Firm-Specific Investor Sentiment and the Value of Corporate Cash Holdings*

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Abstract

Using overnight returns and buy-sell order imbalance as the proxies for firm-specific investor sentiment, we find a positive relation between sentiment and the value of corporate cash holdings. Our analysis further suggests that high firm-specific investor sentiment leads to retail investors' overvaluation of firm future growth opportunities, thus increasing the market perceived value of corporate cash holdings. However, the positive relation can not be explained by market-level investor sentiment, market turbulence, firm-level financial constraint, and asymmetric information. Our results are robust to alternative definitions of cash holdings and change in cash, change in sentiment, lag sentiment, and controls for financial constraints, corporate governance, and unobserved firm heterogeneity. Overall our paper sheds light on the important role of firm-specific investor sentiment in corporate outcomes.

JEL classification: G12; G14; G30; G32
Keywords: Firm-specific investor sentiment; Marginal value of cash; Overnight returns; Order imbalance

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1. Introduction

Is investor sentiment one of the prominent drivers of corporate outcomes? According to Fisher's Separation Theorem (Fisher, 1930), a firm's investment decisions are separate from the preferences of the firm's shareholders. However, this view has been challenged by recent studies showing that at the market-level, investor sentiment affects corporate discourse policies (Bergman and Roychowdhury, 2008), analysts' earnings forecast errors (Hribar and McInnis, 2012; Walther and Willis, 2013), stock market response to earnings news (Mian and Sankaraguruswamy, 2012), general corporate investment (Arif and Lee, 2014), external financing costs (McLean and Zhao, 2014), bidder announcement abnormal returns (Danbolt et al., 2015), and R&D investment (Dang and Xu, 2018). Since market-wide sentiment measures only exhibit time-series variations, it would be desirable to know how investor sentiment at the firm level, with both time-series and cross-sectional variations, may affect managers' assessment of daily financial and investment decisions. Confounding economic factors, such as business cycles and monetary policy, may influence both market-wide investor sentiment and corporate outcomes, causing a spurious association. However, the cross-sectional variations of firm-specific investor sentiment usually cannot be explained by these potential economic factors, which help researchers to establish a causal link between sentiment and corporate outcomes.

In this paper, we employ stock overnight returns as our main proxy for firm-specific investor sentiment. Berkman et al. (2012) show that the positive pattern of a stock's overnight returns and its return reversal during trading days can be explained by the trading activities of attention-triggered retail investors. Comparing with institutional investors, retail investors are more likely to be attracted by attention-generating events and place orders during the non-trading hours (Barber et al., 2009; Berkman et al., 2012). Aboody et al. (2018) further propose to use overnight returns as a measure of firm-specific investor sentiment, since overnight returns possess several characteristics expected of a

sentiment measure.[1] Besides overnight returns, we also adopt the buy-sell order imbalance of investors as an alternative measure of firm-specific investor sentiment. Kumar and Lee (2006) find that retail investors' trades are systematically correlated and the buy-sell order imbalance of retail investors can be taken as a sentiment measure to explain stock return comovements. Barber et al. (2009) also show that a high net retail investor purchase is usually followed by low subsequent stock returns which is consistent with the studies on market-wide investor sentiment. Given that these two measures are available for most US public firms after 1992, we study the impact of firm-specific investor sentiment on corporate outcomes through an under-researched channel: the value of corporate cash holdings.

In a market without friction, the market value of an additional dollar in a public firm's cash holdings should be exactly one dollar. However, among US public firms, the marginal value of cash exhibits significant cross-sectional variations due to market friction such as financial policy and dividend tax (Faulkender and Wang, 2006), financial constraints (Denis and Sibilkov, 2009), information asymmetry (Chen et al., 2015), and agency problems (Dittmar and Mahrt-Smith, 2007; Liu and Mauer, 2011). All these studies, either explicitly or implicitly, assume that market investors effectively adjust their valuation of firm cash holdings according to these frictions. Nevertheless, the market value of an additional dollar in cash holdings depends not only on a firm's actual efficiency in using the extra dollar but also on market investors' perceived value of holding the extra dollar on the firm's balance sheet. According to the existing sentiment literature, high market-wide sentiment drives contemporaneous stock overvaluation, especially for stocks with high future growth opportunities (e.g., Lamont and Stein, 2004; Baker and Wurgler, 2006; Stambaugh et al., 2012). If firm-specific investor sentiment can affect investors' expectations of firm future growth opportunities, then by extension, the sentiment will also be related to the market perceived value of corporate cash holdings. Based on previous market-wide sentiment studies, we posit that firm-specific investor sentiment is positively related to the marginal value of cash. Since one extra dollar of cash is physically the same between firms with high

[1] Please refer to Section 2.2 for detailed discussions of these characteristics.

and low firm-specific investor sentiment, the impact of sentiment on the value of cash is less affected by the potential confounding firm characteristics than the impact of sentiment on the other corporate outcomes.

To empirically examine the effect of firm-specific investor sentiment on the value of corporate cash holdings, we use a panel sample of US public firms over the period of 1992–2018 and employ Faulkender and Wang's (2006) value of cash model. Using overnight returns as our main measure of firm-specific investor sentiment, we document a positive correlation between the marginal value of one dollar in cash holdings and sentiment. Controlling for various observable and unobservable factors that are expected to affect the value of cash, a one-standard-deviation increase in firm-specific investor sentiment measured by overnight returns is associated with a \$0.33 higher marginal value of cash.

Next, we follow the value of cash literature and investigate whether our main results are robust after controlling for alternative measures of change in cash, three cash regimes, market-level investor sentiment, external institutional investor monitoring, and internal corporate governance indexes. First, the change in corporate cash holdings can be decomposed into expected and unexpected parts. Only the unexpected change in cash will lead to investors' revision of a firm's market value. In our baseline regressions, we follow the value of cash studies and assume that the expected cash holdings at the end of a fiscal year is equal to the actual cash holdings at the beginning of the fiscal year. We further use three alternative measures of the expected change in cash: the average change in cash in the benchmark portfolio over a fiscal year and two measures of expected change in cash estimated by Almeida et al.'s (2004) models. The positive relation between firm-specific investor sentiment and the marginal value of cash remains robust when we measure the market's expected change in cash by these three alternative ways. Second, Halford et al. (2017) suggest that it is important to control for three ex-ante cash regimes when studying the marginal value of cash. We find that the positive relation between firm-specific investor sentiment and the marginal value of cash remains statistically significant in all three ex-ante cash regimes. In economic terms, a one-standard-deviation increase

in overnight returns is associated with a \$0.18, \$0.31, and \$0.47 increase in the marginal value of cash in the distributing cash, servicing debt, and raising cash regime, respectively. Third, we show that the positive relation between firm-specific investor sentiment and the marginal value of cash is not driven by the time-varying market-level investor sentiment, measured by Baker and Wurgler's (2006) Sentiment Index (BWI) and the University of Michigan's Consumer Sentiment Index (CSI). Last, Dittmar and Mahrt-Smith (2007) find that corporate external and internal governance proxies are positively correlated with the market value of cash holdings. We find that the impact of firm-specific investor sentiment on the marginal value cash remains robust after controlling for total institutional ownership, motivated monitoring institutional ownership (Fich et al., 2015), *Gindex* (Gompers et al., 2003), and *Eindex* (Bebchuk et al., 2009), suggesting that our result can not be explained by the possible reason that firms with better corporate governance attract more retail investors and have a higher firm-specific investor sentiment.

To shed light on how firm-specific investor sentiment affects the marginal value of cash, we adopt a cross-section analysis using sub-samples to explore five plausible channels. Specifically, we divide our main sample into two subsamples based on firms' future growth opportunities measured by P/E and *Tobin's Q*, market-level investor sentiment measured by BWI and CSI, market turbulence periods according to the dot-com bubble and recent financial crisis, financial constraints measured by Kaplan and Zingales's (1997) index and Whited and Wu's (2006) index, and information asymmetry measured by the standard deviations of financial analysts' earnings forecasts and stock price informativeness (Ferreira et al., 2011; Foucault and Fresard, 2014). Although the impact of firm-specific investor sentiment on the value of cash is positive and statistically significant in two sub-samples based on all five criteria, our analysis only supports the future growth opportunity channel. The impact of firm-specific investor sentiment on the value of cash is statistically larger for firms with high future growth opportunities than for firms with low future growth opportunities, while the differences in such impact are not statistically significant between two sub-samples based on the other four criteria. These channel tests suggest that high

firm-specific investor sentiment leads to retail investors being optimistic about firms' future growth opportunities. Therefore, retail investors tend to overvalue the discounted future cash flow and overestimate the efficiency of using cash, thus increasing the market perceived value of corporate cash holdings.

To improve the causal inferences of our analysis, we conduct two tests to mitigate the potential endogeneity between firm-specific investor sentiment and the marginal value of cash due to omitted variables and reverse causality. First, our results are robust to Gormley and Matsa's (2014) high-dimensional fixed effects model, which controls for the firm and interacted industry-year fixed effects in our baseline regressions and alleviates the potential endogeneity concern due to unobserved heterogeneity across firms and time-varying heterogeneity across industries. Second, we find a positive relation between the change in firm-specific investor sentiment from year $t-1$ to t and the marginal value of cash in year t, which mitigates the potential simultaneity and reverse causality concerns. In an additional test, we use the buy-sell order imbalance of investors (Kumar and Lee, 2006; Barber et al., 2009; Yuan, 2015) as an alternative measure of firm-level investor sentiment. Our results are robust to this alternative proxy of firm-specific investor sentiment. In a set of untabulated supplementary tests, we find that the impact of firm-specific sentiment on the marginal value of cash does not change over time, the positive relation between sentiment and the value of cash is robust to removing marketable securities from the definition of corporate cash holdings, replacing the firm-specific investor sentiment measured over fiscal year t by the sentiment measured over one year or one month period before the starting of fiscal year t, and converting the continuous sentiment measure into ranks to reduce the noise in estimating sentiment.

Our paper contributes to the existing literature in two ways. First and more general, our focus on firm-specific investor sentiment adds to the nascent line of work that draws insights from behavioral finance to corporate activities. A recent study by Aboody et al. (2018) suggests that firm-specific investor sentiment is better suited to address firm-level issues as compared to market-level investor sentiment. Due to the lack of firm-level sen-

timent measures, previous sentiment studies only explore how the tim-series variations of market-wide investor sentiment can influence corporate major decisions. To our knowledge, Cornelli et al. (2006) is the only existing study that uses Europe's pre-IPO market for shares of 486 companies about to go public to test whether firm-level small investor sentiment can explain post-IPO price anomalies. However, the pre-IPO market price is not an available measure of firm-specific investor sentiment that can be generalized to a panel of US firms. We use overnight returns and buy-sell order imbalance as our proxies for sentiment and show that at the firm-level, investor sentiment is positively related to the value of cash holdings in a large panel sample of US firms. Second, by explicitly connecting firm-specific investor sentiment and the value of corporate cash holdings, our study sets up a new line of research on the real implications of firm-level investor sentiment on corporate outcomes. Since the marginal value of cash is the value which firm shareholders place on an additional one dollar of a firm's cash holdings, we provide a unique perspective that firm-specific investor sentiment influences the shareholders' perception of a firm's cash value.

The remainder of the paper is organized as follows. Section 2 describes our baseline regression, proxies for firm-specific investor sentiment, and sample data. Section 3 presents our main test results. Section 4 discusses the analyses we perform to assess the robustness of our main results. We conclude our paper in section 5. Appendix A provides the detailed definition of all the variables used in our empirical analyses.

2. Research design and sample

2.1. Baseline regression model

To study the value of corporate cash holdings, we employ a widely-used empirical framework proposed by Faulkender and Wang (2006) that examines a contemporaneous association between an unexpected change in a firm's cash holdings and an unexpected

change in its market value of equity. We are interested in the market value of corporate cash holdings in connection with firm-specific and time-varying investor sentiment. To measure this dynamic effect, we augment Faulkender and Wang's (2006) model by introducing firm-specific investor sentiment and its interaction with the change in cash holdings. More specifically, we adopt the following baseline regression equation (1):

$$\begin{aligned} r_{i,t} - R^B_{i,t} = {} & \beta_0 + \beta_1 \Delta Cash\ holdings_{i,t} + \beta_2 FS_{i,t} + \beta_3 FS_{i,t} \times \Delta Cash\ holdings_{i,t} + \\ & \beta_4 \Delta Earnings_{i,t} + \beta_5 \Delta Net\ assets_{i,t} + \beta_6 \Delta R\&D_{i,t} + \beta_7 \Delta Interest\ expenses_{i,t} + \\ & \beta_8 \Delta Dividends_{i,t} + \beta_9 Net\ financing_{i,t} + \beta_{10} Cash\ holdings_{i,t-1} + \beta_{11} Cash\ holdings_{i,t-1} \\ & \times \Delta Cash\ holdings_{i,t} + \beta_{12} Leverage_{i,t} + \beta_{13} Leverage_{i,t} \times \Delta Cash\ holdings_{i,t} + \epsilon_{i,t} \end{aligned} \tag{1}$$

where the dependent variable $r_{i,t} - R^B_{i,t}$ is the annual return on firm i's stock minus the annual return on one of the Fama and French's (1993) 25 value-weighted portfolios, constructed by independently sorting stocks by firm size and book-to-market ratios, to which firm i belongs at the beginning of fiscal year t; Δ indicates a change in the corresponding variables over fiscal year t; *FS* is firm-specific investor sentiment described in Section 2.2; *Cash holdings* is cash and marketable securities; *Earnings* is earnings before interest and extraordinary items; *Net assets* is total assets net of cash; *R&D* is research and development expenses; *Interest expenses* is interest expenses; *Dividends* is common dividends; *Net financing* is net financing proceeds; and *Leverage* is leverage. All the above accounting variables are deflated by 1-year lagged market value of equity. The detailed definitions of these variables are provided in Appendix A. The independent variables of interest are the change in cash holdings and the interaction of firm-specific investor sentiment with the change in cash holdings. Because both the dependent and explanatory variables are normalized by market value of equity at the end of the fiscal year $t-1$, the estimated coefficient β_1 measures the marginal value of cash, the dollar change in equity market value resulting from a dollar change in cash holdings. The estimated coefficient of β_3 can be

interpreted as the effect of firm-specific investor sentiment on the marginal value of cash.

2.2. Proxying for firm-specific investor sentiment

We use two proxies for firm-specific investor sentiment. The first proxy used in our main empirical analyses, $FS\text{-}OR_{i,t}$, is firm i's average overnight returns over fiscal year t. Berkman et al. (2012) find that positive overnight returns tend to be followed by reversals during the next trading day, which can be explained by attention-triggered retail buying at the start of the trading day. Aboody et al. (2018) further show that overnight returns possess four characteristics of a sentiment measure and are suitable for measuring firm-specific investor sentiment. Specifically, short-term overnight returns are persistent, which is a characteristic to be expected from a measure of sentiment driven by the persistent share demand of sentiment-influenced retail investors (e.g., Barber et al., 2009); short-term overnight-return persistence is stronger for harder-to-value firms, which is consistent with the empirical evidence that market-wide sentiment has a greater impact on the prices of firms that are harder to value (e.g., Baker and Wurgler, 2006; Berkman et al., 2009; Hribar and McInnis, 2012; Mian and Sankaraguruswamy, 2012; Seybert and Yang, 2012); short-term overnight-return persistence is higher for firms with lower institutional ownership, which is consistent with the evidence that retail investors are less rational and more likely to be affected by sentiment than institutional investors (e.g., Yu and Yuan, 2011); and stocks with high overnight returns underperform those with low overnight returns over the longer term, which is consistent with the evidence that mispricing due to the sentiment-driven demand of retail investors is temporary (e.g., Hvidkjaer, 2008) and stocks with strong retail investor demand underperform those with weak retail investor demand (e.g., Barber et al., 2009).

Following Aboody et al. (2018), we keep stocks in the CRSP database with end-of-prior-year prices greater than \$5 per share and market capitalizations of more than \$10 million. The sample period is 1992–2018, because stock opening prices are only available in the CRSP databse from 1992. The overnight return of firm i's stock on day j, $OR_{i,j}$, is

calculated as:

$$OR_{i,j} = \frac{Open_{i,j} - Close_{i,j-1}}{Close_{i,j-1}} \tag{2}$$

where $Open_{i,j}$ is the opening price of firm i's stock on day j and $Close_{i,j-1}$ is the closing price of firm i's stock on day $j-1$. All opening and closing prices are adjusted for stock splits, stock dividends, and cash dividends. We treat an overnight return on day j as missing if either the closing price on day $j-1$ or the opening price on day i is not available in CRSP. To construct an annualized proxy of firm-specific investor sentiment, we define $FS\text{-}OR_{i,t}$ as:

$$FS\text{-}OR_{i,t} = 250 \times \frac{\sum_{j=1}^{N} OR_{i,j}}{N} \tag{3}$$

where N is the number of non-missing $OR_{i,j}$ over fiscal year t. We treat $FS\text{-}OR_{i,t}$ as missing if N is less than 100.

The second proxy used in our robustness tests, $FS\text{-}OIB_{i,t}$, is order imbalance. Kumar and Lee (2006) find that retail investor sentiment, proxied by the buy-sell order imbalance of retail investors, explains the return comovements for stocks which are costly to arbitrage and are with high retail investor ownership. Moreover, Barber et al. (2009) show that annual small trade order imbalance is correlated with future returns, that is, stocks heavily bought by retail investors underperform stocks heavily sold by retail investors by 4.4% the following year. Barber et al.'s (2009) finding that high net retail investor purchase is followed by low subsequent stock returns is consistent with the studies on market-wide investor sentiment (e.g., Baker and Wurgler, 2006, 2007; Stambaugh et al., 2012). The empirical evidence documented in Kumar and Lee (2006) and Barber et al. (2009) suggests that trade order imbalance is a suitable gauge of investor sentiment.

Following Kumar and Lee (2006), we calculate the daily order imbalance of each stock using the transaction data from the Trade and Quote (TAQ) database. The sample period is 1993–2018, since the TAQ database starts from 1993. Specifically, the order imbalance

of firm i's stock on day j, $OIB_{i,j}$, is calculated as:

$$OIB_{i,j} = \frac{Buy_{i,j} - Sell_{i,j}}{Buy_{i,j} + Sell_{i,j}} \tag{4}$$

where $Buy_{i,j}$ ($Sell_{i,j}$) is the aggregate buyer-initiated (seller-initiated) dollar trading volume. We classify buyer-initiated and seller-initiated trading volume, following the algorithm of Lee and Ready (1991). A trade is buyer-initiated (seller-initiated) if the trade price is above (below) the midpoint of the recent (previous second) bid-ask quote. If the transaction price is equal to the midpoint of the bid-ask quote, we take a trade as a buyer-initiated (seller-initiated) one if the trade price is above (below) the last executed trading price. We then define our annualized firm-specific investor sentiment $FS\text{-}OIB_{i,t}$ as:

$$FS\text{-}OIB_{i,t} = 250 \times \frac{\sum_{j=1}^{N} OIB_{i,j}}{N} \tag{5}$$

where N is the number of non-missing $OIB_{i,j}$ over fiscal year t. Similar to $FS\text{-}OR_{i,t}$, we treat $FS\text{-}OIB_{i,t}$ as missing if N is less than 100.

When we construct $FS\text{-}OIB_{i,t}$, we do not differentiate orders by their size. Following Yuan (2015), we consider only small size buy and sell trades that are less than \$10,000 based on real values in 1991 dollars when we calculate $OIB_{i,j}$. Similar to $FS\text{-}OIB_t$, we define $FS\text{-}SOIB_t$ based on small size trades, which is a more precise proxy of firm-specific retail investor sentiment. As mentioned by Yuan (2015) and Barber et al. (2009), institutional investors have commonly broken down large orders into small ones in order to reduce transaction costs in recent years. Therefore, we only define $FS\text{-}SOIB_t$ over the period of 1993–2000 so that the accuracy of identifying trades initiated by retail investors is not undermined.

2.3. Data sources and summary statistics

Our analysis is based on a sample of firms covered by the Center for Research in Security Price (CRSP)/Compustat Merged database over the period 1992–2018. We choose the starting year of our sample to be 1992 when CRSP started to provide opening stock price data. All the firm–year observations have available stock return data from CRSP and the accounting data from Compustat. Following Faulkender and Wang (2006), we exclude financial firms (SIC codes between 6000 and 6999) and utility firms (SIC codes between 4900 and 4999), firms whose stocks are traded outside of the NYSE, NASDAQ, and AMEX, and firm–year observations with negative net assets, negative equity, or negative dividend. To control for potential outliers, we follow the literature and winsorize the accounting and stock return variables at the 1% and 99% levels. All accounting data are converted to real values in 2018 dollars using the consumer price index from the website of the Federal Reserve Bank of St. Louis. Next, we collect the data of firm-specific investor sentiment from the CRSP and TAQ databases, following the data selection criteria described in Section 2.2. After merging the marginal value of cash data with the proxy of firm-specific investor sentiment ($FS\text{-}OR_{i,t}$), our main sample consists of 64,548 firm–year observations. For our second proxy of firm-specific investor sentiment ($FS\text{-}OIB_{i,t}$), our robustness test is based on a sample of 81,950 firm–year observations. We also obtain institutional ownership data from Thomson Reuters s34 files, corporate governance data from the Institutional Shareholder Services (ISS, formerly RiskMetrics) database, and Fama–French industry returns from Kenneth R. French's website.

The summary statistics for the variables used in our main empirical analysis are shown in Table 1. The distribution of an annual excess return is right-skewed with a mean annual excess return of −0.7% and a median of −6.4%. On average, corporate cash holdings have been slightly increasing over time, with $\Delta Cash\ holdings_t$'s mean, 25th percentile, and 75th percentile standing at 0.8%, −2.2%, and 3.1%. The average growth in net assets is 5.4%, whereas the average growth in earnings, R&D, interest expenses, and dividends are

positive but negligible. Our prior cash holdings average nearly 14.0%, indicating that the previous cash balances, on average, account for 14.0% of the corresponding market value of equity. The average leverage is about 19.8% and the standard deviation of net financing is 17.5%. All these summary statistics are comparable to those reported in the previous value of cash literature. The means and standard deviations of our firm-specific investor sentiment proxies are: $FS\text{-}OR_{i,t}$ (−0.030 and 0.560), $FS\text{-}SOIB_{i,t}$ (−0.044 and 0.107), and $FS\text{-}OIB_{t,1993--2018}$ (−0.035 and 0.097).

3. Main results

3.1. Firm-specific investor sentiment and the marginal value of cash

Faulkender and Wang (2006) show that an extra dollar of cash is valued by market investors at \$0.75 on average and such value will increase to \$1.47 for a firm without any cash holdings and leverage. In the first two columns of Table 2, we replicate Faulkender and Wang's (2006) main results over their sample period 1972–2001 and our results are comparable to theirs.[2] Column (1) shows that on average, a dollar increase in cash holdings is associated with \$0.77 increase in market value. Column (2) indicates that the marginal value of cash for a firm with zero cash and no leverage is approximately \$1.53. The coefficients of $Cash\ holdings_{t-1} \times \Delta Cash\ holdings_t$ and $Leverage_t \times \Delta Cash\ holdings_t$ are negative and statistically significant, which are consistent with Faulkender and Wang's (2006) findings that the marginal value of cash decreases with cash liquidity and leverage.

To formally test whether the marginal value of cash is contingent upon firm-specific investor sentiment, we estimate regression equation (1) and place emphasis on the coefficient of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$. Column (3) of Table 2 presents the results from

[2]The number of firm–year observations (89,555) in our replication sample is slightly larger than 82,187 reported in Faulkender and Wang (2006). Faulkender and Wang (2006) trim the variables in their sample at the 1% and 99% tails, while we winsorize our variables at the 1% and 99% tails. Additionally, we use the CRSP/Compustat Merged dataset, which was not available in 2006.

estimating equation (1) without controlling for the impact of cash liquidity and leverage on the marginal value of cash. In column (4), we extend the specification in column (3) by controlling for the year and Fama–French 48 industry (Fama and French, 1997) fixed effects. In column (5), we further extend the specification in column (4) by including two interaction terms $Cash\ holdings_{i,t-1} \times \Delta Cash\ holdings_{i,t}$ and $Leverage_{i,t} \times \Delta Cash\ holdings_{i,t}$. Column (3) shows that the value of an extra dollar of cash for an average firm is \$1.12, and column (5) implies that investors value an additional dollar of cash as \$1.88 for a firm with zero cash, leverage, and firm-specific investor sentiment. Both numbers are greater than those documented in Faulkender and Wang (2006), which are consisitent with Bates et al.'s (2018) finding that the value of corporate cash holdings has increased significantly in recent decades. Faulkender and Wang's (2006) sample period is 1972–2001, while ours is 1992–2018.

The coefficients of the interaction term $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level in columns (3)–(5). Based on the estimates in column (3), a one-standard-deviation increase in *FS-OR* will lead to a \$0.37 ($= 0.669 \times 0.560$) increase in the marginal value of cash. After we add the industry and year fixed effects in column (4) and the additional control variables in column(5), a one-standard-deviation increase in *FS-OR* is associated with a \$0.37 ($= 0.661 \times 0.560$) and \$0.33 ($= 0.592 \times 0.560$) increase in the marginal value of cash. The increase in the marginal value of cash associated with firm-specific investor sentiment is economically substantial.

3.2. Alternative measures of unexpected change in cash

In an efficient market, the information of any expected change in cash holdings should have already been incorporated into stock prices by market investors. In Faulkender and Wang's (2006) empirical framework, $\Delta Cash\ holdings_t$, the change of *Cash holdings* from fiscal year $t-1$ to t, is a proxy for the unexpected change in corporate cash holdings. An implicit assumption is that market investors, on average, expect that cash holdings at the end of fiscal year t is the same as the actual cash holdings at the end of fiscal year

$t-1$. However, if the implicit assumption is incorrect, then our estimation of the impact of firm-specific investor sentiment on the marginal value of cash may be biased. To address this concern, we follow Faulkender and Wang (2006) and replace $\Delta Cash\ holdings_t$ by three alternative measures of unexpected change in corporate cash holdings.

The first alternative measure, $\Delta Alternative\ cash\ holdings\ I_t$, is equal to the difference between $\Delta Cash\ holdings_t$ and average $\Delta Cash\ holdings_t$ for all firms in one of the Fama–French 25 size and book-to-market matched portfolios. The average $\Delta Cash\ holdings_t$ in the matched benchmark portfolio is taken as the expected change in a firm's cash holdings. The dependent variable in equation (1), $r_{i,t} - R^B_{i,t}$, is adjusted for the same benchmark portfolio returns, therefore it is likely that $r_{i,t} - R^B_{i,t}$ has already incorporated the information on the average change in cash of firms in the corresponding benchmark portfolio. The second and third alternative measures are developed in Almeida et al. (2004), who use a firm's cash sources and uses of cash to predict the change in its cash holdings. The expected changes in cash are the fitted values of $\Delta Cash\ holdings_t$ in the following two regression equations:

$$\Delta Cash\ holdings_{i,t} = \beta_0 + \beta_1 CF_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3 Size_{i,t-1} + \theta_j + \epsilon_{i,t} \tag{6}$$

$$\begin{aligned}\Delta Cash\ holdings_{i,t} =& \beta_0 + \beta_1 CF_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3 Size_{i,t-1} + \beta_4 Expenditures_{i,t-1} \\ &+ \beta_5 Acquisitions_{i,t-1} + \beta_6 \Delta NWC_{i,t} + \beta_7 \Delta SD_{i,t} + \theta_j + \epsilon_{i,t}\end{aligned} \tag{7}$$

where CF is the ratio of earnings before extraordinary items and depreciation (minus dividends) scaled by the book value of total assets, Q is the market value scaled by the book value of total assets, *Size* is the natural log of the book value of total assets, *Expenditures* is capital expenditures scaled by the book value of total assets, *Acquisitions* is acquisition expenses scaled by the book value of total assets, ΔNWC is changes in noncash net working capital scaled by book value of total assets, ΔSD is changes in short-term debt scaled by book value of total assets, and θ_j is the Fama–French 48 industry fixed effects. $\Delta Alternative\ cash\ holdings\ II$ and $\Delta Alternative\ cash\ holdings\ III$ are the residuals, $\epsilon_{i,t}$, of regression

equation (6) and (7).[3]

The results of estimating equation (1) with the three alternative measures of unexpected change in cash are reported in Table 3. For each alternative measure, we test three specifications similar to those reported in columns (3)–(5) of Table 2. Columns (1)–(9) of Table 3 show that the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. Columns (1)–(9) imply that a one-standard-deviation increase in *FS-OR* is associated with \$0.31 (= 0.545 × 0.560) to \$0.40 (= 0.707 × 0.560) higher marginal value of cash. The positive effect of firm-specific investor sentiment on the marginal value of cash is also economically significant.

3.3. Cash regimes

Halford et al. (2017) draw the conclusion that it may lead to a biased estimation if cash regimes are not controlled in Faulkender and Wang's (2006) framework. Using interest coverage and industry market-to-book ratio, Faulkender and Wang (2006) classify firms into three ex-ante cash regimes: raising cash, distributing cash, and servicing debt.[4] They show that the marginal value of cash increases from \$0.45 in the servicing debt regime to \$1.16 in the raising cash regime, which is consistent with the view that the marginal value of cash is a function of cash regimes. The marginal value of one dollar to investors is higher for a firm borrowing money externally to finance its growth than a firm distributing cash to its shareholders. In unreported tests, we follow Faulkender and Wang's (2006) classification and find that the positive relation between firm-specific investor sentiment and the marginal value of cash holds across these three ex-ante classified cash regimes.

Halford et al. (2017) further emphasize the importance of identifying cash regimes ex-post when analyzing the marginal value of cash. Given the assumption that stock prices unbiasedly incorporate firms' future activities, Halford et al. (2017) define three ex-post

[3] Almeida et al. (2004) and Faulkender and Wang (2006) provide the detailed discussions of these alternative measures.

[4] Interest coverage is the sum of cash holdings and earnings in the beginning of fiscal year t divided by the interest expense over year t.

cash regimes as the following: firms that issue equity and do not pay dividends in fiscal year t are within the raising cash regime; firms that distribute cash to shareholders and do not issue equity in fiscal year t are within the distributing cash regime; and firms with market leverage ratios being in the top decile distribution of firms at the beginning of fiscal year t and without cash rasing or distributing activities over year t are within the servicing debt regime. Table 4 presents the results by dividing the sample into three ex-post cash regimes. Similar to our baseline regression results, the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ remain positive and statistically significant. Columns 3, 6, and 9 imply that a one-standard-deviation increase in *FS-OR* is associated with a \$0.31 increase in the marginal value of cash in the servicing debt regime, a \$0.47 increase in the marginal value of cash in the rasing cash regime, and a \$0.18 increase in the marginal value of cash in the distributing cash regime.[5] Taken as a whole, the positive relation between firm-specific investor sentiment and the marginal value of cash remain robust after controlling for the cash regimes.

3.4. Additional controls

In this section, we further control for market sentiment, institutional ownership, and corporate governance in our estimation of the marginal value of cash. We add both the additional control variable and its interaction with the change in cash in our baseline regression equation (1). Table 5 presents the results. Columns with odd numbers present the coefficient estimates of specification (4) of Table 2, and columns with even numbers present the coefficient estimates of specification (5) of Table 2.

Bates et al. (2018) document an increase in the marginal value of cash from the 1980s to the 2000s, and they also find that market-level investor sentiment is weakly positively related to the marginal value of cash in the 1980s, slightly more positive in the 1990s, but not statistically significant in the 2000s. Similar to firm-specific investor sentiment, market-level investor sentiment can affect the aggregate market perceived value of future

[5]The standard deviations of $FS\text{-}OR_t$ in these three cash regimes are 0.657, 0.750, and 0.377.

investment opportunities, and thus the marginal value of cash. To mitigate the concern that the positive relation between firm-specific investor sentiment and the marginal value of cash is driven by the time-varying market-level investor sentiment, we control for the states of market-level investor sentiment. Specifically, we consider sentiment states classified by two different market-level sentiment indicators: Baker and Wurgler's (2006) Sentiment Index (BWI) and the University of Michigan's Consumer Sentiment Index (CSI).[6] Since these two sentiment indexes are measured for each calendar year, we match sentiment indexes to the closest fiscal year-end for each observation. We set BWI and CSI to 1 (0) for years that start with high (low) market-level sentiment. In line with Baker and Wurgler (2006), we define a year as starting with high (low) sentiment if a sentiment index at the end of the previous year is above (below) the full sample mean value of the sentiment index. Column (1)–(4) of Table 5 show that the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. Consistent with Bates et al.'s (2018), the coefficients of the interactions between market-level investor sentiment and change in cash are positive and statistically significant in columns (1), (3), and (4).

Previous studies show that institutional monitoring and activism are positively associated with corporate governance (e.g., Gillan and Starks, 2000). Ward et al. (2018) also find that greater motivated monitoring institutional ownership is associated with a higher marginal value of cash. On the other hand, according to Liu et al. (2019), institutional investors are less subject to sentimental biases relative to individual investors. If our firm-level investor sentiment proxy may only capture the preference of individual investors, then institutional ownership may condition the effect of firm-level investor sentiment on the marginal value of cash. In order to mitigate the impact of institutional investors on the marginal value of cash, we control for total institutional ownership TIO and the motivated monitoring institutional ownership $MMIO$. TIO is defined as the percentage of outstanding shares held by institutional investors. Following Fich et al. (2015), $MMIO$ is

[6]CSI data is from the Federal Reserve Economic Data (FRED) database. BWI data is available at Jeffrey Wurgler's website: http://people.stern.nyu.edu/jwurgler/.

the ownership of institutional investors whose holding value in a firm ranked among the top 10% of the stocks in their portfolios. Column (5)–(8) of Table 5 show that the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. The coefficients of the interactions between the two measures of institutional ownership and change in cash are also positive and statistically significant, which is consistent with previous literature (e.g., Ward et al., 2018).

Dittmar and Mahrt-Smith (2007) document a positive relation between corporate governance and the marginal value of cash in their US sample. Pinkowitz et al. (2006) and Kalcheva and Lins (2007) also provide international evidence that shareholder protection is related to corporate cash policy. To mitigate the potential estimation bias due to agency problems, we control for two corporate governance entrenchment indexes: *Gindex* proposed by Gompers et al. (2003) and *Eindex* proposed by the Bebchuk et al. (2009). The ISS stops reporting the *Gindex* values after 2007, we follow Li and Li (2016) and extrapolate a firm's *Gindex* values after 2007, from its last *Gindex* value reported in the ISS. *Eindex* is the managerial entrenchment index composed of the six most important anti-takeover provisions from the twenty-four provisions included in the *Gindex*. A higher value of both indexes indicates more restrictions on shareholder rights and thus represents worse corporate governance. It is worth noting that the number of firm–year observations falls substantially after controlling for governance quality. Columns (9)–(12) of Table 5 show that the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. The coefficients of the interactions between the corporate governance indexes and change in cash are negative and statistically significant, consistent with Dittmar and Mahrt-Smith's (2007) finding that the marginal value of cash significantly increases with good corporate governance.

3.5. Potential explainations

In this section, we investigate the potential channels through which firm-specific investor sentiment has a positive impact on the marginal value of cash. Specifically, we

examine whether the impact of firm-specific investor sentiment on the marginal value of cash varies with firm growth opportunities, market-level investor sentiment, market turbulence, firm-level financial constraint, and asymmetric information. We adopt a cross-section analysis using sub-samples instead of interaction terms. Sub-sample analyses allow all coefficients of the independent variables and fixed effects to vary, conditioning on the partitioning variables. Table 6 presents the coefficients of estimates of specification (5) of Table 2. We test the equality of the regression coefficients between the two subsamples using seemingly unrelated estimations.

First, we study the cross-sectional variation in the effect of firm-specific investor sentiment on the marginal value of cash with respect to firm future growth opportunities. Previous studies show that stocks with high growth opportunities are more exposed to investor sentiment (e.g., Baker and Wurgler, 2006; Stambaugh et al., 2012). If the increase in the marginal value of cash associated with high firm-specific investor sentiment is due to retail investors overvaluing firm future growth opportunities, we should observe a greater impact of sentiment on value of cash for firms with better future growth opportunities. In columns (1)–(2) of Panel E of Table 6, we divide the sample according to the median of price-to-earnings ratios, *P/E*. In columns (3)–(4), we divide the sample according to the median of *Tobin's Q*. Firms with higher *P/E* and *Tobin's Q* are those with better future growth opportunities. Panel E shows that the estimated coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are positive and statistically significant at the 1% level for both sub-samples. Seemingly unrelated estimations show that the coefficients of the interaction term for firms with high future growth opportunities are larger than those for firms with low future growth opportunities, and the difference is statistically significant at 5% and 1% levels when we split our sample by *P/E* and *Tobin's Q*. Since firms may use internal cash to finance their future growth opportunities, our findings are consistent with the notion that high sentiment may lead to overvaluation of firms' future cash flows, and the perceived value of cash by retail investors is higher for firms with better future growth opportunities.

Second, we consider subsamples based on the market-level investor sentiment. Gao

et al. (2018) find that following the periods of positive market-level investor sentiment, the media and financial analysts produce more firm-specific information and institutional investors conduct more informed trading. Mian and Sankaraguruswamy (2012) also show that stock price sensitivity to good (bad) earning news is higher (lower) during high market-level investor sentiment periods than during periods of low sentiment. Therefore, market-level investor sentiment may affect how retail investors value corporate cash holdings. Similar to Section 3.4, we use *BWI* and *CSI* to classify the years with high or low market-level sentiment. Panel A of Table 6 shows that the estimated coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are positive and statistically significant at the 1% level for both sub-samples. Seemingly unrelated estimations show that the differences in the coefficients of the interaction term are not statistically significant between two sub-samples, suggesting that the empirical association between firm-specific investor sentiment and the marginal value of cash does not vary with market-level investor sentiment.

Third, we examine the impact of market turbulence on the relation between firm-specific investor sentiment and the marginal value of cash. Bates et al. (2018) find that the value of cash holdings increases with heightened macroeconomic and capital market uncertainty in the 2000s. In addition, although there's no evidence based on firm-specific investor sentiment, Garcia (2013) show that the predictability of stock returns using market-level investor sentiment is concentrated during recession periods. Upon these considerations, in columns (1)–(2) of Panel B of Table 6, we divide our sample into two time periods which are before (1992–2008) and after (2009–2018) the recent financial crisis. In columns (3)–(4) of Panel B, we divide our sample into two time periods which are in (2000–2001 and 2008–2009) and out (1992–1999, 2002–2007, and 2010–2018) of two market recessions following the bust of the dot-com bubble in 1999 and the real estate bubble in 2007. Panel B shows that the estimated coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are positive and statistically significant at the 1% level for both sub-samples. Seemingly unrelated estimations show that the differences in the coefficients of the interaction term are not statistically significant between two sub-samples. Our results indicate that market-wide uncertainty does

not affect the relation between firm-specific investor sentiment and the marginal value of cash.

Fourth, we examine the effect of firm-specific investor sentiment on the marginal value of cash separately for financially constrained and unconstrained firms. In columns (1)–(2) of Panel C of Table 6, we split the sample according to firms' Kaplan and Zingales (1997) index (KZ). We construct the KZ index using Kaplan and Zingales's (1997) five accounting ratios and regression coefficients (in parathesis): cash flow to total capital (-1.002), the market-to-book ratio (0.283), debt to total capital (3.139), dividends-to-total capital (-39.368), and cash holdings to capital (-1.315). In columns (3)–(4) of Panel C, we split the sample according to firms' Whited and Wu (2006) index (WW), which is consistent with firm characteristics associated with external financial constraints and constructed via the generalized method of moments estimation of an investment Euler equation. The five components and their corresponding coefficients in the WW index are: cash flow to total assets (-0.091), an indicator that takes the value of one if the firm pays cash dividends (-0.062), long-term debt to total assets (0.021), the natural log of total assets (-0.044), three-digit industry sales growth (0.102), and sales growth (-0.035).[7] The KZ and WW indexes are higher for firms with more financial constraints. Panel C shows that the estimated coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are positive and statistically significant at the 1% level for both sub-samples. Seemingly unrelated estimations show that the differences in the coefficients of the interaction term are not statistically significant between firms with high and low financial constraints. These results do not support the view that our main results are driven by retail investors' reaction to firms' financial constraint status.

Finally, we investigate whether asymmetric information has an impact on the relation between firm-specific investor sentiment and the marginal value of cash. Since information discovery is more costly for retail investors than for institutional investors, the positive

[7]Please refer to Kaplan and Zingales (1997) and Whited and Wu (2006) for the detailed information on the construction of the KZ and WW indexes.

relation between firm-specific investor sentiment and the marginal value of cash may be affected by firm information asymmetry. In columns (1)–(2) of Panel D of Table 6, we divide the sample according to the median of the standard deviations of financial analysts' earnings forecasts, *DISP*. Financial analysts tend to have a high dispersion of opinions in firms with high asymmetric information. In columns (3)–(4), we divide the sample according to the median of firm stock price informativeness, Ψ. Ψ is equal to $log(1-R^2)-log(R^2)$ where R^2 is estimated from the following regression for each firm–year:

$$R_i = \beta_0 + \beta_1 R_M + \beta_2 R_I + \epsilon_i \tag{8}$$

where R_i is firm i's daily stock return, R_M is the daily euqal-weighted stock returns of all CRSP stocks, and R_I is the daily equal-weighted stock returns of firms with the same 3-digit SIC code as firm i.[8] Ψ measures firm-specific stock return variation relative to market-wide variation or lack of synchronicity with the market. Firms with a higher Ψ have less information asymmetry. Panel D shows that the estimated coefficients of $FSOR_t \times \Delta Cash\ holdings_t$ are positive and statistically significant at the 1% level for both sub-samples. Seemingly unrelated estimations show that the differences in the coefficients of the interaction term are not statistically significant between firms with high and low information asymmetry. These results suggest that the positive relation between firm-specific investor sentiment and the marginal value of cash is not due to retail investors misvaluing firms with high asymmetric information.

Taken together, the results reported in Table 6 suggest that high firm-specific investor sentiment leads to retail investors' overvaluation of firm future growth opportunities, thus increasing the market perceived value of corporate cash holdings. However, the positive relation between firm-specific investor sentiment and the marginal value of cash can not be explained by market-level investor sentiment, market turbulence, firm-level financial constraint, and asymmetric information.

[8] Please refer to Ferreira et al. (2011) and Foucault and Fresard (2014) for the detailed definition of Ψ.

4. Robustness tests and further discussions

4.1. Endogeneity

Our analysis so far indicates that firm-specific investor sentiment is positively related to the marginal value of cash. Although our results are robust after controlling for cash regimes, market-level investor sentiment, institutional ownership, and governance entrenchment indexes in Faulkender and Wang's (2006) empirical framework, our tests may still be subject to the endogeneity bias due to unobservable firm characteristics affecting both firm-specific investor sentiment and the marginal value of cash. Furthermore, previous literature has shown that the marginal value of cash is associated with many firm characteristics as discussed in Section 1. It is not feasible for us to control for all of them in our empirical tests. We follow Gormley and Matsa's (2014) advice and adopt a high-dimensional fixed effects model to mitigate the potential endogeneity concern due to unobserved heterogeneity across firms and time-varying heterogeneity across industries.

In columns (1) and (2) of Table 7, we estimate the specification (4) and (5) of Table 2 with the firm and year fixed effects. In columns (3) and (4) of Table 7, we estimate specification (4) and (5) of Table 2 with the firm and year×industry fixed effects, which control for unobserved time invariable firm characteristics and time-varying industry effects. Consistent with the baseline regression results reported in Table 2, the estimated coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. Columns (1)–(4) imply that a one-standard-deviation increase in *FS-OR* is associated with \$0.29 (= 0.520 × 0.560) to \$0.35 (= 0.627 × 0.560) higher marginal value of cash. The positive effect of firm-specific investor sentiment on the marginal value of cash remains statistically and economically significant after controlling for unobserved firm characteristics.

Another cause of endogeneity is simultaneity where the explanatory variable is jointly determined with the dependent variable. Similar to most of the value of cash studies us-

ing Faulkender and Wang's (2006) empirical framework, we measure both the explanatory variable of interest *FS-OR* and the dependent variable excess returns in year t. An alternative explanation of our main finding is that firms with a higher value of cash might attract more retail investors, leading to higher contemporaneous firm-specific investor sentiment. To mitigate the potential endogeneity due to the simultaneity between sentiment and value of cash, we repeat our baseline analysis after replacing $FS\text{-}OR_t$ with $\Delta FS\text{-}OR_t$, the change in firm-specific investor sentiment from year $t-1$ to year t. Table 8 presents the results. Columns (1)–(3) of Table 8 are specification (3)–(5) of Table 2. We find that the coefficients on the interaction term, $\Delta FS\text{-}OR_t \times \Delta Cash\ holdings_t$, are positive and statistically significant at the 1% level.

Overall, it is unlikely that our inferences are driven by the potential endogeneity due to omitted variables and simultaneity.

4.2. Alternative measures of firm-specific investor sentiment

Throughout our main empirical tests, we adopt overnight returns as our primary measure of firm-specific investor sentiment. To further establish the link between firm-specific investor sentiment and the marginal value of cash, we supplement our analysis by using the order imbalance, *FS-OIB* and *FS-SOIB* discussed in Section 2.2, as an alternative measure of firm-specific investor sentiment.

Columns (1) and (2) of Table 9 report the results using small trade order imbalance (*FS-SOIB*) and order imbalance of all trades (*FS-OIB*) as the proxy for firm-specific investor sentiment over the sample period 1993–2000. In column (3), we use *FS-OIB* but extend the sample period to 1993–2018. The specification in all three columns is the same as column (5) of Table 2. The coefficients of $FS\text{-}SOIB_t \times \Delta Cash\ holdings_t$ and $FS\text{-}OIB_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level. Over the period 1993–2000, a one-standard-deviation increase in *FS-SOIB* is associated with \$0.18 ($= 1.649 \times 0.107$) higher marginal value of cash, while a one-standard-deviation increase in *FS-OIB* is associated with \$0.16 ($= 1.426 \times 0.115$) higher marginal value of cash.

Over the period 1993–2018, a one-standard-deviation increase in *FS-OIB* is associated with \$0.10 (= 1.069 × 0.097) higher marginal value of cash. Our results remain robust for the alternative measure of firm-specific investor sentiment.

4.3. Further discussions

4.3.1. Does the impact of sentiment on value of cash change over time?

Bates et al. (2018) find that the impact of market-level investor sentiment on the marginal value of cash changes over time. Market-level investor sentiment is weakly positively related to the marginal value of cash in the 1980s and 1990s, but such positive relation disappears in the 2000s. Market-level investor sentiment only has time-series variations, while firm-specific investor sentiment has both time-series and cross-sectional variations. In the previous sections, we have shown that the impact of firm-specific sentiment on the marginal value of cash is robust after controlling for market sentiment and does not vary with the changes in market sentiment over time. To further distinguish our paper from Bates et al. (2018), we divide our sample into three time periods: 1992–1999, 2000-2009, 2010–2018. The first two time periods overlap with the last two examined in Bates et al. (2018). Using specifications (4) and (5) in Table 2, untabulated results suggest that the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ are all positive and statistically significant at the 1% level over these three time periods. Seemingly unrelated estimations show that the differences in the coefficients of $FS\text{-}OR_t \times \Delta Cash\ holdings_t$ between any two of these three time periods are not statistically significant. Our results indicate that firm-specific investor sentiment is strongly positively related to the marginal value of cash, and that such positive relation does not vary over time. Comparing to Bates et al.'s (2018) findings, firm-specific investor sentiment offers greater explanatory power than market-level investor sentiment in explaining the marginal value of corporate cash holdings.

4.3.2. Excluding marketable securities from the definition of cash holdings

In our main empirical analysis, we follow Faulkender and Wang (2006) and define cash ($Cash\ holdings_t$) as pure cash plus marketable securities normalized by the lag of market value of equity. Previous sentiment literature shows that high market-level investor sentiment is positively associated with the contemporaneous overvaluation of stocks (e.g., Baker and Wurgler, 2006; Stambaugh et al., 2012; Huang et al., 2015). Therefore the market value of marketable securities may be different from their book value and that difference might be correlated with firm-specific investor sentiment. To make sure that our finding is not merely driven by this potential effect, we also replicate our baseline regression results using pure cash balance (Compustat code CE) instead of cash plus marketable securities (Compustat code CHE). Untabulated results suggest that the coefficients of $FS\text{-}OR_t \times \Delta Pure\ cash\ holdings_t$ are all positive and statistically significant at the 1% level in specification (3)–(5) of Table 2. A one-standard-deviation increase in *FS-OR* will lead to a \$0.30, \$0.30, and \$0.27 increase in the marginal value of cash in the three specifications. Comparing to Section 3.1, the economic effect of *FS-OR* on the value of cash is slightly smaller after excluding marketable securities from the definition of cash.

4.3.3. Firm-specific investor sentiment and corporate cash holdings

Our paper suggests that firm-level investor sentiment has an impact on firms' cash holding value. A related question is whether firm-specific investor sentiment has an impact on corporate cash policy. Observing the positive relation between firm-specific investor sentiment and value of cash, firm managers may hold more cash during the years when firm-specific investor sentiment is higher. To test this market timing hypothesis, we examine the relation between cash holdings in year t and firm-specific investor sentiment in year t and $t-1$. Neither the contemporaneous (p-value$= 0.635$) nor the lag firm-specific investor sentiment (p-value$= -0.115$) is related to cash holdings. We do not find direct evidence that firm-specific investor sentiment has an impact on corporate cash policy.

4.3.4. Mechanical relation between overnight returns and excess stock returns

In Faulkender and Wang's (2006) empirical framework, the dependent variable is excess stock returns, $r_{i,t} - R^B_{i,t}$. Since we use overnight returns as a proxy for firm-specific investor sentiment in our main empirical analyses, one may claim that overnight returns might be mechanically correlated with excess stock returns which aggregate both daily and overnight stock returns. We believe that it is unlikely the case, for the following reasons. First, Berkman et al. (2012) find a strong tendency for positive overnight returns followed by reversals during the trading day. It is not necessary that the combined daily and overnight returns are positively related to overnight returns. Second, our main result rely on the coefficient of the interaction term, $FS\text{-}OR_t \times \Delta Cash\ holdings_t$, not $FS\text{-}OR_t$ itself. Third, our main result remains robust when we use trade imbalance as an alternative measure of firm-specific investor sentiment in Section 4.2. Order imbalance is insulated from the concern about a mechanical correlation between sentiment and value of cash. Finally, we find that $\Delta FS\text{-}OR_t$, the change in overnight returns from year $t-1$ to t, has a positive impact on the marginal value of cash in Section 4.1. In untabulated tests, we replace $FS\text{-}OR_t$ by $FS\text{-}OR$ measured over one year or one month period before the starting of fiscal year t in our baseline regression equation (1). We find that both lagged $FS\text{-}OR$ measures have a positive impact on the marginal value of cash in year t. These two findings further mitigate the concern that overnight returns and the marginal value of cash are contemporaneous measured.

4.3.5. Measurement noise in the sentiment estimates

Previous market-wide sentiment studies tend to classify market states into high and low market-level investor sentiment (Baker and Wurgler, 2006). To reduce noise in estimating firm-specific investor sentiment, we also convert $FS\text{-}OR_t$ into ranks. Specifically, for each year, we rank $FS\text{-}OR_t$ into deciles and then standardize the deciles so that they range from zero to one, with observations in the bottom decile taking the value zero and

those in the top decile taking the value one. Then we replace $FS\text{-}OR_t$ by its rank measure in our baseline regression equation (1), untabulated results show that our main results remain robust.

5. Conclusions

While research on investor sentiment has long focused on the impact of market-wide sentiment on asset prices and corporate outcomes, this paper advances the sentiment research by examining the effects of firm-level investor sentiment on the value of corporate cash holdings. When investors are optimistic, the market perceived value of corporate cash holdings is higher than what would be justified based on firms' actual use of cash and future growth opportunities. Using overnight returns and buy-sell order imbalance as proxies for firm-level investor sentiment, we present evidence that at the firm level, investor sentiment is positively associated with the value of cash. This positive relation is consistent with the explanation that when firm-specific investor sentiment is high, retail investors are optimistic about the potential use of cash in firms' future growth opportunities, thus increasing the market perceived value of corporate cash holdings. We do not find support for the other possible explanations such as market-level investor sentiment, market turbulence, firm-level financial constraint, and asymmetric information. Our findings have important implications because firm-level investor sentiment, with both time-series and cross-sectional variations, could influence managerial decisions more than market-wide investor sentiment. This insight provides additional rationales for firm managers to incorporate shareholders' sentiment with corporate activities.

Appendix A

Table A1. Variable definitions

This table provides variable definitions and corresponding data sources in our main empirical tests. CRSP refers to the Centre for Research in Security Prices, ISS refers to the Institutional Shareholder Services (formerly RiskMetrics), s34 files refer to the Thomson Reuters 13F Database, TAQ refers to the Trade and Quote database, FRED refers to the Federal Reserve Economic Data database, IBES refers to the Institutional Brokers' Estimate System, FF refers to Kenneth French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html, and KK refers to Jeffrey Wurgler's website: http://people.stern.nyu.edu/jwurgler/.

Variable	Definition	Source
$r_{i,t} - R^B_{i,t}$	Excess stock returns with the benchmark portfolios defined as Fama–French 25 portfolios formed on size and book-to-market (Faulkender and Wang, 2006).	CRSP, Compustat, and FF
MV_t	Market value of equity, defined as the number of shares outstanding (CSHPRI) multiplied by stock price (PRCC_F) (Faulkender and Wang, 2006).	Compustat
Cash holdings$_t$	Cash plus marketable securities (CHE) normalized by MV (Faulkender and Wang, 2006).	Compustat
Δ*Cash holdings*$_t$	Change in cash holdings from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t (Faulkender and Wang, 2006).	Compustat
FS-OR$_t$	Firm-specified investor sentiment proxy defined as 250 $\times$ the average daily overnight returns over fiscal year t (Aboody et al., 2018).	CRSP
Δ*FS-OR*$_t$	The difference between *FS-OR*$_t$ and *FS-OR*$_{t-1}$.	CRSP
Δ*Earnings*$_t$	Change in earnings from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t. Earnings are calculated as earnings before extraordinary items (IB) plus interest (XINT), deferred tax credits (TXDI), and investment tax credits (ITCI) (Faulkender and Wang, 2006).	Compustat
Δ*Net assets*$_t$	Change in net assets from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t. Net assets are calculated as total assets (AT) minus cash holdings (CHE) (Faulkender and Wang, 2006).	Compustat
$\Delta R\&D_t$	Change in R&D expenditure (XRD) from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t (Faulkender and Wang, 2006).	Compustat

Continued on next page

Table A1 - continued from previous page

Variable	Definition	Source
$\Delta Interest\ expenses_t$	Change in interest expenses (XINT) from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t (Faulkender and Wang, 2006).	Compustat
$\Delta Dividends_t$	Change in total common share dividends (DVC) from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t (Faulkender and Wang, 2006).	Compustat
$Leverage_t$	Calculated as total debt (DLC+DLTT) divided by the sum of total debt and MV (Faulkender and Wang, 2006).	Compustat
$\Delta Net\ financing_t$	Change in net financing proceeds from from fiscal year $t-1$ to year t, normalized by MV at the start of fiscal year t. Net financing proceeds are defined as equity issuance (SSTK) minus repurchases (PRSTKC), plus debt issuance (DLTIS) minus debt redemption (DLTR) (Faulkender and Wang, 2006).	Compustat
BWI_t	An indicator variable equals to one (zero) for years that start with above (below) the full sample mean value of the Baker and Wurgler's Sentiment Index (Baker and Wurgler, 2006, 2007).	BW
CSI_t	An indicator variable equals to one (zero) for years that start with above (below) the full sample mean value of the University of Michigan's Consumer Sentiment Index.	FRED
TIO_t	Total institutional ownership.	s34 files
$MMIO_t$	The ownership of institutional investors whose holding value in a firm ranked as the top 10% of the stocks in their portfolios (Fich et al., 2015).	s34 files
$Gindex_t$	Corporate governance index composed of twenty-four provisions on investor rights and takeover protections applied to the company (Gompers et al., 2003).	ISS
$Eindex_t$	Entrenchment index composed of the six most important provisions in *G-index* (Bebchuk et al., 2009).	ISS
KZ_t	Kaplan and Zingales's (1997) index of financial constraints.	CRSP and Compustat
WW_t	Whited and Wu's (2006) index of external financial constraints.	CRSP and Compustat
$DISP_t$	Standard deviation of financial analysets' earnings per share forecasts.	IBES
Ψ_t	Stock price informativeness $log(1-R^2)-log(R^2)$ (Ferreira et al., 2011; Foucault and Fresard, 2014).	CRSP
P/E_t	Price(PRCC_F)-to-earnings(EPSFI) ratio (Basu, 1977).	Compustat
Tobin's Q_t	(AT + MV − book value of equity)/AT (Gompers et al., 2003)	Compustat

Continued on next page

Table A1 - continued from previous page

Variable	Definition	Source
$FS\text{-}SOIB_t$	Alternative firm-specific investor sentiment proxy: noise trader order imbalance defined as (buyer-initiated dollar trading volume - sell-initiated dollar trading volume)/(buyer-initiated dollar trading volume + sell-initiated dollar trading volume), consider only trades which are less than \$10,000 (based on 1992 dollars) (Yuan, 2015).	TAQ
$FS\text{-}OIB_t$	Alternative firm-specific investor sentiment proxy: aggregate order imbalance defined as (buyer-initiated dollar trading volume - sell-initiated dollar trading volume)/(buyer-initiated dollar trading volume + sell-initiated dollar trading volume), consider all the trades (Yuan, 2015).	TAQ

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Table 1. Summary statistics

This table reports the summary statistics of all variables used in our empirical analyses. The main sample consists of 64,548 firm–year observations over the fiscal years 1992 through 2018, with required data for our baseline regressions. The number of observations, mean, standard deviation, 1st percentile, 25th percentile, median, 75th percentile, and 99th percentile are reported from left to right, in sequence for each variable. All variables are defined in Appendix A.

Variable	Obs.	Mean	S.D.	p1	p25	Median	p75	p99
$r_{i,t} - R^B_{i,t}$	64,548	-0.007	0.500	-0.922	-0.299	-0.064	0.189	1.877
$\Delta Cash\ holdings_t$	64,548	0.008	0.103	-0.287	-0.022	0.001	0.031	0.421
$FS\text{-}OR_t$	64,548	-0.030	0.560	-2.388	-0.232	0.004	0.217	1.645
$\Delta FS\text{-}OR_t$	58,108	-0.003	0.571	-1.889	-0.270	0.001	0.269	1.908
$\Delta Earnings_t$	64,548	0.001	0.138	-0.480	-0.023	0.004	0.028	0.459
$\Delta Net\ assets_t$	64,548	0.054	0.316	-0.887	-0.033	0.022	0.107	1.447
$\Delta R\&D_t$	64,548	0.001	0.015	-0.047	0.000	0.000	0.001	0.061
$\Delta Interest\ expenses_t$	64,548	0.001	0.014	-0.040	-0.001	0.000	0.002	0.061
$\Delta Dividends_t$	64,548	0.000	0.009	-0.049	0.000	0.000	0.000	0.040
$Cash\ holdings_{t-1}$	64,548	0.140	0.172	0.001	0.030	0.084	0.185	0.844
$Leverage_t$	64,548	0.198	0.206	0.000	0.017	0.138	0.309	0.825
$Net\ financing_t$	64,548	0.031	0.175	-0.353	-0.030	0.000	0.043	0.843
$\Delta Alternative\ cash\ holdings\ I_t$	64,498	0.001	0.101	-0.289	-0.032	-0.004	0.026	0.408
$\Delta Alternative\ cash\ holdings\ II_t$	64,548	0.000	0.102	-0.285	-0.034	-0.007	0.023	0.419
$\Delta Alternative\ cash\ holdings\ III_t$	59,368	0.000	0.099	-0.279	-0.033	-0.007	0.023	0.401
TIO_t	63,509	0.557	0.282	0.006	0.332	0.595	0.789	1.000
$MMIO_t$	63,509	0.131	0.167	0.000	0.000	0.061	0.204	0.616
$Gindex_t$	10,965	9.317	2.645	4.000	7.000	9.000	11.000	15.000
$Eindex_t$	13,856	3.049	1.254	0.000	2.000	3.000	4.000	6.000
P/E_t	64,239	17.917	155.916	-207.571	5.000	15.691	25.196	300.000
$Tobin's\ Q_t$	64,439	2.015	1.838	0.652	1.132	1.513	2.238	8.765
$FS\text{-}SOIB_{t,1993--2000}$	28,465	-0.044	0.107	-0.337	-0.108	-0.034	0.018	0.226
$FS\text{-}OIB_{t,1993--2000}$	28,512	-0.071	0.115	-0.372	-0.136	-0.055	0.007	0.168
$FS\text{-}OIB_{t,1993--2018}$	81,947	-0.035	0.097	-0.369	-0.078	-0.013	0.015	0.176

Table 2. Baseline regressions: Firm-specific investor sentiment and the marginal value of cash

This table reports the OLS regressions of firm excess returns on changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The sample consists of 67,548 firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R^B_{it}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variables from year $t-1$ to t. In columns (1)–(2), we replicate Faulkender and Wang's (2006) baseline regressions over the their sample period 1972–2001. The coefficients of the year and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm level. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$\Delta Cash\ holdings_t$	0.772***	1.529***	1.117***	1.127***	1.880***
	(38.502)	(39.938)	(36.114)	(35.972)	(35.425)
$FS\text{-}OR_t$			0.086***	0.093***	0.089***
			(20.838)	(22.250)	(21.644)
$FS\text{-}OR_t \times \Delta Cash\ holdings_t$			0.669***	0.661***	0.592***
			(11.433)	(11.330)	(10.477)
$\Delta Earnings_t$	0.531***	0.526***	0.608***	0.613***	0.608***
	(41.433)	(41.512)	(28.532)	(28.570)	(28.597)
$\Delta Net\ assets_t$	0.168***	0.177***	0.256***	0.251***	0.257***
	(26.191)	(27.984)	(22.648)	(22.094)	(23.014)
$\Delta R\&D_t$	1.259***	1.171***	0.912***	1.156***	1.065***
	(9.424)	(8.866)	(5.088)	(6.401)	(6.007)
$\Delta Interest\ expenses_t$	-1.667***	-1.591***	-2.878***	-2.714***	-2.460***
	(-19.422)	(-18.753)	(-13.856)	(-12.912)	(-11.903)
$\Delta Dividends_t$	3.385***	3.345***	1.814***	1.864***	1.829***
	(16.856)	(16.761)	(8.823)	(9.092)	(8.909)
$Cash\ holdings_{t-1}$	0.314***	0.248***	0.222***	0.270***	0.223***
	(25.802)	(19.392)	(15.933)	(17.386)	(13.881)
$Leverage_t$	-0.494***	-0.491***	-0.427***	-0.512***	-0.510***
	(-58.333)	(-59.322)	(-45.199)	(-46.724)	(-46.950)
$Net\ financing_t$	0.093***	0.068***	-0.067***	-0.047**	-0.068***
	(7.279)	(5.463)	(-3.123)	(-2.178)	(-3.200)
$Cash\ holdings_{t-1} \times \Delta Cash\ holdings_t$		-0.728***			-0.816***
		(-12.508)			(-8.721)
$Leverage_t \times \Delta Cash\ holdings_t$		-1.609***			-2.290***
		(-21.162)			(-18.548)
Constant	0.058***	0.058***	0.026***	0.065***	0.061**
	(18.037)	(18.462)	(8.178)	(2.734)	(2.525)
Observations	89,555	89,555	64,548	64,548	64,548
R^2-adjusted	0.191	0.204	0.186	0.198	0.210
Year fixed effects	No	No	No	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes

Table 3. Three alternative definitions of the unexpected change in cash holdings

This table reports the OLS regressions of firm excess returns on alternative proxies for changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The sample consists of 64,548 firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R^B_{it}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. Δ*Alternative cash holdings* is the difference between the realized change in cash holdings and the expected change in cash holdings. Following Faulkender and Wang (2006), we define three alternative measures of the expected change in cash holdings from year $t-1$ to year t: (1) The average change in cash holdings of firms in the Fama and French (1993) 25 size and book-to-market benchmark portfolios over fiscal year t; (2) the predicted value of the Almeida et al. (2004) regression specification I: $\Delta Cash\ holdings_{i,t} = \beta_0 + \beta_1 Cash\ flow_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3 Size_{i.t-1} + Industry\ fixed\ effects + \epsilon_{i,t}$; (3) the predicted value of the Almeida et al. (2004) regression specification II with the additional explanatory variables: capital expenditures, acquisitions, change in net working capital, and change in short-term debt, all normalized by the lagged market value of assets. The coefficients of the year and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm level. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Portfolio average			Almeida et al. (2004) I			Almeida et al. (2004) II		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
$\Delta Alternative\ cash\ holdings_t$	1.055***	1.061***	1.786***	1.142***	1.154***	1.927***	1.079***	1.093***	1.854***
	(34.612)	(34.545)	(33.265)	(36.767)	(36.548)	(35.676)	(33.370)	(33.319)	(32.078)
$FS\text{-}OR_t$	0.092***	0.098***	0.095***	0.092***	0.099***	0.095***	0.098***	0.105***	0.101***
	(21.740)	(23.062)	(22.566)	(21.546)	(22.851)	(22.189)	(21.945)	(23.102)	(22.509)
$FS\text{-}OR_t \times \Delta Alternative\ cash\ holdings_t$	0.618***	0.613***	0.545***	0.707***	0.696***	0.619***	0.676***	0.665***	0.599***
	(10.510)	(10.452)	(9.628)	(11.996)	(11.823)	(10.890)	(10.481)	(10.328)	(9.611)
$\Delta Earnings_t$	0.628***	0.631***	0.624***	0.588***	0.593***	0.587***	0.594***	0.599***	0.593***
	(29.155)	(29.154)	(29.198)	(27.454)	(27.513)	(27.594)	(26.344)	(26.446)	(26.573)
$\Delta Net\ assets_t$	0.247***	0.243***	0.247***	0.265***	0.261***	0.265***	0.258***	0.256***	0.260***
	(21.890)	(21.390)	(22.229)	(23.156)	(22.650)	(23.495)	(21.712)	(21.395)	(22.128)
$\Delta R\&D_t$	0.971***	1.231***	1.148***	0.984***	1.211***	1.139***	0.993***	1.189***	1.106***
	(5.366)	(6.748)	(6.409)	(5.477)	(6.689)	(6.406)	(5.115)	(6.092)	(5.771)
$\Delta Interest\ expenses_t$	-2.962***	-2.787***	-2.541***	-2.888***	-2.725***	-2.455***	-3.029***	-2.881***	-2.619***

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Table 3 - continued from previous page

Variables	Portfolio average			Almeida et al. (2004) I			Almeida et al. (2004) II		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(-14.149)	(-13.184)	(-12.249)	(-13.879)	(-12.948)	(-11.878)	(-13.787)	(-12.933)	(-11.929)
$\Delta Dividends_t$	1.743***	1.832***	1.809***	1.916***	1.973***	1.938***	1.910***	1.996***	1.953***
	(8.460)	(8.922)	(8.819)	(9.337)	(9.635)	(9.449)	(9.218)	(9.626)	(9.412)
$Net\ financing_t$	-0.038*	-0.019	-0.039*	-0.076***	-0.061***	-0.083***	-0.065***	-0.052**	-0.070***
	(-1.773)	(-0.882)	(-1.846)	(-3.573)	(-2.798)	(-3.941)	(-2.871)	(-2.269)	(-3.168)
$Cash\ holdings_{t-1}$	0.208***	0.253***	0.201***	0.197***	0.244***	0.185***	0.190***	0.237***	0.181***
	(15.113)	(16.624)	(12.499)	(14.367)	(16.048)	(11.511)	(13.636)	(15.278)	(11.185)
$Cash\ holdings_{t-1} \times \Delta Alternative\ cash\ holdings_t$			-0.849***			-0.944***			-0.979***
			(-8.390)			(-9.285)			(-9.078)
$Leverage_t$	-0.439***	-0.523***	-0.530***	-0.447***	-0.532***	-0.546***	-0.442***	-0.521***	-0.535***
	(-45.999)	(-47.289)	(-47.998)	(-47.103)	(-48.263)	(-49.076)	(-45.183)	(-46.458)	(-47.267)
$Leverage_{t-1} \times \Delta\ Cash\ holding_t$			-2.246***			-2.329***			-2.214***
			(-17.952)			(-18.525)			(-16.581)
Constant	0.038***	0.038***	0.078***	0.042***	0.076***	0.079***	0.046***	0.082***	0.086***
	(12.294)	(12.294)	(3.199)	(13.563)	(3.156)	(3.230)	(14.695)	(3.342)	(3.460)
Observations	64,498	64,498	64,498	64,548	64,548	64,548	59,368	59,368	59,368
R^2-adjusted	0.18	0.192	0.203	0.188	0.200	0.212	0.186	0.198	0.209
Year fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

Table 4. Firm-specific investor sentiment and the marginal value of cash: Three cash regimes

This table reports the OLS regressions of firm excess returns on alternative proxies for changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables after controlling for three cash regimes. We follow Halford et al. (2017) and define three cash regimes. Firms in the servicing debt regime have market leverage ratio in the top decile of all firms and do not raise or distribute cash, firms in the raising cash regime issue equity and do not pay dividends, and firms in the distributing cash regime pay dividends or repurchase equity. The sample consists of firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R^B_{it}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. The coefficients of the year and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm levels. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Servicing debt			Raising cash			Distributing cash		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
$\Delta Cash\ holdings_t$	0.410***	0.367***	0.318	1.357***	1.302***	2.018***	0.734***	0.739***	1.239***
	(4.753)	(4.105)	(0.987)	(16.369)	(15.753)	(15.934)	(19.085)	(18.853)	(17.937)
$FS\text{-}OR_t$	0.096***	0.081***	0.079***	0.038***	0.035***	0.034***	0.099***	0.103***	0.102***
	(3.728)	(2.883)	(2.798)	(3.048)	(2.743)	(2.718)	(17.693)	(17.924)	(17.858)
$FS\text{-}OR_t \times \Delta Cash\ holdings_t$	0.423*	0.420*	0.465*	0.747***	0.679***	0.622***	0.477***	0.474***	0.479***
	(1.717)	(1.693)	(1.840)	(5.122)	(4.749)	(4.416)	(5.812)	(5.784)	(5.943)
$\Delta Earnings_t$	0.276***	0.254***	0.249***	0.662***	0.649***	0.649***	0.584***	0.590***	0.590***
	(4.679)	(4.226)	(4.145)	(9.591)	(9.457)	(9.448)	(20.769)	(20.750)	(20.855)
$\Delta Net\ assets_t$	0.119***	0.124***	0.125***	0.346***	0.305***	0.323***	0.189***	0.195***	0.195***
	(3.619)	(3.167)	(3.227)	(9.264)	(8.141)	(8.692)	(13.800)	(14.211)	(14.497)
$\Delta R\&D_t$	0.277	-0.595	-0.631	0.653	1.214***	1.108***	-0.133	0.048	0.042
	(0.222)	(-0.466)	(-0.517)	(1.621)	(2.993)	(2.786)	(-0.512)	(0.183)	(0.162)
$\Delta Interest\ expenses_t$	-1.750***	-1.125**	-1.150**	-2.239***	-2.008***	-1.544**	-2.365***	-2.035***	-2.009***
	(-3.878)	(-2.344)	(-2.434)	(-3.625)	(-3.225)	(-2.514)	(-8.221)	(-7.034)	(-7.000)
$\Delta Dividends_t$	1.043	1.018	0.972	0.784	0.951	0.682	2.488***	2.492***	2.468***
	(0.603)	(0.571)	(0.541)	(0.734)	(0.873)	(0.643)	(11.225)	(11.276)	(11.128)
$Cash\ holdings_{t-1}$	0.264***	0.269***	0.240***	0.377***	0.551***	0.570***	0.142***	0.170***	0.141***
	(6.392)	(5.019)	(4.606)	(6.076)	(8.396)	(8.877)	(8.746)	(9.497)	(7.521)

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Table 4 - continued from previous page

	Servicing debt			Raising cash			Distributing cash		
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
$Leverage_t$	-2.820***	-3.174***	-3.169***	-0.890***	-1.134***	-0.991***	-0.317***	-0.359***	-0.370***
	(-16.420)	(-16.137)	(-16.124)	(-21.707)	(-23.586)	(-20.904)	(-28.788)	(-29.596)	(-30.088)
$Net\ financing_t$	0.099*	0.106	0.100	-0.004	0.034	-0.033	-0.165***	-0.170***	-0.161***
	(1.683)	(1.572)	(1.481)	(-0.063)	(0.517)	(-0.518)	(-6.077)	(-6.279)	(-6.013)
$Cash\ holdings_{t-1} \times \Delta Cash\ holdings_t$			-0.410			-0.808**			-0.589***
			(-1.365)			(-2.247)			(-5.322)
$Leverage_{t-1} \times \Delta Cash\ holdings_t$			0.638			-3.198***			-1.184***
			(1.251)			(-9.508)			(-7.984)
Constant	1.895***	2.146***	2.165***	0.085***	0.052	0.043	0.009***	0.054*	0.055*
	(15.315)	(12.287)	(12.450)	(6.639)	(0.529)	(0.454)	(2.608)	(1.786)	(1.823)
Observations	824	824	824	8,465	8,465	8,465	35,188	35,188	35,188
R^2-adjusted	0.513	0.565	0.567	0.217	0.251	0.264	0.154	0.177	0.181
Year fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Industry fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

Table 5. Firm-specific investor sentiment and the marginal value of cash: Additional controls

This table reports the OLS regressions of firm excess returns on changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables after controlling for market sentiment, institutional ownership, and corporage governance. The sample consists of firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R^B_{it}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. In columns (1)–(2), BWI is an indicator variable which is equal to one (zero) for years that start with high (low) market-level sentiment measured by Baker and Wurgler's (2006) and Baker and Wurgler's (2007) Sentiment Index. In columns (3)–(4), CSI is an indicator variable which is equal to one (zero) for years that start with high (low) market-level sentiment measured by the University of Michigan's Consumer Sentiment Index. In columns (5)–(6), TIO is the total institutional ownership. In columns (7)–(8), $MMIO$ is the motivated monitoring institutional ownership defined in Fich et al. (2015). In columns (9)-(10), *Gindex* is the Gompers et al. (2003) entrenchment index. In columns (11)–(12), *Eindex* is the Bebchuk et al. (2009) entrenchment index. Columns with odd numbers present the coefficient estimates of specification (4) of Table 2, and columns with even numbers present the coefficient estimates of specification (5) of Table 2. The coefficients of the control variables, year fixed effects, and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm levels. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	BWI		**CSI**		**TIO**		**MMIO**		**G-Index**		**E-Index**	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
$\Delta Cash\ holdings_t$	1.064***	1.860***	0.936***	1.747***	0.947***	1.760***	0.982***	1.720***	1.647***	2.286***	1.609***	2.161***
	(26.163)	(30.679)	(19.570)	(26.857)	(16.472)	(22.492)	(28.047)	(30.059)	(7.451)	(8.813)	(9.904)	(11.009)
$FS\text{-}OR_t$	0.093***	0.089***	0.093***	0.089***	0.087***	0.083***	0.084***	0.081***	0.137***	0.132***	0.174***	0.169***
	(22.258)	(21.645)	(22.261)	(21.655)	(20.525)	(19.939)	(20.214)	(19.619)	(9.187)	(8.934)	(12.284)	(12.058)
$FS\text{-}OR_t \times \Delta Cash\ holdings_t$	0.681***	0.597***	0.675***	0.601***	0.663***	0.599***	0.637***	0.575***	0.891***	0.895***	1.003***	1.033***
	(11.530)	(10.429)	(11.510)	(10.580)	(11.234)	(10.505)	(10.985)	(10.223)	(3.990)	(4.190)	(4.985)	(5.285)
BWI_t	0.024**	0.027**										
	(2.021)	(2.310)										
$BWI_t \times \Delta Cash\ holdings_t$	0.146**	0.040										
	(2.428)	(0.693)										
CSI_t			-0.022*	-0.023*								

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Table 5 - continued from previous page

	BWI		CSI		TIO		MMIO		G-Index		E-Index	
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
			(-1.711)	(-1.817)								
$CSI_t \times \Delta Cash\ holdings_t$			0.295***	0.180***								
			(4.960)	(3.120)								
TIO_t					0.142***	0.140***						
					(17.833)	(17.836)						
$TIO_t \times \Delta Cash\ holdings_t$					0.400***	0.225**						
					(4.026)	(2.253)						
$MMIO_t$							0.396***	0.397***				
							(33.488)	(34.148)				
$MMIO_t \times \Delta Cash\ holdings_t$							2.127***	1.730***				
							(8.198)	(6.740)				
$Gindex_t$									0.006***	0.006***		
									(4.203)	(4.216)		
$Gindex_t \times \Delta Cash\ holdings_t$									-0.078***	-0.066***		
									(-3.370)	(-2.756)		
$Eindex_t$											0.007***	0.007***
											(2.654)	(2.608)
$Eindex_t \times \Delta Cash\ holdings_t$											-0.211***	-0.195***
											(-4.463)	(-4.053)
$Cash\ holdings_{t-1} \times \Delta Cash\ holdings_t$		-0.753***		-0.727***		-0.719***		-0.651***		-0.892***		-0.479*
		(-8.104)		(-7.859)		(-7.528)		(-6.977)		(-3.153)		(-1.940)
$Leverage_{t-1} \times \Delta Cash\ holdings_t$		-1.998***		-1.990***		-2.017***		-2.031***		-1.880***		-1.803***
		(-18.303)		(-18.230)		(-18.414)		(-18.736)		(-6.448)		(-6.318)
Constant	0.066***	0.061**	0.066***	0.061**	0.014	0.010	0.026	0.021	0.020	0.016	0.044	0.041
	(2.754)	(2.529)	(2.769)	(2.544)	(0.643)	(0.454)	(1.045)	(0.831)	(0.435)	(0.339)	(1.316)	(1.199)
Observations	64,548	64,548	64,548	64,548	63,509	63,509	63,509	63,509	10,965	10,965	13,856	13,856
R^2-adjusted	0.198	0.210	0.199	0.211	0.204	0.215	0.217	0.229	0.189	0.198	0.193	0.200
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. Differential impact of firm-specific investor sentiment on the marginal value of cash

This table reports the OLS regressions of firm excess returns on changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The sample consists of firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R_{it}^{B}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variables from year $t-1$ to t. In Panels A–E, we use sub-sample analyses to test whether the association between firm-specific investor sentiment and the marginal value of cash is affected by future growth opportunities, market-level sentiment, market uncertainty, financial constraint, and asymmetric information, respectively. All five panels present coefficient estimates of specification (5) of Table 2. We conduct seemingly unrelated estimation to test the equality of the regression coefficients between the two sub-samples (Chi-squares and p-values are reported). The coefficients of all the control variables, year, and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm level. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Growth opportunities. In columns (1) and (2), we divide our main sample into two sub-samples based on the medians of P/E. In columns (3) and (4), we divide our main sample into two sub-samples based on the medians of $Tobin's\ Q$. The low sub-samples include firm–years with below-annual-median firm growth opportunities, and the high sub-samples include firm–years with above-annual-median firm growth opportunities.

	P/E		$Tobin's\ Q$	
Variables	**(1) High**	**(2) Low**	**(3) High**	**(4) Low**
$FS\text{-}OR_t \times \Delta Cash\ holdings_t$	0.740***	0.491***	0.653***	0.240***
	(6.722)	(7.820)	(6.021)	(4.356)
Observations	32,121	32,116	32,218	32,221
R^2-adjusted	0.245	0.203	0.211	0.239
Control variables	Yes	Yes	Yes	Yes
Year and industry fixed effects	Yes	Yes	Yes	Yes
Subsample comparison of coefficients on $FS\text{-}OR_t \times \Delta Cash\ holdings_t$	Chi-square=3.90 (p-value=0.048)		Chi-square=11.44 (p-value=0.000)	

Panel B. Market-level sentiment. In columns (1) and (2), we divide our main sample into two sub-samples based on BWI. In columns (3) and (4), we divide our main sample into two sub-samples based on CSI. The high sub-samples include firm–years with high market-level sentiment, and the low sub-samples include firm–years with low market-level sentiment. A year is defined as with high (low) sentiment if the sentiment proxy at the end (December) of the previous year is above (below) the full sample mean value.

	BWI		CSI	
Variables	**(1) High**	**(2) Low**	**(3) High**	**(4) Low**
FS-OR$_t$×Δ*Cash holdings*$_t$	0.533***	0.632***	0.623***	0.477***
	(7.179)	(6.963)	(9.275)	(4.469)
Observations	31,126	33,422	45,246	19,302
R^2-adjusted	0.224	0.205	0.224	0.189
Control variables	Yes	Yes	Yes	Yes
Year and industry fixed effects	Yes	Yes	Yes	Yes
Subsample comparison of coefficients on *FS-OR*$_t$×Δ*Cash holdings*$_t$	Chi-square=0.85 (p-value=0.357)		Chi-square=0.94 (p-value=0.331)	

Panel C. Market turbulence. In columns (1) and (2), we divide our main sample into two sub-samples based on before or after the 2007 financial crisis. In columns (3) and (4), we divide our main sample into two sub-samples based on in or out of market recessions.

	Financial crisis		**Market recessions**	
Variables	**(1) Before**	**(2) After**	**(3) In**	**(4) Out**
FS-OR$_t$×Δ*Cash holdings*$_t$	0.549***	0.573***	0.571***	0.533***
	(9.238)	(4.188)	(5.157)	(8.671)
Observations	43,357	21,191	12,263	52,285
R^2-adjusted	0.227	0.201	0.219	0.217
Control variables	Yes	Yes	Yes	Yes
Year and industry fixed effects	Yes	Yes	Yes	Yes
Subsample comparison of coefficients on *FS-OR*$_t$×Δ*Cash holdings*$_t$	Chi-square=0.03 (p-value=0.868)		Chi-square=0.03 (p-value=0.867)	

Panel D. Financial constraint. In columns (1) and (2), we divide our main sample into two sub-samples based on KZ. In columns (3) and (4), we divide our main sample into two sub-samples based on WW. Both KZ and WW are financial constraint indexes as defined in Section 3.5. The top 25% sub-samples include firm–years with high financial constraint, and the bottom 25% sub-samples include firm–years with low financial constraint.

	KZ		WW	
Variables	**(1) Bottom 25%**	**(2) Top 25%**	**(3) Bottom 25%**	**(4) Top 25%**
FS-OR$_t$×Δ*Cash holdings*$_t$	0.596***	0.405***	0.489***	0.416***
	(6.070)	(3.490)	(2.870)	(5.075)
Observations	15,475	16,500	16,520	16,257
R^2-adjusted	0.236	0.227	0.227	0.205
Control variables	Yes	Yes	Yes	Yes
Year and industry fixed effects	Yes	Yes	Yes	Yes
Subsample comparison of coefficients on *FS-OR*$_t$×Δ*Cash holdings*$_t$	Chi-square=1.25 (p-value=0.264)		Chi-square=0.04 (p-value=0.845)	

Panel D. Asymmetric information. In columns (1) and (2), we divide our main sample into two sub-samples based on the medians of *DISP*. The high sub-samples include firm–years with above-annual-median information astmmetry. In columns (3) and (4), we divide our main sample into two sub-samples based on the medians of Ψ. The high sub-samples include firm–years with above-annual-median stock price informativeness.

	DISP		Ψ	
Variables	**(1) High**	**(2) Low**	**(3) High**	**(4) Low**
FS-OR$_t$×Δ*Cash holdings*$_t$	0.550***	0.715***	0.491***	0.606***
	(5.417)	(4.439)	(6.027)	(4.404)
Observations	22,564	22,623	24,409	24,409
R^2-adjusted	0.221	0.221	0.210	0.217
Control variables	Yes	Yes	Yes	Yes
Year and industry fixed effects	Yes	Yes	Yes	Yes
Subsample comparison of coefficients on *FS-OR*$_t$×Δ*Cash holdings*$_t$	Chi-square=0.77 (p-value=0.380)		Chi-square=0.51 (p-value=0.4743)	

Table 7. Mitigating endogeneity concerns: High-dimensional fixed effects model

This table reports the high-dimensional fixed effects regressions of firm excess returns on changes in cash holdings, firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The sample consists of firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R_{it}^{B}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. Following Gormley and Matsa (2014), we use the high-dimensional fixed effects model to control for unobserved firm characteristics. In columns (1) and (2), we control for the firm and year fixed effects. In columns (3) and (4), we control for the firm and interacted industry-year fixed effects. Control variables in columns (1) and (3) are the same as those included in specification (4) of Table 2, and control variables in columns (2) and (4) are the same as those included in specification (5) of Table 2. The coefficients of the control variables and fixed effects are suppressed for brevity. All variables are defined in Appendix A. Standard errors are clustered at the firm levels. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	**(1)**	**(2)**	**(3)**	**(4)**
$\Delta Cash\ holdings_t$	0.979***	1.886***	0.926***	1.787***
	(47.098)	(53.194)	(45.121)	(51.104)
$FS\text{-}OR_t$	0.126***	0.120***	0.116***	0.110***
	(30.619)	(29.489)	(28.228)	(27.175)
$FS\text{-}OR_t \times \Delta Cash\ holdings_t$	0.851***	0.771***	0.777***	0.704***
	(20.712)	(18.912)	(19.196)	(17.508)
Constant	-0.020***	-0.029***	-0.019***	-0.027***
	(-10.581)	(-15.227)	(-10.492)	(-14.935)
Observations	63,262	63,262	63,257	63,257
R^2-adjusted	0.257	0.270	0.309	0.321
Control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	No	No
Industry×Year fixed effects	No	No	Yes	Yes

Table 8. Mitigating endogeneity concerns: Change in firm-specific investor sentiment

This table reports the OLS regressions of firm excess returns on changes in cash holdings, change in firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The sample consists of firm–year observations of US firms over the sample period 1992–2018 with required data for the regressions. The dependent variable is $r_{it} - R_{it}^{B}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. Control variables in columns (1)–(3) are the same as those included in specification (3)–(5) of Table 2. The coefficients of all the control variables, year, and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm level. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	**(1)**	**(2)**	**(3)**
$\Delta Cash\ holdings_t$	1.107***	1.116***	1.886***
	(32.133)	(32.070)	(32.071)
$\Delta FS\text{-}OR_t$	0.087***	0.089***	0.087***
	(21.128)	(21.795)	(21.402)
$\Delta FS\text{-}OR_t \times \Delta Cash\ holdings_t$	0.185***	0.177***	0.170***
	(3.713)	(3.544)	(3.550)
Constant	0.030***	0.018	0.016
	(9.363)	(0.734)	(0.636)
Observations	58,108	58,108	58,108
R^2-adjusted	0.176	0.189	0.201
Control variables	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes
Industry fixed effects	No	Yes	Yes

Table 9. Alternative measures of firm-specific investor sentiment

This table reports the OLS regressions of firm excess returns on alternative proxies for changes in cash holdings, alternative measures of firm-specific investor sentiment, the interaction of the prior two variables, and control variables. The dependent variable is $r_{it} - R^B_{it}$, the annual excess stock return relative to the Fama and French (1993) 25 size and book-to-market portfolios. Δ indicates the change in the corresponding variable from year $t-1$ to t. *FS-SOIB* is the order imbalance of noise traders. *FS-OIB* is the order imbalance of all traders. In columns (1)–(2), the sample consists of firm–year observations of US firms over the sample period 1993–2000 with required data for the regressions. In column (3), the sample consists of firm–year observations of US firms over the sample period 1993–2018 with required data for the regressions. All control variables, the same as those in column (5) of Table 2, are included but their coefficients are not reported. The coefficients of the year and Fama–French 48 industry fixed effects are suppressed for brevity in the respective columns. All variables are defined in Appendix A. Standard errors are clustered at the firm level. t-statistics are reported in brackets. $*$, $**$, and $***$ denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Sample: 1993–2000		**Sample: 1993–2018**
Variables	**(1)**	**(2)**	**(3)**
$\Delta Cash\ holdings_t$	2.171***	2.180***	2.017***
	(27.155)	(26.478)	(42.865)
$FS\text{-}SOIB_t$	0.535***		
	(16.339)		
$FS\text{-}SOIB_t \times \Delta Cash\ holdings_t$	1.758***		
	(3.797)		
$FS\text{-}OIB_t$		0.943***	0.999***
		(30.465)	(43.625)
$FS\text{-}OIB_t \times \Delta Cash\ holdings_t$		1.821***	1.116***
		(4.408)	(4.387)
Observations	28,465	28,512	81,947
R^2-adjusted	0.246	0.263	0.236
Control variables	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes