Do Idiosyncratic Jumps Matter?
Internet Appendix

The internet appendix reports results for the following robustness tests:

- Changing the definition of a jump: in the main paper, jumps are identified as days with absolute idiosyncratic returns greater than three conditional idiosyncratic standard deviations. We test whether our key results are robust to changes in this definition. In particular we test whether the pre-jump drift, positive mean jump-day returns and the high alphas to the strategy that buys stocks with high out-of-sample predicted jump probability are similar if we:
  - Use bipower variation instead of standard deviation to identify jumps,
  - Use 2 or 4 standard deviations instead of 3 standard deviations as the threshold to identify jumps,
  - Identify jumps based on weekly rather than daily returns.
- Subsample analysis for the decomposition of returns into jump and diffusive components: We perform this decomposition for subsamples of stocks based on time and firm size.
- Decomposition of ex ante jump probability and idiosyncratic volatility sorted portfolio returns into jump and non-jump components.
- Returns around jumps and market conditions: We test whether the pre-jump drift, and high average returns on jump days are robust across different market conditions such as high and low levels of market volatility and market returns.
- Macroeconomic news: We show that the positive average abnormal returns of idiosyncratic jumps remain after controlling for macroeconomic news effects documented in

Savor and Wilson (2013).

- Change in jump probabilities and pre-jump returns: We show a negative contemporaneous relationship between the change in jump probabilities and pre-jump returns before all jumps and earnings-related jumps.

- Jump day returns and reversals: We present evidence that past returns do not predict jump direction or jump returns.

- Volatility risk premium: We test whether the returns to the jump probability trading strategy are related to aggregate volatility risk.

1. Alternative jump definitions

1.1. Bipower volatility

Our definition of jumps is similar to the definition analyzed by Lee and Mykland (2008): absolute returns greater than a given multiple of volatility. However, they define volatility as bipower variation instead of standard deviation. Their motivation is that bipower variation does not include the volatility due to jumps and hence measures only the diffusive component of volatility (Barndorff-Nielsen and Shephard, 2006). In this section we define volatility as the bipower volatility of idiosyncratic returns (i.e. residuals of the FFC factor model) for each stock. To ensure that the probability of jumps is comparable to that in the main text, we use a multiple of 5 instead of 3 to identify jumps. Table IA.1 shows our main results are robust to this change in the definition of jumps. The returns on jump days are more likely to be positive with mean jump-day returns of about 3%. In addition, there is a large and significant negative drift before both positive and negative jumps. Fama-French-Carhart adjusted returns are -1.8% in the 30 days before all jumps and -1.5% (-2.3%) before positive (negative) jumps.

Portfolios constructed to predict jumps also perform similarly when jumps are identified using bipower variation instead of standard deviation. Table IA.2 presents results of regressions of the excess returns of jump probability portfolios on the Fama-French-Carhart factors. The daily average return and alpha of the long minus short portfolio are both about 10 bps (25% annually) in equally-weighted and value-weighted specifications. These estimates are slightly higher than those of the specification in the paper. The weekly and monthly portfolios have mean returns and alphas comparable to those reported in the paper.

1.2. Different volatility thresholds

To ensure that our results are robust to the threshold used to identify jumps, we redo our key tests using two and four standard deviations as thresholds. Tables IA.3 and IA.5 report the returns around jumps where jumps are defined as absolute idiosyncratic returns that are higher than two and four conditional exponentially weighted stock standard deviations, respectively. Average jump day returns remain large and positive across thresholds. Not surprisingly, the magnitude of jump day returns is positively related to the threshold. The pre-jump drift is also robust across thresholds and increases in absolute magnitude as the threshold increases. For all jumps, FFC-adjusted returns in the 30-trading days before a jump are -1.3% when the threshold is two (Table IA.3), -1.8% when the threshold is three (main paper), and -2% when the threshold is four (Table IA.5). These results are consistent with the tests in the paper that show that the magnitude of the drift is related to the size of the jump.

We also examine returns to the jump probability trading strategy with model parameters estimated based on past jumps identified using 2 and 4 standard deviation thresholds. Tables IA.4 and IA.6 report results for equal and value-weighted portfolios formed from quintile sorts on predicted jump probability at the daily, weekly, and monthly horizon based on jumps identified using these thresholds. Average excess returns and alphas on the long minus short portfolio are positive across all twelve specifications. The point estimates are statistically significant except for the value-weighted monthly portfolios where the estimates are economically large but are not significant in all specifications.

1.3. Weekly returns

We repeat the main analysis of the paper using jumps identified from weekly as opposed to daily returns. We analyze weekly returns to test whether the jump day premium is due to the strategic disclosure of news by managers. Perhaps positive news is disclosed instantly, but negative news leaks out slowly. If material information is incorporated into prices over several days, our setup may not recognize a jump in prices, despite a large movement. To test if this is the case, we identify jumps in weekly as opposed to daily returns. Tables IA.7 and IA.8 report the returns around jumps where jumps are defined as absolute idiosyncratic weekly returns that are higher than 3 conditional exponentially-weighted weekly stock volatilities. Using this specification does not alter the main results. Weekly jump returns are on average positive and large (about 7.5%). FFC-adjusted returns over the 4 weeks leading to a jump are -1.5%. In table IA.8 we report returns and alphas of predicted jump portfolios. We use the same procedure in the paper by estimating the parameters of a logistic model that predicts weekly jumps with the tail measure of Bollerslev and Todorov (2011) and the ratio of implied to realized volatility. The average excess return and alpha on the long minus short portfolio are between 22 and 26 bps (11% and 14% annually) and are highly statistically significant.

2. Return decomposition

In the paper we show that idiosyncratic jumps account for a large fraction of the typical stock's average daily returns. In Panel A of Table IA.9 we show that this pattern is consistent across various time periods. For the periods 1926-1962, 1963-1999, and 2000-2016 the daily FFC-adjusted return for a given stock is negative (between -3 and -4 bps) when only diffusive returns are considered. When the total return is considered, the average stock has a slightly positive FFC-adjusted return. This difference is driven by the jump component of returns which ranges between 3 and 5 bps. Panel B of Table IA.9 shows that the pattern is robust to using different size groupings to analyze the data. Even for firms that constitute the largest quintile in terms of market equity, the diffusive daily FFC-adjusted return is -1 bps, whereas the jump return is over 1 bps.

3. Portfolio return decomposition

In the paper, we decompose weekly returns of portfolios formed from sorts on ex ante jump probability (and idiosyncratic volatility) into components due to jumps and diffusive returns. Specifically, we construct three bins for every portfolio-week combination based on the relative magnitude of each realized stock return to its conditional standard deviation: $z = |r^{idio}/\sigma|$. Bins 1,2, and 3 are: $z < 2 \times \sigma$, $2 \times \sigma \leq z < 3 \times \sigma$, and $3 \times \sigma \leq z$, respectively. In the main text, we assign a stock-week to a given band if the most extreme absolute daily return for that week belongs to that band. Here, we decompose daily instead of weekly returns, thereby avoiding the question of how to allocate daily jumps to weekly returns. Table IA.10 shows that the results of this analysis are consistent with weekly results in the main text. The high jump-probability portfolio earns a 9 bps mean excess return and a 5 bps FFC alpha. The entire excess return is due to stocks whose absolute returns are more than two standard deviations. The alpha of the diffusive component ($z < 2$) is negative at -3 bps. The daily long-short jump-probability portfolio earns average excess returns and FFC alpha of 9 bps. The majority of these returns are attributable to the extreme portions of the portfolio, with absolute idiosyncratic returns beyond two standard deviations accounting for 6 bps.

Panel B reports Fama-French-Carhart alphas from a similar decomposition of portfolios formed from sequential sorts on idiosyncratic volatility and then jump probability. As in the main text, the negative FFC alphas for highly volatile stocks accrue from the diffusive component of returns, while the positive alphas accrue from the jump component.

4. Systematic or idiosyncratic?

Table IA.11 shows that the negative drift before jumps and positive average jump day returns do not depend on overall market conditions, suggesting that a systematic risk based explanation for these patterns is unlikely to be consistent with the data. Specifically the drift before jumps is negative in times of high and low market volatility, whether there are market jumps or not, whether the number of individual stock jumps is high or low, or whether market returns are high or low. High and low are defined relative to the full-sample median for each conditioning variable. Mean returns on jump days are also significantly positive in all these states, except for market jump days when they are negative. Figure IA.1 shows the 30 day moving average of the fraction of stocks that experience negative jumps and the number of 'All' jumps (positive and negative) along with gray bars for NBER dated recessions over the full 1926-2016 sample. Although the fraction of jumps varies over time, there does not seem to be any discernible pattern.

5. Macroeconomic news

Table IA.12 explores the relationship between the jump events that we document and macroeconomic announcements. Following Savor and Wilson (2013), we define macroeconomic news days as days when The Federal Open Market Committee (FOMC) makes interest rate announcements, or days when Consumer Price Index (CPI), Producer Price Index (PPI), or employment reports are announced. We find that consistent with Savor and Wilson (2013), these days are associated with high returns for individual stocks with average daily excess returns of 13 bps (compared to 4 bps in the full sample). However, the abnormal returns on jump days that we identify do not appear to be related to macroeconomic announcements. The decomposition of FFC-adjusted returns in Table IA.12 shows that average abnormal returns for the jump component are positive and significant at about 5 bps, and are negative and significant for the diffusive component around -3 bps during both macroeconomic news days and no news days.

6. Change in jump probabilities before jumps

Under the idiosyncratic jump risk hypothesis, investors receive new information that a jump is more likely. The arrival of this information at some point during the pre-jump window results in a drop in price and investors are compensated for bearing this risk through positive jump day returns. Thus, for the negative average pre-jump drift to be consistent with idiosyncratic jump risk aversion, jump probabilities must increase on average before jumps. This seems plausible, because the sample of stocks that jump is more likely to contain stocks whose jump probabilities have increased in the recent past, relative to those whose probabilities decreased. We test if increases in jump probabilities over the pre-jump period predict jumps in Table IA.13. Panels A and B show that increases in jump probability predict higher incidence rates for jumps. In addition Panel C shows a negative relationship between the change in jump probability during $(t-30, t-1)$ and the contemporaneous abnormal return over the same period. This negative relationship persists if we restrict our analysis to involve only those stocks that experience a jump on day t. These results are consistent with the idiosyncratic jump-risk hypothesis in that investor expectations about a jump are responsible for the negative returns during the pre-jump window.

We also consider the drift before jumps on earnings announcement dates. Despite the pre-scheduled timing of earnings announcements, jump probabilities need not be constant over the pre-announcement period. Jump probabilities are related to investor perceptions of whether the announcement will contain material information that constitutes a surprise to investors, which may change over time. Table IA.13 finds that changes in jump probabilities over the pre-announcement period display dynamics that are similar to those before all jumps. Jumps are twice as likely on earnings announcement dates when jump probabilities increase over the pre-announcement period compared to when they decrease. The table also shows that jump probability changes predict jumps and are negatively related to contemporaneous returns.

7. Reversals

This paper finds that positive average jump-day returns are preceded by negative average returns over the 30-day period before jumps. This pattern is similar to that of reversals in returns at short horizons (e.g. Jegadeesh (1990)). If large past returns reverse, we expect that past losers will experience positive average jump returns, and past winners will experience negative average jump returns. However, because jumps are more likely after extreme negative returns, average jump returns across all stocks may be positive. To explore whether reversals are a potential explanation for our results, we test whether large past returns are followed by average jump returns in the opposite direction. In particular, we construct five portfolios based on returns over the past 30-trading days. Table IA.14 reports the results of this analysis. Panel A presents the realized incidence of jumps in each portfolio. The table shows that as expected, jumps are more likely after negative returns (also consistent with the jump risk aversion hypotheses as discussed in the main text). However, the ratio of positive to negative jumps is about the same across portfolios. Panel B presents a decomposition of the returns of each portfolio into jump and diffusive components. We see reversals in the diffusive component of returns, not the jump component. Past losers have significant positive diffusive alphas and past winners have negative diffusive alphas. Although, the jump component is smaller for past winners than for past losers it is positive and large across all portfolios. Overall, the results of this analysis are inconsistent with reversals being responsible for jump day returns.

8. Volatility Risk Premium

In the paper we show that stocks with high predicted jump probability also have higher future realized volatility. Also, we predict a stock's probability of jumps using the log ratio of its implied to realized volatility. At the market level, this ratio measures the aggregate volatility risk premium. Given this link to volatility, we test the hypothesis that the returns to the expected jump portfolio is related to the market's volatility risk premium. To that end, we use either the realized volatility risk premium (VRP) or expected volatility risk premium ($E[VRP]$) from Bollerslev et al. (2009) as a measure of the market variance risk premium.[1] We regress equal and value-weighted returns of the jump probability trading strategy on both the variance risk measures (separately) along with the Fama-French-Carhart factors. Table IA.15 Panel A shows that both variables (VRP and $E[VRP]$) load either positively or not at all in this factor specification. A positive loading is in the wrong direction for a variance risk premium based explanation for the high average returns of high jump probability stocks: these stocks do well when there are positive shocks to variance.

[1] We thank Professor Zhou for sharing these data on his website.

This means that they hedge volatility risk and should have lower expected returns due to the insurance they provide. Note that the intercept is not interpretable in this regression because the variance risk premium variables are not returns to traded portfolios.

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Table IA.1: Returns around jump days (bipower variation-defined jumps)
This table reports average returns before, during, and after a jump. Using daily returns on all CRSP stocks from January 1926 to 2016 (excluding stocks with a price below $5 as of *t*-31), a positive (negative) jump is defined as a daily idiosyncratic return that is higher (lower) than + (-) 5 exponentially-weighted bipower variations of the stock's daily idiosyncratic returns. For stocks that experience a jump, we report the average jump return as well as the average cumulative return over the 30 trading-days before and after the jump. The returns are reported as gross returns, Fama-French-Carhart (FFC) adjusted returns, and Daniel-Grinblatt-Titman-Wermers (DGTW) adjusted returns. The t-statistics for each measure are in parentheses and are calculated by clustering all observation by calendar month.

	All jumps			Positive jumps			Negative jumps		
	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30
Gross returns	-1.18%	2.94%	1.24%	-0.18%	10.72%	1.36%	-2.81%	-9.85%	1.04%
	(-3.84)	(22.21)	(4.51)	(-0.58)	(75.73)	(5.27)	(-9.38)	(-59.30)	(3.16)
FFC adjusted	-1.79%	2.92%	0.01%	-1.46%	10.92%	0.02%	-2.34%	-10.25%	0.00%
	(-21.21)	(28.21)	(0.11)	(-13.66)	(56.54)	(0.21)	(-17.03)	(-38.93)	(-0.03)
DGTW adjusted	-2.18%	2.87%	-0.52%	-2.14%	10.66%	-0.60%	-2.25%	-10.08%	-0.38%
	(-25.17)	(24.76)	(-8.04)	(-20.96)	(71.96)	(-8.14)	(-15.16)	(-61.35)	(-3.69)

Table IA.2: Returns of portfolios formed from sorts on jump probability (bipower variation-defined jumps)
This table uses expanding-window estimates from the following model:
$Jump_{it} = logit[Tail_{i,t-1}, log(IV_{i,t-1}/RV_{i,t-1})]$
to predict jumps out-of-sample. Jumps are defined as daily absolute idiosyncratic returns that are more than 5 exponentially-weighted bipower variations of the stock's daily idiosyncratic returns. $Tail$ is the average of the left- and right-tail measures extracted from option prices using the method of Bollerslev and Todorov (2011). IV and RV are implied and realized volatilities respectively. The model is estimated using expanding monthly windows. Out-of-sample estimates of predicted jump probability formed from estimated parameters and current values of each variable are then used to sort stocks into quintile portfolios. Portfolios are equal or value weighted and held for one day, one week (skipping a day), and one month (non-overlapping). Excess returns of these portfolios are evaluated using the FFC four-factor model. The portfolio formation period is January 1997 to April 2016.

Panel A: Daily portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump incidence
Low	-0.01%	-0.04%	1.02	0.52	0.13	-0.07	-0.02%	-0.04%	0.86	-0.04	0.05	0.04	0.33%
	(-0.40)	(-5.90)	(177.39)	(47.11)	(11.34)	(-9.19)	(-0.96)	(-4.99)	(120.56)	(-2.63)	(3.88)	(4.40)	(34.48)
2	0.03%	-0.01%	1.09	0.52	0.11	-0.06	0.01%	-0.02%	0.95	-0.07	0.04	0.06	0.52%
	(1.24)	(-1.30)	(209.30)	(52.08)	(10.61)	(-8.47)	(0.65)	(-2.22)	(152.34)	(-5.84)	(3.66)	(7.65)	(42.27)
3	0.04%	0.01%	1.16	0.56	0.03	-0.09	0.04%	0.01%	1.05	-0.04	-0.08	0.05	0.75%
	(1.84)	(1.05)	(225.52)	(56.54)	(3.03)	(-12.73)	(1.91)	(1.15)	(175.18)	(-3.56)	(-7.23)	(6.38)	(47.05)
4	0.06%	0.03%	1.22	0.60	-0.06	-0.15	0.05%	0.02%	1.17	-0.02	-0.20	0.01	1.10%
	(2.54)	(4.00)	(216.95)	(55.57)	(-5.91)	(-19.49)	(2.21)	(2.26)	(166.10)	(-1.58)	(-14.85)	(0.88)	(50.81)
High	0.09%	0.06%	1.29	0.70	-0.15	-0.27	0.09%	0.05%	1.31	-0.01	-0.28	-0.09	2.07%
	(3.47)	(6.97)	(183.13)	(51.48)	(-11.22)	(-27.88)	(3.25)	(4.76)	(137.58)	(-0.31)	(-15.18)	(-7.33)	(61.69)
Hi - Lo	0.10%	0.10%	0.28	0.18	-0.28	-0.20	0.10%	0.10%	0.45	0.03	-0.34	-0.14	1.74%
	(7.87)	(9.11)	(30.48)	(10.30)	(-15.82)	(-15.83)	(5.53)	(5.97)	(33.38)	(1.16)	(-12.71)	(-7.47)	(52.34)

Panel B: Weekly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.09%	-0.06%	1.05	0.50	0.20	-0.08	0.06%	-0.06%	0.87	-0.04	0.12	0.01	1.74%
	(0.96)	(-2.02)	(81.17)	(23.07)	(9.24)	(-5.78)	(0.74)	(-1.67)	(55.87)	(-1.59)	(4.74)	(0.39)	(35.17)
2	0.16%	0.00%	1.12	0.46	0.17	-0.05	0.10%	-0.02%	0.93	-0.11	0.05	0.04	2.85%
	(1.68)	(0.10)	(96.11)	(23.49)	(8.57)	(-4.09)	(1.29)	(-0.80)	(73.79)	(-5.35)	(2.32)	(3.33)	(38.57)
3	0.17%	0.00%	1.18	0.51	0.11	-0.08	0.14%	0.00%	1.05	-0.02	-0.03	0.05	3.82%
	(1.63)	(0.15)	(107.74)	(27.33)	(6.16)	(-6.83)	(1.67)	(0.17)	(84.82)	(-1.05)	(-1.25)	(3.85)	(38.70)
4	0.25%	0.10%	1.20	0.52	0.02	-0.15	0.19%	0.06%	1.10	-0.11	-0.17	0.00	5.26%
	(2.34)	(3.70)	(107.34)	(27.78)	(0.93)	(-12.29)	(2.09)	(1.95)	(76.64)	(-4.35)	(-7.13)	(-0.02)	(40.15)
High	0.26%	0.12%	1.24	0.66	-0.10	-0.24	0.23%	0.09%	1.25	-0.04	-0.22	-0.02	7.84%
	(2.29)	(3.59)	(86.14)	(27.13)	(-4.20)	(-15.49)	(2.17)	(2.13)	(71.31)	(-1.36)	(-7.68)	(-0.81)	(45.21)
Hi - Lo	0.17%	0.18%	0.19	0.15	-0.30	-0.16	0.17%	0.15%	0.38	0.00	-0.34	-0.02	6.09%
	(3.40)	(4.05)	(9.66)	(4.73)	(-9.38)	(-7.68)	(2.41)	(2.29)	(13.82)	(0.03)	(-7.53)	(-0.73)	(37.44)

Table IA.2: continued from previous page

Panel C: Monthly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump incidence
Low	0.48%	-0.20%	1.08	0.42	0.36	-0.09	0.27%	-0.21%	0.88	-0.09	0.16	0.01	9.65%
	(1.27)	(-1.55)	(35.84)	(10.70)	(8.41)	(-3.60)	(0.94)	(-1.55)	(27.94)	(-2.11)	(3.67)	(0.36)	(29.33)
2	0.65%	-0.03%	1.05	0.42	0.34	-0.07	0.44%	-0.03%	0.88	-0.15	0.15	0.00	13.71%
	(1.74)	(-0.23)	(37.35)	(11.52)	(8.50)	(-3.02)	(1.59)	(-0.25)	(37.15)	(-4.83)	(4.42)	(0.24)	(31.40)
3	0.87%	0.17%	1.10	0.44	0.26	-0.06	0.50%	-0.06%	1.03	-0.06	0.05	0.06	16.91%
	(2.28)	(1.69)	(45.52)	(14.05)	(7.77)	(-2.92)	(1.59)	(-0.59)	(43.87)	(-2.00)	(1.64)	(2.88)	(33.15)
4	0.99%	0.28%	1.19	0.49	0.12	-0.10	0.82%	0.29%	1.12	-0.14	-0.16	-0.01	20.81%
	(2.36)	(2.68)	(48.14)	(15.48)	(3.32)	(-4.66)	(2.27)	(2.34)	(37.77)	(-3.58)	(-3.79)	(-0.37)	(34.85)
High	1.01%	0.35%	1.20	0.64	-0.08	-0.19	0.66%	0.06%	1.21	0.07	-0.37	0.06	26.31%
	(2.18)	(2.58)	(37.49)	(15.57)	(-1.69)	(-7.34)	(1.56)	(0.34)	(29.34)	(1.25)	(-6.42)	(1.68)	(38.48)
Hi - Lo	0.53%	0.55%	0.12	0.23	-0.43	-0.10	0.39%	0.27%	0.34	0.15	-0.54	0.05	16.66%
	(2.34)	(2.91)	(2.73)	(3.97)	(-6.91)	(-2.85)	(1.24)	(1.02)	(5.44)	(1.91)	(-6.16)	(0.94)	(28.02)

Table IA.3: Returns around jump days ($2\times\sigma$ Jumps)
This table reports average returns before, during, and after a jump. Using daily returns on all CRSP stocks from January 1926 to 2016 (excluding stocks with a price below $5 as of *t*-31), a positive (negative) jump is defined as a daily idiosyncratic return that is higher (lower) than + (-) 2 exponentially-weighted conditional deviations of the stock's daily idiosyncratic returns. For stocks that experience a jump, we report the average jump return as well as the average cumulative return over the 30 trading-days before and after the jump. The returns are reported as gross returns, Fama-French-Carhart (FFC) adjusted returns, and Daniel-Grinblatt-Titman-Wermers (DGTW) adjusted returns. The t-statistics for each measure are in parentheses and are calculated by clustering all observation by calendar month.

	All jumps			Positive jumps			Negative jumps		
	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30
Gross returns	-0.60%	1.35%	1.46%	-0.38%	6.56%	1.25%	-0.91%	-5.70%	1.74%
	(-2.37)	(28.25)	(6.07)	(-1.46)	(97.90)	(5.47)	(-3.59)	(-83.52)	(6.58)
FFC adjusted	-1.33%	1.29%	0.03%	-1.39%	6.66%	-0.18%	-1.26%	-5.99%	0.32%
	(-27.99)	(37.84)	(0.81)	(-23.33)	(92.09)	(-4.53)	(-22.99)	(-79.59)	(5.05)
DGTW adjusted	-1.64%	1.23%	-0.32%	-1.95%	6.25%	-0.60%	-1.23%	-5.58%	0.07%
	(-30.22)	(32.95)	(-6.62)	(-32.27)	(85.67)	(-13.65)	(-16.53)	(-81.41)	(0.99)

Table IA.4: Returns of portfolios formed from sorts on jump probability (2$\times\sigma$ jumps)
This table uses expanding-window estimates from the following model:
$Jump_{it} = logit[Tail_{i,t-1}, log(IV_{i,t-1}/RV_{i,t-1})]$
to predict jumps out-of-sample. Jumps are defined as daily absolute idiosyncratic returns that are more than 2 exponentially weighted conditional standard deviations of the stock's daily idiosyncratic returns. $Tail$ is the average of the left- and right-tail measures extracted from option prices using the method of Bollerslev and Todorov (2011). IV and RV are implied and realized volatilities respectively. The model is estimated using expanding monthly windows. Out-of-sample estimates of predicted jump probability formed from estimated parameters and current values of each variable are then used to sort stocks into quintile portfolios. Portfolios are equal or value weighted and held for one day, one week (skipping a day), and one month (non-overlapping). Excess returns of these portfolios are evaluated using the FFC four-factor model. The portfolio formation period is January 1997 to April 2016.

Panel A: Daily portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	-0.01%	-0.04%	1.05	0.57	0.00	-0.10	-0.03%	-0.05%	0.88	0.01	-0.04	0.00	1.99%
	(-0.43)	(-5.82)	(179.92)	(51.31)	(0.20)	(-13.10)	(-1.54)	(-5.89)	(117.38)	(0.91)	(-2.41)	(0.26)	(69.78)
2	0.02%	-0.01%	1.13	0.57	0.04	-0.09	0.01%	-0.02%	0.98	-0.02	0.03	0.05	3.57%
	(1.08)	(-1.60)	(207.38)	(54.76)	(3.77)	(-11.68)	(0.50)	(-2.56)	(152.67)	(-1.61)	(2.02)	(5.59)	(85.81)
3	0.05%	0.01%	1.17	0.55	0.00	-0.12	0.03%	0.00%	1.05	-0.04	-0.05	0.04	4.76%
	(2.00)	(1.82)	(216.54)	(53.03)	(0.18)	(-16.58)	(1.49)	(0.00)	(171.14)	(-3.31)	(-4.07)	(4.24)	(94.00)
4	0.06%	0.03%	1.20	0.58	0.01	-0.15	0.06%	0.03%	1.14	-0.04	-0.09	0.02	6.05%
	(2.53)	(3.90)	(220.91)	(55.30)	(0.50)	(-20.26)	(2.65)	(3.48)	(183.56)	(-2.96)	(-7.10)	(1.87)	(104.40)
High	0.09%	0.06%	1.23	0.58	0.04	-0.21	0.08%	0.04%	1.25	-0.06	-0.12	-0.04	8.75%
	(3.66)	(7.95)	(210.90)	(52.05)	(3.28)	(-26.15)	(3.17)	(4.98)	(169.69)	(-4.32)	(-8.68)	(-3.84)	(120.10)
Hi - Lo	0.10%	0.10%	0.18	0.01	0.03	-0.10	0.10%	0.10%	0.37	-0.07	-0.09	-0.04	6.76%
	(9.97)	(10.48)	(23.64)	(0.58)	(2.35)	(-9.94)	(6.72)	(6.88)	(31.25)	(-3.29)	(-3.90)	(-2.57)	(99.69)

Panel B: Weekly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.10%	-0.05%	1.12	0.59	0.05	-0.10	0.04%	-0.08%	0.92	0.04	0.04	-0.02	10.02%
	(1.00)	(-1.73)	(88.52)	(27.74)	(2.57)	(-7.82)	(0.48)	(-2.18)	(58.81)	(1.60)	(1.43)	(-1.10)	(55.13)
2	0.16%	0.00%	1.16	0.49	0.07	-0.09	0.08%	-0.04%	0.97	-0.07	0.03	0.02	16.73%
	(1.56)	(0.08)	(102.33)	(25.74)	(3.54)	(-7.86)	(1.05)	(-1.39)	(76.70)	(-3.41)	(1.49)	(1.56)	(67.88)
3	0.17%	0.01%	1.19	0.51	0.08	-0.11	0.11%	-0.02%	1.06	-0.03	0.00	0.04	21.14%
	(1.59)	(0.25)	(106.91)	(27.20)	(4.09)	(-9.16)	(1.34)	(-0.82)	(88.00)	(-1.65)	(0.04)	(3.13)	(77.00)
4	0.23%	0.07%	1.18	0.51	0.09	-0.13	0.21%	0.08%	1.07	-0.07	-0.05	0.01	25.54%
	(2.19)	(2.92)	(109.91)	(28.41)	(4.85)	(-11.67)	(2.38)	(2.64)	(86.34)	(-3.54)	(-2.56)	(1.03)	(85.20)
High	0.26%	0.12%	1.16	0.50	0.12	-0.18	0.23%	0.08%	1.19	-0.11	-0.08	0.01	32.13%
	(2.53)	(4.15)	(96.13)	(24.70)	(5.96)	(-14.38)	(2.31)	(2.40)	(80.27)	(-4.41)	(-3.32)	(0.79)	(99.52)
Hi - Lo	0.16%	0.17%	0.05	-0.09	0.07	-0.08	0.19%	0.16%	0.28	-0.15	-0.12	0.03	22.11%
	(4.34)	(4.55)	(3.05)	(-3.19)	(2.51)	(-4.77)	(3.14)	(2.86)	(11.37)	(-3.71)	(-2.93)	(1.18)	(85.47)

Table IA.4: continued from previous page

Panel C: Monthly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.52%	-0.18%	1.12	0.60	0.16	-0.10	0.23%	-0.26%	0.92	-0.04	0.07	0.01	47.31%
	(1.28)	(-1.53)	(41.70)	(17.18)	(4.33)	(-4.33)	(0.77)	(-1.90)	(28.57)	(-0.90)	(1.51)	(0.51)	(47.91)
2	0.69%	0.01%	1.10	0.49	0.17	-0.08	0.45%	0.00%	0.87	-0.08	0.07	-0.03	65.41%
	(1.77)	(0.14)	(44.01)	(15.25)	(4.85)	(-4.00)	(1.59)	(0.04)	(35.46)	(-2.67)	(2.10)	(-1.35)	(80.16)
3	0.90%	0.20%	1.12	0.50	0.18	-0.06	0.41%	-0.15%	1.03	-0.11	0.10	0.04	72.62%
	(2.30)	(2.12)	(49.90)	(17.11)	(5.85)	(-3.43)	(1.27)	(-1.36)	(39.24)	(-3.21)	(2.76)	(1.90)	(98.56)
4	0.88%	0.19%	1.15	0.42	0.20	-0.11	0.79%	0.28%	1.06	-0.10	-0.08	-0.02	78.70%
	(2.19)	(1.85)	(47.72)	(13.58)	(6.01)	(-5.25)	(2.31)	(2.28)	(37.17)	(-2.67)	(-2.04)	(-0.69)	(121.95)
High	1.02%	0.35%	1.13	0.41	0.27	-0.16	0.72%	0.14%	1.14	-0.08	-0.08	0.04	84.03%
	(2.49)	(2.72)	(37.38)	(10.36)	(6.42)	(-6.42)	(1.97)	(0.97)	(33.69)	(-1.93)	(-1.69)	(1.51)	(151.32)
Hi - Lo	0.49%	0.53%	0.01	-0.19	0.11	-0.07	0.49%	0.40%	0.22	-0.05	-0.15	0.03	36.71%
	(3.13)	(3.56)	(0.42)	(-4.23)	(2.26)	(-2.26)	(2.04)	(1.70)	(4.07)	(-0.66)	(-1.92)	(0.63)	(49.35)

Table IA.5: Returns around jump days ($4\times\sigma$ jumps)
This table reports average returns before, during, and after a jump. Using daily returns on all CRSP stocks from January 1926 to 2016 (excluding stocks with a price below \$5 as of day *t*-31), a positive (negative) jump is defined as a daily idiosyncratic return that is higher (lower) than + (-) 4 exponentially-weighted conditional deviations of the stock's daily idiosyncratic returns. For stocks that experience a jump, we report the average jump return as well as the average cumulative return over the 30 trading-days before and after the jump. The returns are reported as gross returns, Fama-French-Carhart (FFC) adjusted returns, and Daniel-Grinblatt-Titman-Wermers (DGTW) adjusted returns. The t-statistics for each measure are in parentheses and are calculated by clustering all observation by calendar month.

	All jumps			Positive jumps			Negative jumps		
	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30	t-30:t-1	t	t+1:t+30
Gross returns	-1.40%	3.26%	1.11%	-0.36%	11.69%	1.24%	-3.14%	-10.92%	0.88%
	(-4.55)	(20.91)	(3.89)	(-1.18)	(77.01)	(4.74)	(-10.23)	(-57.54)	(2.49)
FFC adjusted	-2.04%	3.24%	-0.13%	-1.67%	11.95%	-0.13%	-2.66%	-11.41%	-0.13%
	(-27.29)	(26.94)	(-1.87)	(-18.83)	(54.09)	(-1.82)	(-31.27)	(-37.63)	(-1.00)
DGTW adjusted	-2.33%	3.14%	-0.52%	-2.31%	11.62%	-0.57%	-2.36%	-11.16%	-0.45%
	(-26.17)	(23.21)	(-7.89)	(-23.44)	(75.93)	(-7.31)	(-15.27)	(-65.77)	(-3.99)

Table IA.6: Returns of portfolios formed from sorts on jump probability ($4\times\sigma$ jumps)
This table uses expanding-window estimates from the following model:
$Jump_{it} = logit[Tail_{i,t-1}, log(IV_{i,t-1}/RV_{i,t-1})]$
to predict jumps out-of-sample. Jumps are defined as daily absolute idiosyncratic returns that are more than 4 exponentially weighted conditional standard deviations of the stock's daily idiosyncratic returns. $Tail$ is the average of the left- and right-tail measures extracted from option prices using the method of Bollerslev and Todorov (2011). IV and RV are implied and realized volatilities respectively. The model is estimated using expanding monthly windows. Out-of-sample estimates of predicted jump probability formed from estimated parameters and current values of each variable are then used to sort stocks into quintile portfolios. Portfolios are equal or value weighted and held for one day, one week (skipping a day), and one month (non-overlapping). Excess returns of these portfolios are evaluated using the FFC four-factor model. The portfolio formation period is January 1997 to April 2016.

Panel A: Daily portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	-0.01%	-0.04%	1.02	0.52	0.10	-0.09	-0.02%	-0.05%	0.87	-0.02	0.03	0.03	0.17%
	(-0.41)	(-5.71)	(173.16)	(46.24)	(8.87)	(-11.72)	(-1.33)	(-5.67)	(119.48)	(-1.12)	(2.32)	(3.20)	(25.79)
2	0.02%	-0.01%	1.11	0.53	0.10	-0.08	0.01%	-0.02%	0.97	-0.05	0.06	0.06	0.35%
	(1.14)	(-1.51)	(203.47)	(50.93)	(9.86)	(-10.41)	(0.64)	(-2.27)	(153.40)	(-3.77)	(4.56)	(6.65)	(36.15)
3	0.04%	0.00%	1.17	0.56	0.03	-0.10	0.03%	0.00%	1.06	-0.02	-0.05	0.04	0.54%
	(1.72)	(0.71)	(225.93)	(56.37)	(2.94)	(-14.81)	(1.57)	(0.16)	(178.28)	(-2.14)	(-4.56)	(5.59)	(42.70)
4	0.07%	0.03%	1.22	0.59	-0.05	-0.15	0.05%	0.02%	1.17	-0.02	-0.16	0.01	0.85%
	(2.74)	(4.71)	(217.62)	(54.69)	(-4.39)	(-20.30)	(2.31)	(2.50)	(172.96)	(-1.81)	(-11.96)	(1.21)	(49.00)
High	0.09%	0.06%	1.27	0.66	-0.10	-0.24	0.08%	0.05%	1.29	-0.02	-0.25	-0.06	1.72%
	(3.45)	(7.00)	(191.60)	(51.60)	(-7.79)	(-26.64)	(3.19)	(4.70)	(145.89)	(-1.00)	(-14.56)	(-5.07)	(59.87)
Hi - Lo	0.10%	0.10%	0.26	0.14	-0.20	-0.15	0.11%	0.10%	0.42	0.00	-0.28	-0.09	1.54%
	(8.33)	(9.30)	(29.86)	(8.32)	(-12.08)	(-12.59)	(6.00)	(6.36)	(32.05)	(-0.05)	(-11.18)	(-5.24)	(53.41)

Panel B: Weekly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.09%	-0.06%	1.06	0.50	0.20	-0.09	0.04%	-0.08%	0.89	-0.01	0.13	0.00	1.05%
	(0.90)	(-2.11)	(80.31)	(22.45)	(8.98)	(-6.65)	(0.54)	(-2.09)	(56.22)	(-0.50)	(4.75)	(-0.20)	(30.48)
2	0.16%	0.00%	1.13	0.45	0.16	-0.06	0.09%	-0.04%	0.96	-0.09	0.07	0.03	2.03%
	(1.58)	(-0.18)	(97.07)	(22.86)	(8.34)	(-4.94)	(1.14)	(-1.31)	(78.03)	(-4.38)	(3.27)	(2.66)	(35.81)
3	0.17%	0.01%	1.18	0.50	0.11	-0.10	0.16%	0.01%	1.06	-0.03	0.02	0.06	2.91%
	(1.69)	(0.50)	(108.11)	(27.06)	(6.03)	(-8.20)	(1.83)	(0.52)	(85.61)	(-1.21)	(0.88)	(4.77)	(37.41)
4	0.24%	0.08%	1.20	0.52	0.03	-0.14	0.19%	0.06%	1.11	-0.08	-0.16	0.00	4.14%
	(2.23)	(3.21)	(107.66)	(27.69)	(1.38)	(-12.25)	(2.04)	(1.84)	(80.14)	(-3.36)	(-6.83)	(-0.22)	(39.05)
High	0.26%	0.12%	1.23	0.64	-0.09	-0.23	0.23%	0.09%	1.24	-0.03	-0.22	-0.01	6.44%
	(2.32)	(3.76)	(88.82)	(27.41)	(-4.00)	(-15.72)	(2.25)	(2.36)	(74.26)	(-1.01)	(-7.89)	(-0.41)	(43.51)
Hi - Lo	0.18%	0.18%	0.16	0.14	-0.29	-0.14	0.19%	0.17%	0.34	-0.01	-0.34	0.00	5.38%
	(3.62)	(4.23)	(8.70)	(4.33)	(-9.24)	(-6.86)	(2.75)	(2.67)	(12.64)	(-0.32)	(-7.62)	(-0.13)	(37.62)

Table IA.6: continued from previous page

Panel C: Monthly portfolios

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.49%	-0.20%	1.08	0.43	0.34	-0.10	0.25%	-0.23%	0.88	-0.08	0.16	0.00	7.26%
	(1.26)	(-1.56)	(36.54)	(11.17)	(8.17)	(-4.03)	(0.85)	(-1.74)	(28.01)	(-1.84)	(3.60)	(0.16)	(25.65)
2	0.63%	-0.05%	1.06	0.43	0.31	-0.07	0.41%	-0.06%	0.89	-0.14	0.14	0.01	11.70%
	(1.69)	(-0.44)	(39.51)	(12.29)	(8.31)	(-2.95)	(1.48)	(-0.59)	(39.01)	(-4.66)	(4.31)	(0.29)	(29.52)
3	0.91%	0.21%	1.11	0.48	0.25	-0.05	0.56%	0.01%	1.01	-0.06	0.07	0.05	14.91%
	(2.37)	(2.09)	(47.37)	(15.76)	(7.56)	(-2.73)	(1.79)	(0.06)	(41.27)	(-1.85)	(1.93)	(2.59)	(31.37)
4	0.94%	0.24%	1.18	0.47	0.13	-0.09	0.83%	0.31%	1.11	-0.15	-0.15	-0.01	18.71%
	(2.28)	(2.31)	(48.90)	(14.92)	(3.90)	(-4.61)	(2.30)	(2.41)	(37.07)	(-3.80)	(-3.53)	(-0.51)	(33.59)
High	1.04%	0.39%	1.18	0.62	-0.04	-0.20	0.66%	0.07%	1.19	0.05	-0.34	0.04	23.94%
	(2.28)	(2.82)	(36.96)	(14.85)	(-0.88)	(-7.48)	(1.59)	(0.43)	(30.13)	(0.90)	(-6.18)	(1.31)	(36.46)
Hi - Lo	0.56%	0.58%	0.10	0.19	-0.38	-0.10	0.41%	0.31%	0.31	0.12	-0.50	0.04	16.68%
	(2.61)	(3.16)	(2.35)	(3.35)	(-6.25)	(-2.78)	(1.37)	(1.20)	(5.17)	(1.57)	(-5.98)	(0.78)	(28.28)

Table IA.7: Returns around jump weeks (jumps based on weekly returns)
This table reports average returns before, during, and after a jump. Using weekly returns on all CRSP stocks from January 1926 to 2016 (excluding stocks with a price below $5 as of day *t*-31), a positive (negative) jump is defined as a weekly absolute idiosyncratic return greater than 3 exponentially-weighted conditional deviations of the stock's weekly idiosyncratic returns. For stocks that experience a jump, we report the average jump return as well as the average cumulative return over the 4 weeks before and after the jump. The returns are reported as gross returns, and Fama-French-Carhart (FFC) adjusted returns. t-statistics for each measure are in parentheses and are calculated by clustering all observation by calendar month.

	All jumps			Positive jumps			Negative jumps		
	w-5:w-1	w	w+1:w+5	w-5:w-1	w	w+1:w+5	w-5:w-1	w	w+1:w+5
Gross returns	-1.50%	7.57%	0.80%	-0.81%	19.26%	0.87%	-2.94%	-17.05%	0.65%
	(-4.85)	(0.01)	(-20.95)	(-2.72)	(61.59)	(4.62)	(-8.66)	(-69.00)	(1.89)
FFC adjusted	-1.46%	7.42%	-0.06%	-1.19%	19.61%	-0.03%	-2.03%	-18.25%	-0.13%
	(-16.74)	(31.04)	(-1.14)	(-10.16)	(100.24)	(-0.43)	(-20.95)	(-84.67)	(-0.89)

Table IA.8: Returns of portfolios formed from sorts on jump probability (jumps based on weekly returns)
This table uses expanding-window estimates from the following model:
$Jump_{it} = logit[Tail_{i,t-1}, log(IV_{i,t-1}/RV_{i,t-1})]$
to predict jumps out-of-sample. Jumps are defined as weekly absolute idiosyncratic returns that are more than 3 exponentially weighted conditional standard deviations of the stock's weekly idiosyncratic returns. $Tail$ is the average of the left- and right-tail measures extracted from option prices using the method of Bollerslev and Todorov (2011). IV and RV are implied and realized volatilities respectively. The model is estimated using expanding monthly windows. Out-of-sample estimates of predicted jump probability formed from estimated parameters and current values of each variable are then used to sort stocks into quintile portfolios. Portfolios are equal or value weighted and held for one week. Excess returns of these portfolios are evaluated using the FFC four-factor model. The portfolio formation period is January 1997 to April 2016.

	Equal-weighted returns						Value-weighted returns						
	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Excess return	Intercept	Market-Rf	SMB	HML	UMD	Jump Incidence
Low	0.04%	-0.11%	1.05	0.59	0.17	-0.07	0.00%	-0.11%	0.88	-0.02	0.05	-0.02	0.65%
	(0.44)	(-3.73)	(39.91)	(14.69)	(4.14)	(-2.40)	(0.02)	(-3.15)	(44.17)	(-0.59)	(1.28)	(-0.70)	(15.82)
2	0.14%	-0.02%	1.08	0.56	0.15	-0.09	0.07%	-0.06%	0.91	-0.05	0.04	0.04	1.07%
	(1.37)	(-0.74)	(47.54)	(13.13)	(4.57)	(-3.70)	(0.90)	(-1.85)	(49.21)	(-1.90)	(1.36)	(2.24)	(19.42)
3	0.20%	0.04%	1.12	0.52	0.09	-0.13	0.12%	-0.01%	1.00	-0.06	-0.06	0.06	1.47%
	(1.96)	(1.54)	(44.00)	(11.52)	(2.69)	(-4.69)	(1.53)	(-0.24)	(60.99)	(-2.27)	(-2.07)	(3.20)	(22.35)
4	0.25%	0.09%	1.19	0.56	0.07	-0.15	0.20%	0.06%	1.09	-0.08	-0.05	0.01	1.96%
	(2.36)	(3.37)	(67.10)	(14.66)	(2.41)	(-7.20)	(2.20)	(1.98)	(57.32)	(-2.63)	(-1.76)	(0.62)	(23.33)
High	0.31%	0.15%	1.27	0.56	0.02	-0.24	0.25%	0.11%	1.24	-0.13	-0.14	-0.06	3.18%
	(2.63)	(4.16)	(60.84)	(14.87)	(0.56)	(-9.39)	(2.45)	(2.76)	(52.73)	(-3.72)	(-2.84)	(-2.33)	(28.47)
Hi - Lo	0.26%	0.26%	0.22	-0.03	-0.14	-0.17	0.25%	0.22%	0.36	-0.11	-0.19	-0.05	2.52%
	(5.30)	(5.79)	(6.17)	(-0.61)	(-2.14)	(-4.26)	(3.73)	(3.55)	(10.01)	(-1.92)	(-2.46)	(-1.11)	(25.77)

Table IA.9: A decomposition of average stock returns over different subsamples
This table decomposes average stock returns into diffusive and jump components. The jump return (JR) is the stock's return on jump days and zero otherwise and the diffusive return (DR) is the stock's return on days without a jump and zero otherwise. For each stock, a jump is a daily absolute idiosyncratic return in excess of 3 conditional idiosyncratic standard deviations from an exponentially-weighted moving average model. The table reports average Fama-French-Carhart model adjusted returns for total, diffusive, and jump components. t-statistics are reported in parentheses and are clustered by calendar month. Panel A uses three subsamples: 1926-1962, 1963-1999, and 2000-2016, whereas Panel B uses NYSE size quintiles to split the data into five subsamples. The sample includes all common stocks from 1926 to 2016 with a stock price above $5, 31 trading days before the observation.

Panel A: Time periods

	FFC-adjust ret	DR	JR	Jump incidence	N
1926 - 1962	0.018%	-0.029%	0.047%	1.626%	7,903,160
	(10.24)	(-17.03)	(26.90)		
1963 - 1999	0.011%	-0.040%	0.050%	1.819%	32,259,084
	(6.81)	(-21.26)	(28.32)		
2000 - 2016	0.007%	-0.025%	0.032%	1.793%	14,622,290
	(1.94)	(-6.14)	(14.82)		

Panel B: NYSE size quintiles

	FFC-adjust ret	DR	JR	Jump incidence	N
Small	0.020%	-0.045%	0.065%	1.918%	23,663,850
	(7.19)	(-19.89)	(35.25)		
2	0.004%	-0.037%	0.041%	1.756%	10,449,293
	(2.40)	(-17.28)	(30.91)		
3	0.005%	-0.027%	0.033%	1.668%	7,780,655
	(2.32)	(-11.81)	(27.21)		
4	0.003%	-0.020%	0.023%	1.558%	6,613,260
	(1.44)	(-8.98)	(21.69)		
Large	0.003%	-0.010%	0.012%	1.420%	6,023,326
	(1.98)	(-7.25)	(15.78)		

Table IA.10: A decomposition of portfolio returns

The table provides a decomposition of jump probability and idiosyncratic volatility–sorted portfolio returns into bands based on the ratio of component stock idiosyncratic return to idiosyncratic standard deviation. In Panel A portfolios are formed daily based on univariate ex ante jump probability sorts, while Panel B presents sequential double sorts on idiosyncratic volatility and ex ante jump probability. Each portfolio's returns are decomposed into mutually exclusive and exhaustive bands based on $z_{i,t} = |r^{idio}_{i,t}|/\sigma_{i,t}$. For the daily specification (Panle A), r^{idio} is stock i's daily idiosyncratic return relative to the Fama-French-Carhart model and σ is its conditional idiosyncratic volatility. For the weekly specification (Panel B), r^{idio} is stock i's delisting-adjusted return and σ its return volatility over the past 52 weeks. The bands, denoted by $j \in \{1, 2, 3\}$, are : $z_{i,t} < 2$, $2 \leq z_{i,t} < 3$, $3 \leq z_{i,t}$. The excess return of a portfolio for band j is $\frac{1}{N}\sum 1_{i,j}(r_i - r_f)$ where $1_{i,j}$=1 if z_i is in band j and zero otherwise, and N is the number of stocks in the portfolio, $r_i - r_f$ is the stock's excess return over the risk-free rate. Panel A reports excess returns, FFC alphas, and prortions for each jump-probability-sorted portfolio. Panel B reports FFC alphas for the idiosyncratic volatility and jump probability-sorted portfolios. The portfolio construction sample period is January 1997 through April 2016.

Panel A. Jump probability-sorted portfolios

	$\lvert r^{idio}\rvert < 2 \times \sigma$			$2 \times \sigma \leq \lvert r^{idio}\rvert < 3 \times \sigma$			$\lvert r^{idio}\rvert \geq 3 \times \sigma$		
	Ret	Alpha	Incidence	Ret	Alpha	Incidence	Ret	Alpha	Incidence
Low	-0.03%	-0.06%	97.72%	0.02%	0.02%	1.75%	0.00%	0.00%	0.53%
	(-1.59)	(-9.79)		(10.18)	(9.84)		(1.12)	(0.91)	
2	-0.01%	-0.05%	95.93%	0.03%	0.03%	3.02%	0.01%	0.01%	1.04%
	(-0.64)	(-8.14)		(11.14)	(11.36)		(4.47)	(4.22)	
3	0.00%	-0.03%	94.70%	0.03%	0.03%	3.82%	0.01%	0.01%	1.48%
	(-0.08)	(-6.18)		(11.66)	(12.24)		(5.17)	(4.79)	
4	0.00%	-0.03%	93.31%	0.04%	0.04%	4.58%	0.03%	0.03%	2.11%
	(-0.06)	(-6.25)		(12.60)	(13.94)		(7.52)	(7.35)	
High	0.00%	-0.03%	90.57%	0.05%	0.04%	5.83%	0.05%	0.04%	3.60%
	(-0.09)	(-5.32)		(12.85)	(14.90)		(9.89)	(10.01)	
Hi - Lo	0.03%	0.03%	-7.15%	0.02%	0.02%	4.09%	0.04%	0.04%	3.07%
	(3.50)	(3.72)		(6.78)	(6.74)		(9.22)	(9.18)	

Table IA.10: continued from previous page

Panel B. Idiosyncratic volatility and jump probability double-sorted portfolios

	Jump Probability											
	Low	Med.	High	Hi-Lo	Low	Med.	High	Hi-Lo	Low	Med.	High	Hi-Lo
iVol	$\|r^{idio}\| < 2 \times \sigma$				$2 \times \sigma \leq \|r^{idio}\| < 3 \times \sigma$				$\|r^{idio}\| \geq 3 \times \sigma$			
Low	-0.02%	-0.01%	-0.01%	0.01%	0.01%	0.02%	0.02%	0.01%	0.00%	0.01%	0.03%	0.03%
	(-3.57)	(-2.22)	(-2.40)	(1.41)	(6.61)	(8.29)	(8.53)	(2.76)	(1.06)	(4.00)	(7.93)	(6.74)
Medium	-0.04%	-0.04%	-0.03%	0.01%	0.02%	0.02%	0.05%	0.03%	0.00%	0.01%	0.04%	0.04%
	(-5.61)	(-5.59)	(-4.09)	(0.68)	(7.23)	(7.84)	(12.40)	(7.26)	(1.06)	(3.82)	(7.71)	(6.96)
High	-0.08%	-0.07%	-0.08%	0.00%	0.03%	0.05%	0.07%	0.05%	0.00%	0.02%	0.05%	0.05%
	(-9.91)	(-7.13)	(-7.39)	(-0.36)	(8.43)	(11.46)	(14.67)	(8.94)	(1.60)	(4.24)	(7.01)	(6.11)
Hi - Lo	-0.06%	-0.05%	-0.07%		0.01%	0.03%	0.05%		0.00%	0.01%	0.02%	
	(-6.34)	(-4.73)	(-5.76)		(3.73)	(6.18)	(9.78)		(0.69)	(1.20)	(2.80)	

Table IA.11: Returns around jump days and systematic events

This table presents average Fama-French-Carhart model-based abnormal returns for the 61 trading days surrounding jumps for different subsamples. A jump is defined as an absolute daily idiosyncratic return in excess of three conditional standard deviations, where the return is idiosyncratic relative to the Fama-French Carhart model, and the conditional standard deviation is based on an exponentially weighted moving average model. The first two sets of subsamples are based on whether the fraction of firms exhibiting jumps and conditional market volatility are above (high) or below (low) their time-series median. The third set of subsamples are based on whether or not the market exhibited a jump on that day. The last two sets of subsamples are based on whether the market returns on date t and dates $t-30$ to t-1 are greater (high) or less (low) than zero.

	All jumps			Positive jumps			Negative jumps		
	t-30 : t-1	t	t+1 : t+30	t-30 : t-1	t	t+1 : t+30	t-30 : t-1	t	t+1 : t+30
Hi mkt vol	-2.36%	2.46%	-0.02%	-2.33%	10.42%	-0.32%	-2.40%	-9.47%	0.42%
	(-23.74)	(20.48)	(-0.27)	(-17.97)	(66.51)	(-3.84)	(-22.51)	(-62.93)	(2.79)
Low mkt vol	-1.21%	2.58%	-0.08%	-0.87%	8.17%	-0.10%	-1.85%	-7.65%	-0.06%
	(-23.45)	(33.97)	(-1.59)	(-15.95)	(45.69)	(-1.76)	(-23.42)	(-25.47)	(-0.67)
Mkt jump	-1.54%	-0.23%	0.09%	-2.28%	9.00%	-0.34%	-0.86%	-8.80%	0.50%
	(-6.84)	(-0.67)	(0.51)	(-3.19)	(24.91)	(-1.25)	(-1.88)	(-21.06)	(1.76)
No mkt jump	-1.84%	2.59%	-0.06%	-1.62%	9.35%	-0.21%	-2.21%	-8.69%	0.20%
	(-28.33)	(35.11)	(-1.05)	(-20.79)	(74.04)	(-3.99)	(-29.59)	(-54.86)	(2.08)
Hi # jumps	-1.87%	2.47%	0.02%	-1.59%	9.14%	-0.22%	-2.33%	-8.45%	0.40%
	(-25.84)	(25.28)	(0.24)	(-17.35)	(55.00)	(-3.45)	(-28.03)	(-37.72)	(3.22)
Low # jumps	-1.76%	2.61%	-0.18%	-1.71%	9.73%	-0.19%	-1.83%	-9.16%	-0.16%
	(-21.44)	(34.67)	(-3.04)	(-18.19)	(89.83)	(-2.97)	(-19.99)	(-87.72)	(-1.67)
Hi mkt ret (t)	-1.80%	3.39%	-0.14%	-1.77%	9.27%	-0.24%	-1.88%	-8.57%	0.09%
	(-25.71)	(50.25)	(-2.62)	(-18.10)	(84.07)	(-4.02)	(-22.94)	(-75.58)	(0.89)
Low mkt ret (t)	-1.87%	1.41%	0.05%	-1.43%	9.45%	-0.16%	-2.43%	-8.81%	0.33%
	(-28.86)	(14.12)	(0.84)	(-19.16)	(42.14)	(-2.67)	(-26.13)	(-32.23)	(2.75)
Hi mkt ret (t-30:t-1)	-1.24%	3.32%	-0.07%	-1.00%	8.93%	-0.03%	-1.73%	-8.21%	-0.16%
	(-22.06)	(44.58)	(-1.42)	(-15.93)	(87.73)	(-0.48)	(-20.79)	(-87.82)	(-2.11)
Low mkt ret (t-30:t-1)	-2.61%	1.44%	-0.02%	-2.64%	10.01%	-0.51%	-2.58%	-9.16%	0.57%
	(-25.84)	(15.08)	(-0.26)	(-18.52)	(38.97)	(-6.04)	(-25.30)	(-32.87)	(3.50)

Table IA.12: Returns around jump days and macroeconomic news events
This table presents a decomposition of the average stock return into diffusive and jump components. For a given stock, excess returns (first set of columns) and FFC-adjusted returns (second set of columns) are multiplied by an indicator variable that takes the value 1 on jump days to obtain the jump component. A jump is defined as a daily stock return in excess of 3 exponentially-weighted conditional deviations of the stock's daily idiosyncratic returns. The first set of rows shows results for all days in the sample, whereas the second and third sets of rows restrict the sample to either days with and without macroeconomic news announcements, respectively. Macroeconomic news days are defined following Savor and Wilson (2013). The sample period is January 1958 to December 2015.

	Excess returns			FFC-adjusted returns				
	Total	DR	JR	Total	DR	JR	Jump prob	N
All	0.037%	-0.009%	0.046%	0.010%	-0.036%	0.045%	1.804%	46,751,397
	(3.65)	(-0.98)	(25.58)	(5.98)	(-19.79)	(32.00)		
No Macro	0.025%	-0.020%	0.045%	0.009%	-0.036%	0.045%	1.814%	41,381,900
	(2.38)	(-2.12)	(24.48)	(5.42)	(-20.21)	(31.39)		
Macro	0.127%	0.077%	0.050%	0.015%	-0.033%	0.047%	1.723%	5,369,497
	(5.46)	(3.52)	(22.54)	(4.23)	(-9.32)	(25.60)		

Table IA.13: Jumps, changes in jump probability, and pre-jump returns
This table presents the relationship between the change in jump probabilities over the period $(t-30, t-1)$ and returns over the same period as well as jump incidence at t. Panel A reports the estimates for a regression of jump incidence on the change in jump probability. Panel B reports the average jump incidence when the change in jump probabilities over $(t-30, t-1)$ is positive and negative. Panel C reports the estimates of a regression of the abnormal cumulative returns over $(t-30, t-1)$ on the change in jump probability over the same period. Abnormal returns are calculated as the difference between the realized return and the Fama-French-Carhart predicted return. The first set of columns uses the full sample while the second set uses only the subsample where t is a jump day. In each panel, the analysis is conducted for all stocks and only for the subsample where t is an earnings announcement day. The sample is from January 1997 to April 2016.

Panel A: Predicting jumps with changes in jump probability

	All	Earnings
Intercept	1.72%	11.92%
	(42.49)	(38.39)
$\Delta Pr(J)$	0.48	2.29
	(18.99)	(14.45)

Panel B: Average realized jump incidence

	All		Earnings	
	$\Delta Pr(J) > 0$	$\Delta Pr(J) \leq 0$	$\Delta Pr(J) > 0$	$\Delta Pr(J) \leq 0$
Realized jumps	2.44%	0.95%	16.15%	7.52%
	(35.52)	(34.39)	(45.87)	(26.21)

Panel C: Pre-jump returns and changes in jump probability

	Unconditional		Conditional on jump	
	All	Earnings	All	Earnings
Intercept	0.16%	0.35%	-1.13%	-0.34%
	(1.49)	(1.76)	(-7.60)	(-1.87)
$\Delta Pr(J)$	-0.53	-0.52	-0.22	-0.28
	(-11.58)	(-6.23)	(-4.02)	(-3.82)

Table IA.14: Past-return portfolios
This table presents jump incidence and return decomposition for portfolios formed on the basis of past returns. Each trading day t, stocks are placed into five portfolios based on the cumulative returns over $(t-30, t-1)$. Panel A shows the average incidence of positive and negative jumps in each of the five portfolios. Panel B presents a decomposition of the equally-weighted returns of each portfolio into jump and diffusive components. This decomposition uses the product of excess returns with a jump indicator to calculate the jump component. The panel presents average excess return for each portfolio, as well as CAPM and Fama-French-Carhart alphas. The sample consists of all stocks with a price greater that \$5 at $t-31$ from 1929 to 2016.

Panel A: Jump incidence in past-return-sorted portfolios

	Positive jumps	Negative jumps	All jumps
Lo	1.25%	0.74%	1.99%
2	1.14%	0.77%	1.92%
3	1.19%	0.79%	1.98%
4	1.08%	0.62%	1.70%
High	0.89%	0.45%	1.34%

Panel B: Past-return portfolio return decomposition

	Excess return		CAPM Alpha		FFC Alpha	
	Jump	Diffusive	Jump	Diffusive	Jump	Diffusive
Lo	0.092%	0.144%	0.088%	0.117%	0.088%	0.111%
	(19.76)	(14.34)	(19.53)	(18.11)	(19.40)	(18.83)
2	0.039%	0.034%	0.037%	0.011%	0.036%	0.005%
	(23.57)	(4.46)	(26.64)	(3.49)	(27.25)	(2.12)
3	0.034%	-0.008%	0.032%	-0.030%	0.032%	-0.035%
	(22.26)	(-1.13)	(24.44)	(-10.83)	(26.00)	(-18.81)
4	0.036%	-0.048%	0.034%	-0.071%	0.034%	-0.077%
	(22.56)	(-6.20)	(24.29)	(-23.06)	(25.52)	(-35.56)
High	0.046%	-0.126%	0.044%	-0.153%	0.043%	-0.161%
	(23.31)	(-12.53)	(25.10)	(-28.11)	(25.76)	(-34.61)

Table IA.15: Jump probability portfolio returns and aggregate volatility risk
This table reports the results of regressions using the high-minus-low jump probability portfolio returns. We construct equal and value-weighted portfolios from quintile sorts on out-of-sample predicted jump probabilities. The jump probabilities are from a logistic model where the parameters are estimated using an expanding yearly window that ends in the prior year. The model parameters are then applied to current, known stock characteristics to obtain predicted jump probabilities. The characteristics are calculated at the last trading day of month $m-1$ and are used to form portfolios held for month m. The tabe reports regression results of the high-minus-low jump probability portfolio returns on the FFC factors as well as the volatility risk premium. We obtain the Volatility Risk Premium factor data from Prof. Zhou's website. We use both the realized Volatility Risk Premium (VRP) and the Expected Volatility Risk Premium (E[VRP]) series. The portfolio construction sample period is January 1997 through April 2016.

	Equal-weighted		Value-weighted	
Intercept	0.52%	0.06%	0.30%	-0.27%
	(2.52)	(0.26)	(1.02)	(-0.79)
Mkt - Rf	0.08	0.16	0.27	0.38
	(2.08)	(3.39)	(4.91)	(5.67)
SMB	0.06	0.06	0.05	0.05
	(1.21)	(1.26)	(0.66)	(0.72)
HML	-0.21	-0.19	-0.34	-0.32
	(-3.78)	(-3.50)	(-4.31)	(-4.04)
UMD	-0.11	-0.10	0.02	0.03
	(-3.24)	(-3.07)	(0.40)	(0.61)
VRP	0.27		0.72	
	(0.39)		(0.71)	
E[VRP]		2.44		3.41
		(2.87)		(2.76)

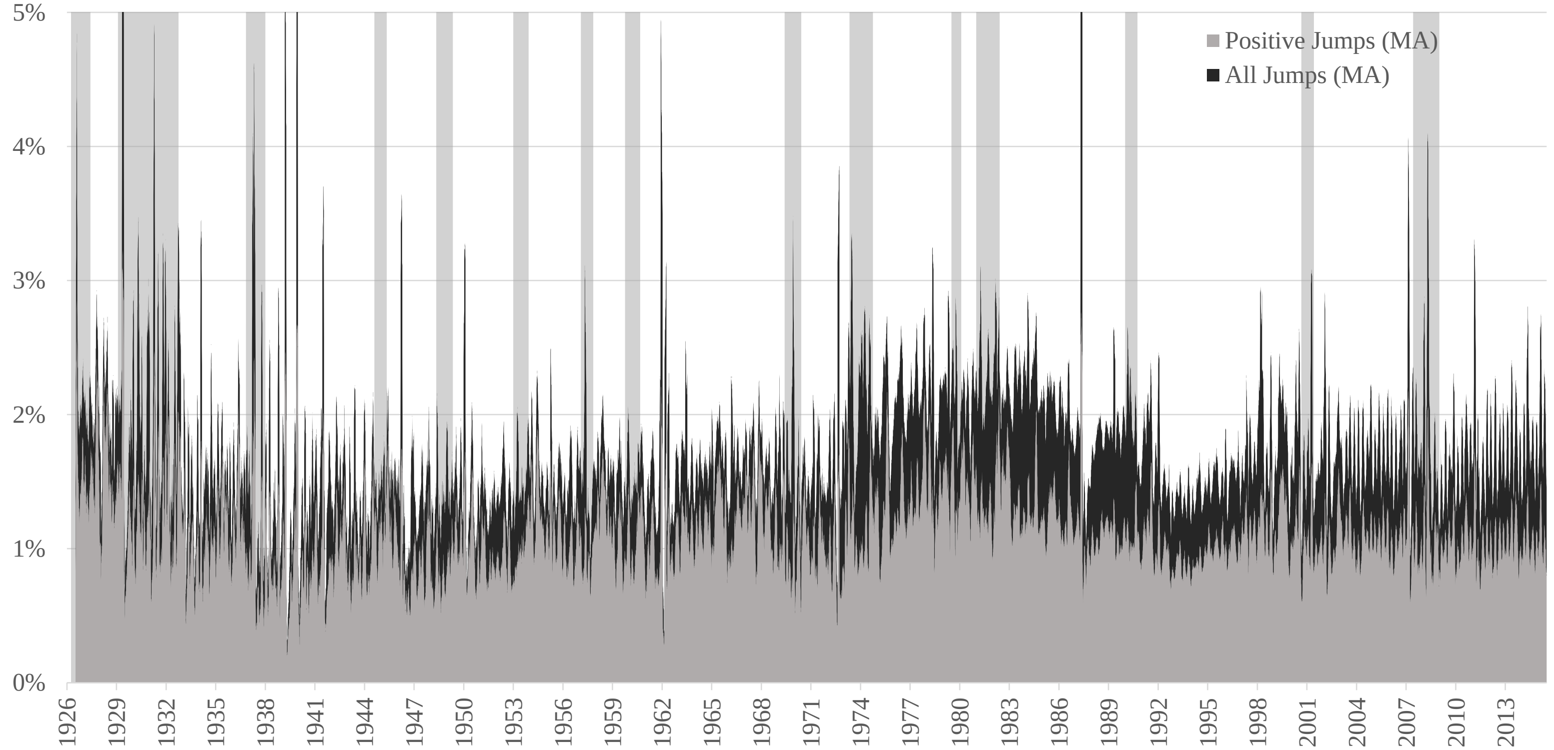

Figure IA.1: The time series of jumps. This figure displays a 30-day moving average of the fraction of firms that exhibit negative jumps and the fraction of firms that exhibit either positive or negative jumps ('All jumps'). A jump on date t is defined as an absolute daily idiosyncratic return in excess of three conditional standard deviations, where the return is idiosyncratic relative to the Fama-French Carhart model, and the conditional standard deviation is based on an exponentially weighted moving average model. NBER dated recessions are shaded in gray.