# Discussion: Information Flow, Noise, and the Irrelevance of FOMC Announcement Returns

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August 29, 2021

# Basic Ideas

- A new approach to empirically quantify information efficiency
  - Unbiasedness regression $R^2$ instead of slope $\beta$
  - Identify noise in prices
- FOMC announcement returns are driven by noise and less informative
- This price inefficiency lasts about two weeks until the noise reverses itself

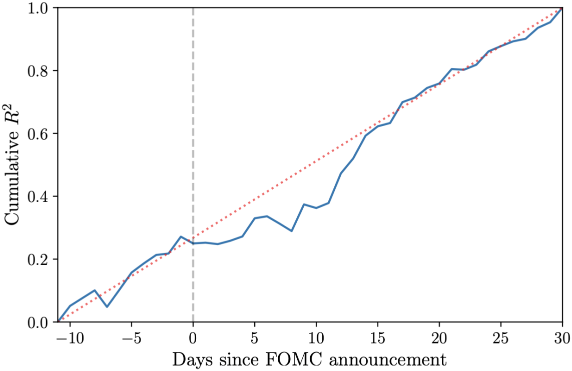
# Summary of contribution

- A methodological contribution for testing information efficiency in prices
- An economic contribution:
  - Information content of price reaction to FOMC announcements
  - Add to the puzzle

# Empirical Method: Price Informativeness

- Regress total mkt ret surrounding event $i$ onto the partial ann ret ending at $t$

$$p_{i,30} - p_{i,-11} = \alpha_t + \beta_t \left(p_{i,t} - p_{i,-11}\right) + \varepsilon_{i,t} \tag{1}$$




- Regression $R^2$ to estimate the evolution of price informativeness

# Theoretical Foundation

- Over short horizon, risk premium may not be important

$$p_t = \mathbb{E}_t \left[ V \right]$$

  $\rightarrow$ Price is a martingale

- Denote innovations in prices $\varepsilon_{t+1} = \left[ \mathbb{E}_{t+1} - \mathbb{E}_t \right] (V)$, then

$$p_t = p_0 + \sum_{j=1}^{t} \varepsilon_j$$

- Denote $Var(\varepsilon_j) = \sigma_j^2$

# Beta

- Testing price efficiency is equivalent as testing martingale property

$$\sum_{j=1}^{T} \varepsilon_j = \alpha + \beta \sum_{j=1}^{t} \varepsilon_j + error$$

- Therefore, $\beta$ is computed as

$$\beta = \frac{Cov\left(\sum_{j=1}^{t} \varepsilon_j, \sum_{j=1}^{T} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)} = \frac{Var\left(\sum_{j=1}^{t} \varepsilon_j\right) + Cov\left(\sum_{j=t+1}^{T} \varepsilon_j, \sum_{j=1}^{t} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)}$$

- Under martingale property, innovations are uncorrelated

$$Cov\left(\sum_{j=t+1}^{T} \varepsilon_j, \sum_{j=1}^{t} \varepsilon_j\right) = 0 \rightarrow \beta = 1$$

- If $\beta > (<) 1$, prices overreact (underreact) to new information

# $R^2$

- Under martingale assumption, the corresponding $R^2$ is

$$R^2 = \frac{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{T} \varepsilon_j\right)} = \frac{\sum_{j=1}^{t} \sigma_j^2}{\sum_{j=1}^{T} \sigma_j^2} = \frac{Var\left(P_t - P_0\right)}{Var\left(P_T - P_0\right)}$$

- Additionally, if $\sigma_j$ is a constant over time, then $R^2 = \frac{t}{T}$ is proportional to time $t$.

- Comment 1: Plot variance ratio of returns will help confirm the assumption of IID

# With Noise $\theta$

- If prices contain noise

$$p_t = \mathbb{E}_t[V] + \theta$$

- Assume noise dissipates at $T$, then price reverses to its true value

$$p_T = V$$

- $R^2$ is therefore

$$R^2 = \frac{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{T} \varepsilon_j\right)} \times \frac{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{t} \varepsilon_j\right) + Var(\theta)} < \frac{Var\left(\sum_{j=1}^{t} \varepsilon_j\right)}{Var\left(\sum_{j=1}^{T} \varepsilon_j\right)} = \frac{t}{T}$$

# With Noise $\theta$ Cont'd

- Comment 2: Would $\beta$ test also detect mis-pricing?
- With noise $\theta$ in $p_t$,

$$
\begin{aligned}
\beta &= \frac{Cov\left(\sum_{j=1}^{t}\varepsilon_j + \theta, \sum_{j=1}^{T}\varepsilon_j\right)}{Var\left(\sum_{j=1}^{t}\varepsilon_j + \theta\right)} \\
&= \frac{Var\left(\sum_{j=1}^{t}\varepsilon_j\right)}{Var\left(\sum_{j=1}^{t}\varepsilon_j\right) + Var\left(\theta\right)} < 1.
\end{aligned}
$$

- Intuition: if $p_t$ contains noise, it is less informative about $P_T$

# Conclusion

- Makes an important methodological contribution
  - comment: clarify when $R^2$ works and $\beta$ test fails
- Thought provoking: are FOMC announcement informative?
  - cannot take the strong stock market reaction as evidence
  - need a more careful empirical test
- All tests are based on the martingale property
  - evidence suggests risk premium on announcement days are large
  - how to take into account of risk premium?