation of future volume that takes into account the possibility of trading volume on day t being correlated with day $t-1$ returns. This may occur if there is drift in volume that is similar to the well-documented drift in prices following information events (Beaver, 1968; Ng et al., 2008).

We define a second alternative SUV measure, SUV_MV, by adapting our estimate of expected volume to include an additional control for the mean trading volume across all firms in our sample on the given trading day ($\overline{Vol}_{k,t}$). We estimate the following modified version of Equation (1):

$$\log Vol_{i,k,t} = \alpha_{i,t,0} + \alpha_{i,t,1}|Ret_{i,k,t}|^{+} + \alpha_{i,t,2}|Ret_{i,k,t}|^{-} + \alpha_{i,t,3}\log \overline{Vol}_{k,t} + \epsilon_{i,k,t}$$

This allows our estimate of expected trading volume to incorporate market-wide trends in volume. Using this modified expectation, the resulting measures of abnormal trading volume are not sensitive to market-wide effects.

Table 20 presents the results of estimating Equation (5) using our SUV measure as a benchmark and then introducing two alternate measures: SUV_LAR and SUV_MV. These two measures differ from the SUV measure in the determination of the baseline expectation of volume, from which the unexpected portion of volume is assessed. The untabulated descriptive statistics on these modified versions of SUV, reveal that while SUV and SUV_LAR have somewhat similar distributions, the distribution of SUV_MV is markedly different. To facilitate more direct comparison, we standardize each of these variables, along with all controls, to have a mean of zero and a standard deviation of one. The significantly positive coefficients on SUV_LAR and SUV_MV presented in Table 20 confirm that our primary inferences are not sensitive to modifications to our estimation of expected volume.

Despite the robustness of our inferences to these alternate measurement techniques, concerns may persist regarding our use of Equations (1) to (4) as a means of estimating abnormal trading volume. We address these concerns even further by adopting an alternative methodology for estimating abnormal trading volume. Following Akbas (2016) and Gervais et al. (2001), we use indicator variables (D_HIGH and D_LOW) to classify a firm-year observation as having high (low) volume if the average daily turnover over days [-11, -7] prior to the earnings announcement is in the top (bottom) 10% of the distribution of weekly turnover observations, for that particular stock, over prior 10 weeks (i.e., days [-61, -12] relative to the earnings announcement). The intention of this method is to use each firm's recent trading volume as its own benchmark.

We re-estimate Equation (5) using D_HIGH and D_LOW in place of SUV as alternative measures of abnormal trading volume. In untabulated analyses we find that the coefficient estimate on D_HIGH is positive and significant at the 5% level and indicates that in years after D_HIGH equals 1, investment increases by approximately 1.8%. In contrast, the coefficient on D_LOW is not significantly different from zero. We further find that the difference between the coefficients on D_HIGH and D_LOW is significant at the 5% level of test. These results are consistent with our inferences and provide further support to our hypothesis that corporate investment increases after firms experience unusually high volume.

4.4 Alternative sample constructions

Throughout our analyses we employ a sample that begins in 1986, because this is the first year in which firms were required to disclose their cash flows from operating, investing, and financing activities in accordance with Statement of Financial Accounting Standards (SFAS) No. 95. Some studies that explore the cash flow-investment relation begin their samples in 1974, but then are forced to use an estimate of cash flows from operations because actual cash flows are not observable. However, Hribar and Collins (2002) demonstrate that the estimation of cash flows from operations, rather than direct measurement from the statement of cash flows, introduces a measurement error that leads to spurious inferences. Moreover, those studies were not able to expolore the role of cash flows from financing activities in shaping corporate investment decisions. Starting the sample in 1986, the first year for which data on actual cash flows are available, allows us to avoid this measurement error problem, while still including cash flows as a control in our analysis, and conduct analyses that involve cash flows from financing activities.

Nevertheless, to provide consistency with prior work, we re-estimate two versions of Equation (5) using an expanded sample starting in 1974. To accomplish this, we employ an estimate of cash flows from operations (defined as net income plus depreciation expense) rather than actual cash flows. The results of this estimation appear in Table 21, Panel A. They reveal that there is a robust positive association between shocks to trading volume and subsequent investment when using this expanded sample and an estimated version of cash flows from operations. These findings indicate that our inferences are not sensitive to the inclusion of observations from earlier years and using an alternative measure of cash flows.

To further offer consistency between prior work and our analyses, we also examine the sensitivity of our inferences to the exclusion of utilities firms from our sample. We initially retain utilities firms in order to construct the most comprehensive sample possible. Moreover, our hypothesis and measurement of key variables apply equally to regulated firms, reducing any concern about including utilities in our sample. Nonetheless, we re-estimate two versions of Equation (5) using a sample that excludes all firms with SIC codes in the range [4900, 4999]. The results of this re-estimation appear in Table 21, Panel B. They reveal that there is a robust positive association between shocks to trading volume and subsequent investment when excluding regulated firms from our sample. These findings indicate that our main results and inferences are unaffected by our inclusion of utilities firms.

4.5 Alternative measurement windows

One potential concern is that our results are reliant on the particular window of time over which we measure SUV or length of the window. To ensure that this is not the case, we measure SUV during one and over two weeks before the earnings announcement and find that our results persist when measuring SUV over these alternate windows. Specifically, we define two new measures, $\text{SUV}^{(-6,-2)}$ and $\text{SUV}^{(-11,-2)}$ to measure unexpected volume one and over two weeks before the annual earnings announcement date of firm i in year t. The measures are calculated by estimating Equation (1) and then re-estimating Equations (2) through (4) using days [-6, -2] and days [-11, -2] relative to the earnings announcement date. This leads to the following modifications of Equation (4):

$$SUV_{i,t}^{(-6,-2)} = \frac{\sum_{k=-6}^{-2} UV_{i,k,t}}{\sigma_\epsilon \sqrt{5}},$$
$$SUV_{i,t}^{(-11,-2)} = \frac{\sum_{k=-11}^{-2} UV_{i,k,t}}{\sigma_\epsilon \sqrt{10}},$$

where σ_ϵ is the standard deviation of residuals from Equation (1). As shown in Table 22, the coefficients on $\text{SUV}^{(-6,-2)}$ and $\text{SUV}^{(-11,-2)}$ are both significantly positive and of similar magnitude to that of our base SUV measure. The results presented in Table 22 confirm that the findings presented in earlier tables are not an artifact of the specific window or length of the window during which SUV is measured.

5 Conclusion

Our study provides evidence of real effects related to the *high-volume return premium*. The leading hypothesis to explain the *high-volume return premium* relies on Merton's (1987) investor recognition hypothesis. The argument, first postulated in Gervais et al. (2001), has two parts. First is the fairly well-accepted view that abnormally high trading volume is associated with an increase in a firm's visibility (Barber and Odean, 2008). The next step in the argument invokes the investor recognition hypothesis to conclude that an increase in visibility will be associated with a decline in the firm's cost of capital, thus rationalizing the short-run stock price appreciation. However, the literature has been silent on the impact that such a change in cost of capital might have on real corporate activities. We fill this void in the literature by examining how firms' investment activities change in response to shocks to trading volume.

Consistent with the prediction of the investor recognition argument, we find that unexpected increases in trading volume are positively associated with corporate investment activity in the subsequent year. High trading volume leads both capital expenditures and net cash flows from financing activities, which stem from a company either raising additional capital or making fewer distributions of existing capital. In periods of turmoil, such as the financial crisis, the investor recognition channel on which our hypothesis is based likely plays a secondary role in enhancing corporate investment activity. Indeed, we find that the association we uncover between extreme volume and increase in investment is absent during the 2007-2009 financial crisis and stems exclusively from non-financial-crisis periods.

Focusing on key sources of cash inflows, we find increased long-term debt issuances and equity based financing activity following shocks to a firm's trading volume. Further supporting our inference that this increased financing activity stems from a reduced cost of capital, we also document a reduction in stock betas for firms experiencing shocks to trading volume. In addition, we show that the association between abnormal volume and subsequent investment is concentrated among firms with high financial constraints and firms with lower levels of institutional ownership.

We conduct several supplemental analyses to bolster our inference that volume-investment relation is driven by increased firm visibility and to rule out alternative interpretations. First, we demonstrate that unexpected volume is an important driver of the previously documented contemporaneous relation between investor recognition and investment. Second, we find that firms experience higher Google search volume in the week after a trading volume shock, consistent with increased visibility. Third, we document that our findings are not subsumed by macroeconomic news, investment-related news revealed in firms' 8-K forms, other corporate announcements, or information revealed by the earnings announcement two weeks later. Fourth, we provide evidence that mutual fund flows that are exogenous to firm fundamentals and are associated with abnormal trading volume are associated with increased corporate investment. Finally, we find that the positive relation between unexpected trading volume and subsequent investment is stronger among firms with lower levels of investor recognition. While our analyses cannot rule out all possible alternative interpretations of the volume-investment relation, we offer a mosaic of evidence that portray a cohesive picture consistent with the investor recognition channel.

Prior work on the link between financial markets and real activity has centered almost exclusively on stock prices as a leading indicator, focusing on the role of mispricing in impacting firm real decisions. Our evidence highlights that trading volume dynamics are associated with subsequent corporate decisions in a manner consistent with Merton's (1987) investment recognition hypothesis. A natural next step would be to analyze what additional insights on real corporate activity one can obtain when using price and volume dynamics jointly as leading indicators. This is left for future research.

Figure 1. Timeline of sample construction

This figure provides a graphical depiction of the timeline of our sample construction. For each firm i, we define the year t earnings announcement date ($\text{EA}_{i,t}$) as day 0. Relative to that date, we measure expected volume ($\text{E[Vol]}_{i,t}$) over days -61 to -12. We measure unexpected volume, $\text{SUV}_{i,t}$, over days -11 to -7. Our primary dependent variables are year $t+1$ annual investment ($\text{INV}_{i,t+1}$) and cumulative investment over quarters 2, 3, and 4 ($\sum_{i=2}^{4}\text{INV}_{t+i}^{Q}$). Via this process, we generate a sample of 31,664 firm-year observations.

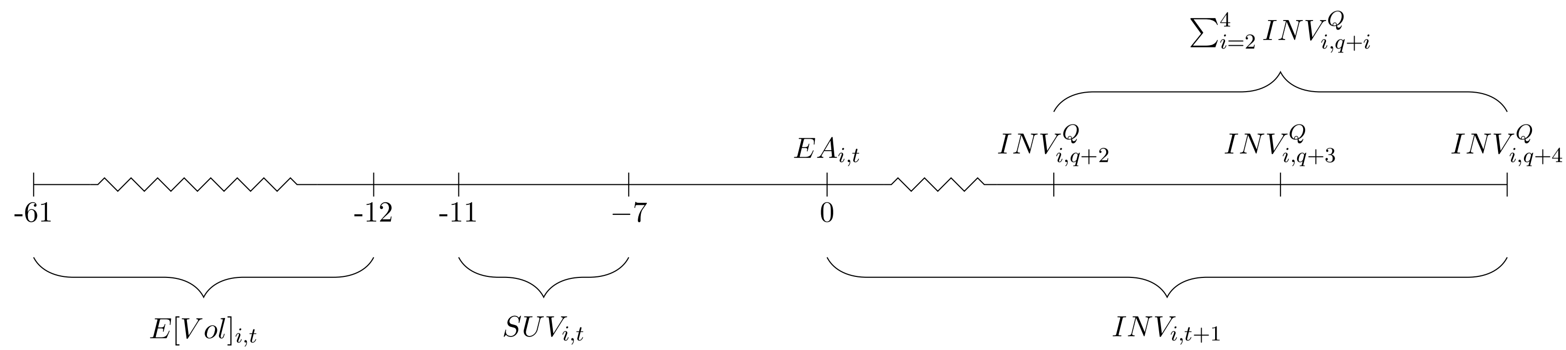

Table 1. Sample description
This table presents a description of our sample. Panel A provides univariate descriptive statistics for the main variables in our analysis. Panel B presents a correlation matrix in which Pearson (Spearman) correlations are reported above (below) the diagonal. All variable definitions appear in the appendix.

(A) Descriptive statistics

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
SUV_t	31,710	0.019	1.570	−0.999	0.003	1.002
INV_{t+1}	31,710	0.071	0.074	0.028	0.051	0.088
$\sum_{i=2}^{4}\text{INV}_{t+i}^{Q}$	29,858	0.055	0.061	0.021	0.039	0.068
Q_t	31,710	1.842	1.439	1.107	1.438	2.065
CFO_{t+1}	31,710	0.111	0.096	0.063	0.104	0.156
SALE_{t+1}	31,710	1.241	0.859	0.652	1.072	1.579
CFF_{t+1}	31,709	0.006	0.196	−0.058	−0.017	0.025

(B) Correlation matrix

	SUV_t	INV_{t+1}	Q_t	CFO_{t+1}	SALE_{t+1}	CFF_{t+1}
SUV_t		0.033	0.038	0.03	-0.016	0.032
INV_{t+1}	0.037		0.082	0.32	0.037	0.203
Q_t	0.049	0.079		0.295	0.073	0.1
CFO_{t+1}	0.032	0.318	0.422		0.147	-0.185
SALE_{t+1}	-0.019	0.125	0.162	0.218		0.022
CFF_{t+1}	0.018	0.219	-0.056	-0.271	-0.03	

Table 2. Regressions of investment on SUV

This table presents regression results from the estimation of Equation (5). In Panel A all variables appear in their originally estimated; in Panel B all variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

(A) Levels

	Dependent variable:	
	INV_{t+1}	$\sum_{i=2}^{4} INV_{t+i}^{Q}$
	(1)	(2)
SUV_t	0.00064***	0.00063***
	(0.00019)	(0.00017)
Q_t	0.00513***	0.00402***
	(0.00122)	(0.00089)
$SALE_{t+1}$	0.02082***	0.01627***
	(0.00320)	(0.00267)
CFO_{t+1}	0.09404***	0.08293***
	(0.01832)	(0.01523)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	31,710	29,858
Adjusted R^2	0.59362	0.55904
Note:	*p<0.1; **p<0.05; ***p<0.01	

(B) Standardized levels

	Dependent variable:	
	$INVz_{t+1}$	$\sum_{i=2}^{4} INVz_{t+i}^{Q}$
	(1)	(2)
$SUVz_t$	0.01354***	0.01627***
	(0.00409)	(0.00444)
Qz_t	0.09982***	0.09499***
	(0.02379)	(0.02107)
$SALEz_{t+1}$	0.24208***	0.22939***
	(0.03723)	(0.03765)
$CFOz_{t+1}$	0.12207***	0.13050***
	(0.02378)	(0.02397)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	31,710	29,858
Adjusted R^2	0.59362	0.55904
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 3. SUV-investment relation during the financial crisis

This table presents regression results from the estimation of a modified version of Equation (5) that allows the relation between SUV and future investment to vary during the 2007-09 financial crisis. In Panel A all variables appear in their originally estimated; in Panel B all variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

(A) Levels

	Dependent variable:	
	INV_{t+1}	$\sum_{i=2}^{4} INV^{Q}_{t+i}$
	(1)	(2)
SUV_t	0.00071***	0.00071***
	(0.00020)	(0.00018)
Q_t	0.00512***	0.00402***
	(0.00122)	(0.00089)
$SALE_{t+1}$	0.02081***	0.01627***
	(0.00320)	(0.00267)
CFO_{t+1}	0.09408***	0.08297***
	(0.01832)	(0.01523)
$SUV_t \times$ Crisis	−0.00065**	−0.00071**
	(0.00032)	(0.00030)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	31,710	29,858
Adjusted R^2	0.59363	0.55906
Note:	*p<0.1; **p<0.05; ***p<0.01	

(B) Standardized levels

	Dependent variable:	
	$INVz_{t+1}$	$\sum_{i=2}^{4} INVz^{Q}_{t+i}$
	(1)	(2)
$SUVz_t$	0.01504***	0.01834***
	(0.00426)	(0.00467)
Qz_t	0.09978***	0.09492***
	(0.02378)	(0.02104)
$SALEz_{t+1}$	0.24204***	0.22932***
	(0.03723)	(0.03763)
$CFOz_{t+1}$	0.12213***	0.13058***
	(0.02378)	(0.02397)
$SUVz_t \times$ Crisis	−0.01388**	−0.01828**
	(0.00672)	(0.00764)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	31,710	29,858
Adjusted R^2	0.59363	0.55906
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 4. Regressions of changes in investment on SUV

This table presents regression results from the estimation of Equation (6). In Panel A all variables appear as originally estimated; Δ denotes the change operator. In Panel B all variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

(A) Changes

	Dependent variable:
	ΔINV_{t+1}
SUV_t	0.00076***
	(0.00018)
ΔQ_t	0.00406***
	(0.00102)
$\Delta SALE_{t+1}$	0.03495***
	(0.00475)
ΔCFO_{t+1}	0.03554***
	(0.01023)
Firm FE	Yes
Year FE	Yes
Crisis interaction	Yes
Observations	30,788
Adjusted R^2	0.02307
Note:	*p<0.1; **p<0.05; ***p<0.01

(B) Standardized changes

	Dependent variable:
	$\Delta INVz_{t+1}$
$SUVz_t$	0.02145***
	(0.00497)
ΔQz_t	0.04625***
	(0.01166)
$\Delta SALEz_{t+1}$	0.20728***
	(0.02815)
$\Delta CFOz_{t+1}$	0.05437***
	(0.01565)
Firm FE	Yes
Year FE	Yes
Crisis interaction	Yes
Observations	30,788
Adjusted R^2	0.02307
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 5. Regressions of investment on quintiles of SUV

Panels A and B present regression results from the estimation of Equations (5) and (6), respectively, using quintiles of SUV. Two-way firm and year cluster robust standard errors are in parentheses. SUV_Qx$_{i,t}$ is an indicator variable equalling 1 if the SUV observation for firm i is in the x-th quintile when ranked within year t, and zero otherwise. All other variables are standardized to have a mean of zero and a standard deviation of one and are defined in the appendix.

(A) Standardized levels

	Dependent variable:
	INV_{t+1}
SUV_$Q2_t$	0.00715
	(0.01300)
SUV_$Q3_t$	0.02253*
	(0.01161)
SUV_$Q4_t$	0.01142
	(0.01055)
SUV_$Q5_t$	0.04961***
	(0.01562)
Qz_t	0.09972***
	(0.02383)
SALEz_{t+1}	0.24185***
	(0.03721)
CFOz_{t+1}	0.12210***
	(0.02381)
Firm FE	Yes
Year FE	Yes
Crisis interaction	Yes
Observations	31,709
Adjusted R^2	0.59363
Note:	*p<0.1; **p<0.05; ***p<0.01

(B) Standardized changes

	Dependent variable:
	ΔINV_{t+1}
SUV_$Q2_t$	0.01412
	(0.02134)
SUV_$Q3_t$	0.00590
	(0.02163)
SUV_$Q4_t$	0.02494
	(0.01792)
SUV_$Q5_t$	0.07122***
	(0.01653)
ΔQz_t	0.04636***
	(0.01169)
ΔSALEz_{t+1}	0.20708***
	(0.02815)
ΔCFOz_{t+1}	0.05444***
	(0.01568)
Firm FE	Yes
Year FE	Yes
Crisis interaction	Yes
Observations	30,787
Adjusted R^2	0.02311
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 6. Regressions of net financing cash flows on SUV

This table presents regression results from a regression of future financing cash flows on abnormal trading volume. In Panel A, the dependent variable is the level of future financing cash flows (CFF_{t+1}). In Panel B the dependent variable is the change in financing cash flows during year $t+1$ (Δ CFF_{t+1}). Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix and are standardized to have a mean of zero and a standard deviation of one.

(A) Standardized levels

	Dependent variable:	
	CFFz_{t+1}	$\sum_{i=2}^{4}\mathrm{CFFz}^{Q}_{t+i}$
	(1)	(2)
SUVz_t	0.02940***	0.02626**
	(0.01007)	(0.01038)
Qz_t	0.13710***	0.09017***
	(0.01669)	(0.01389)
SALEz_{t+1}	0.47450***	0.36739***
	(0.07539)	(0.06498)
CFOz_{t+1}	−0.21029***	−0.18495***
	(0.02803)	(0.02892)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Crisis interaction	Yes	Yes
Observations	31,709	29,296
Adjusted R^2	0.21312	0.18086
Note:	*p<0.1; **p<0.05; ***p<0.01	

(B) Standardized changes

	Dependent variable:	
	$\Delta\mathrm{CFFz}_{t+1}$	$\Delta\sum_{i=2}^{4}\mathrm{CFFz}^{Q}_{t+i}$
	(1)	(2)
SUVz_t	0.02382**	0.02571**
	(0.01044)	(0.01087)
$\Delta\mathrm{Qz}_t$	0.14815***	0.04731***
	(0.03264)	(0.01522)
$\Delta\mathrm{SALEz}_{t+1}$	0.34028***	0.23902***
	(0.04818)	(0.04189)
$\Delta\mathrm{CFOz}_{t+1}$	−0.10872***	−0.09920**
	(0.02918)	(0.04129)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Crisis interaction	Yes	Yes
Observations	30,787	27,214
Adjusted R^2	0.12507	0.05745
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 7. Regressions of annual financing cash inflows on SUV

This table presents regression results from the estimation of Equation (5) using measures of financing cash inflows as the dependent variable. $\text{CFFIN}_{i,t}$ measures the total amount of cash inflow related to financing activities for firm i in year t. $\text{CFFIN\_LTDEBT}_{i,t}$, $\text{CFFIN\_STDEBT}_{i,t}$, and $\text{CFFIN\_STOCK}_{i,t}$ are components of $\text{CFFIN}_{i,t}$ that measure the portion of total financing cash inflows for firm i in year t related specifically to long-term debt issuance, short term debt issuance, or other equity-based financing activities, respectively. All variable definitions appear in the appendix and are standardized to have a mean of zero and a standard deviation of 1. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable:			
	CFFINz_{t+1}	$\text{CFFIN\_LTDEBTz}_{t+1}$	$\text{CFFIN\_STDEBTz}_{t+1}$	$\text{CFFIN\_STOCKz}_{t+1}$
	(1)	(2)	(3)	(4)
SUVz_t	0.01830^{***}	0.01678^{***}	-0.00586	0.03196^{***}
	(0.00627)	(0.00633)	(0.01217)	(0.01040)
Qz_t	0.09032^{***}	0.00648	0.04308^{*}	0.22548^{**}
	(0.01545)	(0.00712)	(0.02461)	(0.08753)
SALEz_{t+1}	0.35021^{***}	0.25682^{***}	0.17789^{***}	0.20121^{***}
	(0.07503)	(0.05946)	(0.05168)	(0.06487)
CFOz_{t+1}	-0.08929^{***}	-0.03247^{**}	-0.16043^{***}	-0.07163
	(0.01778)	(0.01504)	(0.03163)	(0.04941)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	29,199	30,550	17,855	16,331
Adjusted R^2	0.33911	0.35048	0.04233	0.21209

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 8. Changes in stock return betas

This table presents results from estimating a joint market model for 29 investment portfolios formed for top and bottom quintiles of SUV. Following the methodology outlined by Gervais et al. (2001), we use seemingly unrelated regression (SURE) model in which the first equation models portfolio returns, from a period prior to the shock to trading volume, as a function of returns on a value-weighted index, and the second equation includes returns, from a period after the shock to trading volume, as a function of returns on a value-weighted index. The model is estimated separately for firms in top and bottom quintiles of SUV and for two different test periods: 12 months and 9 months. p-val indicates the p-values for testing the null hypothesis that the difference in betas is 0 against the alternative that the difference is different from 0.

(A) Twelve-month horizon

Return horizon	Top 20%	Bottom 20%
[-12, -1]	1.2255	1.022
[+1, +12]	0.994	0.9937
diff	0.2315	0.0283
p-val	0.017	0.76

(B) Nine-month horizon

Return horizon	Top 20%	Bottom 20%
[-12, -4]	1.1486	0.9665
[+4, +12]	0.9648	1.007
diff	0.1838	-0.0405
p-val	0.024	0.65

Table 9. Regressions of investment on SUV by financial constraint level

This table presents regression results from the estimation of Equation (5) on tercile subsamples partitioned by financial constraint indices. In Panel A we use the Kaplan and Zingales (1997) index as a measure of financial constraints. In Panel B we use the Hadlock and Pierce (2010) index as a measure of financial constraints. $INVz_{t+1}$, $SUVz_t$, Qz_t, $SALEz_{t+1}$, and $CFOz_{t+1}$ are standardized to have a mean of zero and a standard deviation of one. KZ_t and HP_t are tercile ranks that vary from 1 to 3. All variable definitions appear in the appendix.

(A) KZ index

	Dependent variable: $INVz_{t+1}$			
		KZ tercile		
	Full	Low	Med	High
	(1)	(2)	(3)	(4)
$SUVz_t$	−0.00576	0.00895*	0.01455	0.01909***
	(0.00887)	(0.00466)	(0.00922)	(0.00739)
Qz_t	0.10239***	0.04077***	0.18001***	0.42444***
	(0.02395)	(0.01186)	(0.03324)	(0.09595)
$SALEz_{t+1}$	0.24265***	0.23657***	0.22813***	0.26037***
	(0.03710)	(0.03755)	(0.07658)	(0.05487)
$CFOz_{t+1}$	0.11751***	0.04807**	0.08407***	0.26834***
	(0.02055)	(0.02387)	(0.02225)	(0.06536)
KZt	−0.01519			
	(0.01615)			
KZt × $SUVz_t$	0.01050**			
	(0.00415)			
Firm and Year FE	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	31,483	10,504	10,486	10,493
Adjusted R^2	0.59402	0.59774	0.59340	0.61585

Note: *p<0.1; **p<0.05; ***p<0.01

Table 9. Regressions of investment on SUV by financial constraint level. All variable definitions appear in the appendix.

(B) HP index

	Dependent variable: $INVz_{t+1}$			
		HP tercile		
	Full	Low	Med	High
	(1)	(2)	(3)	(4)
$SUVz_t$	-0.00019	0.00824	0.01875**	0.01621**
	(0.00776)	(0.00524)	(0.00762)	(0.00796)
Qz_t	0.09797***	0.20273***	0.05458	0.11935***
	(0.02366)	(0.03891)	(0.03677)	(0.03145)
$SALEz_{t+1}$	0.23176***	0.23667***	0.29052***	0.20825***
	(0.03627)	(0.03479)	(0.04543)	(0.07657)
$CFOz_{t+1}$	0.12349***	0.13117***	0.14816***	0.07882***
	(0.02375)	(0.02220)	(0.04234)	(0.02649)
HPt	0.13592***			
	(0.02906)			
HPt × $SUVz_t$	0.00778**			
	(0.00362)			
Firm and Year FE	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	31,709	10,578	10,567	10,564
Adjusted R^2	0.59509	0.63022	0.62377	0.63379

Note: *p<0.1; **p<0.05; ***p<0.01

Table 10. Regressions of investment on SUV with controls for news arrival
This table presents regression results from the estimation of a modified version of Equation (5) including a control for the number of news articles released during the SUV measurement period. In Panel A the dependent variables are levels of investment in year $t+1$ or quarters $t+2$ to $t+4$; in Panel B the dependent variables are changes in investment during year $t+1$ or quarters $t+2$ to $t+4$. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

(A) Standardized level

	Dependent variable:	
	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}_{t+i}^{Q}$
	(1)	(2)
SUVz_t	0.01160**	0.01348***
	(0.00505)	(0.00498)
Qz_t	0.15428***	0.14463***
	(0.02892)	(0.03036)
SALEz_{t+1}	0.19469***	0.20731***
	(0.03801)	(0.04271)
CFOz_{t+1}	0.10496***	0.10980***
	(0.02988)	(0.03004)
NEWSCOUNTz_t	0.00035	−0.00208
	(0.00898)	(0.00938)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Crisis interaction	Yes	Yes
Observations	10,735	10,658
Adjusted R^2	0.71133	0.68051
Note:	*p<0.1; **p<0.05; ***p<0.01	

(B) Standardized change

	Dependent variable:	
	ΔINVz_{t+1}	$\Delta\sum_{i=2}^{4}\text{INVz}_{t+i}^{Q}$
	(1)	(2)
SUVz_t	0.01708**	0.02267**
	(0.00762)	(0.00926)
ΔQz_t	0.05629**	0.04481*
	(0.02725)	(0.02517)
ΔSALEz_{t+1}	0.17753***	0.11116***
	(0.02085)	(0.01330)
ΔCFOz_{t+1}	0.07172***	0.04108*
	(0.02513)	(0.02096)
NEWSCOUNTz_t	−0.00946	−0.00703
	(0.01374)	(0.01597)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Crisis interaction	Yes	Yes
Observations	10,735	10,505
Adjusted R^2	0.06239	0.04183
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 11. Regressions of annual investment on SUV: excluding news arrival during days -7 to -11

This table presents regression results from the estimation of Equation (5) on a subsample of observations where firms do not make disclosures and/or no macroeconomic news arrives during the SUV measurement period. In columns (1) and (2) we exclude all firm-years where the measurement of SUV coincides with the corporate disclosure of dividends, M&A, management forecasts, stock repurchases, and seasoned equity offerings. In columns (3) and (4) we exclude all firm-years where the measurement of SUV coincides with the filing of an 8-K containing investment or financing discussion, following the methodology outlined by Bodnaruk et al. (2015) and Hoberg and Maksimovic (2015). In columns (5) and (6) we exclude all firm-years where the measurement of SUV coincides with the arrival of macroeconomic news, following the methodology outlined by Savor and Wilson (2014). In columns (7) and (8) we exclude all firm-years where the measurement of SUV coincides with any of these events. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

Sample:	Excluding corporate news		Excluding inv/fin news		Excluding macro news		Excluding all news	
Dependent variable:	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SUVz_t	0.01488***	0.01809***	0.01519***	0.01835***	0.01463***	0.01683***	0.01327***	0.01506***
	(0.00413)	(0.00459)	(0.00427)	(0.00464)	(0.00426)	(0.00472)	(0.00478)	(0.00530)
Qz_t	0.10560***	0.09752***	0.09983***	0.09505***	0.09189***	0.08687***	0.09956***	0.09188***
	(0.02619)	(0.02338)	(0.02252)	(0.01985)	(0.02698)	(0.02495)	(0.02989)	(0.02706)
SALEz_{t+1}	0.24649***	0.23170***	0.24178***	0.22778***	0.27621***	0.26271***	0.28055***	0.26578***
	(0.03817)	(0.03805)	(0.03629)	(0.03639)	(0.03269)	(0.03296)	(0.03400)	(0.03453)
CFOz_{t+1}	0.10496***	0.11325***	0.12122***	0.13007***	0.12217***	0.12829***	0.10321***	0.10859***
	(0.01410)	(0.01556)	(0.02271)	(0.02289)	(0.02262)	(0.02271)	(0.01500)	(0.01550)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,410	26,787	30,431	28,605	26,652	25,088	23,070	21,720
Adjusted R^2	0.59914	0.56551	0.59037	0.55593	0.60577	0.57375	0.60884	0.58094

Note: *p<0.1; **p<0.05; ***p<0.01

Table 12. Regressions of annual investment on SUV instrumented by MFFlow
This table presents regression results from a regression of future investment on abnormal trading volume instrumented using mutual fund flows that are exogenous to firm fundamentals. SUV_Fitted is the predicted value of SUV from a regression of SUV on MFFlow. MFFlow is a measure of mutual fund flows following the methodology outlined by Edmans et al. (2012). Definitions of other variables appear in the appendix. Two-way firm and year cluster robust standard errors are in parentheses. All the variables are standardized to have a mean of zero and a standard deviation of one.

	Dependent variable:			
	$INVz_{t+1}$	$\sum_{i=2}^{4} INVz^{Q}_{t+i}$	$INVz_{t+1}$	$\sum_{i=2}^{4} INVz^{Q}_{t+i}$
	(1)	(2)	(3)	(4)
$SUV\_Fittedz_t$	0.01394***	0.01640***	0.01416***	0.01669***
	(0.00512)	(0.00502)	(0.00511)	(0.00501)
SUV_t			0.01497***	0.01799***
			(0.00504)	(0.00547)
Qz_t	0.10344***	0.09930***	0.10307***	0.09883***
	(0.02529)	(0.02236)	(0.02517)	(0.02221)
$SALEz_{t+1}$	0.22925***	0.21911***	0.22871***	0.21843***
	(0.04002)	(0.04059)	(0.03997)	(0.04051)
$CFOz_t$	0.11935***	0.12587***	0.11929***	0.12579***
	(0.02513)	(0.02497)	(0.02513)	(0.02496)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	27,223	25,993	27,223	25,993
Adjusted R^2	0.61408	0.58108	0.61425	0.58134
Note:			$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$	

Table 13. Regressions of investment on SUV and EA period information

This table presents regression results from the estimation of Equation (5) with additional controls for earnings announcement period variables. $SUE_{i,t}$ measures the standardized unexpected earnings of firm i at time t based on a seasonal random walk. $EAAR_{i,t}$ measures the cumulative abnormal stock return for firm i across days [-1,+1] relative to the earnings announcement date. All other variable definitions appear in the appendix. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable:		
	$INVz_{t+1}$		
	(1)	(2)	(3)
$SUVz_t$	0.01430***	0.01501***	0.01430***
	(0.00413)	(0.00425)	(0.00412)
Qz_t	0.09940***	0.09995***	0.09937***
	(0.02347)	(0.02379)	(0.02344)
$SALEz_{t+1}$	0.23624***	0.24169***	0.23630***
	(0.03646)	(0.03732)	(0.03656)
$CFOz_{t+1}$	0.11979***	0.12195***	0.11982***
	(0.02381)	(0.02391)	(0.02392)
$SUEz_t$	0.02794***		0.02799***
	(0.00497)		(0.00493)
$EAARz_t$		0.00252	−0.00053
		(0.00459)	(0.00454)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes
Observations	31,710	31,710	31,710
Adjusted R^2	0.59437	0.59362	0.59436
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 14. Regressions of annual investment on past and contemporaneous changes in breadth
This table presents regression results from the estimation of Equation (10). P_DBREADTH and R_DBREADTH are the predicted and residual values, respectively, from the estimation of Equation (9). All other variable definitions appear in the appendix. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable:	
	$INVz_{t+1}$	
	(1)	(2)
$P\_DBREADTHz_{t+1}$	0.156**	0.146**
	(0.076)	(0.073)
$R\_DBREADTHz_{t+1}$	0.009	0.011
	(0.008)	(0.008)
$DBREADTHz_t$		0.031***
		(0.006)
Qz_t	0.096***	0.084***
	(0.024)	(0.024)
$CFOz_{t+1}$	0.127***	0.125***
	(0.027)	(0.027)
$SALEz_{t+1}$	0.211***	0.207***
	(0.042)	(0.041)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	25,258	25,258
Adjusted R^2	0.596	0.597
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 15. Regressions of Google search volume on SUV

This table presents regression results from the estimation of Equation (11). All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

	Dependent variable:			
	$GVol_{t+1}$			
	Full sample		Reduced sample	
	(1)	(2)	(3)	(4)
$SUVz_t$	0.03326***	0.03263**	0.06181**	0.05987**
	(0.01274)	(0.01296)	(0.03002)	(0.03003)
$BTMz_t$	0.00970***	0.00979***	0.00071	0.00092
	(0.00373)	(0.00373)	(0.01907)	(0.01907)
$LMVEz_t$	0.21382***	0.21185***	0.01782	0.01310
	(0.06734)	(0.06682)	(0.10766)	(0.10633)
$INSTOWNz_t$	−0.05640**	−0.05666**	−0.07397**	−0.07459**
	(0.02501)	(0.02493)	(0.03395)	(0.03305)
$RETz_t^{(-11,-7)}$	−0.00321	−0.00322	0.01839	0.01800
	(0.01150)	(0.01142)	(0.01626)	(0.01638)
$NEWSCOUNTz_t$		0.00704		0.01861
		(0.01517)		(0.04397)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	5,408	5,408	1,813	1,813
Adjusted R^2	0.54782	0.54774	0.53034	0.53008
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 16. Regressions of investment on SUV with indicators for index inclusion

This table presents regression results from the estimation of Equation (10). $\text{SP500}_{i,t}$ and $\text{SP1500}_{i,t}$ are indicators equalling 1 if firm i is in the S&P500 or S&P1500 indices, respectively, at time t. All other variable definitions appear in the appendix and are standardized to have a mean of zero and a standard deviation of 1. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable:			
	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$
	(1)	(2)	(3)	(4)
SUVz_t	0.01786***	0.02277***	0.03192***	0.03723***
	(0.00486)	(0.00572)	(0.00814)	(0.00934)
Qz_t	0.09967***	0.09472***	0.09998***	0.09521***
	(0.02375)	(0.02101)	(0.02394)	(0.02126)
SALEz_{t+1}	0.24014***	0.22572***	0.23864***	0.22518***
	(0.03692)	(0.03704)	(0.03696)	(0.03727)
CFOz_{t+1}	0.12240***	0.13113***	0.12273***	0.13127***
	(0.02377)	(0.02396)	(0.02380)	(0.02400)
SP500_t	−0.06261**	−0.10659***		
	(0.02940)	(0.02588)		
$\text{SP500}_t \times \text{SUVz}_t$	−0.01085	−0.01678**		
	(0.00761)	(0.00801)		
SP1500_t			−0.05646*	−0.06805**
			(0.03146)	(0.03072)
$\text{SP1500}_t \times \text{SUVz}_t$			−0.02912***	−0.03216***
			(0.00921)	(0.01026)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	31,710	29,858	31,710	29,858
Adjusted R^2	0.59376	0.55949	0.59401	0.55957
Note:			*p<0.1; **p<0.05; ***p<0.01	

Table 17. Regressions of investment on SUV by tercile of institutional ownership

This table presents regression results from the estimation of Equation (5) on terciles defined by level of institutional ownership. All variable definitions appear in the appendix. All variables are standardized to have a mean of zero and a standard deviation of 1. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable: $INVz_{t+1}$		
	Tercile of institutional ownership		
	Low	Med	High
	(1)	(2)	(3)
$SUVz_t$	0.01874***	0.02082**	0.00846
	(0.00696)	(0.00838)	(0.00683)
Qz_t	0.12655***	0.07292*	0.12003***
	(0.03841)	(0.03856)	(0.02429)
$SALEz_{t+1}$	0.23849***	0.23491***	0.23469***
	(0.03887)	(0.07074)	(0.04686)
$CFOz_{t+1}$	0.13670***	0.10832***	0.12510***
	(0.04914)	(0.02832)	(0.02533)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes
Observations	10,577	10,561	10,571
Adjusted R^2	0.57667	0.63497	0.64418

Note: *p<0.1; **p<0.05; ***p<0.01

Table 18. Regressions of investment on SUV with Erickson-Whited correction

This table presents regression results from the estimation of equation (5) using the Erickson et al. (2014) higher-order-cumulants estimation technique to address potential measurement error in marginal q. All variable definitions appear in the appendix. Two-way firm and year cluster robust standard errors are in parentheses.

	Dependent variable:	
	INV_{t+1}	
	(1)	(2)
$SUV_t^{(-11,-7)}$	0.000525**	0.000534***
	(0.000230)	(0.000202)
Q_t	0.0150*	0.0143***
	(0.00853)	(0.00447)
$SALE_{t+1}$	0.0215***	0.0217***
	(0.00325)	(0.00367)
CFO_{t+1}	0.0634**	0.0654***
	(0.0320)	(0.0226)
Observations	31711	31711
Cumulants	4	5

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 19. Regressions of annual investment on SUV and additional controls

This table presents regression results from the estimation of Equation (5) with additional controls. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

	Dependent variable:							
	$INVz_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$SUVz_t$	0.01545***	0.01502***	0.01432***	0.01503***	0.01483***	0.01464***	0.01648***	0.01472***
	(0.00433)	(0.00427)	(0.00417)	(0.00426)	(0.00425)	(0.00435)	(0.00430)	(0.00436)
Qz_t	0.09056***	0.09996***	0.08975***	0.09985***	0.09970***	0.09848***		
	(0.02183)	(0.02386)	(0.02328)	(0.02381)	(0.02400)	(0.02337)		
$SALEz_{t+1}$	0.22711***	0.24215***	0.23527***	0.24198***	0.24189***	0.24361***	0.26562***	0.23515***
	(0.03548)	(0.03727)	(0.03665)	(0.03721)	(0.03848)	(0.03737)	(0.04116)	(0.03895)
$CFOz_{t+1}$	0.11694***	0.12207***	0.12218***	0.12201***	0.12168***	0.12216***	0.13680***	0.12759***
	(0.02404)	(0.02378)	(0.02375)	(0.02378)	(0.02394)	(0.02380)	(0.02355)	(0.02395)
$LEVz_t$	−0.11720***							−0.12770***
	(0.01611)							(0.01701)
$\Delta GDPz_{t+1}$		−0.01399						−0.01562
		(0.01837)						(0.01941)
$MOMz_t$			0.02998***					0.04726***
			(0.00990)					(0.01008)
$RETz_t^{(-11,-7)}$				0.00497***				0.00477***
				(0.00066)				(0.00084)
$ACCz_t$					0.00848			0.00285
					(0.00581)			(0.00563)
$\Delta FHTz_t$						0.00308		0.00731
						(0.00578)		(0.00635)
$Q^{tot}z_t$							0.03273**	0.01948*
							(0.01460)	(0.01113)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31,710	31,710	31,710	31,710	30,710	24,713	31,591	23,911
Adjusted R^2	0.59728	0.59363	0.59431	0.59364	0.59785	0.60342	0.59520	0.61374

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 20. Regressions of investment on alternative measures of SUV

This table presents regression results from the estimation of Equation (5) with alternative measures of SUV. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

	Dependent variable:		
	$INVz_{t+1}$		
	(1)	(2)	(3)
$SUVz_t$	0.01504***		
	(0.00426)		
SUV_MVz_t		0.01657***	
		(0.00601)	
SUV_LARz_t			0.01349***
			(0.00415)
Qz_t	0.09978***	0.09898***	0.09991***
	(0.02378)	(0.02374)	(0.02376)
$SALEz_{t+1}$	0.24204***	0.24345***	0.24207***
	(0.03723)	(0.03740)	(0.03726)
$CFOz_{t+1}$	0.12213***	0.12196***	0.12213***
	(0.02378)	(0.02377)	(0.02378)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes
Observations	31,710	31,710	31,710
Adjusted R^2	0.59363	0.59360	0.59360
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 21. Regressions of investment on SUV using alternative sample constructions
This table presents regression results from the estimation of Equation (5) using alternative sample constructions. In Panel A the sample begins in 1974; in Panel B the sample excludes utilities firms (defined as firms with SIC codes in the range [4900, 4999]). All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

(A) Sample beginning in 1974

	Dependent variable:	
	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$
	(1)	(2)
SUVz_t	0.01154***	0.01406***
	(0.00339)	(0.00404)
Qz_t	0.11166***	0.10104***
	(0.02141)	(0.01758)
SALEz_{t+1}	0.22083***	0.23751***
	(0.02727)	(0.03178)
CFOEstz_{t+1}	0.10357***	0.09322***
	(0.02871)	(0.02733)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	39,085	32,356
Adjusted R^2	0.56507	0.53698
Note:	*p<0.1; **p<0.05; ***p<0.01	

(B) Sample excluding utilities

	Dependent variable:	
	INVz_{t+1}	$\sum_{i=2}^{4}\text{INVz}^{Q}_{t+i}$
	(1)	(2)
SUVz_t	0.01470***	0.01806***
	(0.00390)	(0.00424)
Qz_t	0.09599***	0.09485***
	(0.02149)	(0.02003)
SALEz_{t+1}	0.22519***	0.22692***
	(0.03392)	(0.03546)
CFOz_{t+1}	0.11917***	0.13021***
	(0.02305)	(0.02346)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	28,917	28,435
Adjusted R^2	0.60196	0.55948
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 22. Regressions of investment on standardized SUV in alternate windows
This table presents regression results from the estimation of equation (5) with measures of SUV estimated over alternative windows. All variables are standardized to have a mean of zero and a standard deviation of one. Two-way firm and year cluster robust standard errors are in parentheses. All variable definitions appear in the appendix.

	Dependent variable:		
	$INVz_{t+1}$		
	(1)	(2)	(3)
$SUVz_t$	0.01504***		
	(0.00426)		
$SUVz_t^{(-11,-2)}$		0.01521***	
		(0.00452)	
$SUVz_t^{(-6,-2)}$			0.01053**
			(0.00420)
Qz_t	0.09978***	0.09955***	0.09971***
	(0.02378)	(0.02374)	(0.02378)
$SALEz_{t+1}$	0.24204***	0.24207***	0.24247***
	(0.03723)	(0.03717)	(0.03720)
$CFOz_{t+1}$	0.12213***	0.12211***	0.12212***
	(0.02378)	(0.02379)	(0.02379)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes
Observations	31,710	31,710	31,710
Adjusted R^2	0.59363	0.59363	0.59354
Note:	*p<0.1; **p<0.05; ***p<0.01		

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A Variable definitions

Variable	Description
$AT_{i,t}$	Total assets for firm i at the end of year t
$ACC_{i,t}$	Total discretionary accruals for firm i in year t, measured as outlined in Polk and Sapienza (2009)
$CFO_{i,t}$	Total net cash flows from operations reported by firm i in year t , scaled by lagged total assets
$CFOEst_{i,t}$	Total estimated net cash flows from operations, measured as income before taxes plus depreciation expense, reported by firm i in year t , scaled by lagged total assets
$CFF_{i,t}$	Total net cash flows from financing activities reported by firm i in year t , scaled by lagged total assets
$CFFIN_{i,t}$	Total cash inflows from financing activities reported by firm i in year t , scaled by lagged total assets
$CFFIN\_LTDEBT_{i,t}$	Total financing cash inflows related to long term debt issuances reported by firm i in year t , scaled by lagged total assets
$CFFIN\_STDEBT_{i,t}$	Total financing cash inflows related to short term debt changes reported by firm i in year t , scaled by lagged total assets
$CFFIN\_STOCK_{i,t}$	Total financing cash inflows related to equity activities reported by firm i in year t , scaled by lagged total assets
$Crisis_t$	Indicator equalling 1 if year t is in the period 2007 to 2009, and zero otherwise
$DBREADTH_{i,t}$	Change in the number of 13F filers owning firm i's shares during year t divided by the number of 13F filers during year $t-1$
$EAAR_{i,t}$	Abnormal stock return for firm i during the 3 days centered on the firm's year t earnings announcement date
$\Delta FHT_{i,t}$	Change in the percent-cost price impact of trade for firm i over the month t following the methodology outlined by Fong et al. (2017)
ΔGDP_t	Change in U.S. GDP from year $t-1$ to quarter t
$GVol_{i,t}$	Rank of weekly Google search volume for firm i in week t relative to prior 20 weeks
$HPt_{i,t}$	Tercile rank of Hadlock and Pierce (2010) index for firm i in year t
$INSTOWN_{i,t}$	Percentage of firm i's shares outstanding held by institutions at the end of year t
$INV_{i,t}$	Level of capital expenditure made by firm i in year t, scaled by lagged total assets
$KZt_{i,t}$	Tercile rank of Kaplan and Zingales (1997) index for firm i in year t
$LEV_{i,t}$	Leverage reported by firm i at the end of year t, defined as the ratio of the book value of outstanding debt (the sum of Compustat variables $DLTT_{i,t}$ and $DLC_{i,t}$) to the book value of debt plus equity (the sum of Compustat variables $DLTT_{i,t}$, $DLC_{i,t}$, and $SEQ_{i,t}$)
$LMVE_{i,t}$	Logarithm of the market value of equity of firm i at the end of year t
$MOM_{i,t}$	Five-month cumulative stock return for firm i, ending two months prior to the period t end date
$NEWSCOUNT_{i,t}$	Logarithm of 1 + the number of news articles related to firm i in the RavenPack database over day -11 to day -7 relative to the year t earnings announcement
$P\_DBREADTH_{i,t}$	Predicted value from equation (9) using $DBREADTH_{i,t}$ as a dependent variable
$Q_{i,t}$	Tobin's Q measure for firm i at the end of year t, defined as the book value of total assets minus the book value of equity plus the market value of equity, scaled by the book value of total assets

$Q^{tot}_{i,t}$	Alternative Tobin's Q measure for firm i at the end of year t, defined following the methodology outlined in Peters and Taylor (2017)
R_DBREADTH$_{i,t}$	Residual from equation (9) using DBREADTH$_{i,t}$ as a dependent variable
$\text{RET}^{(-11,-7)}_{i,t}$	Cumulative stock return for firm i over days [-11,-7] relative to the year t earnings announcement date
SALE$_{i,t}$	Total revenues reported by firm i in year t , scaled by lagged total assets
SP500$_{i,t}$	Indicator equalling 1 if firm i is a member of the S&P 500 index in year t, and 0 otherwise
SP1500$_{i,t}$	Indicator equalling 1 if firm i is a member of the S&P 1500 index in year t, and 0 otherwise
SUE$_{i,t}$	Standardized unexpected earnings reported by firm i in year t
SUV$_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day -11 to day -7 relative to the year t earnings announcement
SUV_Q$k_{i,t}$	Indicator variable equalling 1 if $\text{SUV}^{(-11,-7)}_{i,t}$ is in quintile k, where k ranges from 1 to 5. Quintile ranks are formed separately by year.
$\text{SUV}^{(-11,-2)}_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day -11 to day -2 relative to year t earnings announcement
$\text{SUV}^{(-6,-2)}_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day -6 to day -2 relative to year t earnings announcement
SUV_MV$_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day -11 to day -7 relative to the year t earnings announcement. The expectation of volume comes from a modified version of Equation (1) that includes a control for the average market volume on each day t.
SUV_LAR$_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day -11 to day -7 relative to the year t earnings announcement. The expectation of volume comes from a modified version of Equation (1) that includes a control for the absolute return for firm i on day $t-1$.