

American Disclosure Options and Asset Pricing

Kerry Back, Rice University

Bruce Carlin, Rice University

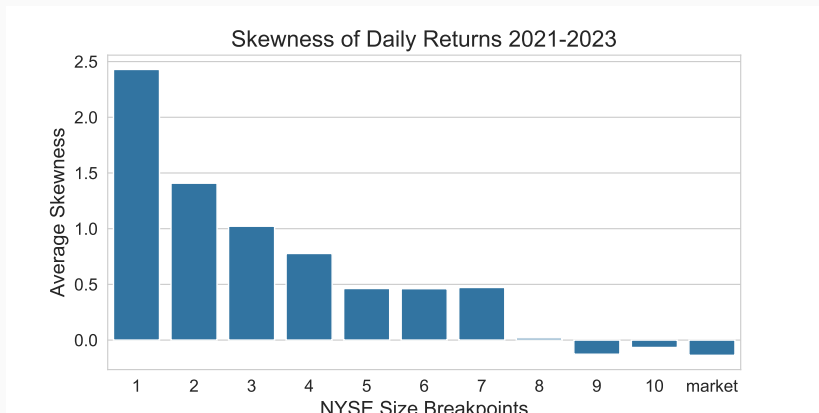
Seyed Kazempour, L.S.U.

Chloe Xie, M.I.T.

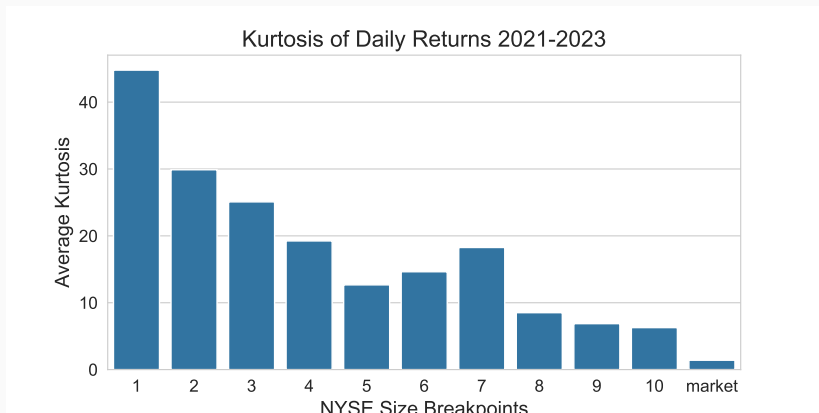
Daily Stock Returns

- Daily stock returns are generally positively skewed (the market is slightly negatively skewed)
- Daily stock returns have much higher kurtosis than the market
- Especially small caps

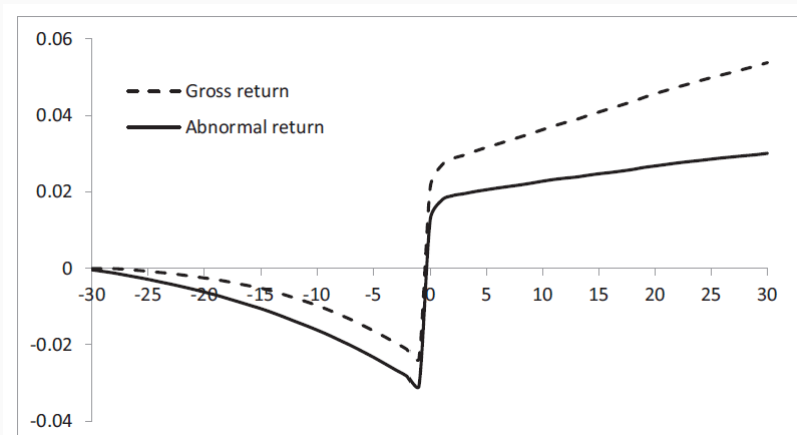
Skewness of Daily Returns



Kurtosis of Daily Returns



Returns Around Outlier Returns

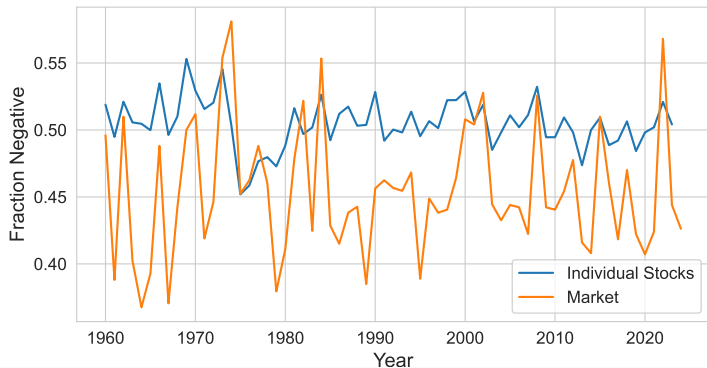


Kapadia-Zekhnini (JFE, 2019) - 30 days before and after ± 3 sigma returns. Most outlier returns are on announcement days.

Corporate Disclosures: No News is Bad News

- The present value of growth opportunities is a large part of the value of most companies.
- When growth occurs, firms disclose: building a new plant, launching a new product, . . .
- Days without announcements are disappointing.
- Many small negative returns mixed with some large positive returns should be normal.

Fraction of Negative Days



Seminal Work on Voluntary Truthful Disclosure

- Grossman (1981), Milgrom (1981) - unraveling \Rightarrow everyone discloses
- Dye (1985), Jung & Kwon (1988) - possibility of being uninformed limits unraveling
- Dye & Hughes (2017) - with risk-averse investors, nondisclosure increases variance
- Acharya, DeMarzo & Kremer (2011) - American disclosure option.
 - May want to keep a disclosure option alive in anticipation of good public news.
 - Bad public news \Rightarrow disclosure is escalated.

Time Varying Risk and Return

- If disclosures are anticipated but do not occur, does risk change?
- Does the risk premium change?
- Are the alphas of announcement returns over-estimated due to time-varying risk?

Time Varying Risk and Return

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- Are the alphas of announcement returns over-estimated due to time-varying risk?

Yes

Model

- Time interval $[0, 1]$
- Two firms, values \tilde{x}_i are symmetric normal with correlation ≥ 0 .
- Firms learn their values at independent uniformly distributed random times.
- Firms choose disclosure dates. Disclosures are discretionary but must be truthful.
- Firms are known to be informed by time $t = 1$, so unraveling – everyone discloses then or before.

- Constant risk-free rate, normalized to zero
- Representative CARA investor who consumes \tilde{w} at date 1
- $(\tilde{x}_1, \tilde{x}_2, \tilde{w})$ are joint normal and symmetric in \tilde{x}_1 and \tilde{x}_2 .
- SDF \propto marginal utility
- Prices are risk-neutral expectations $E_t^*[\tilde{x}_i]$ conditional on disclosures/non-disclosures and $= \tilde{x}_i$ after disclosures.
- Risk-neutral distribution is normal with same variances and correlation but different means $\mu^* < \mu$.

Objectives and Equilibrium

- Assume firms care about short-run prices.
- Assume firms maximize the risk-neutral expectation of the average price between $t = 0$ and $t = 1$:

$$E^* \int_0^1 P_{it} dt.$$

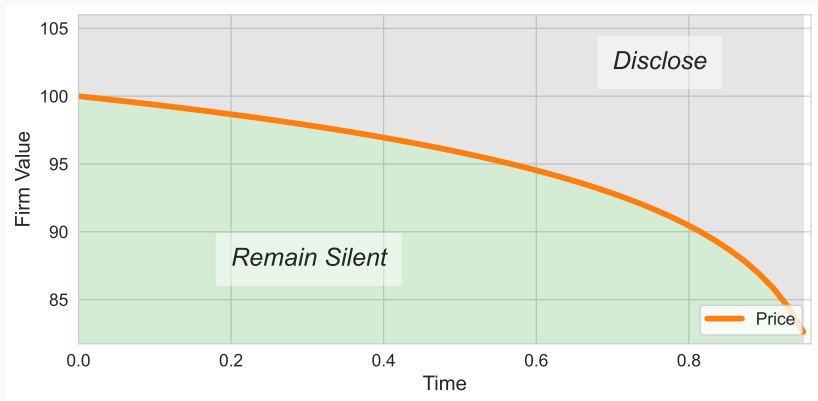
- Disclosure option is option to exchange P_{it} for \tilde{x}_i .
 - At the money when $P_{it} = \tilde{x}_i$
 - Out of the money when $P_{it} > \tilde{x}_i$
 - In the money when $P_{it} < \tilde{x}_i$
- Look for Perfect Bayes Equilibrium.

Versions of the Model

1. Firm 2 is uninformed until time $t = 1$.
2. Firm 2 is nonstrategic – discloses when it gets information
3. Both firms are strategic – choose optimal disclosure times

Model 1: Firm 2 is Uninformed

Equilibrium

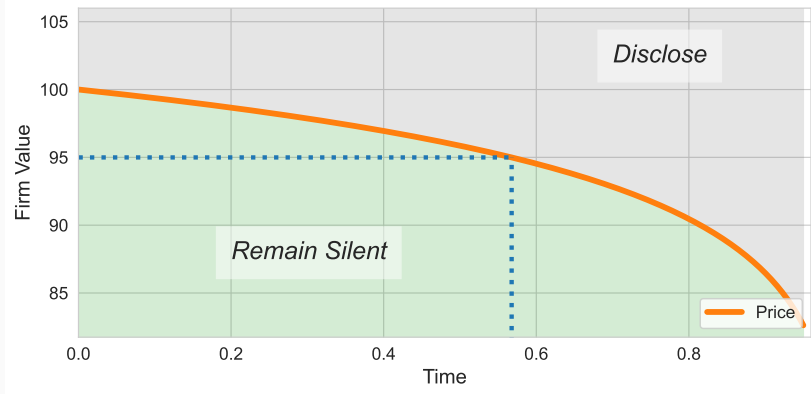


Remain silent when price $>$ value.

Disclose when price \leq value (option is at or in the money).

Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

Example: Value = 95

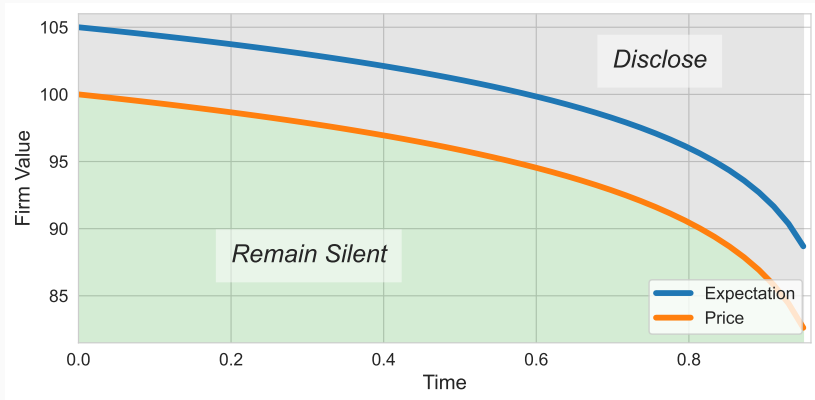


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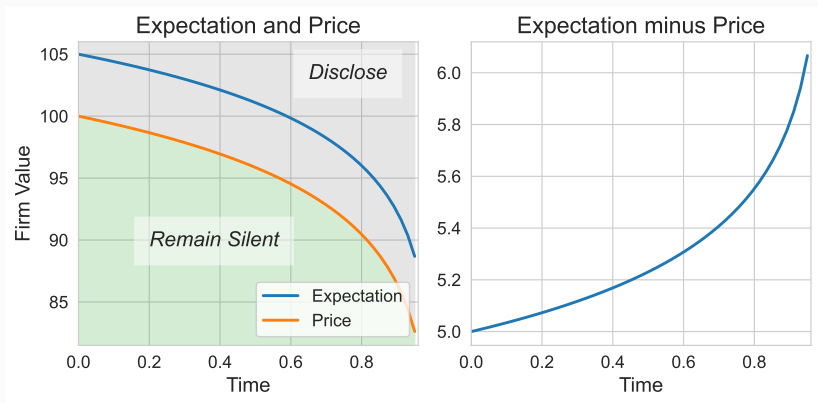
Expectation and Price



§ risk premium is $E_t[\tilde{x}] - E_t^*[\tilde{x}] > 0$

Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

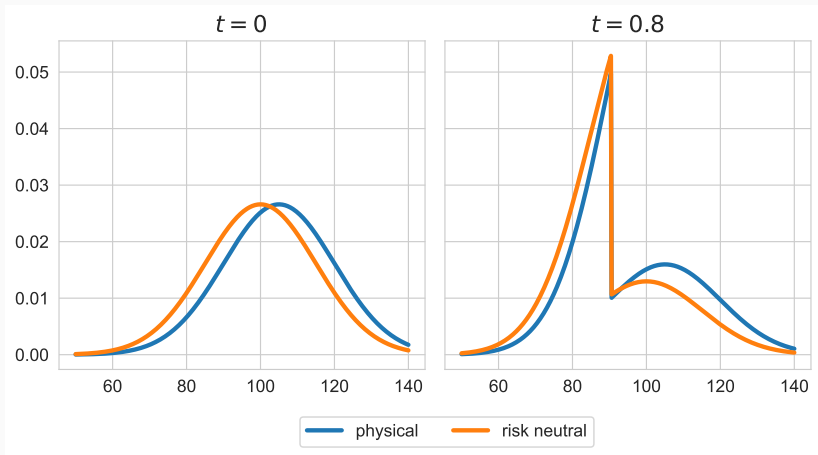
Risk Premium



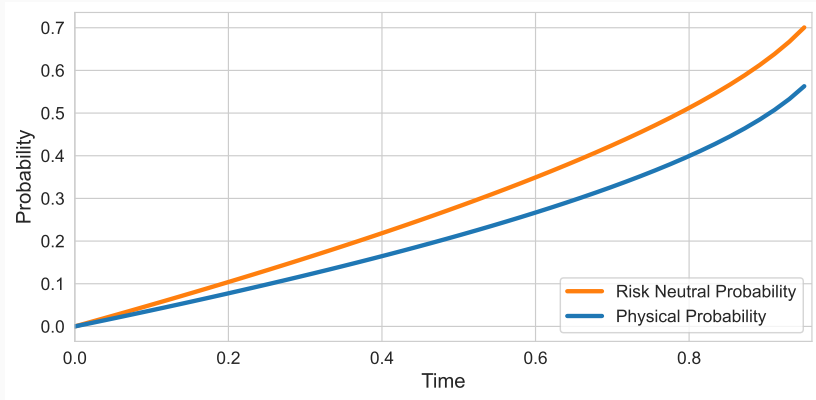
Risk premium $E_t[\tilde{x}] - P_t$ rises before disclosures.

Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

Densities Conditional on No Disclosure



Probability Negative News Has Been Withheld



Physical Probability:

$$\frac{t \cdot \text{prob}(\tilde{x} < P_t)}{t \cdot \text{prob}(\tilde{x} < P_t) + 1 - t}$$

Risk-Neutral Probability:

$$\frac{t \cdot \text{prob}^*(\tilde{x} < P_t)}{t \cdot \text{prob}^*(\tilde{x} < P_t) + 1 - t}$$

CAPM in Model 1

Alpha in \$ Terms

$$\alpha P = -\text{cov}(\tilde{x}, \tilde{m}) - \frac{\text{cov}(\tilde{x}, \tilde{w})}{\text{var}(\tilde{w})} \times (-\text{cov}(\tilde{w}, \tilde{m}))$$

\$ alpha

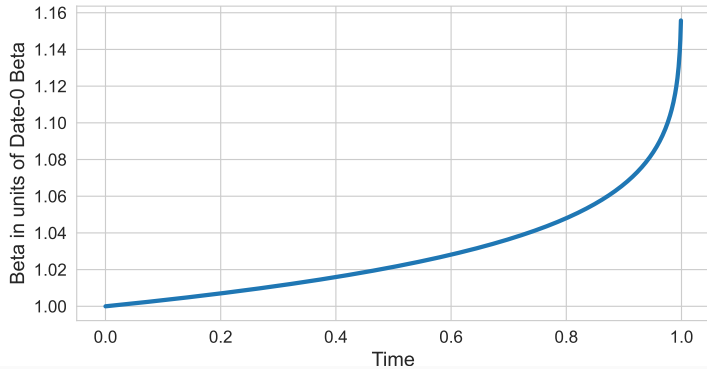
\$ beta

\$ risk prem

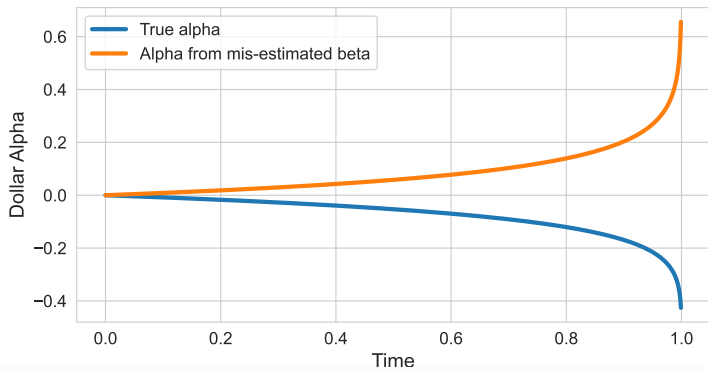
\$ market risk prem

- Consider returns from buying at t and holding until after disclosures.
- Above equation is always true. Use conditional covariances, variance, and SDF.

Beta Prior to Disclosure



Alpha Prior to Disclosure



Mis-estimated beta is date-0 beta.

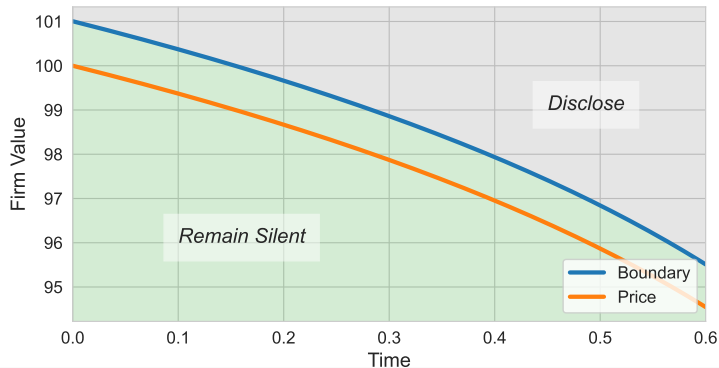
Ignoring time variation in market risk \Rightarrow over-estimate alpha.

Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

Model 2. Firm 2 is Nonstrategic

- Discussed by Acharya, DeMarzo, and Kremer (2011)
- Value to keeping disclosure option alive: other firm may announce good news, lifting price.
- Disclosure option must be sufficiently far in the money before exercise is optimal.

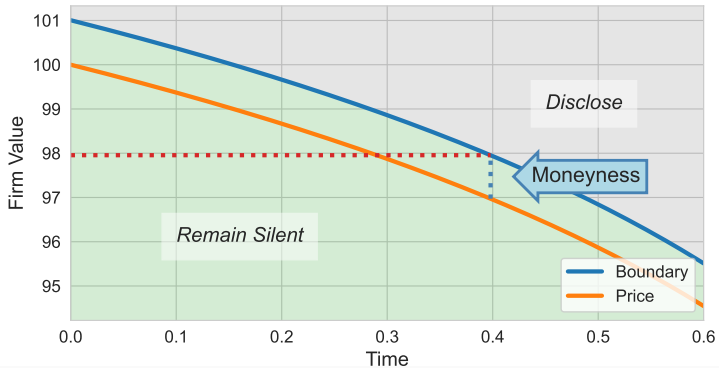
Equilibrium



Remain silent even when price $<$ value to a certain extent.

Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

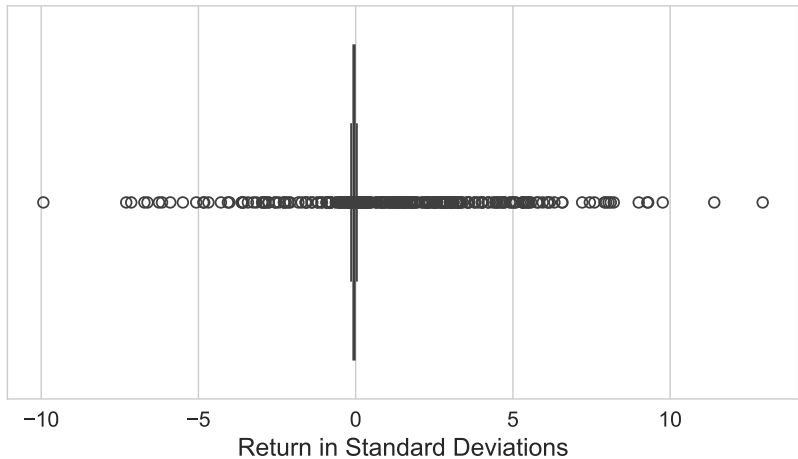
Example: Value = 98



Parameters: $\mu = 105$, $\mu^* = 100$, $\sigma = 15$.

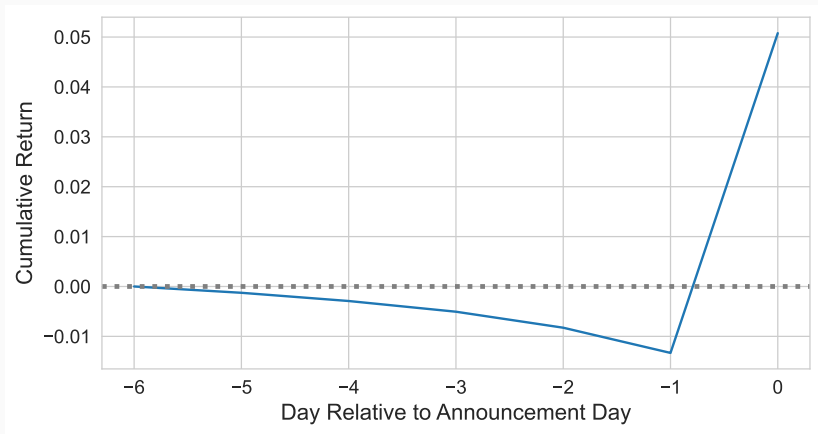
Skewness and Kurtosis of Simulated Daily Returns

- Simulate 100,000 paths of the model.
- Divide time interval $[0, 1]$ into 30 equal pieces. Call each a day.
- Compute daily return for each stock until and including disclosure.
- Skewness of daily returns = 3.9.
- Kurtosis of daily returns = 39.5.



First 100 simulations. Approximately 3,500 daily returns. All negative returns are from nonstrategic disclosures.

Returns Prior to Announcements

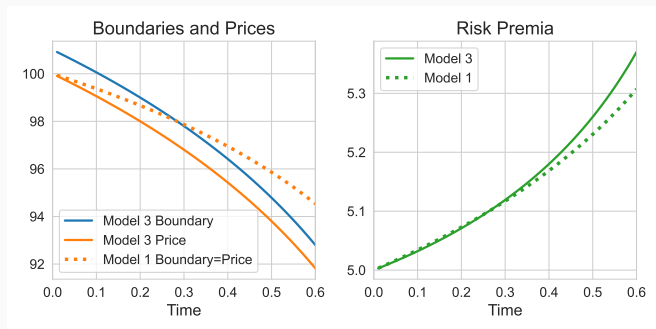


Average over all announcements that occurred on day 6 or later.

Model 3: Both Firms are Strategic

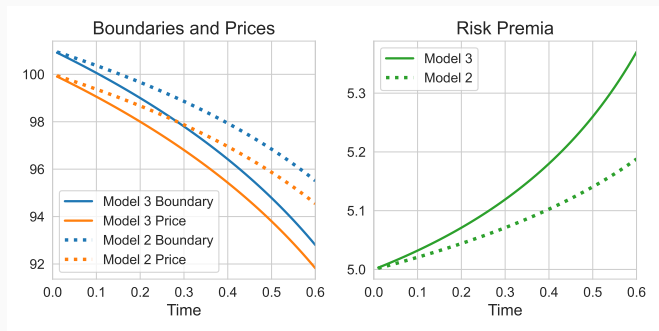
- Disclosure boundary must be optimal for each firm given that other firm plays the same boundary and given that the market updates based on the boundary.
- Model comparisons:
 - More firms, all strategic (Model 3 vs Model 1)
 - More strategic firms, same overall number (Model 3 vs Model 2)

More Firms (Model 3 vs Model 1)



- More benefit to waiting \Rightarrow greater moneyness before exercise is optimal \Rightarrow slower disclosure.
- Market makes more extreme inferences if more firms fail to disclose \Rightarrow faster price drop \Rightarrow faster disclosure

More Strategic Firms (Model 3 vs Model 2)



- Lower benefit to waiting (because other firm is also waiting) \Rightarrow faster disclosure.
- Market makes more extreme inferences \Rightarrow faster disclosure

Announcement Returns

- 1st announcer returns $>$ 2nd, as in Savor-Wilson, 2016
- 1st announcer returns: Model 3 $>$ Model 1 $>$ Model 2
- 2nd announcer returns: Model 3 $>$ Model 2 $>$ Model 1
- In simulation, mean announcement return $>$ $2.5 \times$ unconditional risk premium, but only $\approx 25\%$ of firms delay announcements.

Solution of Model

Optimal Disclosure Timing

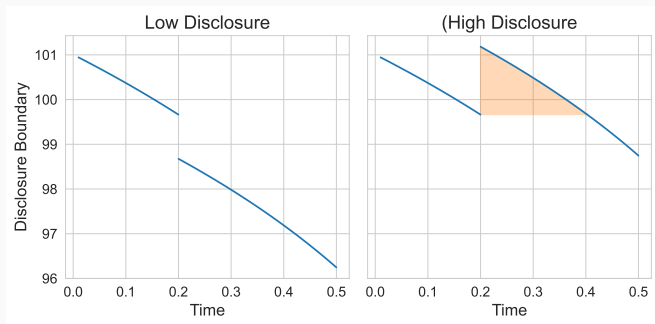
- Differential equation, value matching, and smooth pasting for optimal exercise of the disclosure option



firm at the boundary ($\tilde{x}_i = B_t$) must be indifferent between disclosing and waiting.

- Cost of waiting is the foregone price increase $B_t - P_t$.
 - Benefit of waiting is the possibility of announcement by firm 2 that lifts firm 1's price.
-
- Matching benefit to cost produces a messy but tractable equation for B_t and $B \Rightarrow P$ by Bayes' Rule

Benefit of Waiting



- Consider firm with value at the boundary (from left) at $t = 0.2$.
- If other firms makes a low disclosure at $t = 0.2$, it provides no benefit – remains optimal to disclose.
- High disclosure produces value equal to “triangular” area.

Expected Benefit of Waiting

- Expected benefit of waiting is triangular area integrated over possible disclosures of other firm multiplied by arrival rate of disclosures.
- If the other firm is strategic, two reasons it might disclose:
 1. Knew its value, and boundary has fallen to it
 2. Just learned its value, which is above boundary
- Type #1 arrival rate depends on slope of boundary.
- But type #1 arrivals are all like left figure on previous slide – do not contribute to value of waiting.
- End up with a separate fixed-point condition in B_t at each t .

Propositions

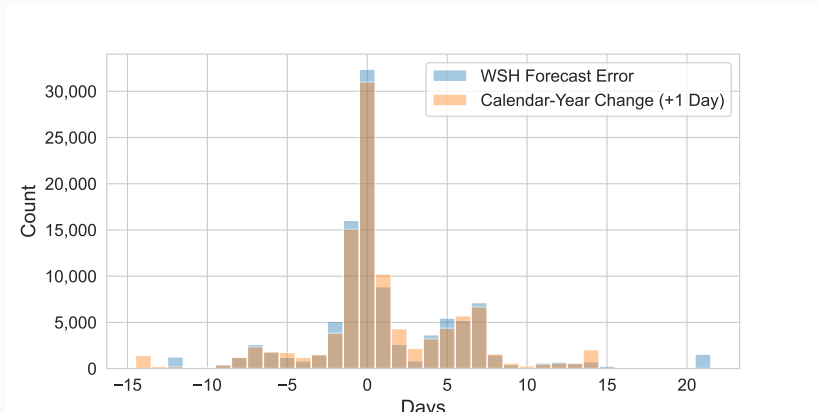
Empirics

- Look at changes in earnings announcement dates relative to
 - Previous year announcement day
 - Forecast of date by Wall Street Horizons
- Johnson & So (2018) show firms delay announcements when they have bad news.
- We show that firms adjust announcement dates in response to peer news:
 - delay when peers announce good news
 - accelerate when peers announce bad news
- Uber & Lyft: from WSJ, May 4, 2022
Lyft's commentary was so bad, Uber Technologies moved up its earnings release and conference call after watching its own shares trade off sharply in sympathy.

Exclude Predictable Firms

- Exclude firms for which either
 - WSH is exactly correct more than 50% of the time, or
 - firm announces on the same day of the week more than 90% of the time
- Leaves us with 4,000 firms and 115,000 announcements.
- Representative of original sample
 - Slightly smaller firms
 - Similar industry distribution

Announcement Date Shifts for Retained Firms



Regression of Forecast Errors on Peer Returns

	(1)	(2)	(3)	(4)	(5)	(6)
R^{FF12}	0.07*** (0.02)	0.07*** (0.02)			0.04** (0.02)	
R^{GICS4}			0.05*** (0.02)	0.04* (0.02)		0.03 (0.02)
R^{agg}					0.20** (0.09)	0.19** (0.10)
Firm FE	Y	Y	Y	Y	Y	Y
Day FE	N	Y	N	Y	Y	Y
Num Obs	105,066	105,066	104,973	104,973	105,065	104,972

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Units of coefficients are days. Regressors are standardized.

Windows for Peer Announcements

- Announcements early, on-time, or late
- Look at peer announcement returns in window before announcement for early and on-time
- Look at peer announcement returns in window before anticipated date for late
- Three-day windows in all cases
- Windows are after announcement scheduling. Hypothesis is that firms anticipate peer announcement returns when scheduling.
 - Schedule early or on-time if anticipate bad peer news
 - Schedule late if anticipate good peer news

Conclusion

- Positive skewness, high kurtosis, negative drifts before positive jumps, and high average announcement returns can all be induced by voluntary disclosure.
- High risk premia correspond to extra pessimism under risk-neutral probability about negative news being withheld.
- Betas rise with nondisclosure. Using historical betas cause alphas to be over-estimated.
- More firms and more strategic firms increase announcement returns.
- Data shows small but significant effect of peer returns on earnings announcement dates.

Thanks!

Model 1 Equilibrium

Suppose firm 2 always discloses at time $t = 1$. Define

$$f(z) = \frac{z}{z - z\Phi(z) - \phi(z)}$$

1. The function f is strictly decreasing and maps $(-\infty, 0]$ onto $[0, 1)$.
2. At each date t prior to disclosure, the equilibrium price of firm 1 is

$$P_{1t} = \mu^* + \sigma f^{-1}(t)$$

Model 3 Equilibrium

The normalized disclosure boundary $(B_t - \mu^*)/\sigma$ is the solution b of

$$\frac{t(1+\rho)\phi(b) \left[1 - t + t\Phi \left(b\sqrt{\frac{1-\rho}{1+\rho}} \right) \right]}{\left[1 - t + t\Phi(b) \right]^2 + t^2 \left[\Gamma(b, b, \rho) - \Phi(b)^2 \right]} + b =$$
$$\frac{\sqrt{1-\rho^2}}{\rho} \times \frac{\int_{-\infty}^{f^{-1}(t)} \phi \left(\frac{\xi - b\sqrt{1-\rho^2}}{\rho} \right) \int_{\xi}^{g(\cdot|\xi)^{-1}(t)} (g(z|\xi) - t) dz d\xi}{1 - t + t\Phi \left(b\sqrt{\frac{1-\rho}{1+\rho}} \right)},$$

where $\Gamma(\cdot, \cdot, \rho)$ denotes the bivariate distribution function for normal random variables with zero means, unit standard deviations, and correlation equal to ρ . The equilibrium price P_t prior to any disclosure is

$$P_t = \mu^* - \sigma \times \frac{t(1+\rho)\phi(b) \left[1 - t + t\Phi \left(b\sqrt{\frac{1-\rho}{1+\rho}} \right) \right]}{\left[1 - t + t\Phi(b) \right]^2 + t^2 \left[\Gamma(b, b, \rho) - \Phi(b)^2 \right]}.$$

