Fed Tails – FOMC Announcements and Stock Market Uncertainty

Heiner Beckmeyer
heiner.beckmeyer@wiwi.uni-muenster.de

Nicole Branger
nicole.branger@wiwi.uni-muenster.de

Thomas Grünthaler
thomas.gruenthaler@wiwi.uni-muenster.de

1. The Fed and Downside Risks

— Summary —

Uncertainty around FOMC announcements **builds up days ahead of the meeting** and fully resolves once the policy decision is announced. Disentangling tail uncertainty shows that the **perception of bad economic states is the primary driver of this pattern**, despite the stabilizing intent of policy operations. Investors are afraid of the revelation of bad states and are willing to pay a **hedging premium of approx. 9% per meeting**. FOMC announcements are special as uncertainty around other macroeconomic news releases is not driven by downside uncertainty. Not only does tail uncertainty predict pre-announcement stock market returns but also changes in the fed fund target rate for horizons up to one year. Our results indicate that **policy makers closely monitor downside uncertainty** and use this information as part of their decision-making process.

The Fed and (Downside) Uncertainty

The Federal Reserve aims to reduce economic uncertainty through clear policy communication:

> *Clarity in policy communications [...]* ***reduces economic and financial uncertainty****, increases the effectiveness of monetary policy, and enhances transparency [...], which are essential in a democratic society.*

⇒ **How** and **why** does economic uncertainty behave around U.S. monetary policy announcements?

The literature so far: Interventions by the Fed are perceived as **tail risk-insuring** operations:

- Fed acts as lender or market maker of last resort (Duffie, 2020).
- "Greenspan Put": target rate cuts more likely after periods of stock market declines (Cieslak and Vissing-Jorgenssen, 2020)
- At the same time, put options are cheaper when target rate is lower than fundamentally motivated by the Taylor rule (Dayiha et al., 2019)

⇒ What is the role of **downside uncertainty** around FOMC announcements?

Identifying Event-driven Changes in Uncertainty

We measure **uncertainty** using information embedded in the **most liquidly traded options contracts at a high frequency** (S&P 500 index options).
Following Bloom (2009) we use expected volatility to gauge **overall stock market uncertainty**:

$$\mathbb{E}_t^{\mathbb{Q}}\left[\mathrm{QV}_t^{t+\tau}\right] = 2e^{\int_t^{t+\tau} r_s ds}\left(\int_0^{\infty} \frac{O_t^{\tau}(K)}{K^2} dK\right).$$

Left **tail uncertainty** follows from Bollerslev et al. (2015):

$$LU_t = \int_t^{t+\tau}\int_{-\infty}^{-k_t} x^2 \nu_s(dx)ds$$

with generalized tempered stable jumps,

$$\nu_t(dx) = \left(\phi_t^+ \times e^{-\alpha_t^+ x}\mathbf{1}_{\{x>0\}} + \phi_t^- \times e^{\alpha_t^- x}\mathbf{1}_{\{x<0\}}\right).$$

Difference estimation of meeting effects (Bollerslev et al., 2018) at each time-of-day:

- Purge uncertainty from intra-day effects.
- Compare announcement uncertainty to levels before blackout period (here 21 business days).
  → approximates prevailing economic state.

$$\widetilde{\mathcal{U}}_{d\in\mathcal{T}_j}(t) = log\left[\mathcal{U}_{d\in\mathcal{T}_j}(t)\right] - \frac{1}{30}\sum_{i=8}^{37} log\left[\mathcal{U}_{F_{j-i}}(t)\right].$$

Dummy regressions disentangle effects at different points in time, while incorporating information of variation across meetings and time, and allow us to control for the impact of downside uncertainty:

$$\widetilde{\mathcal{U}}_{d\in\mathcal{T}_j}(t) = \sum_i \beta_i D_{i,t} + \delta LU_t + \varepsilon_t, \quad \text{with} \tag{1}$$
$$D_t = [-5,\ldots,-1,\mathrm{PRE},\mathrm{POST},1]' \quad \text{and}$$
$$\beta_{JUMP} = \beta_{POST} - \beta_{PRE},$$

with bootstrapped confidence intervals. D encompasses the **blackout period**, in which committee members must refrain from publicly discussing topics related to the upcoming meeting.
→ Coefficients β capture **average uncertainty relative to control group**.

2. Announcement Behavior

Data

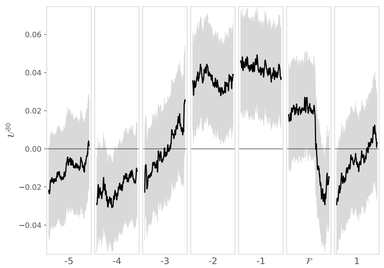
- **Sample:** S&P 500 options, 2004 through 2018.

→ After filters, left with 235 OTM calls, and 784 OTM puts *per minute* on average.

112 FOMC announcements in our sample (190 in an extended daily sample going back to 1996).

Uncertainty Announcement Pattern

Economic Uncertainty aroud FOMC

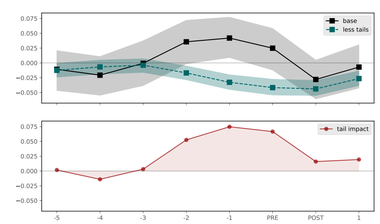


- Uncertainty below control group levels at start of blackout period.
- Large increase, typically on Friday and during weekend.
- Abrupt decline in uncertainty overnight from day $\mathcal{F}-1$ to $\mathcal{F}$.
- Significant downward jump in uncertainty as news is announced.
- Recovery one day after announcement, back to starting levels.

⇒ **No lasting resolution of uncertainty through FOMC meetings?**

Peculiar pattern of uncertainty around FOMC announcements. **What is its driver?**

Impact of Downside Uncertainty



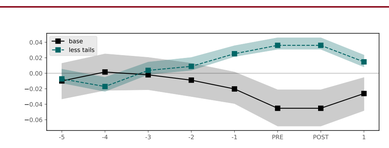
- Uncertainty about the outcome of the meeting. Realization may trigger large stock market move.
- Tail uncertainty (in red) builds up as meeting premium and resolves quickly as meeting concludes.

⇒ High-frequency identification would **erroneously** identify resolution of uncertainty **at announcement time**. This is 100% meeting premium.

- Pattern less jump impact (in teal) reduces to continuous downward drift **ahead** of meeting (3).

Other Macro Announcements

Is this pattern **unique to FOMC annoucements?**
⇒ Build pseudo blackout weeks around the announcement time of the three most important macroeconomic releases (as defined by Bloomberg; 221 announcements in total): GDP, nonfarm payroll, initial jobless claims.



- Tail impact reverses (black minus teal line) → from positive to negative.
- Release of macroeconomic news decreases downside risks *ahead of the announcement.*

Robustness

- Other meeting characteristics (press conference, surprises, news content of announcement).
- Inclusion of right tail uncertainty, RU.
- Staddle and Strangle returns suggest large downside uncertainty premium for FOMC announcement dates.
- Sample extension to mid-2020.
- Longer daily sample.

3. Predicting Monetary Policy Decisions

Target Rate Changes

Dependent Variable: $FFR_{t+n} - FFR_{t-1}$	$n=0$	$n=1$	$n=3$	$n=7$
LU	**−0.141**	**−0.225**	**−0.421**	**−0.537**
	[−4.488]	[−4.124]	[−3.483]	[−2.680]
r^-	−0.004	**0.021**	**0.032**	**0.041**
	[−1.284]	[2.622]	[2.707]	[2.925]
r^+	0.016	0.021	**0.051**	0.057
	[1.526]	[1.667]	[2.004]	[1.852]
$const$	−0.035	−0.006	−0.034	−0.023
	[−1.126]	[−0.127]	[−0.215]	[−0.079]
$Adj.R^2$	0.332	0.384	0.286	0.201
N	112	112	112	112
Logit Model ($n=0$)				
LU	**1.269**	[3.329]		
$const$	**−3.274**	[−5.844]		

- Target rate changes are connected to elevated downside uncertainty, LU.
- A 1-σ increase in LU corresponds to a 14bps cut in the next meeting, and a 54bps cumulative target rate cut over the next eight meetings (one year).
- Robust to the inclusion of intermeeting signed returns (Cieslak and Vissing-Jorgenssen, 2020).
  ⇒ expected downside uncertainty and realized returns contain complementary information for Fed decisions.
- Results carry over to longer daily sample (1996 – 2019), which includes more variation in the target rate.

Stock Market Returns

	Model 1			Model 2		
	r_{FOMC}	r_{PRE}	r_{POST}	r_F	r_{PRE}	r_{POST}
LU	**0.611**	**0.552**	0.058	**0.661**	**0.642**	0.020
	[2.847]	[2.257]	[0.371]	[2.792]	[2.315]	[0.117]
$U^{\perp}$	−0.007	0.086	−0.093			
	[−0.057]	[1.168]	[−0.754]			
r^-				0.032	0.047	−0.016
				[1.287]	[1.372]	[−0.436]
r^+				−0.038	−0.076	0.039
				[−0.584]	[−1.170]	[0.697]
$const$	**0.404**	**0.324**	0.080	**0.536**	**0.565**	−0.029
	[3.320]	[3.455]	[0.868]	[2.526]	[2.478]	[−0.169]
Adj. R^2	0.168	0.226	−0.006	0.167	0.245	−0.016
N	112	112	112	112	112	112

- LU positively predicts stock market returns in the 24-hour window before announcements (Lucca and Moench, 2015).
- Returns in a 30-minute window around the announcement time are close to flat.
- Robust to the inclusion of remaining uncertainty $U^{\perp}$, and intermeeting signed returns (Cieslak and Vissing-Jorgenssen, 2020).
- Results carry over to longer daily sample (1996 – 2019), which includes more variation in the target rate.

Interpretation and Conclusion

Challenges for theoretical models simultaneously explaining announcement uncertainty and return drift:

- Downside component of uncertainty seems disconnected from overall uncertainty → meeting premium exclusively jump-driven.
- Announcements **reduce uncertainty**, but spark fear of revelation of bad (or good) economic states (corroborates Wachter and Zhu, 2019). This downside premium resolves almost fully once information is revealed.
- High-frequency announcement resolution driven exclusively by tail uncertainty. Requires separately modeling jump component.

Summary of Our Results:

- Economic uncertainty reacts to the **prospect of possible changes in monetary policy** released at FOMC announcement times.
  - This reaction is amplified by increased downside uncertainty (which corresponds to more frequent mentions of "downside risk" in FOMC meeting minutes)...
  - ... and unique to FOMC announcements.
- The **economic content of elevated downside uncertainty is large**, predicting both stock market returns and target rate changes around scheduled FOMC announcements.
- **A question left for us to answer:** is this increase in downside uncertainty driven by increased demand for tail insurance, or by decreased supply provided by market makers in the options market?