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The Real Side of the High-Volume Return Premium

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Abstract. Prior literature demonstrates that 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 or 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. Because reductions in cost of capital should generally be associated with an increase in the net present value (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 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 reestimating 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 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 and investment 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 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 (2019) 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. The Online Appendix presents a variety of robustness analyses, such as incorporating additional controls and using alternative measures and measurement windows of abnormal trading volume. Section 4 concludes.

2. Data and Methodology

To test our hypotheses, we construct a comprehensive sample of firm-years from the intersection of Compustat and the Center for Research in Security Prices (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 No. 95 (Hribar and Collins 2002). Consistent with prior literature on corporate investment, we exclude financial firms (identified as those with Standard Industrial Classification 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]

Our central hypothesis posits that unexpected trading volume leads to reductions in cost of capital and increased investment. Prior theoretical work provides some foundation for the existence of trading volume in the absence of fundamental news. For instance, in the framework of noisy rational expectations, investors can trade for liquidity reasons that are unrelated to price-relevant news (Grossman and Stiglitz 1980, Israeli et al. 2017). Alternatively, Van Bommel (2003) develops a theoretical model in which traders spread rumors to generate abnormal trading activity and, consequently, move prices away from fundamentals. We abstract away from the underlying theoretical constructs that may lead to unexpected trading volume and instead 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 that 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 trade-off 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. Although, technically, the investment period begins with the start of the fiscal period, we expect that, typically, firms 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 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 five-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] The variable $|Ret_{i,k,t}|^{+}$ measures 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 zero otherwise. Similarly, $|Ret_{i,k,t}|^{-}$ is equal to the absolute value of firm i's stock return when the return is negative and zero 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 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:

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

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 -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:

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

Table 1. Sample Description

Panel A: Descriptive statistics

Statistic	N	Mean	Standard deviation	25th percentile	Median	75th percentile
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
$\sum_{i=2}^{4} INV_{t+i}^{Q}$	29,859	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

Panel 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	0.030	−0.016	0.032
INV_{t+1}	0.037		0.082	0.320	0.037	0.203
Q_t	0.049	0.079		0.295	0.073	0.100
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	−0.030	

Notes. 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.

In Equation (5), i indexes firms, and t indexes years. $INV_{i,t+1}$ 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 ($\Sigma_{i=2}^{4} INV_{t+i}^{Q}$). 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 $SUV_{i,t}$ and the two investment variables. Consistent with prior research on the investment–q relation, $Q_{i,t}$ 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 ($SALE_{i,t+1}$) and cash flows from operations ($CFO_{i,t+1}$) 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.

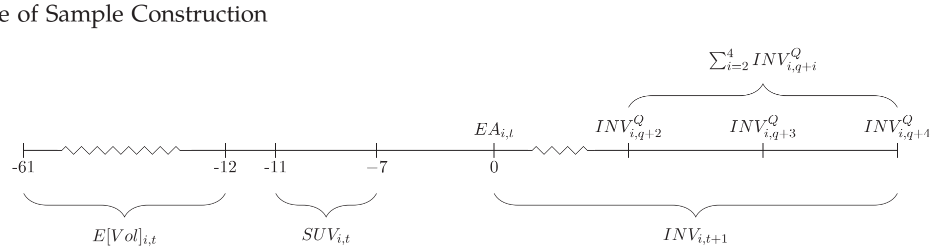
Panel A of Table 1 provides descriptive statistics for the variables used in our analyses. All variable definitions appear in the appendix. The panel reveals that the mean and the median of our measure of unexpected trading volume, SUV, are positive but close to zero. The average (median) firm in our 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 the 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 ($\Sigma_{i=2}^{4} INV_{t+i}^{Q}$). Results from estimating this modified regression, which appear in column (2), indicate that a one standard deviation increase in SUV is associated with a 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

Figure 1. Timeline of Sample Construction



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

Table 2. Regressions of Investment on *SUV*

Panel A: Levels		
	Dependent variable	
	INV_{t+1} (1)	$\Sigma_{i=2}^{4} INV_{t+i}^{Q}$ (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***	0.01623***
	(0.00320)	(0.00265)
CFO_{t+1}	0.09404***	0.08296***
	(0.01832)	(0.01523)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	31,710	29,859
Adjusted R^2	0.59362	0.55902

Panel B: Standardized levels		
	Dependent variable	
	$INVz_{t+1}$ (1)	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$ (2)
$SUVz_t$	0.01354***	0.01631***
	(0.00409)	(0.00443)
Qz_t	0.09982***	0.09499***
	(0.02379)	(0.02107)
$SALEz_{t+1}$	0.24208***	0.22879***
	(0.03723)	(0.03740)
$CFOz_{t+1}$	0.12207***	0.13055***
	(0.02378)	(0.02396)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	31,710	29,859
Adjusted R^2	0.59362	0.55902

Notes. This table presents regression results from the estimation of Equation (5). In panel A, all variables appear in their originally estimated form; 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.

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

evidence that 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 reestimate 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 data set 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 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), $\Delta INV_{i,t+1}$ denotes the change in firm *i*'s annual investment from year *t* to year $t+1$. Analogously, $\Delta SALE_{i,t+1}$ and $\Delta CFO_{i,t+1}$ indicate the changes

Table 3. *SUV*–Investment Relation During the Financial Crisis

Panel A: Levels

	Dependent variable	
	INV_{t+1} (1)	$\Sigma_{i=2}^{4} INV_{t+i}^{Q}$ (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***	0.01622***
	(0.00320)	(0.00265)
CFO_{t+1}	0.09408***	0.08300***
	(0.01832)	(0.01523)
$SUV_t \times Crisis$	−0.00065**	−0.00071**
	(0.00032)	(0.00030)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	31,710	29,859
Adjusted R^2	0.59363	0.55904

Panel B: Standardized levels

	Dependent variable	
	$INVz_{t+1}$ (1)	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$ (2)
$SUVz_t$	0.01504***	0.01838***
	(0.00426)	(0.00466)
Qz_t	0.09978***	0.09491***
	(0.02378)	(0.02104)
$SALEz_{t+1}$	0.24204***	0.22873***
	(0.03723)	(0.03739)
$CFOz_{t+1}$	0.12213***	0.13062***
	(0.02378)	(0.02396)
$SUVz_t \times Crisis$	−0.01388**	−0.01829**
	(0.00672)	(0.00764)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	31,710	29,859
Adjusted R^2	0.59363	0.55904

Notes. 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 2007–2009 financial crisis. In panel A, all variables appear in their originally estimated form; 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.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

in *SALE* and *CFO* for firm i from year t to year $t+1$, and $\Delta Q_{i,t}$ denotes the change in Q for firm i from year $t-1$ to year t. $Crisis_t$ is an indicator variable equaling 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 is 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 in which 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 a 12 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 with

Table 4. Regressions of Changes in Investment on *SUV*

Panel 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 fixed effects	Yes
Year fixed effects	Yes
Crisis interaction	Yes
Observations	30,788
Adjusted R^2	0.02307

Panel B: Standardized changes

	Dependent variable
	$\Delta INVz_{t+1}$
$SUVz_t$	0.02145***
	(0.00497)
ΔQz_t	0.04620***
	(0.01164)
$\Delta SALEz_{t+1}$	0.20727***
	(0.02815)
$\Delta CFOz_{t+1}$	0.05438***
	(0.01565)
Firm fixed effects	Yes
Year fixed effects	Yes
Crisis interaction	Yes
Observations	30,788
Adjusted R^2	0.02307

Notes. 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.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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 39% 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, although 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 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 (Caballero and Engel 1999, Ramey and Shapiro 2001, Bloom 2009). The partial irreversibility of investment suggests that unexpected increases in trading volume are associated with higher investment although unexpected decreases in volume might not similarly be associated with lower investment.

To more explicitly examine this asymmetry, we reestimate 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

Table 5. Regressions of Investment on Quintiles of *SUV*

Panel 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 fixed effects	Yes
Year fixed effects	Yes
Crisis indicator	Yes
Observations	31,709
Adjusted R^2	0.59363

Panel B: Standardized changes

	Dependent variable
	ΔINV_{t+1}
SUV_Q2_t	0.01414
	(0.02134)
SUV_Q3_t	0.00592
	(0.02163)
SUV_Q4_t	0.02495
	(0.01792)
SUV_Q5_t	0.07124***
	(0.01653)
ΔQz_t	0.04630***
	(0.01166)
$\Delta SALEz_{t+1}$	0.20708***
	(0.02815)
$\Delta CFOz_{t+1}$	0.05444***
	(0.01568)
Firm fixed effects	Yes
Year fixed effects	Yes
Crisis indicator	Yes
Observations	30,787
Adjusted R^2	0.02310

Notes. 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 equaling one 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.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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 fifth 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; because 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 respond to a reduction in cost of capital either by 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 section, we also examine directly the extent to which companies engage in additional financing activities following a shock to trading volume. We do so 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 the company is raising additional external capital (increasing cash inflows) or the company is making fewer distributions of existing internal capital (reducing cash outflows).

Table 6. Regressions of Net Financing Cash Flows on *SUV*

Panel A: Standardized levels

	Dependent variable	
	$CFFz_{t+1}$ (1)	$\Sigma_{i=2}^{4} CFFz_{t+i}^{Q}$ (2)
$SUVz_t$	0.02940***	0.02638**
	(0.01007)	(0.01035)
Qz_t	0.13710***	0.09016***
	(0.01669)	(0.01389)
$SALEz_{t+1}$	0.47450***	0.36550***
	(0.07539)	(0.06460)
$CFOz_{t+1}$	−0.21029***	−0.18481***
	(0.02803)	(0.02893)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Crisis interaction	Yes	Yes
Observations	31,709	29,297
Adjusted R^2	0.21312	0.18068

Panel B: Standardized changes

	Dependent variable	
	$\Delta CFFz_{t+1}$ (1)	$\Delta\, \Sigma_{i=2}^{4} CFFz_{t+i}^{Q}$ (2)
$SUVz_t$	0.02383**	0.02583**
	(0.01043)	(0.01085)
ΔQz_t	0.14807***	0.04741***
	(0.03264)	(0.01522)
$\Delta SALEz_{t+1}$	0.34025***	0.23828***
	(0.04819)	(0.04177)
$\Delta CFOz_{t+1}$	−0.10871***	−0.09912**
	(0.02918)	(0.04128)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Crisis interaction	Yes	Yes
Observations	30,787	27,215
Adjusted R^2	0.12505	0.05727

Notes. 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 $t+1$ ($\Delta\ CFF_{t+1}$). 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.

$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

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, the manager 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 afterward. 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:

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

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 Online Appendix Table B6. 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] We also find 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 section, we provide support for 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. Because 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 is 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 12- and 9-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 7 provide evidence in support of this inference.

Panels A and B of Table 7 present the betas of portfolios that comprise firms in the top and bottom quintiles of *SUV*, using monthly returns over 12- and 9-month horizons, respectively. As panel A indicates, on average, firms in the top quintile of *SUV* experience a 18.4% reduction in their betas (p-value = 0.017), and the betas of firms in the bottom quintile of *SUV* remain statistically unchanged following a shock to trading volume. Panel B offers similar inference, in which, unlike firms in the bottom quintile of *SUV*, those in the top quintile experience a 16% reduction in their betas (p-value = 0.024). Consistent with our main hypothesis, these findings provide supportive evidence that a large shock to trading volume is

Table 7. Changes in Stock Return Betas

Panel A: 12-month horizon		
Return horizon	Top 20%	Bottom 20%
[−12, −1]	1.2255	1.0220
[+1, +12]	0.9994	0.9937
Difference	0.2261	0.0283
p-value	0.0170	0.7600
Panel B: Nine-month horizon		
Return horizon	Top 20%	Bottom 20%
[−12, −4]	1.1486	0.9665
[+4, +12]	0.9648	1.0070
Difference	0.1838	−0.0405
p-value	0.0240	0.6500

Notes. 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 a seemingly unrelated regression 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 and 9 months. *p*-value indicates the *p*-values for testing the null hypothesis that the difference in betas is zero against the alternative that the difference is different from zero.

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 varies with a firm's ability to secure financing. Because of 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 data set, in which 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 8 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)–(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 8, 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 8 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

Table 8. Regressions of Investment on *SUV* by Financial Constraint Level

Panel A: KZ index

	Dependent variable: $INVz_{t+1}$			
	Full (1)	Low (2)	Medium (3)	High (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)			
$KZt \times SUVz_t$	0.01050**			
	(0.00415)			
Firm and year fixed effects	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

Panel B: HP index

	Dependent variable: $INVz_{t+1}$			
	Full (1)	Low (2)	Medium (3)	High (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)			
$HPt \times SUVz_t$	0.00778**			
	(0.00362)			
Firm and year fixed effects	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

Notes. 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 one to three. All variable definitions appear in the appendix.

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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 the 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, $NEWSCOUNT_{i,t}$, is the logarithm of one + the count of news articles about firm *i* during 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 Online Appendix Table B7. 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 with which 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 in which the measurement of *SUV* coincides with one or more of these disclosures. This leaves us with a reduced sample in which 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 reestimate Equation (5) using this subsample and present our findings in columns (1) and (2) of Table 9. The results support our main inferences as we find that the significant 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 use the U.S. Securities and Exchange Commission's Electronic Data Gathering, Analysis, and Retrieval database to download all form 8-Ks and analyze the text of all such forms filed during the *SUV* measurement period.) Bodnaruk et al. (2015) and Hoberg and Maksimovic (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 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 reestimate our main regressions using this reduced sample. Columns (3) and (4) of Table 9 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 Federal Open Market Committee interest rate announcement days and inflation/unemployment announcement days from the U.S. Bureau of Labor Statistics. We then exclude from our sample any firm-years in which these macroeconomic news arrivals coincide with the *SUV* measurement period and reestimate our

Table 9. Regressions of Annual Investment on *SUV*: Excluding News Arrival During Days −7 to −11

Sample	Excluding corporate news		Excluding inv/fin news		Excluding macro news		Excluding all news	
Dependent variable:	$INVz_{t+1}$	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$	$INVz_{t+1}$	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$	$INVz_{t+1}$	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$	$INVz_{t+1}$	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$
	(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***
	(0.00435)	(0.00484)	(0.00448)	(0.00488)	(0.00450)	(0.00500)	(0.00508)	(0.00565)
Qz_t	0.10560***	0.09752***	0.09983***	0.09505***	0.09189***	0.08687***	0.09956***	0.09188***
	(0.02755)	(0.02465)	(0.02363)	(0.02087)	(0.02848)	(0.02641)	(0.03178)	(0.02885)
$SALEz_{t+1}$	0.24649***	0.23170***	0.24178***	0.22778***	0.27621***	0.26271***	0.28055***	0.26578***
	(0.04016)	(0.04012)	(0.03808)	(0.03826)	(0.03451)	(0.03488)	(0.03616)	(0.03682)
$CFOz_{t+1}$	0.10496***	0.11325***	0.12122***	0.13007***	0.12217***	0.12829***	0.10321***	0.10859***
	(0.01483)	(0.01641)	(0.02383)	(0.02407)	(0.02388)	(0.02403)	(0.01595)	(0.01652)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	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

Notes. This table presents regression results from the estimation of Equation (5) on a subsample of observations in which 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 in which 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 in which the measurement of *SUV* coincides with the filing of an 8-K containing an 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 in which 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 in which 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.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

regressions using this reduced sample. Columns (5) and (6) of Table 9 present summary statistics of these estimations and reveal that the significant positive relation between *SUV* and future investment persists in cases in which no macroeconomic news was revealed. Additionally, in the Online Appendix, we include changes in gross domestic product (GDP) as an 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 these sample restrictions simultaneously. We reestimate Equation (5) using this sample and present the results in columns (7) and (8) of Table 9. 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 (Coval and Stafford 2007, Frazzini and Lamont 2008, Ali et al. 2011, Edmans et al. 2012, 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 firm-year to merge these data into our annual panel. We allocate these outflows proportionally to each stock held by the fund, using fundholding 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 noninformational 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 the control variables from Equation (5): *Q*, *SALE*, *CFO*, and firm and year fixed effects. The resulting predicted values reflect the portion of unexpected volume that is explained by the aforementioned controls and 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 reestimating two versions of Equation (5). The results from these analyses appear in columns (1)–(4) of Table 10. 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.

Wardlaw (2020) shows that mutual fund flows as defined by Edmans et al. (2012) include a contemporaneous return component, raising a potential concern that our results are driven by this component. However, this is unlikely to affect our inferences for several reasons. First, we define our measure of unexpected volume, *SUV*, to capture variation in volume that is orthogonal to contemporaneous returns during the period of volume measurement. Second, we include Tobin's *Q*, which is a function of a firms' equity returns, as a control in all of our analyses. We interpret these findings as supporting the view that nonfundamental shocks to trading volume are associated with heightened subsequent corporate investment. Nonetheless, to provide further reassurance that our inferences are not sensitive to information in contemporaneous returns, we also control directly for these returns in our analyses using *MFFlow*. The results of this additional estimation appear in columns (5) and (6) of Table 10 and confirm that the positive coefficients on the predicted value of *SUV* persist even after controlling for contemporaneous returns. Taken together with the results in Table 9, 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.

Table 10. Regressions of Annual Investment on *SUV* Instrumented by *MFFlow*

	Dependent variable					
	$INVz_{t+1}$ (1)	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$ (2)	$INVz_{t+1}$ (3)	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$ (4)	$INVz_{t+1}$ (5)	$\Sigma_{i=2}^{4} INVz_{t+i}^{Q}$ (6)
$SUVFittedz_t$	0.08487***	0.09991***	0.08623***	0.10166***	0.08633***	0.10175***
	(0.03123)	(0.03062)	(0.03116)	(0.03053)	(0.03115)	(0.03054)
$SUVz_t$			0.01497***	0.01799***	0.01496***	0.01798***
			(0.00504)	(0.00547)	(0.00504)	(0.00547)
$RETz_t^{(-11,-7)}$					0.00485***	0.00420***
					(0.00091)	(0.00065)
Qz_t	0.05501	0.04229	0.05387	0.04082	0.05387	0.04083
	(0.03395)	(0.03154)	(0.03380)	(0.03134)	(0.03380)	(0.03134)
$SALEz_{t+1}$	0.27400***	0.27179***	0.27417***	0.27203***	0.27416***	0.27202***
	(0.03780)	(0.03927)	(0.03772)	(0.03916)	(0.03772)	(0.03916)
$CFOz_t$	0.07345***	0.07184***	0.07266***	0.07082***	0.07251***	0.07068***
	(0.02089)	(0.02001)	(0.02089)	(0.01997)	(0.02088)	(0.01997)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,223	25,993	27,223	25,993	27,223	25,993
Adjusted R^2	0.61407	0.58108	0.61425	0.58134	0.61426	0.58134

Notes. 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. SUVFitted is the predicted value of *SUV* from a regression of *SUV* on *MFFlow* and control variables from Equation (5). *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.

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

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 ($EAAR_{i,t}$) and the standardized unexpected earnings ($SUE_{i,t}$) of the earnings announcement. $EAAR_{i,t}$ is the abnormal return cumulated across days [−1,+1] relative to the year t earnings announcement date for firm i. $SUE_{i,t}$ is measured as the difference between the current year's Q4 earnings per share (EPS) 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:

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

where $EPS_{i,t}$ ($EPS_{i,t-4}$) denotes firm i's realized earnings per share in quarter t ($t-4$) and $\sigma^{\delta EPS}$ is the standard deviation of unexpected earnings, $EPS_{i,t} - EPS_{i,t-4}$ over eight quarters. This model of standardized unexpected earnings (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 11 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.

Table 11. Regressions of Investment on *SUV* and Earnings Announcement Period Information

	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)
$SUEz$	0.02795***		0.02801***
	(0.00497)		(0.00493)
$EAARz$		0.00252	−0.00053
		(0.00459)	(0.00454)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes
Observations	31,710	31,710	31,710
Adjusted R^2	0.59437	0.59362	0.59436

Notes. 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.

*$p<0.1$; **$p<0.05$; ***$p<0.01$.

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 periods drive this previously documented contemporaneous relation between changes in investor recognition and corporate investment. We do so in two stages.

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

$$DBREADTH_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 SUV_{i,t} \times Crisis_t + \sum_k \beta_k Controls^k_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t+1}. \quad (9)$$

In Equation (9), $DBREADTH_{i,t+1}$ 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). $Crisis_t$ is an indicator variable equalling one during years 2007–2009 and zero otherwise. The controls vector comprises $Q_{i,t}$, $SALE_{i,t+1}$, and $CFO_{i,t+1}$. As before, 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 ($P\_DBREADTH_{i,t+1}$) that are driven by variation in *SUV* and residual values ($R\_DBREADTH_{i,t+1}$) 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:

$$INV_{i,t+1} = \beta_0 P\_DBREADTH_{i,t+1} + \beta_1 R\_DBREADTH_{i,t+1} + \beta_2 DBREADTH_{i,t} + \sum_k \beta_k Controls^k_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t+1}. \quad (10)$$

In Equation (10), we include change in breadth during the previous period ($DBREADTH_{i,t}$) as an additional explanatory variable. As in Equation (9), the controls vector comprises $Q_{i,t}$, $SALE_{i,t+1}$, and $CFO_{i,t+1}$. 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 zero.

Table 12 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 $R\_DBREADTH_{i,t+1}$, which captures all variation in $DBREADTH_{i,t+1}$ that is not explained by *SUV*, is not statistically different from zero in both specifications. In contrast, the coefficient estimate on $P\_DBREADTH_{i,t+1}$, which captures all variation in $DBREADTH_{i,t+1}$ that is explained by *SUV* from the 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 12 suggests that the relationship between investor recognition and corporate investment is mediated by *SUV*.

In light of the findings in Table 12, 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.

Table 12. Regressions of Annual Investment on Past and Contemporaneous Changes in Breadth

	Dependent variable	
	$INVz_{t+1}$	
	(1)	(2)
$P\_DBREADTHz_{t+1}$	0.14969*	0.14082*
	(0.08461)	(0.08039)
$R\_DBREADTHz_{t+1}$	0.00926	0.01044
	(0.00763)	(0.00781)
$DBREADTHz_t$		0.03136***
		(0.00643)
Qz_t	0.10997***	0.09749***
	(0.02302)	(0.02324)
$CFOz_{t+1}$	0.07343*	0.07475*
	(0.04266)	(0.04182)
$SALEz_{t+1}$	0.11750	0.12023*
	(0.07277)	(0.07034)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	25,258	25,258
Adjusted R^2	0.59633	0.59709

Notes. 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.

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

Although 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 subsequently experience greater investor recognition. We test this by estimating the following regression:

$$GVol_{i,t+1} = \beta_0 SUV_{i,t} + \beta_1 SUV_{i,t} \times Crisis_t + \sum_k \beta_k Controls^k_{i,t} + \alpha_i + \alpha_t + \epsilon_{i,t+1}. \quad (11)$$

As before, $SUV_{i,t}$ 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 $GVol_{i,t+1}$ 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 nonfinancial searches. We construct $GVol_{i,t+1}$ 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 equaling one during years 2007–2009 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 ($NEWSCOUNT_{i,t}$). 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 13. In columns (1) and (2), we 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 3% 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 in which 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 13 indicate, the significant positive relation between *SUV* and subsequent Google search volume persists in this reduced sample with nonoverlapping 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 measurement period.

Table 13. Regressions of Google Search Volume on *SUV*

	Dependent variable			
	GVol			
	(1)	(2)	(3)	(4)
$SUVz_t$	0.02994**	0.02854**	0.05136**	0.05194**
	(0.01393)	(0.01367)	(0.02260)	(0.02154)
$BTMz_t$	0.00968***	0.00986***	−0.00598	−0.00604
	(0.00337)	(0.00337)	(0.02283)	(0.02293)
$MVEz_t$	0.17207***	0.16797***	0.05177	0.05300
	(0.06007)	(0.06058)	(0.10480)	(0.10461)
$INSTOWNz_t$	−0.08492**	−0.08557**	−0.11888**	−0.11869**
	(0.03352)	(0.03330)	(0.05230)	(0.05237)
$RETz_t^{(-11,-7)}$	−0.01061	−0.01060	0.00414	0.00422
	(0.00825)	(0.00820)	(0.01757)	(0.01766)
$NEWSCOUNTz_t$		0.01447		−0.00530
		(0.01493)		(0.03237)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	6,816	6,816	2,291	2,291
Adjusted R^2	0.55257	0.55257	0.53892	0.53865

Notes. 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.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

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 14. In columns (1) and (2), we define the indicator $SP500_{i,t}$ to equal one when firm i is a member of the S&P 500 index in year t and zero 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 5% level of test. Thus, S&P 500 firms that experience a volume shock 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. 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

Table 14. Regressions of Investment on *SUV* with Indicators for Index Inclusion

	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)
$SUVz_t$	0.01786***	0.02282***	0.03192***	0.03729***
	(0.00486)	(0.00571)	(0.00814)	(0.00932)
Qz_t	0.09967***	0.09472***	0.09998***	0.09520x***
	(0.02375)	(0.02101)	(0.02394)	(0.02126)
$SALEz_{t+1}$	0.24014***	0.22513***	0.23864***	0.22459***
	(0.03692)	(0.03680)	(0.03696)	(0.03704)
$CFOz_{t+1}$	0.12240***	0.13118***	0.12273***	0.13132***
	(0.02377)	(0.02395)	(0.02380)	(0.02399)
$SP500_t$	−0.06261**	−0.10648***		
	(0.02940)	(0.02589)		
$SP500_t \times SUVz_t$	−0.01085	−0.01682**		
	(0.00761)	(0.00801)		
$SP1500_t$			−0.05646*	−0.06787**
			(0.03146)	(0.03067)
$SP1500_t \times SUVz_t$			−0.02912***	−0.03220***
			(0.00921)	(0.01025)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Crisis interaction	Yes	Yes	Yes	Yes
Observations	31,710	29,859	31,710	29,859
Adjusted R^2	0.59376	0.55947	0.59401	0.55955

Notes. This table presents regression results from the estimation of Equation (10). $SP500_{i,t}$ and $SP1500_{i,t}$ are indicators equaling one 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 one. Two-way firm and year cluster robust standard errors are in parentheses.

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

institutions enjoy greater levels of investor recognition and, thus, experience smaller real benefits from unexpected volume shocks. To examine this, we estimate Equation (5) on three subsamples of our data, in which each subsample comprises firm-year observations with the same tercile rank of the level of institutional ownership. As predicted, Online Appendix Table B8 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. 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 is 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. Although 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 firms' 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.

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Appendix. 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 equaling one if year t is in the period 2007–2009 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 three 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 one + 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
$RET_{i,t}$	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 equaling one if firm i is a member of the S&P 500 index in year t and zero otherwise
$SP1500_{i,t}$	Indicator equaling one if firm i is a member of the S&P 1500 index in year t and zero 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
$SUV\_Fitted_{i,t}$	Predicted value from a regression of SUV reported by firm i in year t on $MFFlow$ and control variables from Equation (5). $MFFlow$ is a measure of mutual fund flows following the methodology outlined by Edmans et al. (2012).
$SUV\_Qk_{i,t}$	Indicator variable equaling one if $SUV_{i,t}$ is in quintile k, in which k ranges from one to five. Quintile ranks are formed separately by year.
$SUV^{(-11,-2)}_{i,t}$	Standardized unexpected volume reported by firm i in year t, calculated from day −11 to day −2 relative to year t earnings announcement
$SUV^{(-6,-2)}_{i,t}$	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 $t-1$.

Endnotes

[1] Hirshleifer and Teoh (2003), Barber and Odean (2008), Lim et al. (2010), Da et al. (2011), 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.

[3] Although our measurement window (two weeks prior to the earnings announcement) is designed to avoid contamination by the release of earnings news, we also consider specifications in which we add measures of earning surprise. Although 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.

[4] In the Online Appendix, 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 nonmissing 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 postannouncement 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 the Online Appendix, we explore alternative volume measurement windows and find that our inferences are the same.

[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 zero trading volume, we add one to the dollar volume when estimating this equation and computing the level of unexpected trading volume.

[11] We require at least 30 days of available trading data to estimate Equation (1). In the Online Appendix, 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.

[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 the Online Appendix, 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.

[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 product by the average value of *INV* in our sample (0.071). This yields the estimated 1.4% effect.

[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-statistic = 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-statistic = 3.91).

[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-statistic = 4.03).

[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.

[17] In accordance with U.S. generally accepted accounting principles, net financing cash flows reported in the statement of cash flows does not include cash payments related to interest on borrowings.

[18] We obtain this estimate from an untabulated test in which we replicate column (1) of Online Appendix Table B6 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.

[19] According to Table 8, 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).

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

[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).

[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.

[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.

[24] This construction of *GVol* results in fully nonoverlapping measurement of *GVol* and *SUV* for all firm-years in which the earnings announcement occurs on Sunday, Monday, or Tuesday. For firm-years with earnings announcements on other days of the week, there is 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 13.

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