Uncertainty Risk Resolution Before Earnings Announcements

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Abstract

Data show that 72% of the earnings announcement premium is realized *before*, rather than after, earnings releases. We propose that uncertainty risk resolution before the announcement leads to large pre-announcement returns and test the uncertainty risk resolution hypothesis in the cross section. Compelling empirical evidence supports this hypothesis: an interquartile increase in the firm's uncertainty level is associated with a 6.3% greater uncertainty reduction and 0.65% higher market-adjusted returns in the 10-day period before earnings announcements. We also provide evidence that there are two distinct channels for uncertainty risk resolution: information acquisition by investors and information supply by analysts and firm management.

Key words: pre-announcement returns, earnings announcements, uncertainty risk resolution.

JEL Classification: G12, G14.

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1. Introduction

Earnings announcements are the most important corporate announcements on firms' fundamentals. Previous literature documents that stocks on average earn higher returns when firms announce their earnings.[1] During our sample period, stocks on average earn 0.36% in excess of market returns over a 21-day window centered on earnings announcement dates. Surprisingly, the majority of the announcement returns is realized during the pre-announcement period, namely, the period *before* the earnings release. In particular, the average excess returns during a 10-day pre-announcement window are 0.26%, accounting for 72% of the total earnings announcement return.

Several explanations are proposed in the literature to explain the large returns realized before or around earnings announcements. These theories broadly fall into five categories: inventory risk (Johnson and So 2018), lottery preferences (Liu et al. 2020), leakage and informed trading (Utama and Cready 1997, Brennan et al. 2018, Huang et al. 2021), limited attention (Aboody et al. 2010, Frazzini and Lamont 2007), and other risk-based explanations including systematic risk (Savor and Wilson 2016), idiosyncratic risk (Barber et al. 2013, Di Maggio et al. 2022), and information risk (Yang et al. 2020).

In this paper, we propose an alternative uncertainty risk resolution explanation for the large pre-announcement returns. Motivated by Hu et al. (2022), who propose a two-risk explanation for large pre-announcement market returns before the release of important macroeconomic indexes, we assume that individual firms' earnings news also carries two distinct uncertainties: the first on the news itself (ε) and the second on the magnitude of the news' impact on stock prices (σ). The total market impact of the news is then given by the product of these two components, ($\sigma \cdot \varepsilon$). Both the news shock ε and the impact of the news on stock prices σ are random, and they both might affect subsequent returns. The resolution of these two risks, however, could happen at different times. As the earnings announcement date approaches, the uncertainty associated with the market impact of the upcoming release, namely, the uncertainty of σ, could be resolved before the actual announcement, yielding positive pre-

[1] These papers include Beaver (1968), Chari et al. (1988), Ball and Kothari (1991), Cohen et al. (2007), Frazzini and Lamont (2007), Berkman and Truong (2009), Aboody et al. (2010), Bushman et al. (2012), Barber et al. (2013), Savor and Wilson (2016), Liu et al. (2020), and others.

announcement returns. To account for potential leakage of the news risk, the assumption is that a proportion of the news shock, ε_1, is realized before earnings announcements. Afterward, the earnings news is released on the announcement date, and the remaining portion of the news risk, ε_2 $(= \varepsilon - \varepsilon_1)$, is resolved. The stock prices would also respond positively to the resolution of news risk.

We refer to the risk regarding the magnitude of the earnings news' impact on the stock price as "uncertainty risk" to distinguish it from the news risk itself. The key point of our uncertainty risk resolution hypothesis is that the resolution of the uncertainty risk, which is different from the news risk itself, can occur before the earnings announcement, and that this early uncertainty risk resolution potentially leads to significantly positive pre-announcement returns. In comparison, existing papers often assume that there is only one source of risk, namely, the news risk associated with the content of the actual announcement. With the news risk as the sole source of risk, its resolution and the associated risk premium mostly occur after the earnings announcement.

To test the uncertainty risk resolution hypothesis, we examine the dynamics of uncertainty and returns in the cross section of earnings announcements, focusing on the pre-announcement periods before earnings releases. In particular, we hypothesize that earnings announcements for firms with ex ante heightened uncertainty, which would naturally induce a greater interest or desire to resolve it, would have larger uncertainty risk resolution and higher returns before earnings' releases. Indeed, when we sort stocks based on their ex ante uncertainty levels, proxied by option-implied volatilities measured at 11 days before the announcements, high-uncertainty stocks have a 5.9% average drop in their uncertainty during the next 10-day trading window before the announcements, and an average of 1.26% in market-adjusted abnormal returns, both of which are highly significant. In contrast, low-uncertainty stocks do not experience significant pre-announcement returns, and their uncertainty actually increases by 2.1% before the announcements.

The cross-sectional relation between uncertainty and pre-announcement returns is robust and economically important. In a Fama-MacBeth regression framework that controls other stock characteristics such as size, the book-to-market ratio, and past 12-month returns, an interquartile increase in uncertainty leads to a 6.3% drop in uncertainty and a 0.65% increase in abnormal returns in the 10-day period before the earnings announcements. Similarly, a trading strategy that longs a portfolio of high-uncertainty stocks and shorts an equal-amount portfolio of low-uncertainty stocks for 10 days before their expected earnings announcements earns up to 2.48% per month in risk-adjusted abnormal returns. These findings strongly support our hypothesis that stocks with heightened uncertainty experience more uncertainty risk resolution and higher returns during the pre-announcement window.

The above empirical findings support our hypothesis that uncertainty risk resolution before earnings announcements leads to stock price appreciation. It nevertheless remains puzzling how uncertainty risk is resolved during the pre-announcement window. We provide direct evidence that early uncertainty risk resolution can occur via two distinct channels: active information acquisition by investors and an increasing information supply by analysts and the firm management. We use the EDGAR search volume of Ryan (2017) as a proxy for investor information acquisition, and analysts' revised earning forecast and firm management's issuance of earnings guidance as proxies for their information supply. Notably, all three proxies increase significantly more for firms with higher uncertainty during the 10-day window right before the earnings announcements. An interquartile increase in uncertainty is associated with an increase of 6.7% to 7.3% in EDGAR search volume, a 2.8% to 3.0% increase in the probability of revised earnings forecasts, and a 0.3% to 0.4% increase in the probability of earnings guidance. Clearly, high-uncertainty firms attract more intensive information-related activities from investors, analysts, and firm management. Given that these proxies of information activities are inherently noisy, testing their direct impact on pre-announcement returns and uncertainty is challenging empirically. We employ a partial least squares (PLS) procedure to first extract a common component (an information channel proxy) from the three information measures in the pre-announcement window and then examine its relation with return and uncertainty dynamics. Indeed, our analysis shows that increased intensity in information-related activities leads to greater uncertainty risk resolution and higher returns during this period. An interquartile increase in the information channel proxy is associated with a 1.49% drop in uncertainty and a 0.24% increase in returns during the pre-announcement window.

In further analyses, we investigate our findings in relation to the existing explanations in the literature. We begin by distinguishing between our hypothesis of uncertainty risk resolution and information leakage using the cross-sectional differences between pre- and post-announcement returns.

According to our uncertainty risk hypothesis, the return drivers in these two periods are different. When the uncertainty is sufficiently high, both the expected return and return-to-variance ratios during the pre-announcement period will be higher than their counterparts for the post-announcement period. The leakage hypothesis, however, would imply the same return-to-variance ratios in both periods as the returns would have been driven by the same news risk. Our empirical evidence clearly supports the uncertainty risk hypothesis. For a value-weighted portfolio of stocks with the highest uncertainty, the average monthly return and return-to-variance ratio in the pre-announcement window are 2.63% and 1.14, respectively, significantly higher than their post-announcement counterparts, which are statistically indifferent from zero. In sharp contrast, for stocks with lower uncertainty, there is no significant difference in the returns and return-to-variance ratios between the two time windows.

Our hypothesis also differs from those focusing on market frictions, such as inventory risk and informed trading, or behavioral biases such as limited attention and lottery preferences. Compared with other risk-based explanations in the existing literature, our hypothesis highlights the possibility of an additional uncertainty risk associated with earnings announcements. Of course, we acknowledge that many proposed theories, including ours, are not exclusive of each other. To demonstrate the uniqueness of the uncertainty risk resolution mechanism, we conduct a series of horse race tests to compete our uncertainty measure against different proxies from existing theories. Our uncertainty measure passes these horse race tests, confirming the robustness of our results.

Finally, we investigate the nature of uncertainty risk and the impact of different sources of uncertainty on firms' pre-announcement returns. The firm-level uncertainty contains two components: one related to market-level systematic uncertainty and one related to firm-level idiosyncratic uncertainty. We decompose firm uncertainty into these two components and find that both components have a positive and significant impact on the pre-announcement returns. We also employ an alternative strategy to decompose the news itself following Savor and Wilson (2016). Within each quarter, firms releasing earnings earlier reveal more information regarding systematic uncertainty and vice versa. We find that the pre-announcement returns of early announcers are significantly larger in magnitude and exhibit a stronger link with uncertainty, highlighting the role of the systematic news component in explaining the pre-announcement return.

Our study is closely related to several strands of literature. The pattern of pre-earnings announcement returns shares similar features with the pre-Federal Open Market Committee (FOMC) returns first documented by Lucca and Moench (2015), who find that the U.S. equity market appreciates by 49 basis points on average during the 24-hour window before pre-scheduled FOMC meetings, the most impactful macro release affecting the overall market. Recently, Laarits (2019), Ai et al. (2021), and Hu et al. (2022) propose that the resolution of uncertainty before FOMC meetings could potentially explain the large pre-FOMC returns.[2] Our paper is also related to a large body of literature on stock returns around earnings announcements, including Chari et al. (1988), Ball and Kothari (1991), Cohen et al. (2007), Frazzini and Lamont (2007), Berkman and Truong (2009), Aboody et al. (2010), Bushman et al. (2012), Barber et al. (2013), Savor and Wilson (2016), Brennan et al. (2018), Liu et al. (2020), Yang et al. (2020), Huang et al. (2021), and Di Maggio et al. (2022), among others. While many papers in this body of literature focus on the entire earnings announcement month, a few, such as Aboody et al. (2010), Barber et al. (2013), Brennan et al. (2018), Johnson and So (2018), Liu et al. (2020), and Yang et al. (2020), look at the returns before the earnings announcements. Finally, our paper is related to a growing body of literature on uncertainty around earnings announcements, including Patell and Wolfson (1979), Dubinsky et al. (2018), and Gao et al. (2018).

In comparison with previous studies, ours is the first to provide an in-depth examination of the joint dynamics of uncertainty and returns across individual stock earnings announcements. We propose a new hypothesis based on uncertainty risk resolution and provide compelling empirical evidence that uncertainty risk resolution can occur before earnings announcements, resulting in substantial stock price appreciation. By documenting the rich cross-sectional variation in uncertainty dynamics, our results also add a new dimension to recent studies on firm-level uncertainty around earnings announcements.

2. Model and Hypothesis

In this section, we briefly review a two-risk model proposed by Hu et al. (2022) to illustrate the dynamics of risks and returns around announcements when uncertainty risk is present. Hu et al. (2022,

[2] There is a large literature studying the stock impact of macroeconomic announcements. Other papers include Savor and Wilson (2013), Bernile et al. (2016), Ai and Bansal (2018), Cieslak et al. (2019), Ying (2020), Fisher et al. (2022), Liu et al. (2022), and Wachter and Zhu (2022).

HPWZ hereafter) propose a simple model to illustrate the dynamics of uncertainty risk resolution around macroeconomic announcements, such as FOMC announcements, and how it explains return movements during these important periods. The return and risk patterns for firm-level announcements have similarities with, but are not identical to, those of market-level announcements. In this section, we first introduce the HPWZ model to illustrate the timeline and provide the intuition, and then we apply it to firm-level announcements and derive a testable hypothesis in the cross section.

2.1 A Stylized Model

The HPWZ model assumes that there are two types of risks associated with an announcement: one involves directional news on the asset payoff (ε), and the other involves the magnitude of the news' impact on the asset payoff (σ), referred to as the uncertainty risk for distinction. The resolution of these two risks occurs at different times. In particular, the HPWZ model considers an economy with three dates, $t = \{0,1,2\}$. There is a unit mass of identical, infinitesimal, and competitive investors who are endowed with zero units of a riskless bond and one share of a risky stock. Each unit of the bond yields a riskless payoff of 1 at $t = 2$, and each share of stock pays a terminal risky payoff D at $t = 2$. The payoff D is given by

$$D = \overline{D} + \sigma\varepsilon = \overline{D} + \sigma(\varepsilon_1 + \varepsilon_2), \tag{1}$$

where $\overline{D}$ is a positive constant, and σ, ε_1, ε_2 are independent random variables. Variable $\varepsilon(= \varepsilon_1 + \varepsilon_2)$ captures the realization of news and has two independent components, ε_1 and ε_2; σ captures the size of the news' impact on the asset payoff. These variables are unknown to the market ex ante but are revealed over time gradually. For tractability, ε_1 and ε_2 are independent normally distributed variables with zero mean and variance δ and $1 - \delta$, respectively, which add up to one unit. Variable σ^2 follows an exponential distribution with location parameter $\lambda_0 \geq 0$ and scale parameter $\lambda \geq 0$. Investors are assumed to have CARA utility over their terminal wealth, $-\exp\{-\alpha W_2\}$, where α is the risk-aversion coefficient ($\lambda < \frac{2}{\alpha^2}$ for the model to be well-defined) and W_2 is the wealth at $t = 2$. The timeline of the model is as follows:

$t = 0$: Investors observe none of σ^2, ε_1, and ε_2. Investors know about the underlying parameters of the economy and trade the stock by submitting competitive demand functions. The market clears at the equilibrium price P_0.

$t = 1$: Investors observe σ^2 and ε_1, but not ε_2. The revelation of σ^2 is referred to as the resolution of uncertainty risk. In addition, a fraction δ of the news content ε_1 also becomes known to the market before the official announcement time and can be interpreted as leaked information before official announcements. Investors trade in the market again. The market clears at the equilibrium price P_1. The period from 0 to 1 is the "pre-announcement" period, during which the uncertainty about the news' impact and a fraction of the news content are resolved.

$t = 2$: Investors observe the second component of the news content ε_2. Dividend D is paid on the stock, and investors consume their terminal wealth. The period from 1 to 2 is the "post-announcement" period, during which the news is released, and its impact on asset payoff ε is realized.

Hu et al. (2022) solve this model to find the equilibrium prices, and the corresponding expected returns and variances at times 1 and 2 become

$$E(R_1) = \alpha\delta(\lambda_0 + \lambda) + \frac{\frac{1}{2}\alpha^3\lambda^2}{1-\frac{1}{2}\alpha^2\lambda} > 0, \quad V(R_1) = \delta(\lambda_0 + \lambda) + \alpha^2(1-\delta)^2\lambda^2 \tag{2}$$

$$E(R_2) = \alpha(1-\delta)(\lambda_0 + \lambda) > 0, \quad V(R_2) = (1-\delta)(\lambda_0 + \lambda) + \alpha^2(1-\delta)^2\lambda^2. \tag{3}$$

That is, the expected returns over both periods are positive, but they are compensating for different risks. The expected stock return at the pre-announcement period, time 1, reflects compensation for both the fraction of the news risk revealed in this period (first term) and the uncertainty risk (second term). The expected stock return at the post-announcement period, time 2, reflects compensation for the remaining part of the news risk and is proportional to $\lambda_0 + \lambda$.

Meanwhile, the model provides interesting insights regarding the dynamics of the volatility. For a variance swap, which pays $(D - P_1)^2$ at $t = 2$, the equilibrium price at 0 is $v_0 = (1-\delta)(\lambda_0 + \lambda) + (1-\delta)\frac{\frac{1}{2}\alpha^2\lambda^2}{1-\frac{1}{2}\alpha^2\lambda}$; the equilibrium price at 1 is $v_1 = (1-\delta)\sigma^2$. The expected change in the price of the variance swap price is $E(v_1 - v_0) = -(1-\delta)\frac{\frac{1}{2}\alpha^2\lambda^2}{1-\frac{1}{2}\alpha^2\lambda} < 0$. Since the price of the variance swap is equivalent to the square of the options-implied volatility (IV), the model implies that the IV_1 decreases when the uncertainty is resolved during the pre-announcement period, or $\Delta IV_1 < 0$. That is, the change in the options-implied volatility is related to λ^2, which determines the size of the pre-announcement return.

2.2 Testable Hypothesis for Firm-Level Announcements

Motivated by the HPWZ model, we also assume that there are two types of risks associated with firm-level earnings announcements: one involves directional news on earnings, and the other involves the magnitude of the news' impact on the return, referred to as the uncertainty risk. The resolution of these two risks occurs at different times. The derivations of the equilibrium prices and dynamics of returns and uncertainty would be parallel to Equations (2) and (3). The key prediction for firm-level announcements becomes: if the uncertainty risk is resolved before the announcement time, the stock price will rise ($R_1 > 0$) and the uncertainty will drop ($\Delta IV_1 < 0$).

We test this prediction on individual firms' returns and options-implied volatilities around earnings announcements, taking advantage of the rich variation in uncertainty across different stocks and time periods. In particular, we expect that earnings announcements with ex ante high uncertainty (IV_0) are more likely to experience uncertainty risk resolution because there will be a greater interest or desire to resolve the heightened uncertainty before announcements. That is, firms with higher IV_0 will have a larger pre-announcement return R_1 because of greater uncertainty risk resolution $-\Delta IV_1$. Conversely, firms with low IV_0 will have a smaller pre-announcement return R_1 and change in uncertainty $-\Delta IV_1$.

An alternative explanation for the positive pre-announcement returns is information leakage before the official announcement. According to the HPWZ model, if leakage before an announcement ($t = 1$) only reveals the announcement's content (ε_1) but no uncertainty concerning its impact (σ^2), then the return-to-variance ratios before and after the announcement should be identical; that is, $\frac{E(R_1)}{V(R_1)} = \frac{E(R_2)}{V(R_2)}$. We can, therefore, compare the return-to-variance ratios of returns before and after the announcement to empirically test the presence of information leakage versus uncertainty risk resolution during the pre-announcement window. If the pre-announcement return is mostly related to leakage, then the variance ratio before and after the announcement should be similar. If the pre-announcement return is mostly related to uncertainty resolution, then the variance ratios would be significantly different before and after the announcement.

Notice that our firm-level volatility measure might contain information on both systematic uncertainty and idiosyncratic (firm-level) uncertainty risks. According to Hu et al. (2022), there is a positive relation between the systematic uncertainty resolution and subsequent returns. However, since we lack particular theoretical guidance on how idiosyncratic uncertainty resolution is related to future returns, it becomes an empirical question. Our later empirical results examine the patterns of firm total volatility, and we decompose total volatility into market and firm-level components in Section 6.3.

3. Data

3.1 Sample and Filters

Our sample includes firms with common stocks listed on the NYSE, Nasdaq, and Amex from 1996 to 2019. We obtain stock-level data from the Center for Research in Security Prices (CRSP) and exclude stocks with prices below $1 at the end of the previous month. The accounting information is from Compustat. We require non-missing daily return data in CRSP from day -10 to day -1 relative to the earnings announcement date to ensure the consistency of our pre-announcement return measures. Since we control for past returns in the previous 12 months with a one-month lag in regressions, we also require non-missing Compustat and CRSP data in the last 13 months to allow for calculation of the control variables.

The date of a future earnings announcement is usually known by the public ex ante, which triggers heightened uncertainty approaching the announcement date. We obtain the quarterly earnings announcement dates for all firms from Compustat and validate these dates using Institutional Brokers' Estimate System (I/B/E/S) data. As pointed out by DellaVigna and Pollet (2009), earnings announcement dates validated using both Compustat and I/B/E/S are correct more than 95% of the time after 1994. When the announcement dates in these two databases disagree, we keep the earlier date. We delete an announcement date if it is earlier than or more than 90 days later than the fiscal quarter-end. If the announcement date is not a trading day, we shift it to the next trading day. As the previous literature indicates, I/B/E/S timestamps can be noisy and sometimes lead to the misclassification of trading- and after-hour announcements.[3] Therefore, if the announcement takes place after hours on date t, we set the announcement date as day t rather than shifting it to day $t+1$ to make a conservative estimation of the pre-announcement premium.[4]

We compute the uncertainty measures using data from OptionMetrics, which provides the end-of-day bid and ask quotes, open interest, volume, implied volatility, and "Greeks" for all listed options. For ease of comparison across contracts, OptionMetrics also provides data on "hypothetical options" with standardized parameters. We use both individual *real* and *hypothetical* options for the calculation of uncertainty measures. To mitigate liquidity and market microstructure issues with individual options, we focus on short-term at-the-money options as they are the most liquid option contracts. In particular, we apply the following filters to the individual stock options data: (1) we require the bid and ask prices to satisfy basic arbitrage boundaries;[5] (2) we include only options with positive open interest; (3) we include options with 15 to 60 days to maturity; (4) we include options with an absolute delta between 0.375 and 0.625 (as in Bollen and Whaley 2004); (5) to construct different uncertainty measures, we require options to have "moneyness," which is defined as a strike price over the previous day's stock price, between 0.9 and 1.1 to be at the money.[6]

3.2 Uncertainty Measures

As there could be multiple traded options for the same stock on each day, we calculate three uncertainty measures with different weights to combine the information from these options. The first uncertainty measure is the dollar open interest weighted implied volatility for firm i on day t:

$$IVOW_{i,t} = \sum_{j=1}^{N_{it}} w_{j,t} \times IV_{j,t}. \tag{4}$$

[3] See Berkman and Truong (2009), Bradley et al. (2014), and Michaely et al. (2014).

[4] To capture the returns and uncertainty risk resolution occurring strictly before earnings announcements, we use actual announcement dates in our baseline results, which helps exclude any effects arising from the announcements themselves.

[5] Arbitrage boundaries include: bid>0, bid<offer; for put options, we required strike>=bid and offer>=max (0, strike price–stock price); for call options, we required stock price>=bid and offer>=max (0, stock price-strike price).

[6] We intentionally keep the options with expiration dates after the earnings announcement day to be consistent with the model. We replicate our main results using only short-term options that expire before earnings announcement days as a robustness check. We report this result in Figure IA.5 in the Internet Appendix.

Here, $N_{i,t}$ is the number of options for firm i on day t, and $IV_{j,t}$ is the implied volatility of individual option j. Weights on individual options, $w_{j,t}$, are based on dollar open interest:

$$w_{j,t} = \frac{OptionPrice_{j,t} \times OpenInterest_{j,t}}{\sum_{j=1}^{N_{i,t}} OptionPrice_{j,t} \times OpenInterest_{j,t}}. \tag{5}$$

Our second uncertainty measure is equal-weighted implied volatility, $IVEW$, which is computed similarly to $IVOW$ as in Equation (4), except with equal weight:

$$w_{j,t} = \frac{1}{N_{i,t}}. \tag{6}$$

Our last uncertainty measure, $IVVS$, is directly obtained from the volatility surface, which is constructed by OptionMetrics to provide information on "hypothetical options" with standardized parameters.[7] The $IVVS$ measure is essentially the implied volatility of standardized at-the-money put options with 30 days to maturity. Given that $IVVS$ is computed for standardized options with the same moneyness and days to maturity, it is easily comparable across firms. A potential caveat associated with this measure could arise from how the volatility surface is constructed. OptionMetrics uses all options to extrapolate the implied volatility of the standardized options, some of which might be illiquid. As a result, the implied volatility estimates can be noisy. To mitigate this concern, for each stock-day, we retain $IVVS$ in our sample only if there were data available for at-the-money individual options (with moneyness between 0.9 and 1.1) satisfying the filters in Section 3.1.

The option-based uncertainty measures capture the market perception of the future price uncertainty embedded in option prices. They are used in many studies as proxies for market-anticipated price changes in the future (see Dubinsky et al. 2018, Gao et al. 2018, and Liu et al. 2022). Therefore, we consider them as our main uncertainty measures. One concern for option-implied volatility is that it contains both the expected future uncertainty and the uncertainty risk premium, which are difficult to separate. However, as uncertainty and its premium tend to move in the same direction, their separation is not crucial for our study.

[7] The implied volatility for these hypothetical options is extrapolated using a kernel-smoothing technique based on the prices of traded individual options. For a more detailed description of the volatility surface, please see the data manual from OptionMetrics. Previous studies using volatility surface information include An et al. (2014), Barth and So (2014), and So and Wang (2014).

3.3 Summary Statistics

Table 1 reports the summary statistics of our sample, which covers 89,567 earnings announcements from 1996 to 2019. On average, there are 928 stocks per quarter, which indicates reasonable cross-sectional coverage.[8] The median market capitalization of our sample is $2.5 billion, which is larger than the $1.5 billion median market capitalization of NYSE firms in the same period. This is consistent with the fact that firms with listed options are usually larger. The median book-to-market ratio of our sample is 0.319, lower than but comparable with the median of NYSE firms, which is 0.503. The median past 12-month return is 13.1%, and the median monthly turnover is 15.5%. The last three variables of Table 1 are the uncertainty measures. Suppose the earnings day is day 0; we measure the uncertainties at day -11 as the pre-announcement uncertainty measures and denote the variables with -11 as subscripts. These option-based uncertainty measures have medians of around 0.430, with standard deviations of around 0.220. These uncertainty measures are highly correlated, and their cross-sectional correlations are above 97%.

4. Pre-announcement Returns and the Uncertainty Risk Resolution Hypothesis

4.1 The Average Pattern of Pre-announcement Returns

Here we define the earnings announcement date as day 0, and the period from day -10 to day +10, or the [-10, +10] window, as the 21-day window around earnings announcements. We first compute the abnormal daily returns (AR) by subtracting the CRSP value-weighted daily market returns from the stock daily returns, then obtain the cumulative abnormal returns (CAR) [-10, +10] between day -10 and day +10 by compounding the daily abnormal returns. The returns around earnings announcements, CAR [-10, +10], have a pooled median of 0.037% and a mean of 0.359%, suggesting positive skewness in the announcement premium.

To illustrate the dynamics of the returns around earnings announcements, we plot the average CAR across firms for the [-10, +10] window in Figure 1. The average CAR increases steadily from day -10 to day -1. From day -10 and day -2, on average, the CAR increases at a rate of 2.1 basis points per day. On day -1, the average CAR increases sharply by 6.7 basis points. On the announcement date, day

[8] There are fewer stocks with the OptionMetrics data early in our sample period, but there are still 584 stocks per quarter on average before 2000.

0, the average CAR increases slightly by 2.1 basis points. After the announcements, the average CAR drops by 0.6 basis points on day +1, increases by 1.3 basis points on day +2, then drops again by 3.1 basis points on day +3. An upward trend appears on day +4 and continues until day +10, with average daily abnormal returns of 1.5 basis points. Over the 21-day window from day -10 to day +10, the total average CAR is 0.36%, while the average CAR over day -10 to day -1 is 0.26%, accounting for 72% of the 21-day CAR. It is clear that the majority of the earnings announcement premium is realized before the earnings announcements.

4.2 Uncertainty and Pre-Announcement Returns in the Cross Section: Portfolio-sorting Approach

To test our uncertainty risk resolution hypothesis, we first examine the cross-sectional pattern of uncertainty before earnings announcements using a portfolio-sorting approach. For stocks with ex ante high-uncertainty levels before the earnings announcements, we expect their high-uncertainty levels to induce more significant uncertainty risk resolution before the actual earnings releases, yielding large positive pre-announcement returns. For low-uncertainty stocks, conversely, we expect less or no reduction, or even an increase in their uncertainty levels before the earnings releases, yielding small or insignificant pre-announcement returns.

To avoid look-ahead bias in the construction of uncertainty portfolios, we compare each stock's pre-announcement uncertainty against the cross-sectional distribution in a rolling window, using only available information. Each quarter, every stock is assigned to one of five portfolios based on its level of pre-announcement uncertainty, measured 11 days before its actual earnings announcement day. The portfolio breakpoints for each stock are determined by the distribution of pre-announcement uncertainty of all firms that have released earnings within a rolling 60-day period—from 70 days to 11 days before the respective stock's earnings announcement day.

As documented by Ni et al. (2008), option prices tend to surge immediately before earnings announcements as a result of increasing demand.[9] Therefore, our uncertainty measures, such as $IVOW$, directly computed from options prices, would significantly increase before earnings announcements

[9] Similar patterns are also documented by studies including Dubinsky et al. (2018) and Gao et al. (2018).

because of higher demand and might complicate our analysis. To control for the surge in option prices driven by increased investor demand before earnings announcements, we adjust an individual firm's implied volatility changes by subtracting the average change in implied volatility from a size-matched benchmark portfolio. Our adjustment using size-matched portfolios is motivated by the work of Ni et al. (2008), which shows that the price impact of volatility demand before earnings announcements is strongly related to firm size. Specifically, we create 10 size-based benchmark portfolios each quarter and calculate each portfolio's implied volatilities as the size-weighted average of its constituent stocks. For each firm, its implied volatility change is adjusted by deducting the corresponding change from its size-matched benchmark portfolio. We then report the averages of these adjusted implied volatility changes for each portfolio within the [-10, -1] pre-announcement window. This is done first by value-weighting them across all earnings announcements within each quarter, based on the market capitalization at previous month-end, and then by equal-weighting them across all quarters in our sample period. If the uncertainty risk resolution hypothesis holds, we expect to observe greater reductions in uncertainty and higher pre-announcement returns for firms with higher pre-announcement uncertainty levels.[10]

We first plot the average adjusted cumulative percentage changes in $IVOW$ for the five uncertainty groups in Panel A of Figure 2. For the highest uncertainty group (high), the adjusted cumulative drop in $IVOW$ is 5.88% from day -10 to day -1, with negative changes occurring for each of the 10 days. In comparison, the adjusted cumulative changes in $IVOW$ for the remaining four groups, moving from the lowest to the fourth groups, are 2.06%, -0.53%, -1.60%, and -2.63%, respectively. Clearly, high-uncertainty stocks experience a substantial drop in their uncertainty during the pre-announcement period, which supports our key hypothesis.

We report the cumulative change in firms' uncertainty before earnings announcements, based on different uncertainty measures, in Table 2. As shown in Panel A, when we use value-weighting across firms, the high-uncertainty groups experience robust and statistically significant reductions in

[10] We also use the unadjusted changes in implied volatility to re-estimate our main results in Table 2. The differences between the high and low portfolios are still significantly negative, with magnitudes comparable to those in Table 2. The results are reported in Internet Appendix Table IA.1.

uncertainty during the pre-announcement period. The average pre-announcement change in uncertainty is -5.9%, -5.5%, and -5.1%, respectively, for high-uncertainty groups sorted by $IVOW$, $IVEW$, and $IVVS$. The low-uncertainty groups, however, experience significant uncertainty increases in the pre-announcement period, ranging from 1.7% to 2.1%. The H-L differences are all negative and significant within the range of -6.8% to -7.9%. In Panel B, the equally weighted portfolios show similar results for uncertainty changes. The H-L differences are negative and significant, with magnitudes slightly smaller than the value-weighted portfolios, all indicating that firms with higher uncertainty levels experience larger drops in uncertainty.

We then turn to the cross-sectional relation between uncertainty and pre-announcement returns. We plot the average CARs for the five uncertainty-sorted portfolios in Panel B of Figure 2. For brevity, we only show the results for value-weighted portfolios sorted by the uncertainty measure $IVOW_{-11}$. Results for other sorting methods are similar. Moving from the group with the lowest uncertainty to that with the highest, the average CARs from day -10 to day -1 are -0.07%, 0.06%, 0.28%, 0.34%, and 1.26%, respectively; that is, there is a clear monotonic pattern between the pre-announcement returns and uncertainty during the pre-announcement period.

The CARs for the five uncertainty-sorted portfolios are also presented in Table 3, with the value-weighted portfolio results in Panel A and the equal-weighted portfolio results in Panel B. Here, we aim to find out whether the differences in the pre-announcement returns are significant across different portfolios. Accordingly, we report the average CAR [-10, -1] for each portfolio, along with *t*-statistics. To account for time-series correlations, we compute the *t*-statistics using Newey-West adjusted standard errors with three lags.

In Table 3, Panel A, the pre-announcement returns increase almost monotonically with respect to all our uncertainty measures. For value-weighted portfolios sorted on $IVOW_{-11}$, $IVEW_{-11}$, and $IVVS_{-11}$, the highest uncertainty groups have significantly positive average returns of 1.26%, 1.24%, and 1.32%, respectively. The average returns for the second-highest uncertainty group (Group 4) are smaller in magnitude, ranging from 0.34% to 0.45%, with *t*-statistics from 1.52 to 2.06. The pre-announcement return differences between the high and low groups (H-L) are 1.33%, 1.30%, and 1.39%, respectively. All numbers are statistically significant. Similar patterns can be observed for the equal-weighted portfolios in Table 3, Panel B. The H-L pre-announcement return differences range from 1.04% to 1.10% and are all statistically significant. The average pre-announcement return differences between high- and low-uncertainty stocks are slightly larger when we use value weights instead of equal weights, suggesting that the relation between uncertainty and returns is stronger for large firms. Overall, the large pre-announcement returns are robust to different uncertainty measures and weighting schemes.

4.3 Uncertainty and Pre-announcement Returns in the Cross Section: Fama-MacBeth Regression Approach

In this section, we adopt the two-stage estimation of Fama and MacBeth (1973) to examine the relation between the pre-announcement return and uncertainty in the cross section, controlling for other relevant firm-level characteristics. For the first stage of the Fama-MacBeth regression, we estimate two cross-sectional specifications for each quarter q:[11]

$$\Delta Uncertainty_{i,q,-10,-1} = b_{0q} + b_{1q} Uncertainty_{i,q,-11} + b_{2q} Controls_{i,m-1} + \varepsilon_{i,q}, \quad (7)$$

$$CAR_{i,q,-10,-1} = c_{0q} + c_{1q} Uncertainty_{i,q,-11} + c_{2q} Controls_{i,m-1} + \varepsilon_{i,q}, \quad (8)$$

where $\Delta Uncertainty_{i,q,-10,-1}$ is the adjusted uncertainty percentage change in stock i in quarter q, from day -10 to day -1, and $Uncertainty_{i,q,-11}$ is the uncertainty proxy of stock i measured at day -11, and $CAR_{i,q,-10,-1}$ is the cumulative pre-announcement abnormal return of stock i from day -10 to day -1, all relative to stock i's earnings announcement day 0 in quarter q. The control variables include the log of the market capitalization from the previous month, the log of the book-to-market ratio from the previous month, and the past 12-month return (skipping the most recent month). If the earnings announcement is made within the first 10 trading days of a month, we lag all the control variables for two calendar months. The first-stage estimation provides the time series of coefficients

[11] A potential caveat about the quarterly Fama-MacBeth estimation is that the earnings announcements are made at different times within a quarter. Akbas (2016) argues that the impact of this non-synchronicity issue on Fama-MacBeth standard errors should be relatively small, given that the procedure allows for cross-sectional correlations. We consider an alternative estimation using daily Fama-MacBeth regressions, where the earnings announcements are fully aligned by day. These results are reported in Table IA.2 of the Internet Appendix, and they are similar to those reported here.

$\{b_{1q}, b_{2q}, c_{1q}, c_{2q}\}$. We make statistical inferences at the second stage using the time-series average of the estimates, and the standard errors are computed using the Newey-West method with three lags.

We report the estimated coefficients in Table 4. The results for the pre-announcement change in uncertainty are reported in Panel A for three different uncertainty proxies. For the uncertainty measure, $IVOW_{-11}$, in column (1), the average coefficient is -0.230, which is significantly negative with a *t*-statistic of -18.52. The negative coefficient is consistent with our hypothesis that higher uncertainty stocks experience more uncertainty risk resolution. Q3 – Q1 suggests that an interquartile change in the uncertainty measured at day -11 is associated with a 6.3% drop in uncertainty from day -10 to day -1. Results in columns (2) and (3) are based on $IVEW_{-11}$ and $IVVS_{-11}$ as uncertainty measures, and the estimated coefficients are similar to those in column (1).

The results for the pre-announcement return are reported in Panel B of Table 4. In column (1), the coefficient on the uncertainty proxy, $IVOW_{-11}$, is 2.371 with a *t*-statistic of 3.34. In terms of economic magnitude, Q3 – Q1 has a 0.65% impact on CAR [-10, -1]. The positive and significant coefficient supports our hypothesis that higher uncertainty stocks have larger pre-announcement returns. Using two other uncertainty measures based on options-implied volatilities, the results in columns (2) and (3) are quite similar to those of column (1). The coefficients on the uncertainty variables are positive and statistically significant at the 1% level.

4.4 Uncertainty and Pre-Announcement Returns in the Cross Section: A Tradable Strategy

In our previous analysis, we rely on actual earnings announcement dates to measure pre-announcement returns and uncertainty risk resolution to ensure that our main results exclusively reflect the average magnitude of the pre-announcement effect. This method is not fully practical for trading purposes, however, because investors do not always know the actual earnings announcement dates 10 days in advance. In this section, we follow the standard calendar-time portfolio approach to design a daily-rebalanced trading strategy to capture the positive returns before expected earnings announcements. This strategy not only further mitigates the look-ahead bias but also helps to check our previous results by controlling for different factor exposures. We take two measures to ensure the tradability of this strategy: 1) we use the breakpoints based on the distribution of the uncertainty measures in a rolling window to assign stocks into their respective portfolios; and 2) we use expected earnings announcement dates rather than actual announcement dates to further avoid look-ahead bias, especially the impacts of delayed announcements.

We first estimate the expected earnings announcement day d^i, following Cohen et al. (2007), for each firm i.[12] At the end of every trading day t, we select the firms with their d^i falling in the window $[t+2, t+11]$ to form portfolios.[13] For every selected firm i, its pre-announcement uncertainty relative to its expected earnings announcement day, $IVOW_{d_i-11}$, has been realized at or before day t and thus can be used for portfolio sorting. Next, we assign each selected firm i into one of five portfolios, based on the distribution breakpoints of the pre-announcement uncertainty of firm j in a rolling 60-day window before d_i, that is, the distribution of $IVOW_{d_j-11}$, where $d_i - 59 \leq d_j \leq d_i$. Under our portfolio construction, each firm i will stay in its assigned portfolio for a 10-day window before its expected earnings announcement date, allowing the portfolio returns to capture the firm's pre-earnings announcement returns.

We report the average monthly excess return as well as alphas with respect to various models for each of the portfolios in Table 5. These models include CAPM, Fama and French (1993) three-factor, Fama and French (1993) three-factor plus momentum, Fama and French (2015) five-factor, Hou et al. (2015) q-factor, and Hou et al. (2021) q^5-factor models. The portfolio returns are value-weighted in Panel A and equal-weighted in Panel B. The results are based on $IVOW_{d-11}$ as the sorting variable for brevity. Results based on alternative uncertainty measures are similar. For the value-weighted portfolios in Panel A, the lowest uncertainty portfolio has an excess return of 0.50% with a *t*-statistic of

[12] This algorithm is widely used by previous studies, including Barth and So (2014), Gao et al. (2018), and Stoumbos (2023), among others. Details of this algorithm are discussed in Appendix A of Cohen et al. (2007) as well as in our Internet Appendix. Our results are robust to alternative expected announcement dates with various rolling estimations.

[13] To ensure that this strategy is fully tradable, we exclude stocks whose actual announcement dates fall on day t, which means that results here are contaminated by the announcement effect. It would also be plausible to drop stocks whose actual announcement dates fall on day $t+1$ to focus only on the pre-announcement returns. The underlying assumption is that firms' actual earnings announcement dates are disclosed to the public at least one day in advance. Investigating firms' scheduling of earnings announcements, deHaan et al. (2015) show that 96.6% of the earnings announcements in their sample confirmed the exact release days at least one day before. The results are reported in Table IA.3 of the Internet Appendix. This alternative strategy generates larger alphas in the high-minus-low portfolio. This is because high-uncertainty firms tend to have more negative earnings surprises. For example, the average SUE for the high-uncertainty firms is -0.14%, while this number ranges between 0.04% and 0.06% for the other groups.

1.61. Depending on the model, the lowest uncertainty portfolio has negative alphas in the range of -0.19% to 0.05%, which are small and statistically insignificant from zero. In sharp contrast, the highest uncertainty portfolio has an excess return of 2.67% with a *t*-statistic of 2.86. The alphas of the highest uncertainty portfolio are in the range of 1.24% to 2.16%, with *t*-statistics ranging between 1.69 and 3.09. The alphas of the high-minus-low spread portfolios are between 1.20% (CAPM) and 2.34% (*q*-factor model), with *t*-statistics ranging between 1.50 and 3.03. The equal-weighted results in Panel B are quantitatively larger and more statistically significant. The excess return of the highest uncertainty portfolio is 3.00 with a *t*-statistic of 3.70. The alphas of the highest uncertainty portfolios are in the range of 1.73% to 2.47%, and the returns of the high-minus-low spread portfolios are between 1.52% and 2.48%, all with statistically significant *t*-statistics. These results are consistent with our earlier findings and support the hypothesis of uncertainty risk resolution.[14]

5. The Mechanism of Uncertainty Risk Resolution

Our empirical results support the uncertainty risk resolution hypothesis in the sense that the heightened uncertainty associated with earnings announcements starts to resolve before the earnings release day, yielding positive pre-announcement returns. Nevertheless, it remains puzzling how uncertainty is resolved prior to earnings releases. In this section, we investigate two distinct channels, information acquisition and supply, through which early uncertainty risk resolution could happen. We discuss the active information acquisition channel in Section 5.1 and the information supply channel in Section 5.2. We test the direct impact of these channels on the return and uncertainty risk resolution during the pre-announcement window in Section 5.3.

5.1 Active Information Acquisition

Active information acquisition by investors could help resolve uncertainty before earnings releases. The investors in firms with higher uncertainty might have a greater incentive to actively obtain information for these firms, to either profit from it or protect their investments. The uncertainty can be

[14] If the holding period focuses on the pre-announcement window and the stocks are dropped one day before the actual earnings announcement day, the alphas of the high-minus-low spread portfolios range between 1.55% and 2.63% based on value-weighting, and between 1.61% and 2.55% based on equal-weighting, and all are statistically significant.

resolved through these information acquisition efforts before the announcements, leading to pre-announcement uncertainty risk resolution and positive pre-announcement returns.

We borrow from literature such as Gao and Huang (2019), Li and Sun (2019), and Chen et al. (2020), and use the EDGAR search volume to directly proxy for active investor information acquisition efforts. Starting in 2003, the Securities and Exchange Commission (SEC) maintains a multiple-terabyte database of traffic to its public filings. For each user view, the SEC records information including the view time, target filing, viewer's IP address, and so on. Using the SEC's unique firm identifier (CIK) and date, one can aggregate these individual views to firm- and day-level EDGAR traffic. However, drawing meaningful inferences from these data carries a complication: the SEC counts both human views and visits by automated programs. Fortunately, Ryan (2017) uses an algorithm to filter out traffic by automated web crawlers, and we follow his algorithm in this study so as to only include human traffic.[15] In our sample, a median firm has 1,681 EDGAR searches per quarter. We also observe an increasing trajectory for the average EDGAR search volume before the earnings announcements.[16]

We hypothesize that investors' active information acquisition before earnings announcements is higher for high-uncertainty firms. To test this hypothesis, we adopt a two-stage Fama-MacBeth regression to examine the cross-sectional relation between the pre-announcement EDGAR search volume and firms' uncertainty levels:

$$ESV_{i,-10,-1} = e_{0q} + e_{1q}Uncertainty_{i,-11} + e_{2q}ESV_{i,q-1} + e_{3q}Controls_{i,m-1} + \varepsilon_{i,q}. \quad (9)$$

The dependent variable, $ESV_{i,-10,-1}$, is the log of 1 plus the total EDGAR search volume from day -10 to day -1 for stock i before its earnings release for quarter q. We include $ESV_{i,q-1}$, which is the log of 1 plus the total EDGAR search volume in the previous quarter $q-1$, as a control variable. Other control

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15 See Ryan (2017) for a detailed discussion of the algorithm.

16 In Panel A of Figure IA.1 in the Internet Appendix, we plot the average total search volume on EDGAR for each 10-day window surrounding the quarterly earnings announcement day (day 0). The average EDGAR volume gradually declines from the time window [-50, -41] to [-40, -31], reaching the lowest level in the time window [-30, -21]. This downward trend reverses in the lead-up to the earnings releases, with the average EDGAR search volume reaching 402 at the pre-announcement window [-10, -1], the highest level among all the periods before announcements. Clearly, investors substantially intensify their information searching as the earnings announcement day approaches. This evidence is consistent with Drake et al. (2012), who argue that investors demonstrate higher information demand before quarterly earnings announcements. After the release of the announcements, there is, unsurprisingly, a spike in the average EDGAR search volume in the post-announcement window [0, 9] as investors try to digest the just-released information.

variables are defined in the same way as those in Equation (7). After we obtain the time series of the quarterly coefficients, we compute the time-series average and their *t*-statistics at the second stage. If firms with higher uncertainty have higher active ESVs, we expect the pre-announcement uncertainty measures to carry significantly positive coefficients.

The estimation results are presented in Table 6, Panel A. The coefficients for the three uncertainty measures are 0.268, 0.272, and 0.246, respectively. All coefficients are positive and statistically significant, with *t*-statistics higher than 6.00. The pattern is clear across different columns: higher uncertainty stocks indeed have greater ESVs before their earnings releases. Regarding the magnitude, Q3 – Q1 suggests that an interquartile increase in uncertainty is associated with an increase of 6.7% to 7.3% in the search volume during the pre-announcement window.

5.2 Information Supply by Analysts and Firm Management

In addition to the information acquisition channel discussed above, the overall information environment could also improve because of an increased information supply as earnings announcement dates approach. We focus on the two most important types of information supplier: analysts and firm management. Analysts, as one of the largest groups of information suppliers, collect information and provide forecasts for future earnings. Heightened uncertainty surrounding earnings announcements may push analysts to improve the quality of their earnings forecasts, which in turn could help resolve uncertainty in the underlying stocks before their earnings announcements.[17] In addition, firm management often issues earnings guidance to mitigate information asymmetry, improve market liquidity, and reduce capital costs (Anantharaman and Zhang 2011, Balakrishnan et al. 2014, Frenkel, et al. 2020). Such an active information supply by analysts and firm management could potentially contribute to the early resolution of uncertainty risk.

[17] We find supportive evidence for this argument in the average pattern of analyst forecast revisions before the earnings announcements. In Panel B of Figure IA.1 in the Internet Appendix, there is a notable increase in the number of forecast revisions in the [-10, -1] pre-announcement window, which surpasses the levels observed in all other periods before the earnings announcements and is second only to the peak levels observed during the post-announcement periods.

Next, we examine whether information supply activities by analysts and firm management are related to firms' pre-announcement uncertainty levels in the cross section, based on the standard two-stage Fama-MacBeth regressions:

$$Forecast_{i,-10,-1} = f_{0q} + f_{1q}Uncertainty_{i,-11} + f_{2q}AnalystCoverage_{i,q-1} + f_{3q}Controls_{i,m-1} + \varepsilon_{i,q} ,$$

$$Guidance_{i,-10,-1} = g_{0q} + g_{1q}Uncertainty_{i,-11} + g_{2q}Guidance_{i,q-1} + g_{3q}Controls_{i,m-1} + \varepsilon_{i,q} . \quad (10)$$

For the information supply by analysts, we use $Forecast_{i,-10,-1}$ as the dependent variable, which is set to 1 if there are revised analysts' forecasts for firm i from day -10 and day -1 relative to earnings announcement day 0. Similarly, we use $Guidance_{i,-10,-1}$ to gauge the information supply by firm management, which is set to 1 if the management of firm i issues earnings guidance from day -10 and day -1 relative to earnings announcement day 0. When $Forecast_{i,-10,-1}$ is the dependent variable, we include $AnalystCoverage_{i,q-1}$ (log of 1 plus the number of analysts covering the firm) in the previous quarter to control for the firm's overall level of analyst activities. When $Guidance_{i,-10,-1}$ is the dependent variable, we include $Guidance_{i,q-1}$, an indicator of management guidance in the previous quarter to control for the firm's tendency to issue guidance regularly. Other control variables are defined in the same way as the regression specified by Equation (7).

The estimation results are reported in Table 6, Panels B and C. Clearly, analysts are more likely to issue revised forecasts for high-uncertainty firms before earnings announcements. In the regressions on analysts' forecasts, the coefficients on the three uncertainty measures are 0.107, 0.109, and 0.101, respectively, which are all positive and statistically significant at the 1% level. Regarding the magnitude, Q3 – Q1 has a 2.8% to 3.0% impact on the probability of revised forecasts, a nontrivial increase compared to the full sample average of 36.8% of firms with a revised forecast in the 10-day trading window before the announcements.[18]

[18] We focus on analysts' revisions of existing forecasts in the pre-announcement period as these activities place more emphasis on their intentional information acquisition. In Internet Appendix Table IA.4, we report the results using an indicator that is set to 1 if there are any analyst forecasts, new or revised, as the dependent variable. Qualitatively similar to the current results, the coefficients on the three uncertainty measures are 0.076, 0.077, and 0.069, respectively, all positive and statistically significant at the 1% level. The results are also robust to using a continuous version of the $Forecast_{i,-10,-1}$ variable, that is, the total number of forecast revisions during the pre-announcement window.

Similarly, firm management is also more likely to issue earnings guidance for high-uncertainty firms before earnings announcements. The coefficients on the three uncertainty measures are 0.014, 0.013, and 0.010, respectively, with significant *t*-statistics. Regarding the magnitude, Q3 – Q1 has a 0.3% to 0.4% impact on earnings guidance probability, which is substantial compared to the full sample average of a 2.2% probability of management guidance in the 10-day trading window before the announcements.

5.3 Information Channels versus Pre-Announcement Uncertainty and Returns

In this section, we examine the association between the information channels and the dynamics of returns and uncertainty during the pre-announcement window. Based on the discussions in Section 5.1 and 5.2, there is a strong, positive link between information acquisition and supply activities and the firms' uncertainty levels before earnings announcements. We argue that these information-related activities play a crucial role in reducing uncertainty before earnings announcements, leading to positive pre-announcement returns.

We employ the partial least squares (PLS) procedure to extract a common component of the three information measures (information channel proxy): investors' EDGAR search volume (ESV), analysts' forecast revisions (Forecast), and firms' issuance of earnings guidance (Guidance), and then test the association between this common component and the dynamics of pre-announcement returns and uncertainty.[19] The PLS framework is similar to the principal component analysis (PCA) but is better suited to our purpose because the PLS procedure extracts common components from the standardized independent variables to maximize the explained variation of the dependent variables (rather than the independent variables themselves, as in PCA). We choose the PLS procedure to extract the common component of the three information measures because individual information activities not only resolve uncertainty risk (σ) but also often unveil directional information about the earnings news content (represented by ε_1 in the model).[20] The PLS procedure alleviates the noise in each individual information

[19] The PLS procedure was pioneered by Wold (1966) and introduced into the finance literature by Kelly and Pruit (2013, 2015). It is widely used for information extraction from multiple variables.
[20] Linnainmaa and Zhang (2021) show that analysts tend to be more pessimistic and more likely to revise the forecasts down before earnings announcements. Similarly, Skinner (1994) finds that firm managers face an asymmetric loss function and thus are more likely to disclose negative information in unbundled earnings guidance. Moreover, these information activities are often intertwined. It is thus implausible to regress pre-

measure and extracts a common component from these measures that most closely correlates with uncertainty risk resolution.

In the first step, for each quarter q, we estimate a PLS specification, as shown in Equation (11), to extract a common component from the individual information measures that explains the most cross-sectional variation in uncertainty change:

$$\Delta IVOW_{i,q} = h_{0q} + h_{1q} ESV\_scaled_{i,q} + h_{2q} Forecast_{i,q} + h_{3q} Guidance_{i,q} + \varepsilon_{i,q}. \quad (11)$$

To eliminate the impact of the overall market attention to the firm, we scale the positively skewed pre-announcement EDGAR search volume by the firm's previous-quarter total EDGAR search volume.[21] We expect the information activities to be negatively associated with uncertainty change. Therefore, we define the information channel proxy ($INFO_{i,q}$) as the opposite of the extracted component for firm i in quarter q. We also obtain the corresponding weights of the three information activities ($w_{ESV\_scaled,q}$, $w_{Forecast,q}$, $w_{Guidance,q}$) in $INFO_{i,q}$. To ensure that enough information is extracted, we only use a subsample covering the period from 2003 Q2 to 2017 Q2 (57 quarters) where EDGAR search volume data are available. Panel A of Table 7 reports the summary statistics of the estimated component weights. As expected, the average weights of the three information activity proxies are positive with values of 0.247 (ESV_scaled), 0.192 ($Forecast$), and 0.346 ($Guidance$). This is consistent with our hypothesis that information activities help reduce uncertainty of the earnings announcements.

In the second step, we estimate the Fama-MacBeth regressions of uncertainty risk resolution $\Delta IVOW_{i,q}$ and pre-announcement returns $CAR_{i,q}$ on the information channel proxy ($INFO_{i,q}$). Panel B of Table 7 reports the estimation results, controlling for additional variables including firm size, the book-to-market ratio, and past performance. For the change in uncertainty during the pre-announcement window, the information channel proxy carries a negative coefficient of -1.362, with a significant *t*-

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announcement returns directly on these information variables. We discuss these issues and how they influence the PLS estimates in detail in the Internet Appendix, with the results reported in Table IA.5.

[21] $Forecast_{i,q}$ and $Guidance_{i,q}$ are indicators and thus not scaled. The scaling is used on EDGAR search volume for a simple normalization. The results are robust to using cross-sectional orthogonalization against previous-quarter total search volume or using unscaled EDGAR search volume. The results are also robust to using all analyst forecasts instead of revised forecasts. These results are reported in Tables IA.6, IA.7, and IA.8 of the Internet Appendix.

statistic of -14.43. This is consistent with the results in Panel A that $INFO$ (the extracted component) is negatively (positively) correlated with uncertainty changes. More interestingly, for the pre-announcement returns, the coefficient on the information channel proxy is 0.215, which is positive with a significant *t*-statistic of 3.34. This finding supports that information activities induce a positive return before the earnings announcement. In terms of economic magnitude, Q3 – Q1 suggests a 1.49% drop in uncertainty and a 0.24% increase in returns during the pre-announcement window. In other words, more intense information-related activities contribute to greater uncertainty risk resolution and higher returns during the pre-announcement window, thus supporting our information channel hypothesis.

6. Further Discussion

6.1 Uncertainty Risk versus News Risk

Rather than resolution of uncertainty risk, the positive pre-announcement returns could be completely driven by resolution of the news risk itself as a result of information leakage. In this subsection, we examine the characteristics of pre- and post-announcement returns in the cross section, which helps us confirm the presence of uncertainty risk and differentiate it from information leakage. Under our hypothesis, the positive pre-announcement returns are related to the resolution of the uncertainty risk, which is distinct from the news risk. As discussed in Section 2.2, if the uncertainty is sufficiently high, the return-to-variance ratio, as well as the average return, for the pre-announcement period will surpass that of the post-announcement period. In contrast, an alternative hypothesis based on information leakage would imply identical return-to-variance ratios in both periods, since the returns in both periods would have been driven by the same news risk.

To test the presence of uncertainty risk, we compare the average return and the return-to-variance ratios (defined in Section 2.2) of the pre- and post-announcement returns for the five tradable portfolios of stocks sorted based on their pre-announcement uncertainty levels. The results are reported in Table 8. The construction of the tradable strategy to capture the pre-announcement returns is discussed in detail in Section 4.4.[22] To capture the post-announcement returns, we use a method similar

[22] For the purposes of this test, we drop the stock one day before the actual earnings announcement day here to focus on the pre-announcement window.

to that in Section 4.4 to assign the stocks into the respective portfolios based on their pre-announcement uncertainty level but hold the stocks in the portfolios from the actual announcement day to the ninth day afterward.

As evident from Table 8, the characteristics of the pre- and post-announcement returns of the high-uncertainty groups are consistent with our uncertainty risk hypothesis. For the value-weighted portfolio of the high-uncertainty stocks, the average monthly return and the return-to-variance ratio of the pre-announcement window are 2.63% and 1.14, respectively; both are significantly higher than their counterparts of the post-announcement window. The pattern is similar, albeit slightly weaker, for the group with the second highest uncertainty levels. The sharp differences, especially in risk premiums, confirm that a simple leakage of the news risk itself in the pre-announcement window could not explain the empirical results. By comparison, for the low-uncertainty groups, there is no significant difference in the returns and return-to-variance ratios of the two time windows.

Overall, the characteristics of the pre- and post-announcement returns support our hypothesis that the resolution of the uncertainty risk, a distinct risk different from the news risk itself, is an important driver for the large pre-earnings announcement returns.[23]

6.2 Other Hypothesis for Positive Pre-Announcement Returns

The existing literature has proposed several theories for the large returns observed around earnings announcements, including inventory risk, lottery preferences, informed trading, limited attention, and risk-based explanations such as systematic, idiosyncratic, and information risk. Our paper introduces a new explanation based on uncertainty risk, distinct from news risk, which could be resolved before the earnings announcement. This risk-based approach differs from existing explanations focused on market frictions or behavioral biases and emphasizes the possibility of an additional uncertainty risk associated with earnings announcements.

[23] In the Internet Appendix, we discuss another prediction of the model on the distribution of the post-announcement returns. If the uncertainty risk is resolved during the pre-announcement period, post-announcement returns will be normally distributed. Conversely, if both the uncertainty risk and news risk are resolved simultaneously at the news release time, the post-announcement returns will exhibit fat tails. This pattern is observed empirically. We demonstrate in Figure IA.6 in the Internet Appendix that the high-uncertainty portfolio shows a normal distribution post-announcement, while the low-uncertainty portfolio exhibits fat tails.

Of course, we recognize that many of the theories proposed (including our own) are not entirely mutually exclusive. For instance, we find that stocks with high levels of uncertainty are more likely to have uncertainty risk resolution before announcements, leading to a positive pre-announcement premium. However, such stocks may also be the ones that invite more lottery-like trading interest.[24]

To test the robustness of our results, we employ a set of horse race tests where we include proxies of these potential theories in the Fama-MacBeth regressions specified by Equation (8). We consider five broad groups of proxies based on the measures proposed in the existing literature: a firm-level asymmetric liquidity provision to proxy for dealers' inventory risk (inventory risk); expected skewness, jackpot probability, and the stock price level to proxy for investors' lottery preference (lottery preference); probability of informed trading (PIN), institutional ownership, and standardized unexpected earnings to proxy for potential leakage of the news information and informed trading before earnings announcements (informed trading); past returns and turnover for investors' attention (limited attention); and the market beta, idiosyncratic volatility, and abnormal idiosyncratic volatility to proxy for systematic, firm-level, and information risks, respectively.

As evident from Table 9, our main uncertainty measure (dollar open interest weighted average implied volatility $IVOW$) passes the horse race tests. The estimated Fama-MacBeth regression coefficients of $IVOW$ range from 2.203 to 4.221 and remain statistically significant. By comparison, very few of the alternative proxies show explanatory power for pre-announcement returns. This might be because our sample consists of listed firms with traded options, which are relatively larger firms compared to the full sample of public firms. For these relatively larger firms, some channels (such as informed trading and lottery preferences) might have a relatively smaller impact.[25]

6.3 Decomposition of Uncertainty

Our empirical results so far provide strong evidence that firm-level uncertainty risk resolution can lead to positive pre-announcement returns. Notice that our firm-level volatility measure might

[24] To show this formally, we report the average firm characteristics of the five portfolios sorted by our uncertainty measure in Table IA.9 of the Internet Appendix. As expected, the variables that are most closely related to our uncertainty measures are proxies for inventory risks and lottery preferences.

[25] In addition to the above horse race tests, we form sequentially sorted portfolios based on the alternative proxies and uncertainty measures. The results are presented in Table IA.10 of the Internet Appendix.

contain information about both systematic uncertainty and idiosyncratic (firm-level) uncertainty risks. According to Hu et al. (2022), there is a positive relation between the systematic uncertainty resolution and the subsequent returns. However, since we lack particular theoretical guidance on how idiosyncratic uncertainty resolution is related to future returns, it becomes an empirical question. In this subsection, we employ two strategies to decompose firm-level uncertainty risk and investigate the impact of each type of uncertainty risk. We begin with an explicit decomposition of the pre-announcement uncertainty level. Then we follow Savor and Wilson's (2016) approach to distinguish between earnings news itself with high and low levels of systematic information.

We quantify the different roles of the systematic component and the idiosyncratic component on pre-announcement returns with a simple decomposition estimation. For each firm i in each quarter q, we use the daily data from quarter $q-3$ to quarter $q-1$ to estimate the firm's uncertainty exposure to market uncertainty, $l_{1i,q}$, where the market uncertainty is proxied by VIX:

$$Uncertainty_{i,d} = l_{0i,q} + l_{1i,q}\, VIX_d + \varepsilon_{i,d}. \tag{12}$$

Here, the subscript d denotes day d in the lagged three-quarter rolling window. $Uncertainty_{i,d}$ is the uncertainty measure of stock i for day d, and VIX_d is the close value of VIX for day d. We drop estimates with fewer than 20 observations in the lagged rolling window. With the estimated $\widehat{l_{0i,q}}$ and $\widehat{l_{1i,q}}$ in quarter q, we decompose firm-level uncertainty at day -11 before the earnings announcement day 0 in quarter q, $Uncertainty_{i,-11}$, into two parts:

$$Uncertainty_{i,-11} = \widehat{Uncertainty}^{syst}_{i,-11} + \widehat{Uncertainty}^{idio}_{i,-11}, \tag{13}$$

with
$$\widehat{Uncertainty}^{syst}_{i,-11} = \widehat{l_{1i,q}}\, VIX_{-11}, \tag{14}$$

and
$$\widehat{Uncertainty}^{idio}_{i,-11} = Uncertainty_{i,-11} - \widehat{Uncertainty}^{syst}_{i,-11}. \tag{15}$$

We then re-estimate the Fama-MacBeth regression specified by Equation (7) and replace the uncertainty measure $Uncertainty_{i-11}$ with $\widehat{Uncertainty}^{syst}_{i,-11}$ and $\widehat{Uncertainty}^{idio}_{i,-11}$.[26]

[26] Dennis et al. (2006) assume that option-implied volatility correlates with market-implied volatility in the same way as realized volatilities, and decomposed implied volatility with its systematic and idiosyncratic components

The results are reported in Table 10. For brevity, we only report the results based on $IVOW$ as the uncertainty measure. As shown in the table, systematic and idiosyncratic uncertainty both predict the pre-announcement returns and the change in implied volatilities before earnings releases. For an interquartile change in systematic and idiosyncratic uncertainty, the impacts on the pre-announcement returns are 0.438% and 0.556%, and the impacts on the change in implied volatilities are -3.7% and -6.1%, respectively. The positive return predictability of the systematic component is consistent with Hu et al. (2022). That said, the idiosyncratic component also has significantly positive return predictability. This result suggests that the dynamics of the stock prices before earnings announcements are also related to firms' idiosyncratic uncertainty risks.

In an alternative strategy, we decompose the earnings news itself rather than the pre-announcement uncertainty measure based on the timing of the earnings announcement. Savor and Wilson (2016) document that firms announcing earnings earlier in the quarter reveal more information on aggregate cash flow. Following the same logic, we expect that the resolution of the uncertainty risk associated with these early announcers will contain more systematic components. Conversely, the uncertainty risk resolution associated with late announcers is more likely to be firm specific. Following Savor and Wilson (2016), we define early ($Early_{i,q}$) and late ($Late_{i,q}$) announcers as those expected to announce earnings in the first and last quartiles among all announcers of the quarter. The remaining announcers are defined as middle ($Middle_{i,q}$) announcers. We then estimate the following two-stage Fama-MacBeth regressions:

$$CAR_{i,-10,-1} = k_{1q}Early_{i,q} \times Uncertainty_{i,-11} + k_{2q}Middle_{i,q} \times Uncertainty_{i,-11}$$

$$+k_{3q}Late_{i,q} \times Uncertainty_{i,-11} + k_{4q}Early_{i,q} + k_{5q}Middle_{i,q} + k_{6q}Late_{i,q}$$

$$+k_{7q}Controls_{i,m-1} + \varepsilon_{i,q}. \tag{16}$$

All control variables are standardized to facilitate a clear interpretation of the coefficients on the indicators.

based on the market model: $IV_{i,d}^{2,idio} = IV_{i,d}^2 - \beta_i^2 VIX_d^2$. The two decomposition methods yield quantitatively similar results.

The results are reported in Table 11. For brevity, we only report the results based on the uncertainty measure $IVOW$. As shown in column (1), early announcements have the highest pre-announcement returns, with an average of 0.51% that is statistically significant at the 1% level. In comparison, the pre-announcement returns for the middle and late groups are around 0.18%, measures that are significantly smaller in magnitude but still statistically significant. Moreover, as shown in column (2), the uncertainty risk exhibits a significantly larger impact on the pre-announcement return among the early announcers. The coefficient on the uncertainty proxy is 3.543 (*t*-stats = 4.52) for early announcers, which is substantially higher than the coefficient of 2.392 (*t*-stats = 2.69) for middle announcers. For the late announcers, firm-level uncertainty no longer predicts pre-announcement returns, with a statistically insignificant coefficient of 0.768. Results in this table suggest that the systematic news component plays a much more important role than the idiosyncratic news component in explaining the pre-announcement returns.[27]

7. Conclusion

In this paper, we propose an uncertainty risk resolution explanation for large pre-announcement returns before earnings releases. We hypothesize that there are two distinct risks: the news risk and the uncertainty risk associated with the impact of the news. Anticipation of upcoming announcements brings heightened uncertainty to the underlying stock, and the subsequent resolution of this uncertainty risk leads to positive pre-announcement returns prior to earnings releases. Using options-implied volatilities as our uncertainty measures, we find that stocks with ex ante high-uncertainty levels experience significantly more uncertainty risk resolution and larger pre-announcement returns before their earnings announcements. We provide evidence that information acquisition by investors and information supply by analysts and firm management can contribute to uncertainty risk resolution before earnings announcements.

[27] In Table IA.11 of the Internet Appendix, we also employ a piecewise regression and identify a significant discontinuity in pre-announcement returns surrounding GDP announcements. In Internet Appendix Figures IA.2 and IA.3, we show that the average pre-announcement return positively comoves with the level of VIX. We also show that 1) the return-uncertainty association weakens in recent years, 2) the weakening is largely due to the relatively low market uncertainty in these years, and 3) the improvement in the information environment is another contributing factor. The results are reported in Tables IA.12, IA.13, IA.14, and Figure IA.4 of the Internet Appendix. Relatedly, Heitz et al. (2023) and Martineau (2022) document a weakened earnings announcement premium and post-earnings-announcement drift in recent years, respectively.

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Table 1. Summary Statistics

This table reports the summary statistics. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. Our quarterly earnings announcement dates are from Compustat and I/B/E/S. Size is the firm's market capitalization. B/M is the firm's book-to-market ratio where the book value of equity is calculated as the book value of equity, adding back deferred taxes and subtracting preferred equity. Turnover is the number of shares traded in the month divided by the number of shares outstanding. $IVOW_{-11}$ is calculated as the dollar open interest weighted average implied volatility of at-the-money individual options at day -11 of the earnings announcement. $IVEW_{-11}$ is calculated as the equally weighted average implied volatility at day -11 of the earnings announcement. $IVVS_{-11}$ is the implied volatility of standard 30-day at-the-money put options extrapolated from the OptionMetrics volatility surface at day -11 of the earnings announcement. Observations are at the earnings announcement level.

Variable	N	Mean	Median	25th Pctl	75th Pctl	Std Dev
Size (in million)	89,567	12,205	2,487	875	8,498	36,474
B/M	89,315	0.454	0.319	0.161	0.571	0.643
Past 12 month ret	89,567	0.278	0.131	-0.121	0.428	0.945
Turnover	89,567	0.207	0.155	0.098	0.250	0.205
$IVOW_{-11}$	89,567	0.477	0.430	0.316	0.588	0.224
$IVEW_{-11}$	89,567	0.477	0.431	0.316	0.587	0.222
$IVVS_{-11}$	89,567	0.481	0.434	0.318	0.592	0.228

Table 2. Uncertainty Resolution of Uncertainty-sorted Portfolios

This table examines the relationship between pre-announcement uncertainty and pre-announcement uncertainty change. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We utilize three proxies for firm-level uncertainty measured at day -11, including $IVOW_{-11}$, $IVEW_{-11}$, and $IVVS_{-11}$. $IVOW$ is the dollar open interest weighted average implied volatility. $IVEW$ is the equally weighted average implied volatility. $IVVS$ is the implied volatility of standard 30-day at-the-money put options extrapolated from the OptionMetrics volatility surface. Each quarter, every stock is assigned to one of five portfolios based on its level of pre-announcement uncertainty, measured 11 days before its earnings announcement day. The portfolio breakpoints for each stock are determined by the distribution of pre-announcement uncertainty of all firms that have released earnings within a rolling 60-day period—from 70 days to 11 days before the respective stock's earnings announcement day. When $IVOW_{-11}$ is used as the uncertainty measure and the sorting variable, for example, the uncertainty change is the cumulative percentage change in $IVOW$ from day -11 to day -1. We adjust option-based uncertainty changes for the volatility demand impact by subtracting the average volatility change in a size-based benchmark portfolio. To calculate the average uncertainty change, we first average across all earnings announcements of each sorted portfolio within each quarter, using value weighting based on day -11 market capitalization in Panel A and equal weighting in Panel B, then we take the time-series average across all quarters in our sample. *t*-statistics are calculated based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Uncertainty change in value-weighted portfolios

Sort by	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Low	0.021***	0.018***	0.017***
	[7.08]	[6.02]	[5.73]
2	-0.005*	-0.004	-0.002
	[-1.67]	[-0.98]	[-0.56]
3	-0.016***	-0.015***	-0.014***
	[-3.81]	[-4.08]	[-3.59]
4	-0.026***	-0.023***	-0.023***
	[-7.50]	[-6.64]	[-7.86]
High	-0.059***	-0.055***	-0.051***
	[-13.88]	[-13.53]	[-12.75]
H -L	-0.079***	-0.074***	-0.068***
	[-13.40]	[-12.75]	[-11.91]

Panel B. Uncertainty change in equal-weighted portfolios

Sort by	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Low	0.029***	0.027***	0.026***
	[10.29]	[9.36]	[8.41]
2	0.011***	0.011***	0.011***
	[6.17]	[6.20]	[6.39]
3	0.004**	0.004**	0.005***
	[2.36]	[2.46]	[2.68]
4	-0.004**	-0.004**	-0.004***
	[-2.39]	[-2.52]	[-2.64]
High	-0.038***	-0.036***	-0.034***
	[-23.73]	[-21.26]	[-18.39]
H -L	-0.068***	-0.063***	-0.061***
	[-18.18]	[-16.86]	[-14.19]

Table 3. Pre-announcement Return of Uncertainty-sorted Portfolios

This table reports the pre-announcement returns of different uncertainty groups. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We utilize three proxies for firm-level uncertainty measured at day -11 before the earnings announcements, including $IVOW_{-11}$, $IVEW_{-11}$, and $IVVS_{-11}$. $IVOW$ is the dollar open interest weighted average implied volatility. $IVEW$ is the equally weighted average implied volatility. $IVVS$ is the implied volatility of standard 30-day at-the-money put options extrapolated from the OptionMetrics volatility surface. Each quarter, every stock is assigned to one of five portfolios based on its level of pre-announcement uncertainty, measured 11 days before its earnings announcement day. The portfolio breakpoints for each stock are determined by the distribution of pre-announcement uncertainty of all firms that have released earnings within a rolling 60-day period—from 70 days to 11 days before the respective stock's earnings announcement day. CAR [-10, -1] is the cumulative abnormal return of the portfolio from day -10 to day -1 before the earnings announcement. To calculate the average CAR [-10, -1], we first average across all earnings announcements of each sorted portfolio within each quarter, using value weighting based on day -11 capitalization in Panel A and equal weighting in Panel B; then, we take the time-series average across all quarters in our sample. t-statistics are calculated based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. CAR [-10, -1] of value-weighted portfolios

Sort by	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Low	-0.068	-0.061	-0.072
	[-0.52]	[-0.46]	[-0.54]
2	0.056	0.026	0.042
	[0.46]	[0.22]	[0.37]
3	0.283	0.306	0.181
	[1.27]	[1.36]	[0.78]
4	0.340	0.452**	0.390*
	[1.52]	[2.06]	[1.90]
High	1.258***	1.236***	1.315***
	[3.58]	[3.50]	[3.47]
H -L	1.326***	1.296***	1.387***
	[3.07]	[3.01]	[3.05]

Panel B. CAR [-10, -1] of equal-weighted portfolios

Sort by	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Low	-0.062	-0.074	-0.053
	[-0.65]	[-0.76]	[-0.51]
2	0.054	0.057	0.090
	[0.68]	[0.74]	[1.24]
3	0.220**	0.210**	0.197*
	[2.17]	[2.06]	[1.81]
4	0.297	0.313	0.301
	[1.53]	[1.63]	[1.53]
High	1.022***	1.026***	0.982***
	[2.74]	[2.74]	[2.67]
H -L	1.085**	1.100**	1.035**
	[2.47]	[2.48]	[2.36]

Table 4. Uncertainty Resolution and Pre-announcement Returns: Predictive Fama-MacBeth Regressions

This table reports the Fama-MacBeth regressions of the pre-announcement return CAR[-10, -1] and the pre-announcement uncertainty change on the uncertainty measures at day -11. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We utilize three proxies for firm-level uncertainty measured at day -11, including $IVOW_{-11}$, $IVEW_{-11}$, and $IVVS_{-11}$. $IVOW$ is the dollar open interest weighted average implied volatility. $IVEW$ is the equally weighted average implied volatility. $IVVS$ is the implied volatility of standard 30-day at-the-money put options extrapolated from the OptionMetrics volatility surface. In Panel A, the dependent variable is the uncertainty change, which is the cumulative change in the uncertainty measure in the window [-10, -1]. We adjust option-based uncertainty changes for the volatility demand impact by subtracting the average volatility change in a size-based benchmark portfolio. In Panel B, the dependent variable is CAR [-10, -1], which is the cumulative abnormal return of the firm from day -10 to day -1 before the earnings announcement. LogSize is the natural logarithm of the firm's market capitalization in the previous month. LogBM is the natural logarithm of the firm's book-to-market ratio where the book value of equity is calculated as the book value of equity adding back deferred taxes and subtracting the preferred equity lagged from the previous month. Past ret is the past 12-month return skipping the most recent month. If the earnings announcement is made within the first 10 trading days of the month, we lag control variables for two calendar months. *t*-statistics are calculated based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. Q3-Q1 indicates the interquartile impact of uncertainty on the dependent variable.

Panel A. Uncertainty resolution

	(1)	(2)	(3)
Dep. var.	$\Delta IVOW$	$\Delta IVEW$	$\Delta IVVS$
Uncertainty Measures	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Uncertainty	-0.230***	-0.215***	-0.211***
	[-18.52]	[-16.35]	[-16.70]
LogSize	-0.016***	-0.015***	-0.015***
	[-20.47]	[-20.04]	[-18.18]
LogBM	-0.007***	-0.006***	-0.007***
	[-7.90]	[-7.60]	[-9.42]
Past ret	0.003**	0.003**	0.002
	[2.06]	[2.12]	[0.96]
Constant	0.440***	0.413***	0.416***
	[22.00]	[20.77]	[18.91]
Q3-Q1	-0.063	-0.058	-0.058
Adj. Rsq	0.052	0.052	0.050

Panel B. Pre-announcement returns

	(1)	(2)	(3)
Dep. var.	CAR [-10, -1]	CAR [-10, -1]	CAR [-10, -1]
Uncertainty Measures	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Uncertainty	2.371***	2.436***	1.990***
	[3.34]	[3.39]	[2.91]
LogSize	0.088**	0.092**	0.058
	[2.42]	[2.48]	[1.64]
LogBM	0.080*	0.081*	0.067*
	[1.88]	[1.92]	[1.69]
Past ret	0.026	0.025	0.033
	[0.16]	[0.16]	[0.20]
Constant	-2.961***	-3.069***	-2.169**
	[-3.35]	[-3.38]	[-2.45]
Q3-Q1	0.646	0.661	0.545
Adj. Rsq	0.033	0.033	0.032

Table 5. Tradable Strategies with Expected Announcement Dates

This table reports the monthly alphas of tradable strategies based on uncertainty. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We utilize three proxies for firm-level uncertainty $IVOW_{d-11}$ measured at day $d-11$. We first estimate the expected earnings announcement day d^i following Cohen et al. (2007) for each firm i. At the end of every trading day t, we select the firms with their d^i falling in the window $[t+2, t+11]$ to form portfolios. We drop firms whose actual earnings release dates fall on day $t+1$. Next, we assign each selected firm i to one of the five portfolios, based on the distribution breakpoints of the pre-announcement uncertainty in a rolling 60-day window before d_i, that is, the distribution of $IVOW_{d_j-11}$, where $d_i - 59 \leq d_j \leq\ d_i$. We calculate the monthly portfolio returns using value weighting in Panel A and equal weighting in Panel B. Portfolio excess returns are portfolio returns in excess of the risk-free rate. Portfolio alphas are estimated in the time series relative to models including CAPM, Fama-French three-factor, and Fama-French three-factor plus momentum. *t*-statistics are calculated based on robust standard errors and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Value-weighted portfolios

	Excess Return	CAPM	FF-3	FF-3 + MOM	FF-5	*q*-factor	q^5-factor
Low	0.495	0.042	0.046	-0.015	-0.132	-0.192	-0.142
	[1.61]	[0.16]	[0.18]	[-0.06]	[-0.48]	[-0.69]	[-0.53]
2	1.283***	0.632**	0.586*	0.567*	0.570*	0.538	0.569*
	[3.28]	[2.04]	[1.91]	[1.80]	[1.68]	[1.58]	[1.71]
3	1.371***	0.483	0.455	0.403	0.626	0.337	0.580
	[2.71]	[1.32]	[1.25]	[1.10]	[1.63]	[0.88]	[1.42]
4	1.994***	0.922*	1.010**	0.925**	1.391***	1.213**	0.996**
	[3.05]	[1.87]	[2.17]	[2.05]	[2.88]	[2.51]	[1.97]
High	2.674***	1.239*	1.401**	1.556**	2.160***	2.151***	1.853***
	[2.86]	[1.69]	[2.01]	[2.30]	[3.09]	[2.94]	[2.59]
H -L	2.178**	1.196	1.355*	1.571**	2.291***	2.343***	1.995***
	[2.43]	[1.50]	[1.79]	[2.20]	[2.97]	[3.03]	[2.66]

Panel B. Equal-weighted portfolios

	Excess Return	CAPM	FF-3	FF-3 + MOM	FF-5	*q*-factor	q^5-factor
Low	0.656**	0.206	0.168	0.129	0.024	-0.016	0.017
	[2.36]	[0.91]	[0.75]	[0.56]	[0.10]	[-0.06]	[0.07]
2	1.304***	0.668***	0.584**	0.567**	0.543**	0.487*	0.541**
	[3.74]	[2.63]	[2.42]	[2.32]	[2.13]	[1.87]	[2.18]
3	1.588***	0.776***	0.694**	0.714***	0.765***	0.566*	0.928***
	[3.62]	[2.64]	[2.53]	[2.63]	[2.61]	[1.95]	[2.88]
4	1.949***	0.963**	0.985***	1.000***	1.122***	1.033***	1.013***
	[3.51]	[2.48]	[2.84]	[2.88]	[3.07]	[2.85]	[2.62]
High	3.003***	1.728***	1.852***	2.047***	2.441***	2.468***	2.267***
	[3.70]	[2.78]	[3.17]	[3.61]	[4.22]	[4.21]	[3.68]
H -L	2.348***	1.523**	1.684***	1.918***	2.417***	2.484***	2.250***
	[3.06]	[2.22]	[2.64]	[3.10]	[3.69]	[3.82]	[3.34]

Table 6. Active Information Acquisition and Information Supply

This table examines the mechanism of uncertainty resolution. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We utilize three proxies for firm-level uncertainty measured at day -11, including $IVOW_{-11}$, $IVEW_{-11}$, and $IVVS_{-11}$. $IVOW$ is the dollar open interest weighted average implied volatility. $IVEW$ is the equally weighted average implied volatility. $IVVS$ is the implied volatility of standard 30-day at-the-money put options extrapolated from the OptionMetrics volatility surface. In Panel A, the dependent variable is ESV, which is the log of 1 plus the total EDGAR search volume from day -10 to day -1. The EDGAR search volume is obtained from Ryan (2017). The control variables include firm size, the book-to-market ratio, past performance, and the log of 1 plus the total EDGAR search volume in the previous quarter. In Panel B, the dependent variable is Forecast. Forecast is an indicator equal to 1 if there is a revised analyst forecast between day -10 and day -1. The control variables include firm size, the book-to-market ratio, past performance, and analyst coverage (log of 1 plus the number of analysts covering the firm). In Panel C, the dependent variable is Guidance, which is equal to 1 if management earnings guidance is released between day -10 and day -1. The control variables include firm size, the book-to-market ratio, past performance, and an indicator of management earnings guidance in the previous quarter. t-statistics are based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. Q3-Q1 indicates the interquartile impact of uncertainty on the dependent variable.

Panel A. Active information acquisition

	(1)	(2)	(3)
Dep var	ESV	ESV	ESV
Uncertainty =	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Uncertainty	0.268***	0.272***	0.246***
	[7.11]	[7.15]	[6.78]
Q3-Q1	0.073	0.073	0.067
Adj. Rsq	0.838	0.848	0.848

Panel B. Analyst forecast revisions

	(1)	(2)	(3)
Dep var	Forecast	Forecast	Forecast
Uncertainty =	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Uncertainty	0.107***	0.109***	0.101***
	[3.84]	[3.82]	[3.83]
Q3-Q1	0.029	0.030	0.028
Adj. Rsq	0.159	0.159	0.159

Panel C. Management earnings guidance

	(1)	(2)	(3)
Dep var	Guidance	Guidance	Guidance
Uncertainty =	$IVOW_{-11}$	$IVEW_{-11}$	$IVVS_{-11}$
Uncertainty	0.014***	0.013***	0.010**
	[3.38]	[3.22]	[2.42]
Q3-Q1	0.004	0.004	0.003
Adj. Rsq	0.007	0.007	0.006

Table 7. PLS Estimation of an Information Channel Proxy

This table examines the role of information channels in uncertainty resolution. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 2003 to 2017 where EDGAR search data are available. To reduce noisiness in the information measures, each quarter we extract an information channel proxy ($INFO$) from the pre-announcement EDGAR search volume scaled by the firm's previous-quarter total EDGAR search volume, analyst forecast revisions, and earnings guidance based on the partial least squares (PLS) model specified in Equation (11). $INFO$ is defined as the opposite of the extracted component. Panel A reports the summary statistics of the weight estimations. Panel B reports the regressions of the uncertainty change and pre-announcement return on the information channel proxy ($INFO$). We include firm size, the book-to-market ratio, and past performance as control variables. For both the PLS estimation and the Fama-MacBeth regressions, $\Delta IVOW$ is adjusted for the volatility demand impact by subtracting the average volatility change in a size-based benchmark portfolio. $\Delta IVOW$ is in percentages in this table. *t*-statistics are in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. Q3-Q1 indicates the interquartile impact of $INFO$ on the dependent variable.

Panel A. Estimation of *INFO*

Variable	N	Mean	Median	25th Pctl	75th Pctl	Std Dev
w_{ESV_scaled}	57	0.247	0.306	-0.220	0.831	0.625
$w_{Forecast}$	57	0.192	0.273	-0.136	0.606	0.514
$w_{Guidance}$	57	0.346	0.426	0.066	0.632	0.390
$INFO$	50,755	0.002	-0.104	-0.590	0.502	1.033

Panel B. Fama-MacBeth regressions

	(1)	(2)
Dep var	$\Delta IVOW$	CAR [-10, -1]
$INFO$	-1.362***	0.215***
	[-14.43]	[3.34]
Q3-Q1	-1.487	0.235
Adj. Rsq	0.010	0.022

Table 8. Pre- and Post-announcement Return-to-variance Ratios

This table compares the average return, variance, and return-to-variance ratios for the tradable portfolios that are constructed to capture the pre- and post-announcement returns. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. For the pre-announcement returns, the tradable portfolios hold the stock from day -10 to day -1 relative to the expected announcement day. For the post-announcement returns, the tradable portfolios hold the stock from day 0 to day 9 relative to the actual announcement day. The details of the construction of the tradable portfolios are discussed in Section 6.1. We report the average monthly return (Ret), variance (Var), and return-to-variance (Ret/Var) for the value-weighted portfolios in Panel A and equal-weighted portfolios in Panel B. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively.

Panel A. Value-weighted portfolios

Uncertainty Rank	Pre-announcement			Post-announcement			Pre-Post	
	Ret (%)	Var (%)	Ret/Var	Ret (%)	Var (%)	Ret/Var	Ret (%)	Ret/Var
Low	0.700**	0.240	2.917**	0.876**	0.362	2.416**	-0.176	0.502
	[2.41]		[2.21]	[2.46]		[2.29]	[-0.38]	[0.30]
2	1.458***	0.360	4.055***	1.832***	0.482	3.805***	-0.375	0.250
	[4.10]		[3.64]	[4.46]		[4.22]	[-0.69]	[0.17]
3	1.407***	0.653	2.154***	1.797***	1.022	1.759***	-0.390	0.394
	[2.94]		[2.65]	[3.00]		[3.29]	[-0.51]	[0.41]
4	2.346***	1.072	2.187***	1.339*	1.518	0.882*	1.007	1.305*
	[3.82]		[3.76]	[1.83]		[1.82]	[1.06]	[1.72]
High	2.631***	2.318	1.135***	-0.789	2.375	-0.332	3.420***	1.467***
	[2.92]		[3.10]	[-0.86]		[-0.84]	[2.66]	[2.73]

Panel B. Equal-weighted portfolios

Uncertainty Rank	Pre-announcement			Post-announcement			Pre-Post	
	Ret (%)	Var (%)	Ret/Var	Ret (%)	Var (%)	Ret/Var	Ret (%)	Ret/Var
Low	0.766***	0.195	3.920**	1.047***	0.277	3.777***	-0.282	0.144
	[2.92]		[2.54]	[3.36]		[2.91]	[-0.69]	[0.07]
2	1.394***	0.301	4.636***	1.925***	0.339	5.676***	-0.530	-1.04
	[4.29]		[3.76]	[5.58]		[4.98]	[-1.12]	[-0.62]
3	1.391***	0.476	2.924***	1.479***	0.763	1.938***	-0.088	0.987
	[3.41]		[3.13]	[2.86]		[2.98]	[-0.13]	[0.87]
4	2.309***	0.87	2.655***	1.441**	1.148	1.255**	0.868	1.400*
	[4.18]		[4.23]	[2.27]		[2.26]	[1.03]	[1.67]
High	2.909***	1.755	1.657***	-0.405	2.027	-0.200	3.313***	1.857***
	[3.71]		[3.97]	[-0.48]		[-0.48]	[2.88]	[3.14]

Table 9. Robustness: Horse Race Regressions

This table reports the Fama-MacBeth regressions of the pre-announcement return CAR[-10, -1] on the uncertainty measure $IVOW_{-11}$ at day -11 and different sets of control variables. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. The dependent variable is CAR [-10, -1], which is the cumulative abnormal return of the firm from day -10 to day -1 before the earnings announcement. For the control variables, the firm-level asymmetric liquidity provision (ALP) is estimated following Johnson and So (2018) for firms with at least 20 earnings announcements; turnover is the number of shares traded in the month divided by the number of shares outstanding; ILLIQ is the illiquidity measure based on Amihud (2002); expected skewness (Skewexp) is calculated following Boyer et al. (2010); jackpot probability (Jackpotp) is calculated following Conrad et al. (2014); the stock price level (Prc) is calculated following Liu et al. (2020); the market beta is estimated using the previous three months of daily returns; idiosyncratic volatility (IVOL) is estimated following Ang et al. (2006, 2009); abnormal idiosyncratic volatility (AIV) is estimated following Yang et al. (2020); the probability of informed trading (PIN) is based on Easley et al. (1996); institutional ownership is the number of shares held by institutional investors divided by the number of shares outstanding; standardized unexpected earnings (SUE) is calculated as the median value of analyst forecasts minus the actual earnings per share value deflated by the last quarter-end stock price; the volume concentration ratio (VCR) is the percentage of the total share volume over the previous four years that occurred in the announcement month, following Frazzini and Lamont (2007); Past ret is the past 12-month return skipping the most recent month; LogSize is the natural logarithm of the firm's market capitalization in the previous month; LogBM is the natural logarithm of the firm's book-to-market ratio where the book value of equity is calculated as the book value of equity adding back deferred taxes and subtracting the preferred equity lagged from the previous month. We use PIN, SUE, and the post-announcement return of the announcing quarter, and the institutional ownership of the previous quarter. If the earnings announcement is made within the first 10 trading days of the month, we lag the control variables for another calendar month. *t*-statistics are calculated based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. Q3-Q1 indicates the interquartile impact of uncertainty on the dependent variable.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.			CAR[-10, -1]			
Uncertainty			$IVOW_{-11}$			
Uncertainty	2.302***	2.953***	2.203***	3.670***	2.337***	4.087***
	[3.20]	[4.14]	[3.01]	[3.69]	[3.29]	[3.74]
Inventory risk:						
ALP	0.108					0.136
	[0.86]					[0.58]
Turnover	-0.187					0.100
	[-0.45]					[0.15]
ILLIQ	2.659					9.202
	[0.66]					[1.06]
Lottery preferences:						
Skewness		-0.094				-0.224
		[-0.56]				[-0.84]
Jackpot		-0.292				-0.626*
		[-1.59]				[-1.96]
Prc		0.139				0.358**
		[1.25]				[2.21]
Risks:						
Market beta			0.108			0.104
			[1.14]			[0.77]
IVOL			-0.340			-1.046*
			[-0.92]			[-1.95]
AIV			0.276*			0.237
			[1.88]			[1.21]
Informed trading:						
PIN				-3.948**		-3.959**
				[-2.12]		[-2.08]
IO				0.060		-0.173
				[0.18]		[-0.58]
SUE				52.883***		83.813***
				[3.64]		[3.54]
CAR [0, +1]				-0.053***		-0.067***
				[-6.36]		[-7.00]
Limited attention						
VCR					2.709***	1.062
					[2.93]	[0.45]
Past ret	0.012	0.067	0.052	-0.051	0.022	-0.061
	[0.07]	[0.43]	[0.34]	[-0.21]	[0.14]	[-0.25]
Other controls:						
LogSize	0.083*	0.060	0.078**	0.003	0.084**	-0.023
	[2.11]	[1.10]	[2.36]	[0.05]	[2.27]	[-0.27]
LogBM	0.083*	0.041	0.095*	0.190***	0.079*	0.148**
	[1.96]	[1.35]	[1.78]	[2.93]	[1.89]	[2.22]
Constant	-2.815***	-1.819	-2.713***	-1.019	-3.849***	0.988
	[-2.92]	[-1.45]	[-3.33]	[-0.63]	[-4.19]	[0.45]
Q3-Q1	0.626	0.803	0.599	0.998	0.636	1.111
Adj. Rsq	0.039	0.040	0.038	0.047	0.034	0.066

Table 10. Systematic vs. Idiosyncratic Uncertainty

This table examines firm- and market-level uncertainty. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. We first estimate Equation (13) for each firm i and quarter q using daily data from quarter $q-3$ to quarter $q-1$ requiring at least 20 observations. We use the dollar open interest weighted average implied volatility $IVOW$ as the firm uncertainty measure and CBOE VIX as the market uncertainty measure. Based on the estimated exposure to the market uncertainty, $\widehat{l_{1iq}}$, we decompose $IVOW_{-11}$ into market-specific and firm-specific components, defined in Equations (15) and (16), respectively. Panel A reports the summary statistics of the first-stage estimations. Panel B reports the Fama-MacBeth regressions of uncertainty change and the pre-announcement return on these two components. We adjust the $IVOW$ change for the volatility demand impact by subtracting the average cumulative volatility change in a benchmark portfolio. LogSize is the natural logarithm of the firm's market capitalization in the previous month. LogBM is the natural logarithm of the firm's book-to-market ratio where the book value of equity is calculated as the book value of equity adding back deferred taxes and subtracting the preferred equity lagged from the previous month. Past ret is the past 12-month return skipping the most recent month. If the earnings announcement is made within the first 10 trading days of the month, we lag the control variables for two calendar months. *t*-statistics are in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. Q3-Q1 indicates the interquartile impact of uncertainty on the dependent variable.

Panel A. First-stage estimates

Variable	N	Mean	Median	25th Pctl	75th Pctl	Std Dev
$l_{0i,q}$	87841	0.286	0.237	0.142	0.376	0.234
$\widehat{l_{1i,q}^{VIX}}$	87841	0.805	0.739	0.373	1.159	1.030
$Adj.R^2$	87841	0.280	0.206	0.049	0.464	0.262
$\widehat{Uncertainty}_{i,-11}^{syst}$	87841	0.159	0.129	0.061	0.227	0.210
$\widehat{Uncertainty}_{i,-11}^{idio}$	87841	0.315	0.267	0.161	0.418	0.255

Panel B. Fama-MacBeth regressions

	(1)	(2)
Dep var	$\Delta IVOW$	CAR [-10, -1]
$\widehat{Uncertainty}_{i,-11}^{syst}$	-0.221***	2.641***
	[-17.01]	[3.38]
$\widehat{Uncertainty}_{i,-11}^{idio}$	-0.237***	2.165***
	[-19.80]	[3.17]
LogSize	-0.016***	0.076**
	[-22.34]	[2.07]
LogBM	-0.007***	0.074*
	[-7.62]	[1.78]
Past ret	0.003**	0.040
	[2.19]	[0.24]
Constant	0.444***	-2.701***
	[23.65]	[-3.07]
Q3-Q1 (*syst*)	-0.037	0.438
Q3-Q1 (*idio*)	-0.061	0.556
Adj. Rsq	0.054	0.037

Table 11. Pre-announcement Returns and Market Uncertainty

This table reports the association between the pre-announcement return CAR[-10, -1] and market uncertainty. We include all earnings announcements made by firms listed on NYSE, Nasdaq, and Amex from 1973 to 2019. CAR [-10, -1] is the cumulative abnormal return of the firm from day -10 to day -1 before the earnings announcement. We use a timing-based approach to separate systematic and idiosyncratic uncertainty. Early and late earnings announcements are defined similar to Savor and Wilson (2016) as those expected in the first and last quartiles of the quarter, respectively. Middle indicates the rest of the earnings announcements. LogSize is the natural logarithm of the firm's market capitalization in the previous month. LogBM is the natural logarithm of the firm's book-to-market ratio where book value of equity is calculated as the book value of equity adding back deferred taxes and subtracting preferred equity lagged from the previous month. Past ret is the past 12-month return skipping the most recent month. If the earnings announcement is made within the first 10 trading days of the month, we lag control variables for two calendar months. Control variables in Panel A are standardized to help with interpretation of the coefficients in column (1). The reported values are time-series average coefficient estimates of cross-sectional regressions. *t*-statistics are calculated based on Newey-West standard errors with three lags and are reported in brackets. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively.

	(1)	(2)
Dep. var.	CAR [-10, -1]	CAR [-10, -1]
Uncertainty Measures	$IVOW_{-11}$	$IVOW_{-11}$
Early×Uncertainty		3.543***
		[4.52]
Middle×Uncertainty		2.392***
		[2.69]
Late×Uncertainty		0.768
		[1.17]
Early	0.505***	-1.351***
	[4.71]	[-3.79]
Middle	0.178*	-1.375***
	[1.65]	[-3.19]
Late	0.181**	-0.077
	[1.99]	[-0.23]
LogSize	-0.223***	0.146*
	[-4.54]	[1.85]
LogBM	0.017	0.087*
	[0.48]	[1.67]
Past ret	0.243***	0.101
	[4.44]	[1.39]
Adj. Rsq	0.029	0.063

Figure 1. Average Cumulative Abnormal Return around Earnings Announcements

This figure shows the cumulative abnormal return (CAR) and uncertainty ($IVOW$) level around all earnings announcements. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. Panel A shows the average CAR from day -10 to day +10, where day 0 is the earnings announcement day. The daily abnormal return is calculated by subtracting the value-weighted market return from the daily stock return. For each day within the window [-10, +10], we average all firm-level CARs across all earnings announcements.

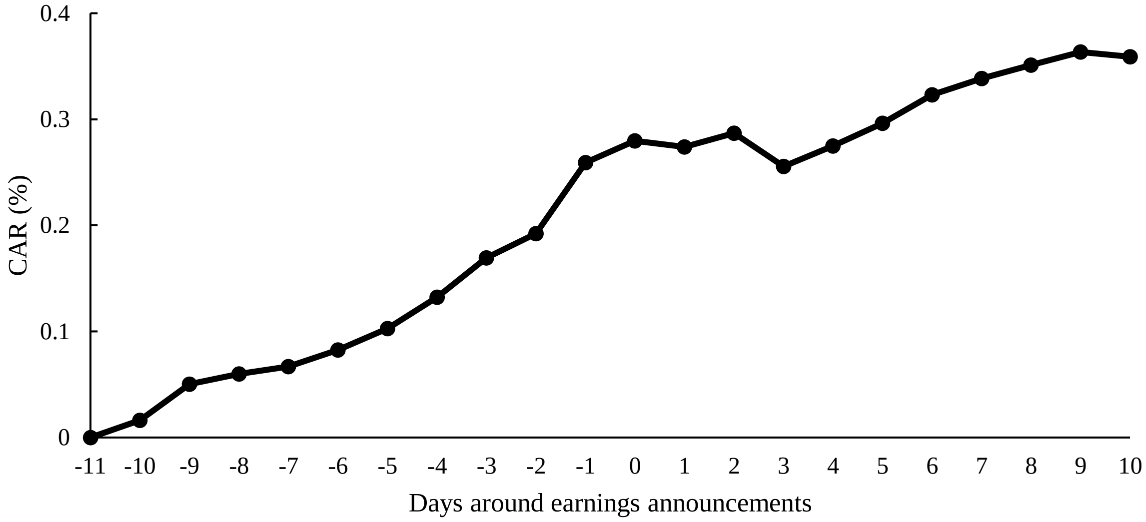
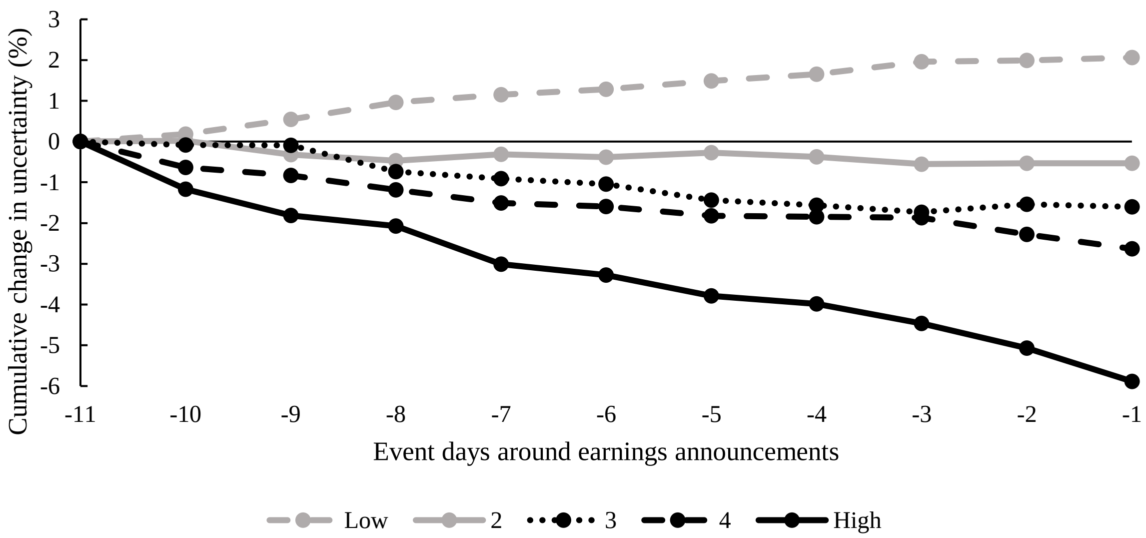


Figure 2. Uncertainty and Pre-announcement Returns

This figure shows the cumulative abnormal return (CAR) and change in uncertainty ($IVOW$) around earnings announcements sorted on the pre-announcement uncertainty level measured by $IVOW$ at day -11 before the earnings announcement. $IVOW$ is the dollar open interest weighted average implied volatility. Our sample covers firms listed on the NYSE, Nasdaq, and Amex with OptionMetrics data from 1996 to 2019. Each quarter, we assign stocks into five portfolios based on their pre-announcement uncertainty levels, which are measured 11 days before their respective actual earnings announcement dates. The portfolio breakpoints for each stock are determined by the distribution of pre-announcement uncertainty of all firms that have released earnings within a rolling 60-day period—from 70 days to 11 days before the respective stock's earnings announcement day. Panel A reports the time-series average of each sorted portfolio's cumulative uncertainty change across all quarters. We adjust the change in $IVOW$ for the volatility demand impact by subtracting the average $IVOW$ change in a benchmark group. We construct 10 benchmark groups every quarter using our sample firms based on the firm size. Panel B reports the average CAR of each sorted portfolio. For each day within the window [-10, -1], we average across all earnings announcements of each sorted portfolio within each quarter, using value weighting based on day -11 market capitalization; then, we take the time-series average across all quarters in our sample.

Panel A. Average change in uncertainty before earnings announcement



Panel B. Average cumulative abnormal return before earnings announcements