# The Real Effects of Sentiment and Uncertainty

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**Abstract**

Sentiment effects should be strongest during times of heightened valuation uncertainty. As such, we document a significant amplifying role for market uncertainty in the relation between market sentiment and aggregate investment. A one-standard-deviation increase in uncertainty more than doubles the explanatory power of sentiment for investment. Our results are robust to various sentiment, uncertainty, and investment measures. We also document similar effects when examining aggregate equity issuance. As theory suggests, we find even stronger evidence in the cross-section of valuation uncertainty.

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# 1 Introduction

The question of whether stock market inefficiencies can have real effects has been of long-standing interest to economists.[1] However, empirical tests of this relation arrive at mixed conclusions (e.g., Fischer and Merton, 1984; Barro, 1990; Morck, Shleifer, and Vishny, 1990; Blanchard, Rhee, and Summers, 1993; Chirinko and Schaller, 2001; Gilchrist, Himmelberg, and Huberman, 2005; Lamont and Stein, 2006; Arif and Lee, 2014; McLean and Zhao, 2014). We argue that the link between sentiment and real economic outcomes depends on the underlying level of market uncertainty. In particular, we predict that in times of low market uncertainty, there will be a weak link between fluctuations in sentiment and variation in real managerial decisions. Conversely, we expect to observe a tight link between sentiment and real outcomes in times of high market uncertainty. Consistent with our hypotheses, we find that the level of market uncertainty is crucial in determining the relation between market sentiment and aggregate investment and corporate issuance activity. Further, we document empirically large cross-sectional implications, with significantly stronger effects for the subset of stocks likely to be most affected by sentiment.

Substantial evidence suggests that irrationality is exacerbated in settings of heightened uncertainty. A long literature in psychology provides strong evidence for systematic deviations from rationality in the presence of uncertainty (e.g., Kahneman and Tversky, 1973; Kahneman, 2003). In a finance context, Hirshleifer (2001) points out that psychological biases leading to mispricing should be strongest for stocks with the greatest uncertainty. Baker and Wurgler (2006) provide corroborating cross-sectional evidence, showing that sentiment-induced mispricing is largest for stocks with the greatest uncertainty about valuations. Analogously, in the time series, Keynes (1936) argues that waves of optimistic and pessimistic sentiment will most likely affect the stock market when uncertainty is greatest. Birru and Young (2022) provide corroborating time-series evidence, finding that many previously identified asset-pricing effects of sentiment are strongest when market uncertainty is greatest. In

[1] See Keynes (1936).

short, existing evidence suggests that the asset-pricing effects of sentiment are most significant in the presence of high uncertainty.

As intuitive examples, bubbles tend to be times of high market sentiment, high market uncertainty, and high investment. While financial crises tend to be times of high market uncertainty, low market sentiment, and low investment. Figure 1 plots the time-series dynamics of our main variables of interest and provides preliminary evidence that the real effects of sentiment are greatest in times of high market uncertainty. For example, the tech bubble of the late 1990s is a time of high sentiment and high uncertainty, and we observe high investment. In contrast, the financial crisis of 2008 is a time of high uncertainty but low sentiment, and we observe low investment.

Why might there be a relation between sentiment and corporate investment, and why might such a relation depend on the underlying level of market uncertainty? At least four potential arguments link sentiment to investment, and all should be exacerbated in times of high uncertainty. First, in the presence of rational long-run value-maximizing managers, sentiment-induced overpricing can help firms relax financing constraints and move closer to first-best investment. In the case of a financially constrained firm that is unable to fund all of its positive-NPV projects, a long-run value-maximizing manager will take advantage of irrationally cheap equity financing in times of overpricing by issuing equity to finance new investment but will be less likely to do so in times of underpricing (Stein, 1996). Because sentiment-induced mispricing is more substantial in times of high uncertainty (Birru and Young, 2022), this channel should primarily play a role in times of high uncertainty. Conversely, sentiment-induced mispricing is relatively small in times of low uncertainty and, therefore, less likely to lead to a significantly cheaper cost of capital.

A second channel linking sentiment to investment is that myopic managers cater to investor sentiment by investing when investors are overly optimistic as a means of maximizing the short-term share price, albeit at the cost of potential long-run value (e.g., Polk and Sapienza, 2009). This channel requires managers to exploit sentiment-induced mispricing

and therefore is again most likely to play a role in times of high uncertainty when the scope for sentiment-induced mispricing is greatest.

A third channel is that an empire-building manager can use overpriced equity as a cover to undertake self-aggrandizing investments. Such behavior relies on sentiment-induced mispricing, again suggesting that this channel will likely play a larger role in times of higher uncertainty when investor irrationality has the most scope for influencing prices.

Finally, in the case of a less-than-fully rational manager, sentiment and investment can be linked simply because of correlated sentiment between investors and managers. In this case, managers will invest precisely when investors are overly optimistic. As discussed in Keynes (1936), overly optimistic or pessimistic sentiment should have its greatest impact in times of high uncertainty, again suggesting this channel should play its strongest role when uncertainty is high. In short, while several theories predict a positive relation between sentiment and investment, each channel is likely stronger in times of higher uncertainty because there is more scope for sentiment.

We start by exploring the relation between sentiment and investment in aggregate regressions. When controlling for standard variables affecting aggregate investment, we find only weak evidence of a positive link between sentiment and investment, with results either insignificant or significant at only the 10% level, depending on specification. However, when allowing uncertainty-dependent sentiment effects by including an additional variable capturing the interaction of sentiment and uncertainty, we find an economically and statistically significant role for uncertainty in influencing the relation between sentiment and investment. In our baseline regressions, the effect of sentiment on investment more than doubles when uncertainty is one-standard-deviation above its mean relative to when uncertainty is at its mean. In terms of economic magnitude, higher sentiment is associated with a roughly 30% increase in investment when uncertainty is relatively high. Moreover, we find that accounting for uncertainty's moderating effect on sentiment results in a striking increase in our ability to explain time-varying aggregate investment. Adding only the interaction of sentiment and

uncertainty to the existing eight explanatory variables in our baseline regression increases $R^2$ by roughly 17%.

We also explore the potential non-linear effects of uncertainty on sentiment. Our primary analysis described above measures uncertainty as a continuous variable. Instead defining uncertainty as a binary variable that takes a value of one when uncertainty is in the top quintile of its historical distribution, we find particularly striking evidence of an amplifying role for uncertainty in influencing the effect of sentiment on corporate decisions. Specifically, we find that sentiment fails to significantly affect investment outside times of high uncertainty. In contrast, in times of high uncertainty, we find that the effect of sentiment on investment is roughly 18 times larger than the effect outside high-uncertainty times. Overall, the evidence from aggregate regressions suggests that the real effects of sentiment depend crucially on underlying market uncertainty.

We confirm that our results are robust to several alternative methodological choices. We estimate our baseline regressions at the monthly frequency to take full advantage of the higher-frequency variation in both sentiment and uncertainty. However, we confirm that our results are robust to annual data. Our main specifications use the Baker and Wurgler (2006) orthogonalized investor sentiment index but are robust to alternative sentiment proxies, including the Huang, Jiang, Tu, and Zhou (2015) aligned investor sentiment index and survey-based measures, including the University of Michigan Consumer Sentiment Index, the Conference Board Consumer Confidence Index, and the American Association of Individual Investors sentiment index. Our main uncertainty proxy is mean stock-level idiosyncratic volatility, but our results are also robust to alternative uncertainty proxies, including the Manela and Moreira (2017) news implied volatility index, the CBOE options implied volatility index, and mean stock-level total volatility. A possible concern is that because our primary measure of sentiment, the Baker and Wurgler (2006) orthogonalized investor sentiment index, contains equity issuance variables among the inputs used to construct the index, high equity issuance may be associated with investment for reasons unrelated to sen-

timent. Although we are unaware of theories predicting a more substantial relation between these variables in times of high uncertainty, our use of survey-based sentiment proxies described above confirms that our results are robust to sentiment proxies that do not depend on firm-level variables. We also show that our results are not due to the correlation between uncertainty and sentiment. Our main proxies for sentiment and uncertainty exhibit a correlation of 0.22, but we find similar or sometimes stronger results using several alternative sentiment and uncertainty proxies with near-zero correlations. Furthermore, our results are robust to an alternative definition of investment based on capital expenditures instead of asset growth.

We also explore additional predictions. First, we exploit cross-sectional predictions to provide further evidence of the moderating role of uncertainty in influencing the effects of sentiment on investment. Existing empirical evidence indicates that sentiment should have its greatest impact on stocks with the greatest valuation uncertainty (e.g., Baker and Wurgler, 2006). Following Da, Engelberg, and Gao (2015), we examine portfolios sorted on beta and volatility. Consistent with behavioral theory, we document relatively large sentiment effects in predicting investment for high-beta and high-volatility firms. Even more, when including the interaction of sentiment and uncertainty, we find that a one-standard-deviation increase in uncertainty is associated with sentiment effects that nearly double.

Finally, we explore the link between sentiment and equity issuance. If firms issue equity in response to overvalued equity, we expect to observe elevated equity issuance when both sentiment and uncertainty are high. Accordingly, we find an amplifying role for uncertainty in the relation between sentiment and equity issuance. We also show evidence of cross-sectional effects for equity issuance similar to those we document for investment.

Our work contributes to the existing literature in multiple ways. First, we add to the literature examining the implications of market sentiment or mispricing for investment. A non-exhaustive list of such papers includes Fischer and Merton (1984), Barro (1990), Morck et al. (1990), Blanchard et al. (1993), Chirinko and Schaller (2001), Gilchrist et al. (2005),

Arif and Lee (2014), and McLean and Zhao (2014). Our cross-sectional evidence is also related to the literature using firm-level proxies of mispricing to examine the relation between mispricing and investment in the cross-section of firms (e.g., Baker, Stein, and Wurgler, 2003; Polk and Sapienza, 2009; Bakke and Whited, 2010; Campello and Graham, 2013; Hau and Lai, 2013; Dong, Hirshleifer, and Teoh, 2021).

Second, we contribute to the literature examining the relation between aggregate mispricing and equity issuance. Baker and Wurgler (2000) show that aggregate equity issuance predicts market returns. Other work providing evidence of a link between equity prices and aggregate issuance activity includes Lamont and Stein (2006) and Ma (2019).

Third, we also relate to the literature examining the implications of uncertainty for investment. Most of these papers focus on political uncertainty, and we are unaware of work focusing on the relation between market uncertainty and investment. Julio and Yook (2012) examine the effects of elections on investment, and Gulen and Ion (2016) explore the impact of a news-based policy uncertainty index on investment. In contrast to policy uncertainty, we focus on market uncertainty and examine its indirect influence via moderating the ability of sentiment to explain investment.

The paper proceeds as follows. Section 2 discusses the data. Section 3 presents our empirical methodology and main results testing for a relation between aggregate investment and the interaction of sentiment and uncertainty. Section 4 presents robustness tests. Section 5 examines additional predictions, including cross-sectional predictions and predictions related to equity issuance. Section 6 concludes.

# 2 Data

## 2.1 Stock Sample

Our sample includes the intersection of U.S.-based common stocks listed on the NYSE, Amex, and Nasdaq from CRSP and Compustat from July 1965 to December 2021. We

exclude utilities and financials, firms with missing or non-positive assets, firms with negative R&D, and firms with less than $10 million in assets. To reduce the influence of outliers, we winsorize the data at the 0.5% level.

We follow Baker et al. (2003) and McLean and Zhao (2014) in measuring real outcomes. We measure investment ($INV$) in the broadest possible way: the change in assets, plus R&D, scaled by lagged assets (McLean and Zhao, 2014). We alternatively measure investment ($INV^{\star}$) as capital expenditures, plus R&D, plus SG&A, scaled by lagged assets.[2] We measure equity issuance ($EI$) as the change in equity, plus the change in deferred taxes, minus the change in retained earnings, scaled by lagged assets.

We test our hypotheses both in aggregate and in the cross-section. Following Arif and Lee (2014), we aggregate the data by calculating the value-weighted averages of the accounting variables using year-end market capitalizations as weights. Following Baker and Wurgler (2006) and Da et al. (2015), we use beta- and volatility-sorted portfolios to investigate the cross-section. We calculate beta and volatility using daily data from the past year.

## 2.2 Measuring Sentiment

We measure sentiment using the Baker and Wurgler (2006) orthogonalized investor sentiment index ($SENT$), which is the first principal component of five measures of investor sentiment: the closed-end fund discount, the number of IPOs, the first-day returns of IPOs, the equity share in total new issues, and the dividend premium. We use the orthogonalized version of the index, which accounts for the potential impacts of various macroeconomic conditions: industrial production growth, real durable consumption growth, real nondurable consumption growth, real services consumption growth, employment growth, and recessions. We also consider four alternative well-studied sentiment proxies. The first is the Huang et al. (2015) aligned investor sentiment index ($SENT^{PLS}$), which uses partial least squares to refine the Baker and Wurgler (2006) investor sentiment index. The other three sentiment proxies

[2]We follow the definition in Peters and Taylor (2017). Specifically, they sum capital expenditures, R&D, and 30% of SG&A to capture total investment.

are surveys, including the University of Michigan Consumer Sentiment Index ($MICH$), the Conference Board Consumer Confidence Index ($CCI$), and the American Association of Individual Investors sentiment index ($AAII$). While $MICH$ and $CCI$ survey consumers, $AAII$ surveys retail investors.

## 2.3 Measuring Uncertainty

We measure uncertainty as mean stock-level idiosyncratic volatility ($IVOL$), calculated as the volatility of daily return residuals from the Fama and French (1993) model from the past month. We also use three alternative common uncertainty proxies. The first is the Manela and Moreira (2017) news implied volatility index ($NVIX$).[3] The second is the CBOE options implied volatility index ($VXO$).[4] The third is mean stock-level total volatility ($TVOL$), calculated as the volatility of daily returns from the past month.

## 2.4 Descriptive Statistics

Table 1 provides descriptive statistics for the various sentiment, uncertainty, and investment proxies. Panel A reports summary statistics, including the mean, median, standard deviation, and 25th and 75th percentiles. We standardize the sentiment and uncertainty proxies to have zero mean and unit standard deviation. Our main investment proxy ($INV$) has a mean of 19.91% and a standard deviation of 9.03 percentage points.

Panel B of Table 1 reports correlations. The correlations between $SENT$ and $SENT^{PLS}$, $MICH$, $CCI$, and $AAII$ are 0.55, 0.26, 0.30, and 0.15, respectively. The correlations between $IVOL$ and $NVIX^2$, $VXO$, and $TVOL$ are 0.38, 0.56, and 0.97, respectively. These comovements indicate that the proxies capture slightly different dimensions of noise-trader beliefs and market uncertainty. $SENT$ exhibits moderate correlation with $IVOL$ (0.22), very low correlations with $NVIX^2$ ($-0.03$) and $VXO$ (0.03), and again moderate correlation with

[3]Following Manela and Moreira (2017), we use $NVIX^2$ in our empirical analyses.

[4]We use VXO instead of VIX because VXO provides a longer time series. We find similar results using VIX.

*TVOL* (0.20). The other sentiment and uncertainty proxies exhibit similar ranges in correlations. Finally, the correlations between $INV$ and *SENT*, $SENT^{PLS}$, *MICH*, *CCI*, and *AAII* are 0.41, 0.40, 0.39, 0.44, and 0.26, respectively. These correlations of similar magnitude are a preliminary indication of the positive relation between investment and sentiment. In Section 3, we formally test the relation and show it largely depends on prevailing market uncertainty.

# 3 Main Results

This section presents our main empirical findings on the link between sentiment, uncertainty, and investment.

## 3.1 Regression Evidence: Sentiment, Uncertainty, and Investment

We test the role that uncertainty plays in the sentiment-investment relation using the following regression specification:

$$INV_{t+\tau} = \beta_0 + \beta_1 SENT_t + \beta_2 IVOL_t + \beta_3 (SENT_t \times IVOL_t) + Controls_t + \epsilon_{t+\tau}, \quad (1)$$

where $INV_{t+\tau}$ is $\tau$-month-ahead investment, $SENT_t$ is the Baker and Wurgler (2006) orthogonalized investor sentiment index, and $IVOL_t$ is mean stock-level idiosyncratic volatility. When $\tau = 0$, we study the contemporaneous relation (e.g. Arif and Lee, 2014; McLean and Zhao, 2014). We also consider the predictive relation up to one-quarter ahead ($\tau \in \{1, 2, 3\}$), following evidence on investment lags in Lamont (2000). Like Arif and Lee (2014), we include controls common to the investment literature, including Tobin's q ($q$), return on assets (*ROA*), the term premium (*TERM*), the default premium (*DEF*), the Treasury bill rate (*TBILL*), and the market return (*MKT*).[5] To facilitate interpretation, we standardize the

[5] $q$ is the market value of equity, minus the book value of equity, plus assets, minus deferred taxes, scaled by assets. *ROA* is income before extraordinary items, scaled by assets. *TERM* is the spread between 10-year

independent variables to have zero mean and unit standard deviation.

Since optimism (pessimism) is increasing (decreasing) in our measure of sentiment, we expect a positive relation between sentiment and investment ($\beta_1 > 0$). Moreover, we expect uncertainty to amplify the positive relation ($\beta_3 > 0$). Thus, we are primarily interested in the interaction term ($\beta_3$) and the overall effect of sentiment on investment ($\beta_1 + \beta_3$). Table 2 presents our main results. Columns 1–4 report contemporaneous and predictive regressions of investment on sentiment, uncertainty, and controls. The relation between sentiment and investment is indeed positive, but statistical significance is marginal at best. However, when we allow uncertainty-dependent sentiment effects by adding the sentiment-uncertainty interaction to the specification, columns 5–8 document an economically and statistically significant (at the 1% level) relation between sentiment and investment. For example, when uncertainty is one-standard-deviation above its mean, column 5 shows that a one-standard-deviation increase in sentiment is associated with a 5.82 (2.60 + 3.22) percentage-point increase in investment. Since investment has a mean of 19.91%, this change in investment due to sentiment increases investment by roughly 30% (5.82/19.91). For comparison, a one-standard-deviation increase in $q$ increases investment by roughly 23%. We also find large differences in $R^2$ simply by including the sentiment-uncertainty interaction. For example, the jump in $R^2$ from column 1 to column 5 is 11 percentage points, a roughly 17% increase. Last, columns 6–8 consider one-, two-, and three-month-ahead investment. We find that when uncertainty is one-standard-deviation above its mean, the predictability of sentiment for investment more than doubles. In sum, sentiment exhibits substantial explanatory power for investment after allowing for uncertainty-dependent effects.

Examining the level effect of uncertainty, the positive and statistically significant coefficient is somewhat unexpected, although it is consistent with the evidence in Gulen and Ion (2016) who also report a positive and statistically significant effect of market uncertainty on

and 1-year Treasuries. *DEF* is the spread between BAA and AAA bonds. *TBILL* is the inflation-adjusted 30-day Treasury bill rate. *MKT* is the CRSP value-weighted market return.

investment in their Table 3; however, they do not propose an explanation.[6]

A potential concern is that our findings are affected by the modest yet positive correlation between our main sentiment proxy *SENT* and our main uncertainty proxy *IVOL*. Importantly, our robustness analyses show that this is not the case. Specifically, many of the alternative sentiment-uncertainty combinations that we explore exhibit little to no correlation. For example, our main sentiment proxy *SENT* exhibits a correlation −0.03 with the alternative uncertainty proxy $NVIX^2$, and a correlation of 0.03 with the alternative uncertainty proxy *VXO*. Similarly, the alternative sentiment proxy $SENT^{PLS}$ exhibits a correlation of 0.01 with our main uncertainty proxy *IVOL*. We document even stronger sentiment effects than those reported above in some of these robustness checks.

Uncertainty and sentiment both exhibit non-negligible within-year and within-quarter variation. We focus on monthly regressions to exploit these higher-frequency fluctuations. However, we also confirm that our results are robust to annual regressions. The results are shown in Table IA1. Column 1 indicates a lack of statistical significance for sentiment in the absence of its interaction with uncertainty. In column 2, we include the interaction term and again find an economically and statistically significant role for uncertainty in influencing the relation between sentiment and investment.

We also confirm that our results are robust to measuring investment as capital expenditures, plus R&D, plus SG&A, scaled by lagged assets (e.g., Peters and Taylor, 2017). We continue to use the same controls as in Table 2. Table 3 presents the results. Columns 1–4 again fail to identify a statistically significant role for sentiment in explaining investment when not conditioning on the underlying level of uncertainty. In contrast, columns 5–8 include the interaction term that allows sentiment's role in explaining investment to depend on uncertainty. Consistent with our main results, we observe an economically and statistically significant effect of the interaction term at every horizon. The relative importance of uncer-

[6]They document a positive and statistically significant coefficient on both VXO and a separate variable capturing the cross-sectional standard deviation of firm-level monthly stock returns. The latter is very similar to the variable we use in our main analyses, while VXO is an alternative uncertainty proxy we use in robustness tests.

tainty in influencing the relation between sentiment and investment is slightly greater than exhibited in the baseline regressions, with a one-standard-deviation increase in uncertainty resulting in a relation between sentiment and investment that is more than 2.5 times larger than the relation when uncertainty is at its mean.[7]

## 3.2 Non-Linear Effects

We also examine whether considering non-linear uncertainty affects our conclusions. If the effects of sentiment on asset prices and corporate decisions are negligible when uncertainty is not high, then a binary variable distinguishing times of high uncertainty may be better suited than a continuous variable. Importantly, this test allows us to reaffirm whether our above results using the continuous uncertainty variable are indeed due to times of high uncertainty, as we hypothesize. To examine the extent to which our results are confined to times of high uncertainty, we replace our main continuous uncertainty variable *IVOL* with an uncertainty dummy variable that takes the value of one when uncertainty is in the top quintile of its historical distribution.[8]

Table 4 presents the results using the binary uncertainty variable. Columns 1–4 repeat the analysis in the first four columns of Table 2. We now see that sentiment is unrelated to investment in the absence of the sentiment-uncertainty interaction. Columns 5–8 add the interaction term. The results are striking. In particular, the sentiment level term continues to lack significance, while the interaction term is statistically significant at the 1% level and exhibits substantial economic magnitudes at every horizon. For example, the coefficients in column 5 indicate that in times of high uncertainty, a one-standard deviation increase in sentiment is associated with an increase in aggregate investment of 46.6% (9.28/19.91). Stated differently, in times of high uncertainty, the relation between sentiment and aggregate investment is roughly 18 times larger than in times of low uncertainty. Overall, the results

[7]For example, from column 5, when uncertainty is at its mean, a one-standard-deviation increase in sentiment is associated with a 0.60 percentage-point increase in investment, but when uncertainty is one-standard-deviation above its mean, this increase in investment becomes 1.55 percentage points (0.60 + 0.95).

[8]Like Birru and Young (2022), we also use a top-quintile dummy.

in this section confirm an economically and statistically significant role for uncertainty in amplifying the relation between sentiment and investment.

# 4 Robustness

Our main results in Section 3 highlight uncertainty's moderating role in the sentiment-investment relation. In this section, we explore the extent to which our main results are robust to alternative sentiment and uncertainty proxies.

## 4.1 Alternative Sentiment Proxies

We start by investigating whether our main results continue to hold when using alternative sentiment proxies. Importantly, we examine an alternative market-based sentiment proxy and three alternative survey-based proxies, ruling out the potential concern that sentiment only links to investment via market-based sentiment proxies that contain information about security issuance.

### 4.1.1 Alternative Market-Based Sentiment Proxy

We first consider the Huang et al. (2015) aligned investor sentiment index ($SENT^{PLS}$), which is a revised version of the Baker and Wurgler (2006) investor sentiment index. Huang et al. (2015) use the same five market variables as Baker and Wurgler (2006) to construct the index but instead use partial least squares to extract information from the variables. We also note that $SENT^{PLS}$ exhibits a correlation of only 0.01 with our primary measure of uncertainty, ruling out the possible concern that the correlation between sentiment and uncertainty biases our results. Panel A of Table 5 reports results using $SENT^{PLS}$. The results are economically and statistically significant and similar to the main results in Table 2.

### 4.1.2 Alternative Survey-Based Sentiment proxies

We next consider three popular survey-based sentiment proxies. The survey measures have the added benefit that they are not constructed from variables reflecting underlying firm fundamentals. The first two survey-based measures we consider are the University of Michigan Consumer Sentiment Index ($MICH$) and the Conference Board Consumer Confidence Index ($CCI$), which both capture consumer beliefs. The third is the American Association of Individual Investors sentiment index ($AAII$), which captures retail-investor beliefs. Panel B of Table 5 reports results using $MICH$. The results are consistent with the main results in Section 3. Columns 5–8 show that the interaction of sentiment and uncertainty is significant at the 1% level at every horizon. Interestingly, the level effect of sentiment is never significant in explaining investment. The results with this alternative measure of sentiment suggest that uncertainty is crucial for identifying a relation between sentiment and investment and indicate that the real effects of sentiment only operate at times of heightened uncertainty.

Panel C shows results using $CCI$. Once again, our main results are robust, and the sentiment level coefficient is insignificant in all specifications, again suggesting that the real effects of sentiment only arise at times of heightened uncertainty. Finally, Panel D shows that our main results are mostly robust to using $AAII$. In contrast to the results using $MICH$ and $CCI$, sentiment does enter significantly on its own; however, the interaction term exhibits significance at the 5% level in the contemporaneous and one-month-ahead regression while losing significance thereafter.

## 4.2 Alternative Uncertainty Proxies

We also investigate the robustness of our main results to alternative uncertainty proxies, including the Manela and Moreira (2017) news implied volatility index ($NVIX$), the CBOE options implied volatility index ($VXO$), and mean stock-level total volatility ($TVOL$). Table 6 presents the results using the alternative uncertainty proxies. As mentioned earlier, the correlations between $SENT$ and $NVIX^2$ and $SENT$ and $VXO$ are near zero.

Panel A of Table 6 reports results using *NVIX*. Columns 1–4 indicate that the level term on sentiment does not exhibit a significant relation with investment. Interestingly, uncertainty also loses its significance in predicting investment when using *NVIX*. However, columns 5–8 show that our main results are robust. The coefficients on the sentiment and uncertainty interaction term are significant at the 1% level in all specifications, and the economic magnitudes are somewhat larger than our baseline results in Table 2.

Panel B examines the robustness of our findings to *VXO*. Columns 1–4 show that both sentiment and uncertainty exhibit positive and significant predictability for investment. In columns 5–8, the interaction term between sentiment and uncertainty is now insignificant at the three-month horizon but maintains significance at the 1% level for contemporaneous and one-month ahead investment and is significant at the 5% level for the two-month horizon. Finally, Panel C presents results using *TVOL*. Panel C shows that our results are again robust. In particular, the interaction term in columns 5–8 maintains its significance at the 1% level at every horizon. Relative to the main results, the economic importance of the interaction terms is of comparable, or slightly larger, significance. Overall, the results in this section indicate that our main results are robust to many alternative sentiment and uncertainty proxies, suggesting a strong effect of market uncertainty in moderating the sentiment-investment relation.

# 5 Additional Predictions

In this section, we explore additional predictions. First, we test for heterogeneity in the effects of sentiment on investment in the cross-section of firms. Next, we examine whether uncertainty has a role in influencing the relation between sentiment and aggregate equity financing activity.

## 5.1 Cross-Sectional Predictions

An extensive literature shows that sentiment exhibits its strongest effects in the cross-section. In particular, assets with greater valuation uncertainty are more susceptible to sentiment effects. For example, Baker and Wurgler (2006) and Da et al. (2015) show that sorting portfolios based on volatility and beta produces substantial cross-sectional heterogeneity in sentiment-induced mispricing and future portfolio returns. We explore whether the effects we document for investment are stronger when sorting stocks based on their expected sensitivity to sentiment. Existing theory and evidence (e.g., Baker and Wurgler, 2006; Da et al., 2015) predicts that our results should be particularly strong for stocks with relatively high volatility or beta.

We start by sorting stocks into terciles based on stock-level beta and volatility. Next, we aggregate firm-level investment at the tercile level. We also present results that examine the difference in aggregate investment between the top and bottom terciles. If stock prices and investment are more sensitive to sentiment for high-volatility and high-beta firms, we expect the top minus bottom tercile to be positively related to sentiment. We examine results separately for beta- and volatility-sorted portfolios. Panel A of Table 7 follows our methodology from Equation (1) but now focuses on the average investment of high-beta firms. Columns 1–4 indicate that these firms' investment exhibits considerable sensitivity to sentiment. In columns 5–8, we include the interaction term of sentiment and uncertainty. The results indicate statistically and economically significant effects of uncertainty on the relation between sentiment investment. The interaction term suggests that the impact of sentiment for investment nearly doubles when uncertainty is one-standard-deviation above its mean relative to when uncertainty is at its mean. Further consistent with predictions, Panel B shows that the investment of low-beta firms fails to exhibit a significant relation with sentiment and the interaction of sentiment with uncertainty. In Panel C, we use a dependent variable equal to the difference between the investment of high-beta and low-beta firms. Consistent with the results in Panels A and B, we find that sentiment is influential

in explaining time-variation in the difference in investment for these firms and that the underlying level of market uncertainty plays a significant role in determining time-variation in the importance of this relation.

In Table 8, we explore the results when sorting firms into terciles based on volatility. We find consistent and somewhat economically more significant results. Columns 1–4 of Panel A again show that firms with greater valuation uncertainty exhibit a strong unconditional relation between sentiment and investment. Columns 5–8 show that this relation is heavily dependent on uncertainty, with the relation between sentiment and investment nearly doubling when uncertainty increases from its mean to one-standard-deviation above its mean. As with low-beta firms, we fail to find evidence of a significant relation between sentiment and investment for low-volatility firms. However, we do document a statistically significant interaction term in column 5, indicating a potential role for uncertainty in influencing the relation between sentiment and uncertainty for low-volatility firms, albeit a role that is relatively small economically and is no longer significant at the two- and three-month horizons shown in columns 7 and 8. Finally, regressions in Panel C examining the difference in investment between high and low-volatility firms exhibit statistically and economically significant coefficients for the interaction term, consistent with the interpretations from Panels A and B.

## 5.2 Equity Issuance Activity

Existing literature also presents evidence consistent with market sentiment affecting aggregate equity issuance of firms (see, e.g., Baker and Wurgler, 2000; Lamont and Stein, 2006). We start by examining the implications of market uncertainty for the relation between sentiment and aggregate equity issuance activity and then explore implications for the cross-section of equity issuance.

We measure equity issuance ($EI$) as the change in equity, plus the change in deferred taxes, minus the change in retained earnings, scaled by lagged assets. We estimate regressions

similar to the investment regression of Equation (1), except we replace investment with the measure of equity issuance. We control for variables common to issuance regressions, including Tobin's q, return on assets, leverage, and the log of assets. Moreover, using the Baker and Wurgler (2006) investor sentiment index presents endogeneity concerns because it contains variables related to issuance activity. We instead use the University of Michigan Consumer Sentiment Index (*MICH*) as our main sentiment proxy in these tests because it simply aggregates consumer opinions about the economy's prospects.

Table 9 shows that sentiment is not significantly related to contemporaneous or future equity issuance. Columns 1–4 indicate an insignificant relation between sentiment and equity issuance in the absence of the interaction of sentiment and uncertainty. Columns 5–8 indicate that sentiment does have a statistically and economically significant relation with equity issuance when conditioning on underlying market uncertainty.

Moreover, Table IA2 confirms that our issuance results are robust to the alternative survey-based sentiment measures of *CCI* and *AAII*, though statistical and economic significance varies across specifications for *AAII*. We do not present robustness results with $SENT^{PLS}$ because it suffers from the same endogeneity concern as *SENT*.

### 5.2.1 Equity Issuance Activity in the Cross-Section

Finally, we examine cross-sectional predictions for equity financing activity. Following the cross-sectional investment analysis in Section 5.1, we extend our cross-sectional beta and volatility tests to equity issuance activity. Table IA3 reports equity issuance results for beta-sorted portfolios (Panel A) and volatility-sorted portfolios (Panel B). The results are statistically and economically significant for volatility but mixed for sorts on beta, with statistically significant coefficients on the interaction term for two- and three-month horizons but insignificant coefficients for the contemporaneous and one-month horizons.

# 6 Conclusion

Sentiment should exhibit its strongest influence on financial markets in settings with heightened uncertainty. A sizeable cross-sectional literature shows that aggregate sentiment or mispricing effects are the largest for stocks with the greatest uncertainty. We show that such a relation extends to considering the real effects of sentiment in the time series. We find that the effects of sentiment for corporate investment and financing activities are substantially increased in times of high uncertainty. Further consistent with theory, the time-varying effects of sentiment that we document are largest for the subset of stocks with the greatest valuation uncertainty. Overall, we provide strong evidence supporting a strong role of sentiment in influencing aggregate investment and financing activity in the economy. The real effects of sentiment are substantial but primarily concentrate in times of high market uncertainty.

# References


Arif, S. and C. M. C. Lee (2014). Aggregate investment and investor sentiment. *Review of Financial Studies 27*(11), 3241–3279.

Baker, M., J. C. Stein, and J. Wurgler (2003). When does the market matter? stock prices and the investment of equity-dependent firms. *Quarterly Journal of Economics 118*(3), 969–1005.

Baker, M. and J. Wurgler (2000). The equity share in new issues and aggregate stock returns. *Journal of Finance 55*(5), 2219–2257.

Baker, M. and J. Wurgler (2006). Investor sentiment and the cross-section of stock returns. *Journal of Finance 61*(4), 1645–1680.

Bakke, T.-E. and T. M. Whited (2010). Which firms follow the market? an analysis of corporate investment decisions. *Review of Financial Studies 23*(5), 1941–1980.

Barro, R. J. (1990). The stock market and investment. *Review of Financial Studies 3*(1), 115–131.

Birru, J. and T. Young (2022). Sentiment and uncertainty. *Journal of Financial Economics 146*(3), 1148–1169.

Blanchard, O., C. Rhee, and L. Summers (1993). The stock market, profit, and investment. *Quarterly Journal of Economics 108*(1), 115–136.

Campello, M. and J. R. Graham (2013). Do stock prices influence corporate decisions? evidence from the technology bubble. *Journal of Financial Economics 107*(1), 89–110.

Chirinko, R. S. and H. Schaller (2001). Business fixed investment and "bubbles": The japanese case. *American Economic Review 91*(3), 663–680.

Da, Z., J. Engelberg, and P. Gao (2015). The sum of all FEARS investor sentiment and asset prices. *Review of Financial Studies 28*(1), 1–32.

Dong, M., D. Hirshleifer, and S. H. Teoh (2021). Misvaluation and corporate inventiveness. *Journal of Financial and Quantitative Analysis 56*(8), 2605–2633.

Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics 33*(1), 3–56.

Fischer, S. and R. C. Merton (1984). Macroeconomics and finance: The role of the stock market. *Carnegie-Rochester Conference Series on Public Policy 21*(1), 57–108.

Gilchrist, S., C. P. Himmelberg, and G. Huberman (2005). Do stock price bubbles influence corporate investment? *Journal of Monetary Economics 52*(4), 805–827.

Gulen, H. and M. Ion (2016). Policy uncertainty and corporate investment. *Review of Financial Studies 29*(3), 523–564.

Hau, H. and S. Lai (2013). Real effects of stock underpricing. *Journal of Financial Economics 108*(2), 392–408.

Hirshleifer, D. (2001). Investor psychology and asset pricing. *Journal of Finance 56*(4), 1533–1597.

Huang, D., F. Jiang, J. Tu, and G. Zhou (2015). Investor sentiment aligned: a powerful predictor of stock returns. *Review of Financial Studies 28*(3), 791–837.

Julio, B. and Y. Yook (2012). Political uncertainty and corporate investment cycles. *Journal of Finance 67*(1), 45–83.

Kahneman, D. (2003). Maps of bounded rationality: psychology for behavioral economics. *American Economic Review 93*(5), 1449–1475.

Kahneman, D. and A. Tversky (1973). On the psychology of prediction. *Psychological Review 80*(4), 237–251.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. London: Macmillan.

Lamont, O. A. (2000). Investment plans and stock returns. *Journal of Finance 55*(6), 2719–2745.

Lamont, O. A. and J. C. Stein (2006). Investor sentiment and corporate finance: Micro and macro. *American Economic Review 96*(2), 147–151.

Ma, Y. (2019). Nonfinancial firms as cross-market arbitrageurs. *Journal of Finance 74*(6), 3041–3087.

Manela, A. and A. Moreira (2017). News implied volatility and disaster concerns. *Journal of Financial Economics 123*(1), 137–162.

McLean, R. D. and M. Zhao (2014). The business cycle, investor sentiment, and costly external finance. *Journal of Finance 69*(3), 1377–1409.

Morck, R., A. Shleifer, and R. W. Vishny (1990). Do managerial objectives drive bad acquisitions? *Journal of Finance 45*(1), 31–48.

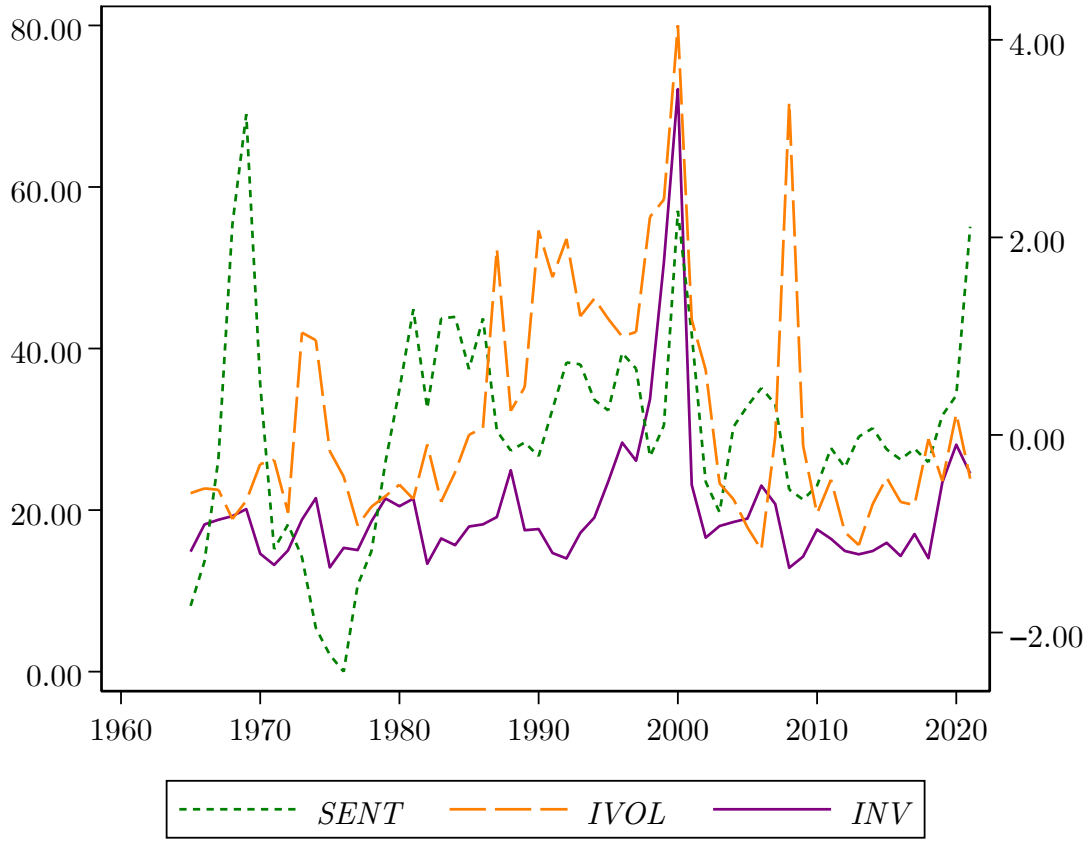
Newey, W. K. and K. D. West (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica 55*(3), 703–708.

Peters, R. H. and L. A. Taylor (2017). Intangible capital and the investment-q relation. *Journal of Financial Economics 123*(2), 251–272.

Polk, C. and P. Sapienza (2009). The stock market and corporate investment: A test of catering theory. *Review of Financial Studies 22*(1), 187–217.

Stein, J. C. (1996). Rational capital budgeting in an irrational world. *Journal of Business 69*(4), 429–455.

Figure 1. Sentiment, Uncertainty, and Investment




This figure plots the aggregate time series of sentiment, uncertainty, and investment. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. *INV* is the change in assets, plus R&D, scaled by lagged assets. For ease of interpretation, we plot the year-end values of the series to smooth the trends. The sample period is July 1965 to December 2021.

Table 1. Descriptive Statistics

*Panel A: Summary Statistics*

| | Mean | Median | SD | 25% | 75% |
|---|---|---|---|---|---|
| $SENT$ | 0.00 | 0.00 | 1.00 | −0.45 | 0.53 |
| $SENT^{PLS}$ | 0.00 | −0.28 | 1.00 | −0.63 | 0.27 |
| $MICH$ | 0.00 | 0.13 | 1.00 | −0.76 | 0.68 |
| $CCI$ | 0.00 | −0.14 | 1.00 | −0.62 | 0.68 |
| $AAII$ | 0.00 | 0.04 | 1.00 | −0.71 | 0.68 |
| $IVOL$ | 0.00 | −0.38 | 1.00 | −0.75 | 0.67 |
| $NVIX^2$ | 0.00 | −0.25 | 1.00 | −0.56 | 0.27 |
| $VXO$ | 0.00 | −0.21 | 1.00 | −0.76 | 0.42 |
| $TVOL$ | 0.00 | −0.33 | 1.00 | −0.71 | 0.57 |
| $INV$ (%) | 19.91 | 17.96 | 9.03 | 15.17 | 20.80 |
| $INV^\star$ (%) | 18.85 | 19.82 | 3.14 | 15.35 | 21.15 |

*Panel B: Correlations*

| | $SENT$ | $SENT^{PLS}$ | $MICH$ | $CCI$ | $AAII$ | $IVOL$ | $NVIX^2$ | $VXO$ | $TVOL$ | $INV$ | $INV^\star$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $SENT$ | 1.00 | | | | | | | | | | |
| $SENT^{PLS}$ | 0.55 | 1.00 | | | | | | | | | |
| $MICH$ | 0.26 | −0.08 | 1.00 | | | | | | | | |
| $CCI$ | 0.30 | 0.13 | 0.77 | 1.00 | | | | | | | |
| $AAII$ | 0.15 | 0.17 | 0.31 | 0.18 | 1.00 | | | | | | |
| $IVOL$ | 0.22 | 0.01 | 0.26 | 0.15 | 0.03 | 1.00 | | | | | |
| $NVIX^2$ | −0.03 | 0.00 | −0.06 | −0.13 | −0.18 | 0.38 | 1.00 | | | | |
| $VXO$ | 0.03 | 0.25 | 0.01 | 0.15 | −0.11 | 0.56 | 0.71 | 1.00 | | | |
| $TVOL$ | 0.20 | 0.03 | 0.22 | 0.13 | −0.01 | 0.97 | 0.51 | 0.68 | 1.00 | | |
| $INV$ | 0.41 | 0.40 | 0.39 | 0.44 | 0.26 | 0.49 | 0.08 | 0.28 | 0.45 | 1.00 | |
| $INV^\star$ | 0.13 | 0.33 | 0.04 | 0.19 | 0.17 | 0.28 | −0.27 | 0.23 | 0.16 | 0.39 | 1.00 |

This table reports descriptive statistics for the various sentiment, uncertainty, and investment proxies. The sentiment proxies include the Baker and Wurgler (2006) orthogonalized investor sentiment index ($SENT$), the Huang et al. (2015) aligned investor sentiment index ($SENT^{PLS}$), the University of Michigan Consumer Sentiment Index ($MICH$), the Conference Board Consumer Confidence Index ($CCI$), and the American Association of Individual Investors sentiment index ($AAII$). The uncertainty proxies include mean stock-level idiosyncratic volatility ($IVOL$), the Manela and Moreira (2017) news implied volatility index ($NVIX^2$), the CBOE options implied volatility index ($VXO$), and mean stock-level total volatility ($TVOL$). The investment proxies include the change in assets, plus R&D, scaled by lagged assets ($INV$), and capital expenditures, plus R&D, plus SG&A, scaled by lagged assets ($INV^\star$). Panel A reports summary statistics, and Panel B reports correlations. We standardize the sentiment and uncertainty proxies to have zero mean and unit standard deviation. The sample period varies between July 1965 and December 2021.

Table 2. Sentiment and Investment

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 1.80* | 1.68* | 1.50 | 1.27 | 2.60*** | 2.42*** | 2.15*** | 1.81*** |
| | (1.76) | (1.70) | (1.63) | (1.54) | (4.13) | (3.94) | (3.61) | (3.15) |
| *IVOL* | 2.36*** | 2.35*** | 2.31*** | 2.22*** | 1.65*** | 1.69*** | 1.72*** | 1.74*** |
| | (3.04) | (3.06) | (3.05) | (3.04) | (2.75) | (2.73) | (2.65) | (2.61) |
| *SENT* × *IVOL* | | | | | 3.22*** | 3.06*** | 2.72*** | 2.27*** |
| | | | | | (6.76) | (6.40) | (5.91) | (4.75) |
| *q* | 5.47*** | 5.51*** | 5.54*** | 5.60*** | 4.65*** | 4.71*** | 4.82*** | 4.99*** |
| | (3.92) | (3.82) | (3.69) | (3.59) | (4.73) | (4.34) | (3.99) | (3.71) |
| *ROA* | 0.48 | 0.45 | 0.36 | 0.25 | 0.13 | 0.11 | 0.06 | 0.00 |
| | (0.54) | (0.51) | (0.41) | (0.30) | (0.22) | (0.18) | (0.09) | (0.00) |
| *TERM* | −2.04*** | −2.21*** | −2.38*** | −2.53*** | −2.40*** | −2.56*** | −2.69*** | −2.78*** |
| | (−2.94) | (−3.27) | (−3.59) | (−3.84) | (−4.34) | (−4.62) | (−4.76) | (−4.79) |
| *DEF* | 0.89 | 0.75 | 0.60 | 0.49 | 1.76*** | 1.57*** | 1.33** | 1.10* |
| | (1.09) | (0.89) | (0.71) | (0.59) | (3.15) | (2.73) | (2.24) | (1.79) |
| *TBILL* | 0.10 | 0.11 | 0.09 | 0.13 | −0.11 | −0.09 | −0.09 | 0.00 |
| | (0.32) | (0.35) | (0.26) | (0.39) | (−0.38) | (−0.28) | (−0.27) | (−0.01) |
| *MKT* | 0.24 | 0.24 | 0.27 | 0.49** | 0.34** | 0.33** | 0.35* | 0.55*** |
| | (1.23) | (1.11) | (1.02) | (2.00) | (2.47) | (2.28) | (1.76) | (2.84) |
| Intercept | 19.91*** | 19.94*** | 19.97*** | 20.00*** | 19.21*** | 19.27*** | 19.37*** | 19.50*** |
| | (27.83) | (28.19) | (28.42) | (28.54) | (35.36) | (34.12) | (32.71) | (31.40) |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.66 | 0.67 | 0.67 | 0.67 | 0.77 | 0.77 | 0.75 | 0.72 |

This table reports aggregate results from contemporaneous and predictive regressions of investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q ($q$), return on assets (*ROA*), the term premium (*TERM*), the default premium (*DEF*), the Treasury bill rate (*TBILL*), and the market return (*MKT*). We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

Table 3. Sentiment and Investment: Alternative Investment Proxy

| | (1) $INV_t^\star$ | (2) $INV_{t+1}^\star$ | (3) $INV_{t+2}^\star$ | (4) $INV_{t+3}^\star$ | (5) $INV_t^\star$ | (6) $INV_{t+1}^\star$ | (7) $INV_{t+2}^\star$ | (8) $INV_{t+3}^\star$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 0.37 | 0.36 | 0.35 | 0.34 | 0.60** | 0.58* | 0.56* | 0.53* |
| | (1.25) | (1.24) | (1.22) | (1.20) | (1.99) | (1.93) | (1.86) | (1.76) |
| *IVOL* | 1.38*** | 1.39*** | 1.39*** | 1.40*** | 1.18*** | 1.19*** | 1.21*** | 1.22*** |
| | (3.93) | (3.98) | (4.03) | (4.05) | (3.52) | (3.56) | (3.59) | (3.62) |
| *SENT* × *IVOL* | | | | | 0.95*** | 0.91*** | 0.87*** | 0.81*** |
| | | | | | (3.66) | (3.49) | (3.31) | (3.04) |
| Intercept | 18.85*** | 18.85*** | 18.84*** | 18.84*** | 18.64*** | 18.65*** | 18.65*** | 18.66*** |
| | (52.01) | (52.31) | (52.58) | (52.89) | (52.71) | (52.61) | (52.52) | (52.32) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.39 | 0.40 | 0.41 | 0.42 | 0.47 | 0.47 | 0.47 | 0.47 |

This table reports aggregate results from contemporaneous and predictive regressions of investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. $INV^\star$ is capital expenditures, plus R&D, plus SG&A, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

Table 4. Sentiment and Investment: Uncertainty Dummy

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 1.70 | 1.58 | 1.40 | 1.18 | 0.54 | 0.47 | 0.43 | 0.38 |
| | (1.63) | (1.57) | (1.49) | (1.39) | (1.05) | (0.88) | (0.76) | (0.65) |
| $IVOL^D$ | 4.23*** | 4.18*** | 4.10*** | 3.91** | 1.90 | 2.03 | 2.24 | 2.41 |
| | (2.58) | (2.65) | (2.65) | (2.53) | (1.19) | (1.27) | (1.40) | (1.48) |
| $SENT \times IVOL^D$ | | | | | 9.28*** | 8.67*** | 7.54*** | 6.17*** |
| | | | | | (4.72) | (4.60) | (4.22) | (3.54) |
| Intercept | 19.06*** | 19.10*** | 19.15*** | 19.22*** | 18.80*** | 18.85*** | 18.92*** | 19.03*** |
| | (26.68) | (26.47) | (26.18) | (25.95) | (31.62) | (30.82) | (29.64) | (28.53) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.64 | 0.65 | 0.65 | 0.65 | 0.75 | 0.74 | 0.72 | 0.70 |

This table reports aggregate results from contemporaneous and predictive regressions of investment on sentiment, an uncertainty dummy, and the interaction between sentiment and the uncertainty dummy. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. $IVOL^D$ is a top-quintile uncertainty dummy corresponding to mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the continuous independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

Table 5. Sentiment and Investment: Alternative Sentiment Proxies

*Panel A: $SENT^{PLS}$*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| $SENT^{PLS}$ | 2.08** | 2.07** | 2.04** | 1.94** | 2.31*** | 2.30*** | 2.27*** | 2.15*** |
| | (2.11) | (2.13) | (2.14) | (2.14) | (4.31) | (4.53) | (4.62) | (4.55) |
| $IVOL$ | 2.65*** | 2.64*** | 2.58*** | 2.49*** | 2.80*** | 2.80*** | 2.75*** | 2.64*** |
| | (3.20) | (3.21) | (3.22) | (3.24) | (4.22) | (4.15) | (3.95) | (3.75) |
| $SENT^{PLS} \times IVOL$ | | | | | 2.33*** | 2.37*** | 2.35*** | 2.19*** |
| | | | | | (6.85) | (6.69) | (6.34) | (5.75) |
| Intercept | 19.75*** | 19.79*** | 19.81*** | 19.84*** | 19.72*** | 19.75*** | 19.77*** | 19.80*** |
| | (28.76) | (29.26) | (29.43) | (29.43) | (36.47) | (37.19) | (36.87) | (35.76) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 666 | 665 | 664 | 663 | 666 | 665 | 664 | 663 |
| Adjusted $R^2$ | 0.67 | 0.68 | 0.69 | 0.69 | 0.74 | 0.76 | 0.76 | 0.75 |

*Panel B: MICH*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| $MICH$ | 0.31 | 0.29 | 0.26 | 0.21 | 0.32 | 0.30 | 0.29 | 0.23 |
| | (0.45) | (0.42) | (0.38) | (0.31) | (0.50) | (0.48) | (0.47) | (0.38) |
| $IVOL$ | 2.27*** | 2.28*** | 2.24*** | 2.17*** | 1.92*** | 1.91*** | 1.87*** | 1.81*** |
| | (2.79) | (2.82) | (2.82) | (2.85) | (3.36) | (3.45) | (3.59) | (3.75) |
| $MICH \times IVOL$ | | | | | 2.31*** | 2.42*** | 2.49*** | 2.44*** |
| | | | | | (3.05) | (3.12) | (3.18) | (3.24) |
| Intercept | 19.91*** | 19.94*** | 19.96*** | 19.99*** | 19.31*** | 19.30*** | 19.31*** | 19.35*** |
| | (27.45) | (27.88) | (28.13) | (28.30) | (36.36) | (37.31) | (37.77) | (38.02) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.63 | 0.64 | 0.65 | 0.65 | 0.70 | 0.72 | 0.73 | 0.73 |

(*continued*)

Table 5. *continued*

*Panel C: CCI*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *CCI* | 0.09 | −0.07 | −0.17 | −0.32 | 0.19 | 0.03 | −0.05 | −0.20 |
| | (0.12) | (−0.10) | (−0.22) | (−0.42) | (0.27) | (0.04) | (−0.08) | (−0.30) |
| *IVOL* | 2.23*** | 2.23*** | 2.18*** | 2.11*** | 2.27*** | 2.28*** | 2.24*** | 2.18*** |
| | (2.85) | (2.88) | (2.89) | (2.89) | (3.71) | (3.88) | (4.13) | (4.32) |
| *CCI* × *IVOL* | | | | | 2.41*** | 2.48*** | 2.57*** | 2.51*** |
| | | | | | (4.18) | (4.44) | (4.69) | (5.02) |
| Intercept | 20.07*** | 20.09*** | 20.11*** | 20.13*** | 19.71*** | 19.72*** | 19.72*** | 19.75*** |
| | (27.27) | (27.80) | (28.12) | (28.37) | (36.15) | (37.49) | (38.33) | (38.38) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 659 | 658 | 657 | 656 | 659 | 658 | 657 | 656 |
| Adjusted $R^2$ | 0.65 | 0.66 | 0.67 | 0.67 | 0.72 | 0.74 | 0.75 | 0.75 |

*Panel D: AAII*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *AAII* | 1.07*** | 0.93*** | 0.77*** | 0.64** | 0.92*** | 0.80*** | 0.69** | 0.57* |
| | (3.12) | (3.06) | (2.70) | (2.09) | (3.13) | (2.89) | (2.38) | (1.80) |
| *IVOL* | 3.32*** | 3.34*** | 3.29*** | 3.20*** | 3.37*** | 3.38*** | 3.32*** | 3.23*** |
| | (3.94) | (4.15) | (4.39) | (4.47) | (4.06) | (4.28) | (4.52) | (4.57) |
| *AAII* × *IVOL* | | | | | 0.77** | 0.68** | 0.41 | 0.36 |
| | | | | | (2.17) | (1.97) | (1.04) | (0.89) |
| Intercept | 21.59*** | 21.63*** | 21.67*** | 21.70*** | 21.57*** | 21.61*** | 21.65*** | 21.69*** |
| | (25.05) | (26.41) | (27.53) | (28.31) | (25.59) | (26.92) | (27.79) | (28.60) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 414 | 413 | 412 | 411 | 414 | 413 | 412 | 411 |
| Adjusted $R^2$ | 0.78 | 0.79 | 0.80 | 0.81 | 0.78 | 0.80 | 0.80 | 0.81 |

This table reports aggregate results from contemporaneous and predictive regressions of investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A, B, C, and D present results using the Huang et al. (2015) aligned investor sentiment index ($SENT^{PLS}$), the University of Michigan Consumer Sentiment Index ($MICH$), the Conference Board Consumer Confidence Index ($CCI$), and the American Association of Individual Investors sentiment index ($AAII$), respectively. $INV$ is the change in assets, plus R&D, scaled by lagged assets. $IVOL$ is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2020 (July 1965 to December 2021 for Panel B, February 1967 to December 2021 for Panel C, and July 1987 to December 2021 for Panel D).

Table 6. Sentiment and Investment: Alternative Uncertainty Proxies

*Panel A: $NVIX^2$*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 1.70 | 1.50 | 1.25 | 0.97 | 2.79*** | 2.54*** | 2.13*** | 1.63** |
| | (1.41) | (1.31) | (1.19) | (1.03) | (3.45) | (3.42) | (3.06) | (2.47) |
| $NVIX^2$ | 0.08 | −0.12 | −0.38 | −0.48 | 1.07** | 0.82* | 0.42 | 0.12 |
| | (0.16) | (−0.22) | (−0.68) | (−0.85) | (2.08) | (1.69) | (0.91) | (0.22) |
| $SENT \times NVIX^2$ | | | | | 4.61*** | 4.39*** | 3.72*** | 2.80*** |
| | | | | | (5.47) | (6.01) | (5.47) | (3.53) |
| Intercept | 19.94*** | 19.96*** | 19.98*** | 20.00*** | 20.07*** | 20.08*** | 20.08*** | 20.08*** |
| | (26.89) | (27.34) | (27.56) | (27.64) | (34.92) | (34.30) | (32.69) | (30.95) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 609 | 608 | 607 | 606 | 609 | 608 | 607 | 606 |
| Adjusted $R^2$ | 0.67 | 0.68 | 0.69 | 0.69 | 0.76 | 0.76 | 0.75 | 0.73 |

*Panel B: VXO*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 3.87*** | 3.47*** | 2.93*** | 2.35*** | 3.22*** | 2.82*** | 2.48*** | 2.23*** |
| | (4.00) | (3.99) | (3.82) | (3.45) | (3.79) | (3.63) | (3.18) | (2.79) |
| *VXO* | 2.86*** | 2.67*** | 2.43*** | 2.42*** | 2.88*** | 2.68*** | 2.44*** | 2.43*** |
| | (4.66) | (4.44) | (3.92) | (3.63) | (4.59) | (4.27) | (3.78) | (3.59) |
| $SENT \times VXO$ | | | | | 1.37*** | 1.36*** | 0.94* | 0.27 |
| | | | | | (3.22) | (3.21) | (1.87) | (0.41) |
| Intercept | 21.28*** | 21.32*** | 21.36*** | 21.40*** | 21.24*** | 21.28*** | 21.33*** | 21.39*** |
| | (29.86) | (29.71) | (28.84) | (28.05) | (31.58) | (30.90) | (29.41) | (28.27) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 421 | 420 | 419 | 418 | 421 | 420 | 419 | 418 |
| Adjusted $R^2$ | 0.83 | 0.83 | 0.81 | 0.80 | 0.84 | 0.84 | 0.82 | 0.80 |

(*continued*)

Table 6. *continued*

*Panel C: TVOL*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 1.80* | 1.68 | 1.50 | 1.27 | 2.64*** | 2.47*** | 2.21*** | 1.85*** |
| | (1.70) | (1.64) | (1.57) | (1.48) | (4.07) | (3.91) | (3.59) | (3.09) |
| *TVOL* | 1.88*** | 1.85** | 1.79** | 1.68** | 1.38** | 1.37** | 1.37** | 1.34** |
| | (2.58) | (2.54) | (2.46) | (2.37) | (2.52) | (2.46) | (2.32) | (2.17) |
| *SENT* × *TVOL* | | | | | 3.30*** | 3.16*** | 2.83*** | 2.34*** |
| | | | | | (7.13) | (6.84) | (6.38) | (4.87) |
| Intercept | 19.91*** | 19.94*** | 19.98*** | 20.01*** | 19.25*** | 19.31*** | 19.40*** | 19.53*** |
| | (26.87) | (27.18) | (27.36) | (27.43) | (34.83) | (33.59) | (32.07) | (30.60) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.64 | 0.65 | 0.65 | 0.65 | 0.76 | 0.76 | 0.74 | 0.71 |

This table reports aggregate results from contemporaneous and predictive regressions of investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A, B, and C present results using the Manela and Moreira (2017) news implied volatility index (*NVIX*), the CBOE options implied volatility index (*VXO*), and mean stock-level total volatility (*TVOL*), respectively. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to March 2016 (January 1986 to January 2021 for Panel B and July 1965 to December 2021 for Panel C).

Table 7. Sentiment and Investment: Beta-Sorted Portfolios

*Panel A: High Beta*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 5.31*** | 5.19*** | 4.90*** | 4.45*** | 6.74*** | 6.59*** | 6.17*** | 5.51*** |
| | (2.72) | (2.78) | (2.91) | (3.08) | (4.88) | (5.26) | (5.62) | (5.82) |
| *IVOL* | 2.35* | 2.28* | 2.17* | 1.83* | 1.08 | 1.02 | 1.02 | 0.89 |
| | (1.74) | (1.75) | (1.77) | (1.73) | (1.23) | (1.18) | (1.21) | (1.08) |
| *SENT* × *IVOL* | | | | | 5.78*** | 5.79*** | 5.30*** | 4.44*** |
| | | | | | (4.36) | (4.52) | (4.58) | (4.17) |
| Intercept | 25.28*** | 25.34*** | 25.39*** | 25.44*** | 24.02*** | 24.07*** | 24.22*** | 24.45*** |
| | (23.00) | (23.97) | (24.82) | (25.53) | (32.54) | (32.65) | (32.79) | (32.60) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.63 | 0.66 | 0.67 | 0.68 | 0.76 | 0.79 | 0.78 | 0.75 |

*Panel B: Low Beta*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 0.44 | 0.51 | 0.53 | 0.55 | 0.47 | 0.58 | 0.62 | 0.67 |
| | (1.09) | (1.22) | (1.19) | (1.21) | (1.15) | (1.34) | (1.39) | (1.47) |
| *IVOL* | 0.97 | 0.91 | 0.72 | 0.62 | 0.93 | 0.85 | 0.63 | 0.51 |
| | (1.20) | (1.15) | (0.91) | (0.78) | (1.16) | (1.08) | (0.80) | (0.65) |
| *SENT* × *IVOL* | | | | | 0.15 | 0.28 | 0.41 | 0.50 |
| | | | | | (0.47) | (0.84) | (1.23) | (1.46) |
| Intercept | 14.64*** | 14.65*** | 14.66*** | 14.67*** | 14.61*** | 14.59*** | 14.57*** | 14.56*** |
| | (23.36) | (23.41) | (23.25) | (23.11) | (22.10) | (22.19) | (22.11) | (22.01) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.22 | 0.22 | 0.21 | 0.21 | 0.22 | 0.22 | 0.22 | 0.21 |

(*continued*)

Table 7. *continued*

*Panel C: High−Low Beta*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 4.88** | 4.68** | 4.37*** | 3.90*** | 6.26*** | 6.01*** | 5.55*** | 4.84*** |
| | (2.52) | (2.56) | (2.69) | (2.87) | (4.37) | (4.52) | (4.73) | (4.78) |
| *IVOL* | 1.39 | 1.37 | 1.45 | 1.21 | 0.15 | 0.17 | 0.39 | 0.37 |
| | (0.88) | (0.91) | (1.04) | (0.98) | (0.13) | (0.15) | (0.36) | (0.35) |
| *SENT* × *IVOL* | | | | | 5.63*** | 5.51*** | 4.89*** | 3.94*** |
| | | | | | (3.94) | (3.85) | (3.68) | (3.13) |
| Intercept | 10.63*** | 10.69*** | 10.73*** | 10.77*** | 9.41*** | 9.48*** | 9.66*** | 9.89*** |
| | (8.59) | (8.93) | (9.15) | (9.33) | (9.53) | (9.53) | (9.62) | (9.73) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.52 | 0.54 | 0.55 | 0.55 | 0.64 | 0.66 | 0.64 | 0.61 |

This table reports cross-sectional results from contemporaneous and predictive regressions of beta-sorted investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A, B, and C present results for high beta, low beta, and high−low beta, respectively. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

Table 8. Sentiment and Investment: Volatility-Sorted Portfolios

*Panel A: High Volatility*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 13.00** | 12.74** | 12.02** | 10.86** | 16.38*** | 16.05*** | 15.03*** | 13.36*** |
| | (2.54) | (2.49) | (2.46) | (2.44) | (5.00) | (5.04) | (4.96) | (4.71) |
| *IVOL* | 5.96* | 6.09* | 5.89* | 5.14* | 2.93 | 3.10 | 3.18 | 2.91 |
| | (1.83) | (1.85) | (1.84) | (1.74) | (1.17) | (1.19) | (1.21) | (1.11) |
| *SENT* × *IVOL* | | | | | 13.72*** | 13.71*** | 12.51*** | 10.50*** |
| | | | | | (5.75) | (5.85) | (5.96) | (4.78) |
| Intercept | 45.29*** | 45.43*** | 45.53*** | 45.63*** | 42.31*** | 42.42*** | 42.78*** | 43.30*** |
| | (15.62) | (15.81) | (15.88) | (15.86) | (20.20) | (19.33) | (18.59) | (17.94) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.68 | 0.69 | 0.68 | 0.67 | 0.78 | 0.78 | 0.77 | 0.73 |

*Panel B: Low Volatility*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | −0.25 | −0.27 | −0.29 | −0.32 | −0.10 | −0.14 | −0.19 | −0.24 |
| | (−0.85) | (−0.92) | (−1.01) | (−1.15) | (−0.35) | (−0.47) | (−0.60) | (−0.78) |
| *IVOL* | 1.33*** | 1.34*** | 1.34*** | 1.35*** | 1.20*** | 1.23*** | 1.24** | 1.28** |
| | (2.93) | (2.89) | (2.79) | (2.75) | (2.66) | (2.62) | (2.53) | (2.52) |
| *SENT* × *IVOL* | | | | | 0.57** | 0.51* | 0.44 | 0.34 |
| | | | | | (2.31) | (1.85) | (1.52) | (1.16) |
| Intercept | 15.51*** | 15.52*** | 15.53*** | 15.54*** | 15.38*** | 15.40*** | 15.43*** | 15.46*** |
| | (37.55) | (37.78) | (37.92) | (38.09) | (35.94) | (35.66) | (35.42) | (35.29) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.38 | 0.38 | 0.38 | 0.38 | 0.40 | 0.39 | 0.38 | 0.38 |

(*continued*)

Table 8. *continued*

*Panel C: High−Low Volatility*

| | (1) $INV_t$ | (2) $INV_{t+1}$ | (3) $INV_{t+2}$ | (4) $INV_{t+3}$ | (5) $INV_t$ | (6) $INV_{t+1}$ | (7) $INV_{t+2}$ | (8) $INV_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *SENT* | 13.24*** | 13.00*** | 12.31*** | 11.18** | 16.48*** | 16.19*** | 15.21*** | 13.60*** |
| | (2.67) | (2.62) | (2.59) | (2.58) | (5.21) | (5.30) | (5.24) | (5.01) |
| *IVOL* | 4.64 | 4.74 | 4.55 | 3.79 | 1.73 | 1.87 | 1.94 | 1.63 |
| | (1.48) | (1.51) | (1.49) | (1.36) | (0.72) | (0.75) | (0.78) | (0.67) |
| *SENT* × *IVOL* | | | | | 13.15*** | 13.20*** | 12.07*** | 10.15*** |
| | | | | | (5.75) | (5.93) | (6.09) | (4.85) |
| Intercept | 29.79*** | 29.91*** | 30.01*** | 30.09*** | 26.93*** | 27.02*** | 27.35*** | 27.84*** |
| | (10.68) | (10.84) | (10.91) | (10.90) | (13.29) | (12.80) | (12.43) | (12.12) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.66 | 0.67 | 0.67 | 0.66 | 0.77 | 0.77 | 0.75 | 0.72 |

This table reports cross-sectional results from contemporaneous and predictive regressions of volatility-sorted investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A, B, and C present results for high volatility, low volatility, and high−low volatility, respectively. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

Table 9. Sentiment and Equity Issuance

| | (1) $EI_t$ | (2) $EI_{t+1}$ | (3) $EI_{t+2}$ | (4) $EI_{t+3}$ | (5) $EI_t$ | (6) $EI_{t+1}$ | (7) $EI_{t+2}$ | (8) $EI_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *MICH* | 0.04 | 0.03 | 0.02 | 0.01 | −0.01 | −0.03 | −0.04 | −0.06 |
| | (0.16) | (0.12) | (0.07) | (0.03) | (−0.06) | (−0.12) | (−0.16) | (−0.22) |
| *IVOL* | 0.55 | 0.59 | 0.58 | 0.55 | 0.46 | 0.49 | 0.48 | 0.45 |
| | (1.14) | (1.19) | (1.22) | (1.25) | (1.19) | (1.27) | (1.36) | (1.43) |
| *MICH* × *IVOL* | | | | | 1.06*** | 1.15*** | 1.19*** | 1.20*** |
| | | | | | (3.18) | (3.33) | (3.44) | (3.49) |
| Intercept | 3.82*** | 3.83*** | 3.84*** | 3.85*** | 3.55*** | 3.53*** | 3.53*** | 3.54*** |
| | (9.07) | (9.19) | (9.28) | (9.31) | (10.39) | (10.57) | (10.66) | (10.73) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.62 | 0.64 | 0.65 | 0.66 | 0.66 | 0.68 | 0.70 | 0.71 |

This table reports aggregate results from contemporaneous and predictive regressions of equity issuance on sentiment, uncertainty, and the interaction between sentiment and uncertainty. *EI* is the change in equity, plus the change in deferred taxes, minus the change in retained earnings, scaled by lagged assets. *MICH* is the University of Michigan Consumer Sentiment Index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, leverage, and the log of assets. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.

# Internet Appendix:

# The Real Effects of Sentiment and Uncertainty

Table IA1. Sentiment and Investment: Annual

| | (1) $INV_t$ | (2) $INV_t$ |
|---|---|---|
| *SENT* | 1.35 | 1.51** |
| | (1.39) | (2.31) |
| *IVOL* | 2.71** | 1.60* |
| | (2.08) | (1.98) |
| $SENT \times IVOL$ | | 2.53*** |
| | | (5.56) |
| Intercept | 18.91*** | 18.92*** |
| | (17.06) | (17.72) |
| Controls | Yes | Yes |
| $N$ | 57 | 57 |
| Adjusted $R^2$ | 0.67 | 0.80 |

This table reports aggregate results from contemporaneous regressions of investment on sentiment, uncertainty, and the interaction between sentiment and uncertainty. *INV* is the change in assets, plus R&D, scaled by lagged assets. *SENT* is the Baker and Wurgler (2006) orthogonalized investor sentiment index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, the term premium, the default premium, the Treasury bill rate, and the market return. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is annual from 1965 to 2021.

Table IA2. Sentiment and Equity Issuance: Alternative Sentiment Proxies

*Panel A: CCI*

| | (1) $EI_t$ | (2) $EI_{t+1}$ | (3) $EI_{t+2}$ | (4) $EI_{t+3}$ | (5) $EI_t$ | (6) $EI_{t+1}$ | (7) $EI_{t+2}$ | (8) $EI_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *CCI* | 0.23 | 0.17 | 0.13 | 0.06 | 0.14 | 0.08 | 0.03 | −0.03 |
| | (0.73) | (0.54) | (0.37) | (0.18) | (0.48) | (0.25) | (0.09) | (−0.09) |
| *IVOL* | 0.41 | 0.45 | 0.44 | 0.40 | 0.48 | 0.52 | 0.51 | 0.48 |
| | (0.94) | (1.00) | (1.02) | (1.02) | (1.27) | (1.39) | (1.51) | (1.60) |
| *CCI* × *IVOL* | | | | | 1.10*** | 1.16*** | 1.20*** | 1.17*** |
| | | | | | (3.48) | (3.68) | (3.96) | (4.27) |
| Intercept | 3.90*** | 3.91*** | 3.92*** | 3.93*** | 3.74*** | 3.74*** | 3.74*** | 3.76*** |
| | (9.47) | (9.63) | (9.76) | (9.80) | (11.29) | (11.59) | (11.74) | (11.69) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 659 | 658 | 657 | 656 | 659 | 658 | 657 | 656 |
| Adjusted $R^2$ | 0.65 | 0.67 | 0.68 | 0.69 | 0.70 | 0.72 | 0.73 | 0.74 |

*Panel B: AAII*

| | (1) $EI_t$ | (2) $EI_{t+1}$ | (3) $EI_{t+2}$ | (4) $EI_{t+3}$ | (5) $EI_t$ | (6) $EI_{t+1}$ | (7) $EI_{t+2}$ | (8) $EI_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *AAII* | 0.23 | 0.12 | 0.04 | 0.04 | 0.19 | 0.09 | 0.02 | 0.02 |
| | (1.52) | (0.85) | (0.22) | (0.22) | (1.33) | (0.62) | (0.14) | (0.12) |
| *IVOL* | 0.33 | 0.30 | 0.20 | 0.07 | 0.36 | 0.32 | 0.21 | 0.08 |
| | (0.61) | (0.57) | (0.42) | (0.17) | (0.66) | (0.62) | (0.45) | (0.20) |
| *AAII* × *IVOL* | | | | | 0.23 | 0.18 | 0.08 | 0.10 |
| | | | | | (1.08) | (0.78) | (0.31) | (0.40) |
| Intercept | 4.76*** | 4.78*** | 4.80*** | 4.82*** | 4.75*** | 4.78*** | 4.80*** | 4.82*** |
| | (10.84) | (11.79) | (12.87) | (13.88) | (10.94) | (11.85) | (12.83) | (13.92) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 414 | 413 | 412 | 411 | 414 | 413 | 412 | 411 |
| Adjusted $R^2$ | 0.77 | 0.79 | 0.81 | 0.83 | 0.77 | 0.79 | 0.81 | 0.83 |

This table reports aggregate results from contemporaneous and predictive regressions of equity issuance on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A and B present results using the Conference Board Consumer Confidence Index (*CCI*) and the American Association of Individual Investors sentiment index (*AAII*), respectively. *EI* is the change in equity, plus the change in deferred taxes, minus the change in retained earnings, scaled by lagged assets. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, leverage, and the log of assets. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is February 1967 to December 2021 (July 1987 to December 2021 for Panel B).

Table IA3. Sentiment and Equity Issuance: Beta- and Volatility-Sorted Portfolios

*Panel A: High−Low Beta*

| | (1) $EI_t$ | (2) $EI_{t+1}$ | (3) $EI_{t+2}$ | (4) $EI_{t+3}$ | (5) $EI_t$ | (6) $EI_{t+1}$ | (7) $EI_{t+2}$ | (8) $EI_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *MICH* | 0.06 | −0.11 | −0.29 | −0.43 | 0.01 | −0.18 | −0.36 | −0.50 |
| | (0.07) | (−0.15) | (−0.36) | (−0.51) | (0.01) | (−0.23) | (−0.44) | (−0.59) |
| *IVOL* | 0.68 | 0.72 | 0.67 | 0.48 | 0.60 | 0.63 | 0.56 | 0.37 |
| | (0.59) | (0.61) | (0.60) | (0.50) | (0.55) | (0.57) | (0.54) | (0.42) |
| *MICH* × *IVOL* | | | | | 0.96 | 1.18 | 1.35* | 1.35* |
| | | | | | (1.34) | (1.57) | (1.78) | (1.95) |
| Intercept | 4.21*** | 4.23*** | 4.25*** | 4.28*** | 3.96*** | 3.92*** | 3.90*** | 3.92*** |
| | (4.25) | (4.41) | (4.57) | (4.73) | (4.44) | (4.63) | (4.77) | (4.89) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.37 | 0.40 | 0.43 | 0.46 | 0.37 | 0.41 | 0.45 | 0.48 |

*Panel B: High−Low Volatility*

| | (1) $EI_t$ | (2) $EI_{t+1}$ | (3) $EI_{t+2}$ | (4) $EI_{t+3}$ | (5) $EI_t$ | (6) $EI_{t+1}$ | (7) $EI_{t+2}$ | (8) $EI_{t+3}$ |
|---|---|---|---|---|---|---|---|---|
| *MICH* | 2.11 | 1.87 | 1.74 | 1.58 | 1.90 | 1.62 | 1.50 | 1.33 |
| | (1.43) | (1.29) | (1.16) | (1.04) | (1.37) | (1.17) | (1.03) | (0.90) |
| *IVOL* | 3.95 | 4.24 | 4.08 | 3.58 | 3.63 | 3.87 | 3.70 | 3.21 |
| | (1.41) | (1.44) | (1.42) | (1.40) | (1.45) | (1.50) | (1.49) | (1.47) |
| *MICH* × *IVOL* | | | | | 3.87* | 4.44** | 4.72** | 4.50** |
| | | | | | (1.88) | (2.02) | (2.10) | (2.21) |
| Intercept | 21.75*** | 21.83*** | 21.92*** | 22.02*** | 20.74*** | 20.67*** | 20.69*** | 20.84*** |
| | (9.12) | (9.37) | (9.60) | (9.79) | (10.05) | (10.49) | (10.79) | (10.83) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $N$ | 678 | 677 | 676 | 675 | 678 | 677 | 676 | 675 |
| Adjusted $R^2$ | 0.57 | 0.59 | 0.61 | 0.62 | 0.59 | 0.61 | 0.63 | 0.64 |

This table reports cross-sectional results from contemporaneous and predictive regressions of beta- and volatility-sorted equity issuance on sentiment, uncertainty, and the interaction between sentiment and uncertainty. Panels A and B present results for high−low beta and high−low volatility, respectively. *EI* is the change in equity, plus the change in deferred taxes, minus the change in retained earnings, scaled by lagged assets. *MICH* is the University of Michigan Consumer Sentiment Index. *IVOL* is mean stock-level idiosyncratic volatility. Controls include Tobin's q, return on assets, leverage, and the log of assets. We standardize the independent variables to have zero mean and unit standard deviation. Newey and West (1987) $t$-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period is July 1965 to December 2021.