American Disclosure Options and Asset Pricing

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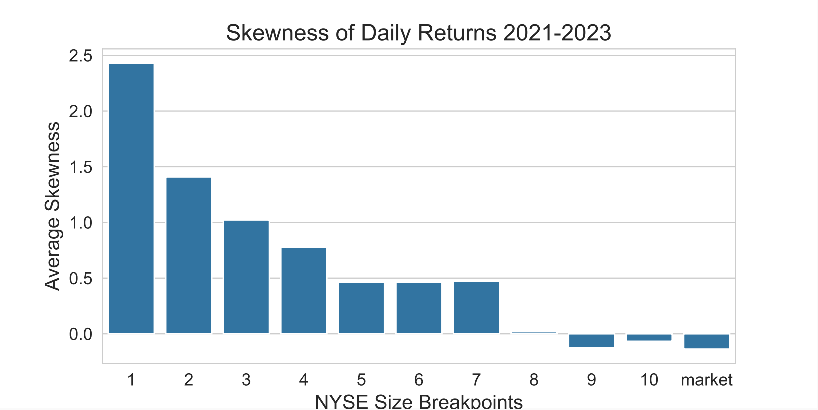
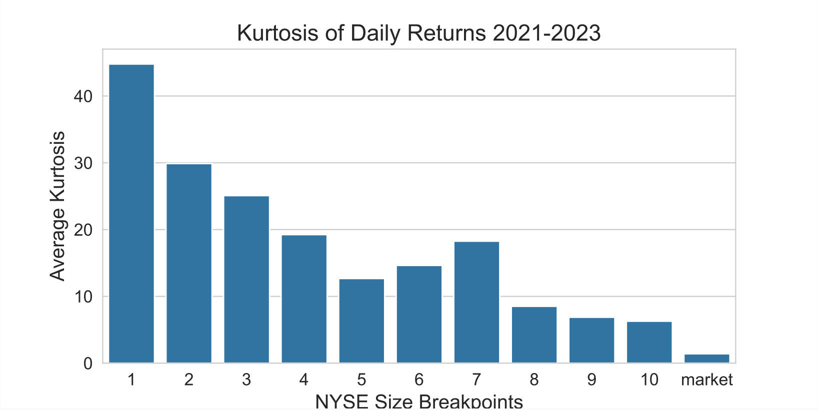
Daily Stock Returns

- 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

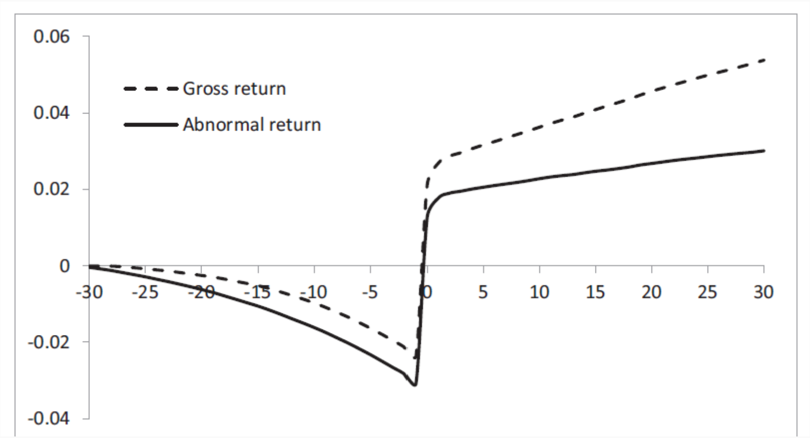
Skewness of Daily Returns



Kurtosis of Daily Returns



Returns Around Outlier Returns



Kapadia-Zekhnini (JFE, 2019) - 30 days before and after $\pm$ 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.

Corporate Disclosures: No News is Bad News

- The present value of growth opportunities is a large part of the value of most companies.
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- Many small negative returns mixed with some large positive returns should be normal.
- In the data, individual stock returns are negative roughly half the time (slightly more for small caps), but the market return is negative only 40% of the time.

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?

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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.

Pricing

- 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 $\mathsf{E}_t^*[\tilde{x}_i]$ 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 $t = 1$:

$$\mathsf{E}^* \int_0^1 P_{it} \, \mathrm{d}t \, .$$

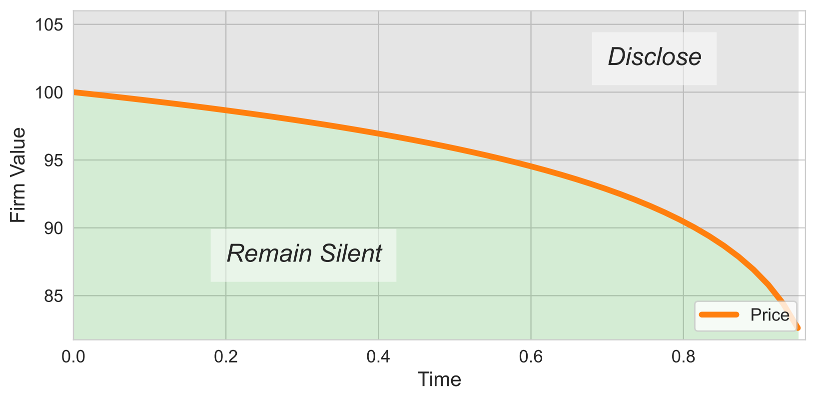
- Disclosure option is option to exchange P_{it} for $\tilde{x}_i$.
  - At the money when $P_{it} = \tilde{x}_i$
  - Out of the money when $P_{it} > \tilde{x}_i$
  - In the money when $P_{it} < \tilde{x}_i$
- Look for Perfect Bayes Equilibrium.

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

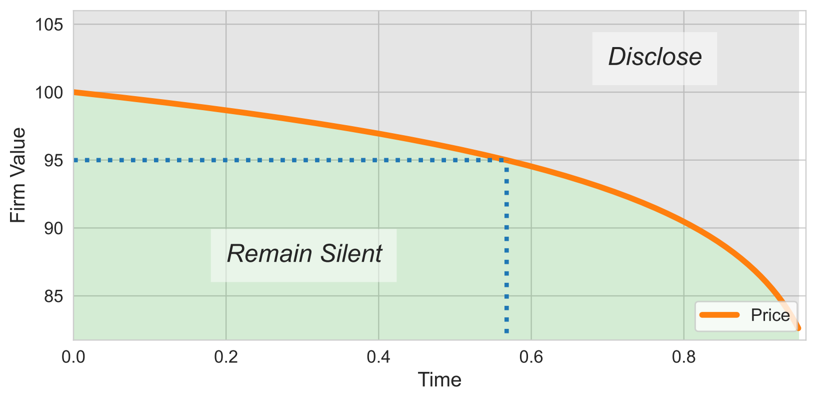


Remain silent when price $>$ value.

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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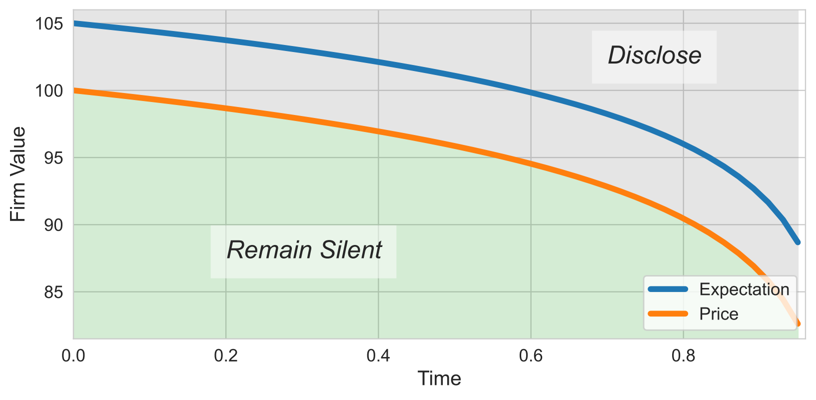
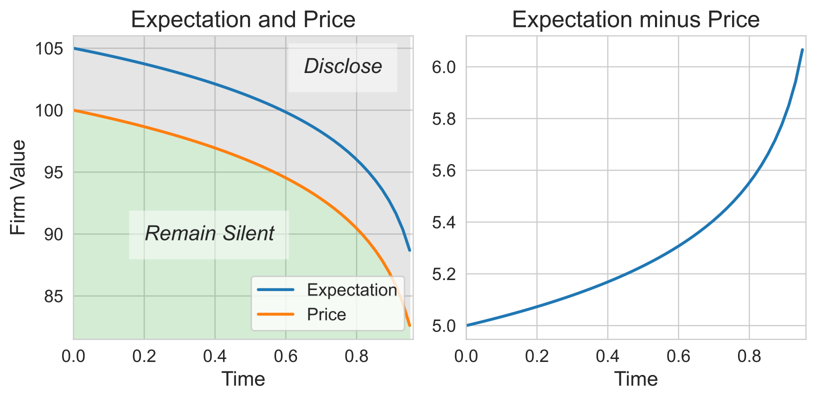
Expectation and Price



\$ risk premium is $\mathrm{E}_t[\tilde{x}] - \mathrm{E}_t^*[\tilde{x}] > 0$

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

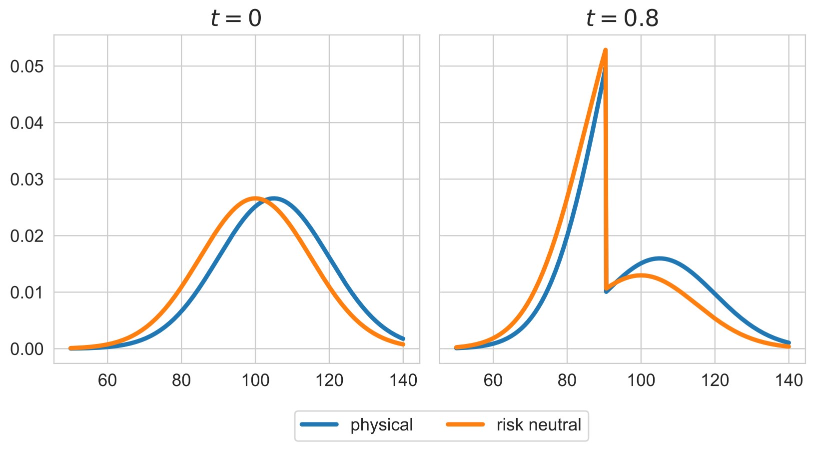
Risk Premium



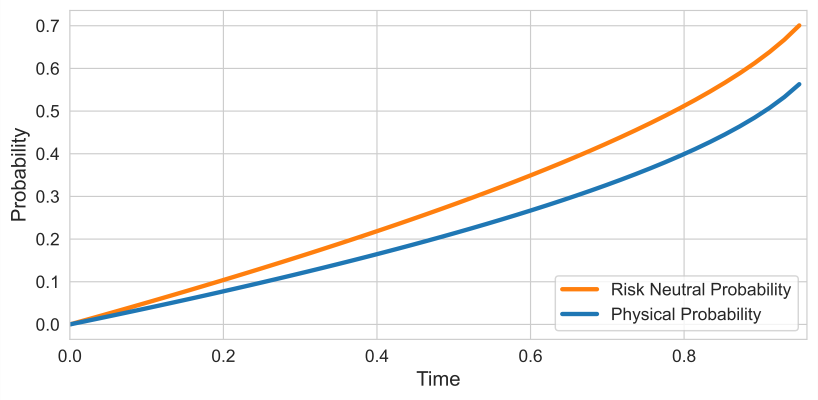
Risk premium $\mathrm{E}_t[\tilde{x}] - P_t$ rises before disclosures.

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

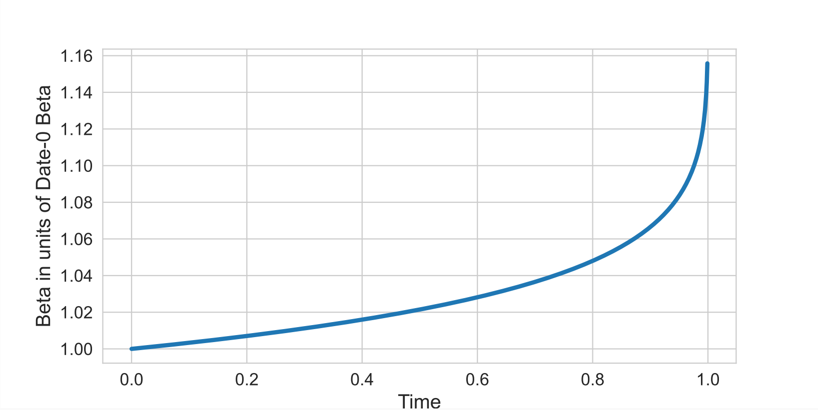
CAPM in Model 1

Alpha in \$ Terms

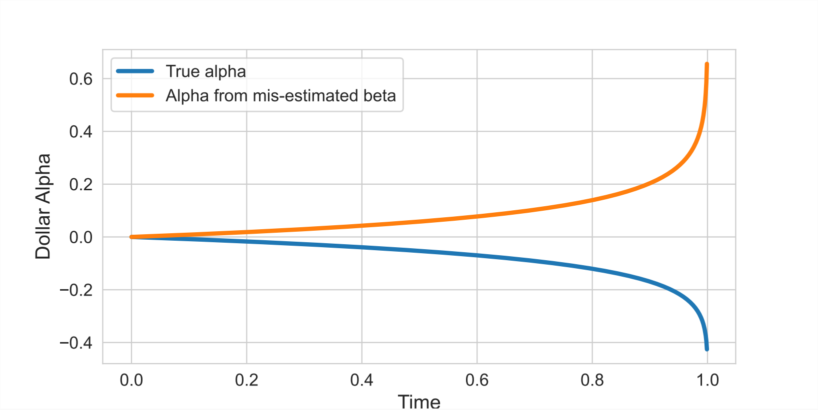
$$\underbrace{\alpha P}_{\text{\$ alpha}} = \underbrace{-\operatorname{cov}(\tilde{x}, \tilde{m})}_{\text{\$ risk prem}} - \underbrace{\frac{\operatorname{cov}(\tilde{x}, \tilde{w})}{\operatorname{var}(\tilde{w})}}_{\text{\$ beta}} \times \underbrace{\Big(-\operatorname{cov}(\tilde{w}, \tilde{m})\Big)}_{\text{\$ market risk prem}}$$

- 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.

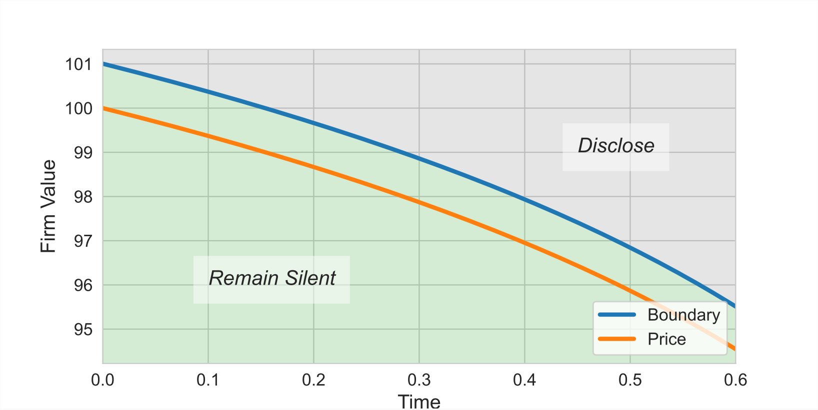
Ignoring time variation in market risk $\Rightarrow$ over-estimate alpha.

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.

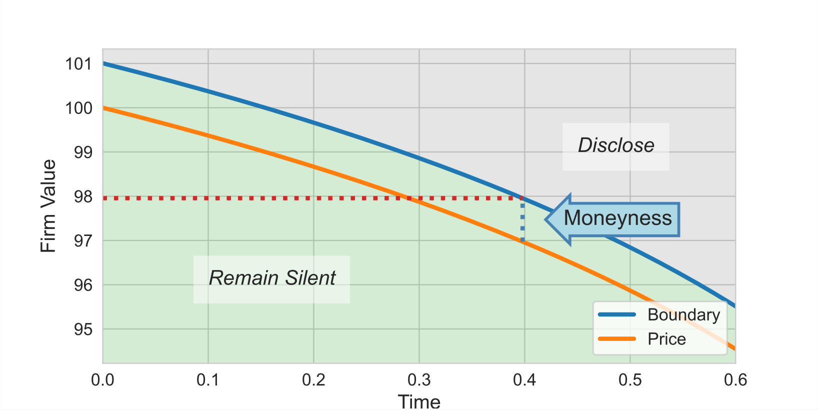
Equilibrium



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

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

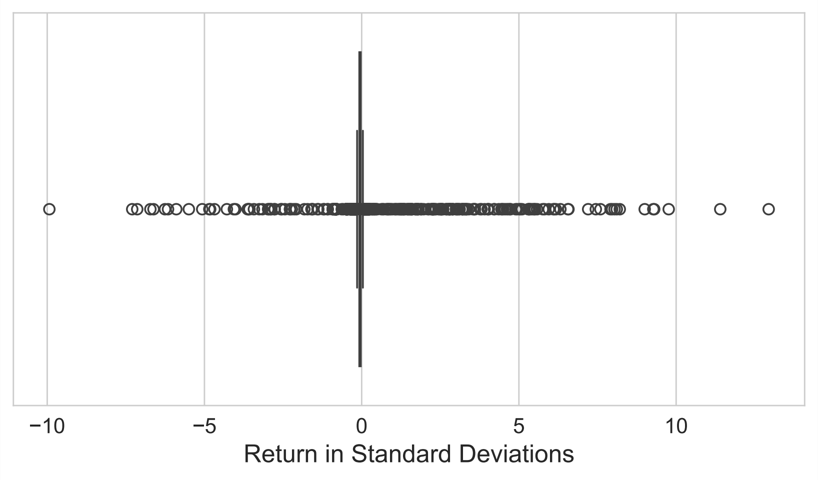
Example: Value = 98



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

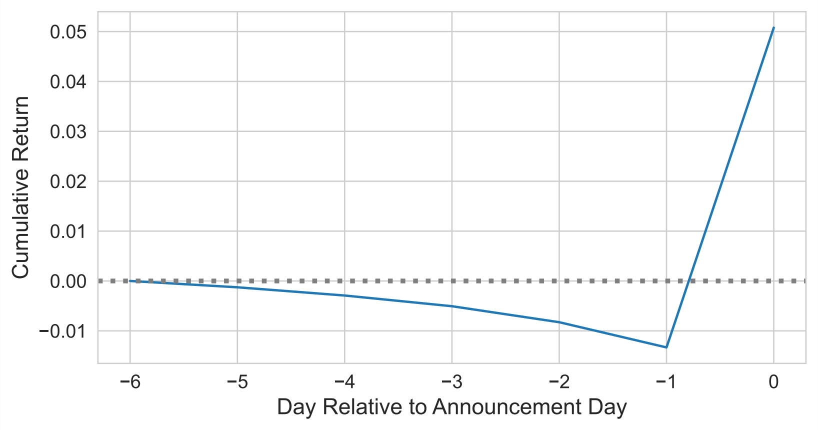
Skewness and Kurtosis of Simulated Daily Returns

- 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

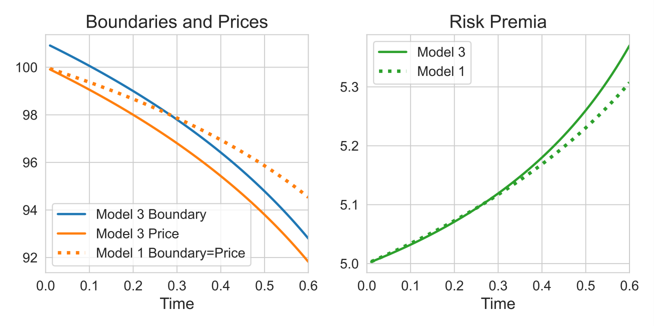


Average over all announcements that occurred on day 6 or later.

Model 3: Both Firms are Strategic

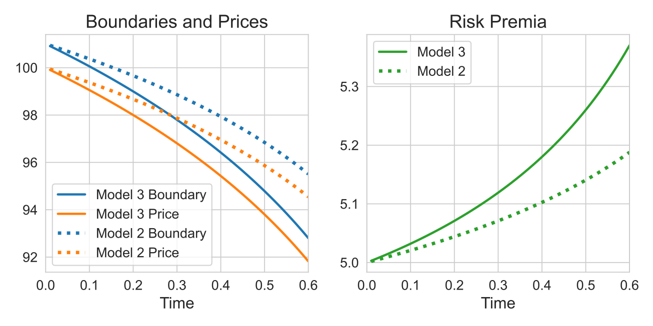
- Disclosure boundary must be optimal for each firm given that other firm plays the same boundary and given that the market updates based on the boundary.
- Model comparisons:
    - More firms, all strategic (Model 3 vs Model 1)
    - More strategic firms, same overall number (Model 3 vs Model 2)

More Firms (Model 3 vs Model 1)



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

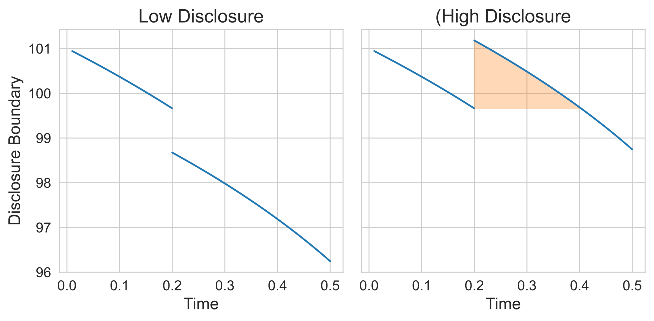
$$\Longleftrightarrow$$

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

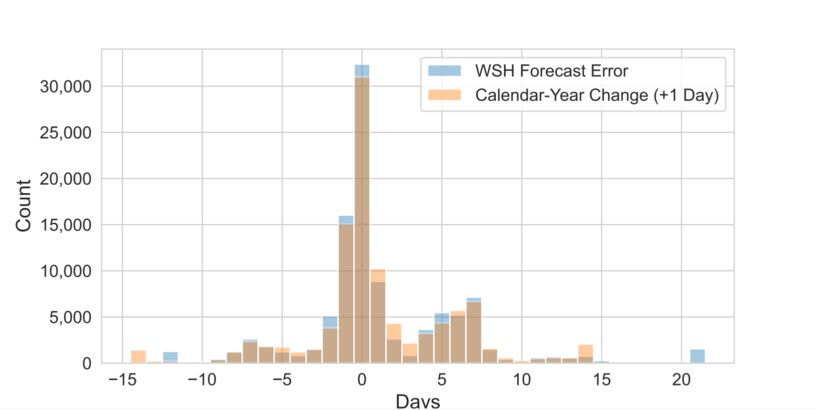
- Look at changes in earnings announcement dates relative to
  - Previous year announcement day
  - Forecast of date by Wall Street Horizons
- Johnson & So (2018) show firms delay announcements when they have bad news.
- We show that firms adjust announcement dates in response to peer news:
  - delay 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***	0.07***			0.04**	
	(0.02)	(0.02)			(0.02)	
R^{GICS4}			0.05***	0.04*		0.03
			(0.02)	(0.02)		(0.02)
R^{agg}					0.20**	0.19**
					(0.09)	(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 mall 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

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

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

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

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