Earnings Announcements and the Rise of Passive Ownership

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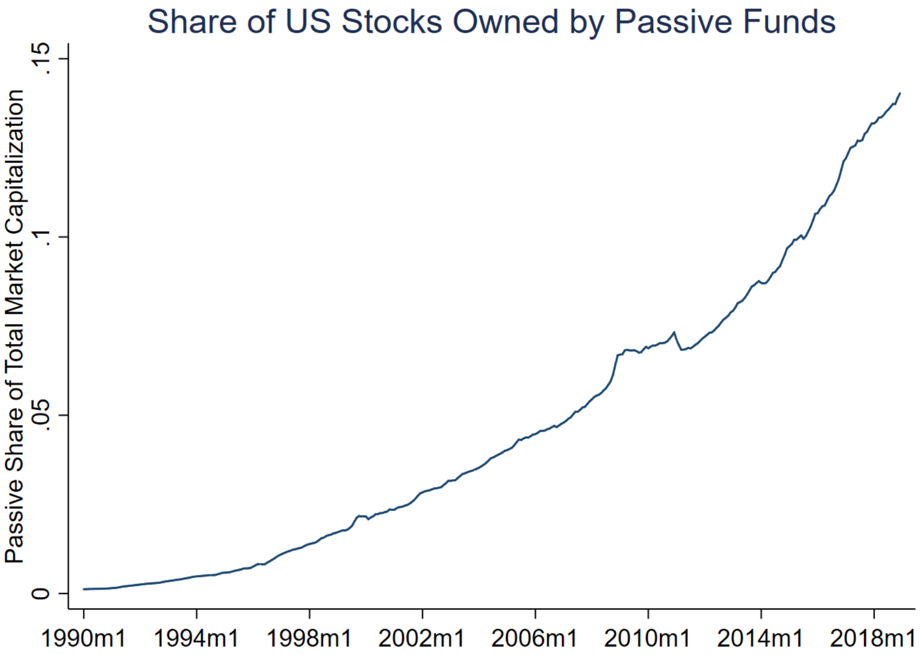
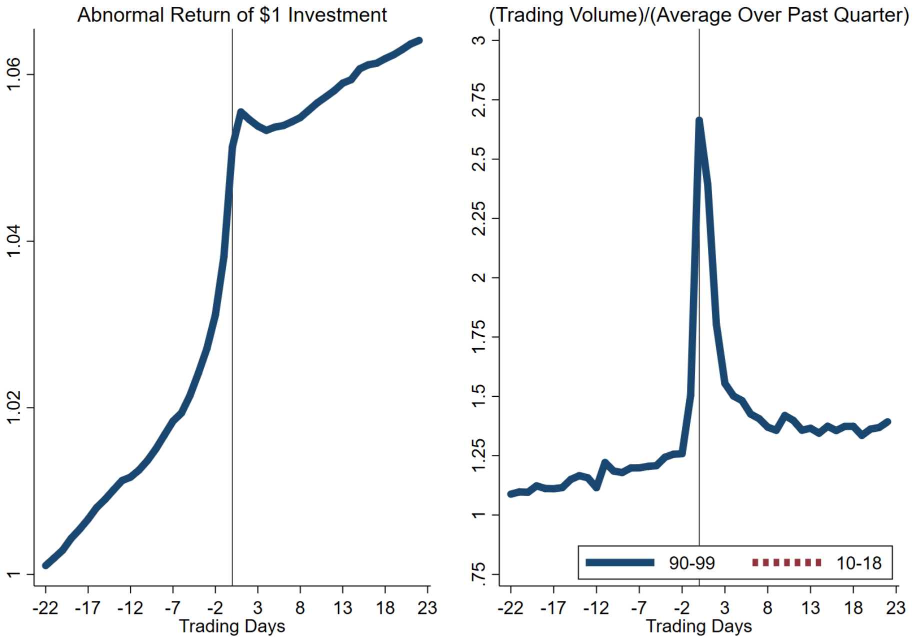
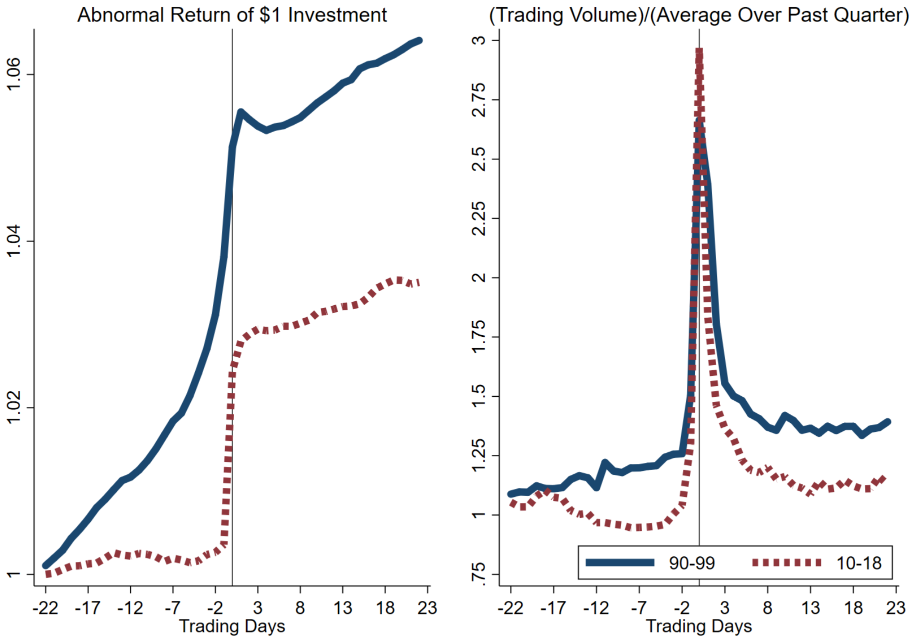
April 13, 2020


Share of US Stocks Owned by Passive Funds
Passive Share of Total Market Capitalization
0
.05
.1
.15
1990m1
1994m1
1998m1
2002m1
2006m1
2010m1
2014m1
2018m1



Abnormal Return of $1 Investment
1.06
1.04
1.02
1
-22
-17
-12
-7
-2
3
8
13
18
23
Trading Days
(Trading Volume)/(Average Over Past Quarter)
3
2.75
2.5
2.25
2
1.75
1.5
1.25
1
.75
-22
-17
-12
-7
-2
3
8
13
18
23
Trading Days
90-99
10-18



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Taking the increase in passive ownership as exogenous, I develop a model to jointly explain:

- Decline in pre-earnings trading volume
- Decline in the pre-earnings drift
- Increase in volatility on earnings days

Roadmap

1. Model
2. Cross-sectional results
3. Index additions/deletions
4. Information gathering

Model

Modeling the introduction of an ETF

- Scenario 1: Economy with $n-1$ assets and n risks
  - $n-1$ asset-specific risks and 1 systematic factor
  - Builds on Grossman-Stiglitz(1980)/Admati(1985)
  - Continuum of informed and uninformed agents
  - One information event (3 periods)
- Scenario 2: Introduce an ETF so agents can directly trade systematic factor
  - Builds on Kacperczyk, Van Nieuwerburgh and Veldkamp(2016)

Model Timeline

Agents make decisions at $t = 0$ and $t = 1$ to maximize expected CARA utility over $t = 2$ wealth

- Time 0
  - Agents make binary decision to become informed or not
  - If informed, decide how to allocate their limited attention to the underlying risks
- Time 1
- Time 2

Model Timeline

Agents make decisions at $t = 0$ and $t = 1$ to maximize expected CARA utility over $t = 2$ wealth

- Time 0
- Time 1
  - Informed agents receive private signals
  - Agents submit demands
- Time 2

Model Timeline

Agents make decisions at $t = 0$ and $t = 1$ to maximize expected CARA utility over $t = 2$ wealth

- Time 0
- Time 1
- Time 2
  - Payoffs realized, agents consume

Asset Payoffs (General)

The time 2 payoff of asset i is defined as:

$$z_i = \mu_i + \beta_i f + \eta_i \text{ for } i = 1, \ldots, n-1$$

- $\eta_i \sim N(0, \sigma_i^2)$, $f \sim N(0, \sigma_f^2)$
- Average endowment of each asset $\overline{x}_i$
- Exogenous supply shocks $x_i \sim N(0, \sigma_{i,x}^2)$

Asset Payoffs (Baseline)

For simplicity of exposition, assume all the assets are symmetric:

$$z_i = \mu + f + \eta_i$$

All assets have $\beta_i = 1$, $\eta_i \sim N(0, \sigma^2)$, average endowment $\overline{x}_i = \overline{x}$, and supply shocks $x_i \sim N(0, \sigma_x^2)$

Signals

If agent j decides to become informed, they receive signals at time 1 about the payoffs of the underlying **assets**:

$$s_{i,j} = (\mu + f + \eta_i) + (\epsilon_{f,j} + \epsilon_{i,j})$$
$$\leftrightarrow s_{i,j} = \mu + (f + \epsilon_{f,j}) + (\eta_i + \epsilon_{i,j})$$

where $\epsilon_{i,j} \sim N(0, var(\epsilon_{i,j}))$

Time 1 Problem

Define:

$$w_{2,j} = r_f \left(w_{0,j} - \mathbb{1}_{inf,j} c \right) + \mathbf{q}_j' (\mathbf{z} - r_f \mathbf{p})$$

Agent j submits demand $\mathbf{q}_j$ to maximize time 1 conditional expected utility:

$$U_{1,j} = E_{1,j}[-exp(-\rho w_{2,j})]$$

Where the time 1 information set is signals $\mathbf{s}_j$ and prices $\mathbf{p}$, or if j is uninformed, just $\mathbf{p}$

Learning Technology

If agent j allocates attention $K_{i,j}$ to risk factor η_i or f, it reduces signal noise:

$$s_{i,j} = \mu + (f + \epsilon_{f,j}) + (\eta_i + \epsilon_{i,j})$$

$$var(\epsilon_{i,j}) = \frac{1}{\alpha + K_{i,j}}, \quad var(\epsilon_{f,j}) = \frac{1}{\alpha + K_{n,j}}$$

Total attention constraint: $\sum_i K_i \leq 1$

Agent's Time 0 Problem

Agent j decides whether or not to pay c and become informed.
If informed, agent j allocates attention $K_{i,j}$'s to maximize time 0 conditional expected utility:

$$U_{0,j} = E_{0,j}\left[-exp(-w_{2,j}/\rho)\right]$$

Where the time 0 information set is the share of agents who decide to become informed.

Asset Payoffs (ETF)

Introduce asset n, the ETF:

$$z_n = \mu + f$$

- Agents receive no ETF endowment
- ETF has supply shocks with volatility $\sigma^2_{n,x}$
- Don't want adding the ETF to increase average systematic risk

Signals (ETF)

Informed agent j receives signals about the payoffs of all the underlying *assets*, including asset n:

$$s_{i,j} = \mu + (f + \epsilon_{f,j}) + (z_i + \epsilon_{i,j})$$
$$s_{n,j} = \mu + (f + \epsilon_{f,j})$$

Learning technology and attention constraint are unchanged

Key Assumptions (1)

- Symmetric equilibrium: all informed agents have the same $K_{i,j} = \overline{K}_i$ for all j
- Assets 1 to $n-1$ have the same:
  - Mean payoff μ_i
  - Loading on systematic factor β_i
  - Volatility of idiosyncratic risk σ_i^2
  - Volatility of supply shocks $\sigma_{i,x}^2$

Key Assumptions (2)

These assumptions reduce an n dimensional problem to a two dimensional problem:

- Allocate K_n attention to systematic risk
- $(1 - K_n)/(n - 1)$ to each idiosyncratic risk factor
- "Waterfilling" (Clover and Thomas 1991)

Equilibrium

- Share Informed
  - At the margin, agents indifferent between paying c and becoming informed, and being uninformed
  - $U_{0,informed} = U_{0,uninformed}$
- Optimal Attention Allocation
- Beliefs
- Market Clearing

Equilibrium

- Share Informed
- Optimal Attention Allocation
  - No agent can improve expected utility by re-allocating $K_{i,j}$'s conditional on $\overline{K}_i$'s
- Beliefs
- Market Clearing

Equilibrium

- Share Informed
- Optimal Attention Allocation
- Beliefs
  - REE: Agents beliefs about joint distribution of payoffs and prices must be consistent with the realized distribution of payoffs and prices in equilibrium
- Market Clearing

Equilibrium

- Share Informed
- Optimal Attention Allocation
- Beliefs
- Market Clearing
  - After submitting demands, agents must hold the endowment of all assets plus the realized supply shocks

Solving the Model Backward

Agent's time 1 problem: Given $\overline{K}_i$'s, and share informed, solve for prices/demand using the methods in Admati (1985)

Solving the Model Backward

Agent's time 0 attention problem: Given optimal demands and the share of agents who decide to become informed, decide how to allocate attention.

Solving the Model Backward

To numerically solve for K_i's:

1. Start all agents at K^0
2. Consider an atomistic agent j who takes K^0 as given, and considers their expected utility by deviating to K_j^1 near K^0
3. If j can be made better off, move all informed agents to K^1
4. Iterate on steps 2 and 3 until j can no longer improve their expected utility by deviating.

Solving the Model Backward

Agent's time 0 become informed problem: Given optimal demands, the equilibrium share of agents who decide to become informed, and optimal $\overline{K}_i$'s, decide to pay c or not.

Parameter Choice

- 11 inputs needed to solve the model
  - Only parameter unique to my model is α, baseline learning
- Focus on effect of introducing the ETF varying ρ (risk aversion), σ_f^2 (volatility of systematic factor) and c (cost of becoming informed)
- Rest of parameters are taken from Kaperczyk et. al. (2016)
  - who *"... pursue a numerical example that matches some salient properties of stock return data"*

Conjectures

Introducing the ETF will have an effect on:

1. How many agents become informed (extensive margin)
2. How agents allocate their attention (intensive margin)
3. Risk premia

Conjectures

Introducing the ETF will have an effect on:

1. How many agents become informed
2. How agents allocate their attention
3. Risk premia

All of these changes will depend on (1) risk-aversion ρ (2) volatility of systematic risk factor σ_f^2 (3) cost of becoming informed c/share of agents who become informed

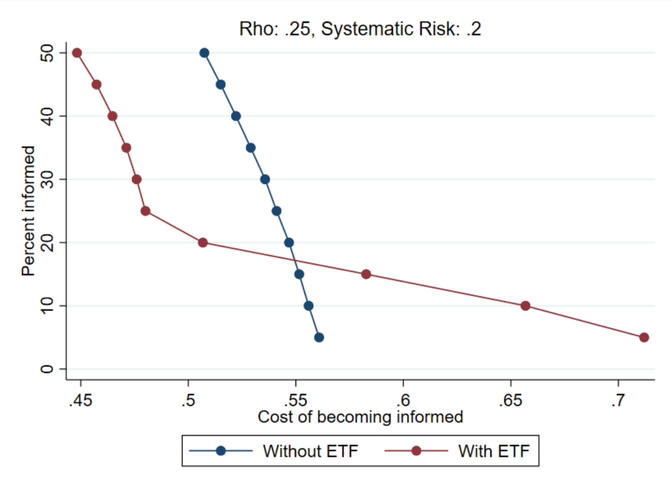
Conjectures

Introducing the ETF will have an effect on:

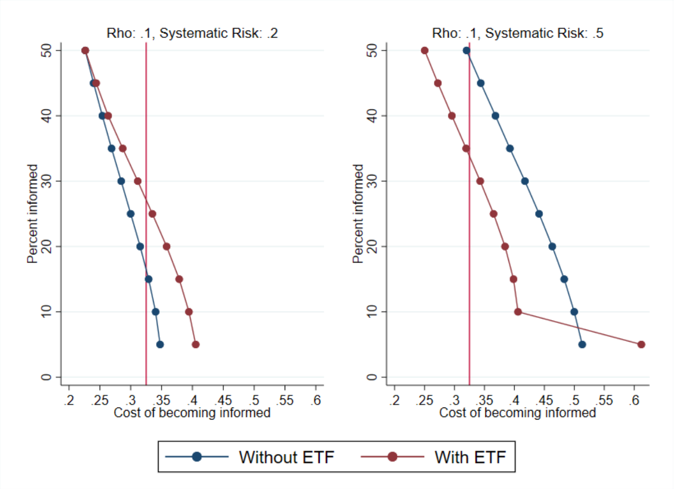
1. How many agents become informed
2. How agents allocate their attention
3. Risk premia

Cannot directly observe effects 1 and 2 in the data, but I will discuss how to measure these effects empirically

Cost of becoming Informed and Share Informed

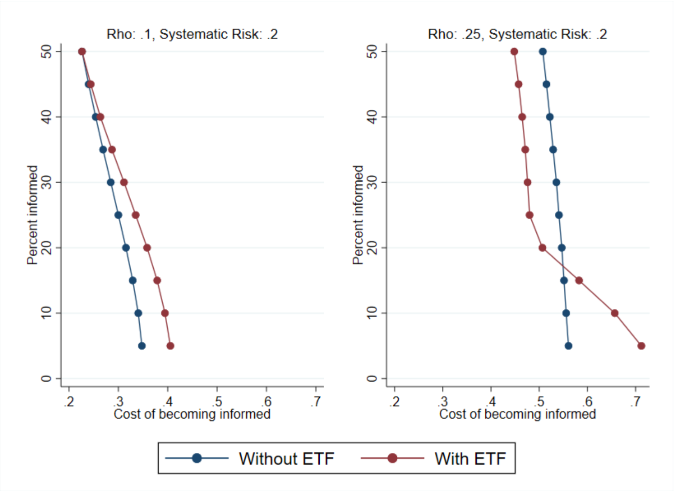


Effect of increasing σ_f^2 on Extensive Learning Margin

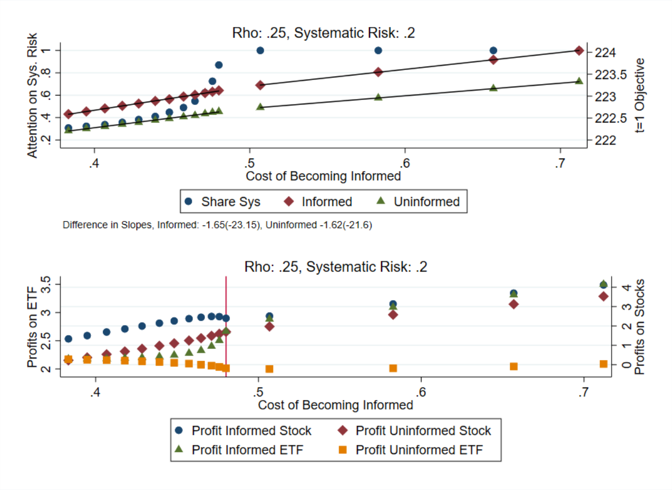


Note: Cost of becoming informed is in dollars, so need to be cautious in directly comparing it across parameter choices

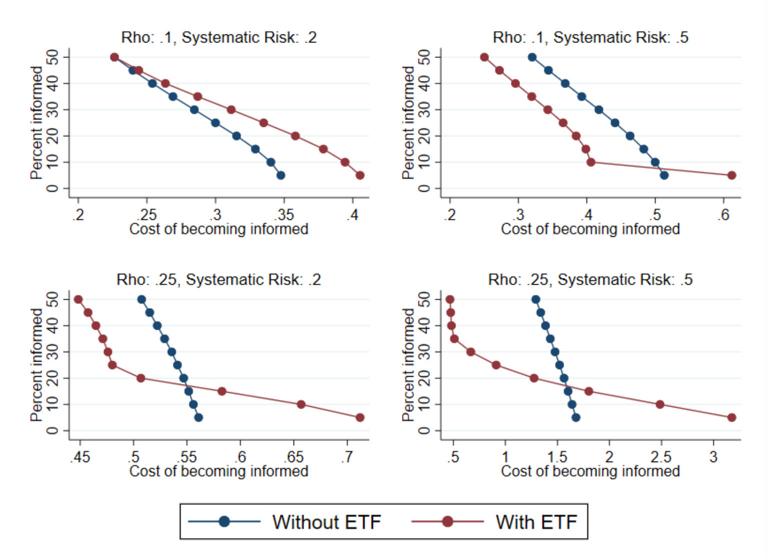
Effect of increasing ρ on Extensive Learning Margin



Understanding kink in percent informed



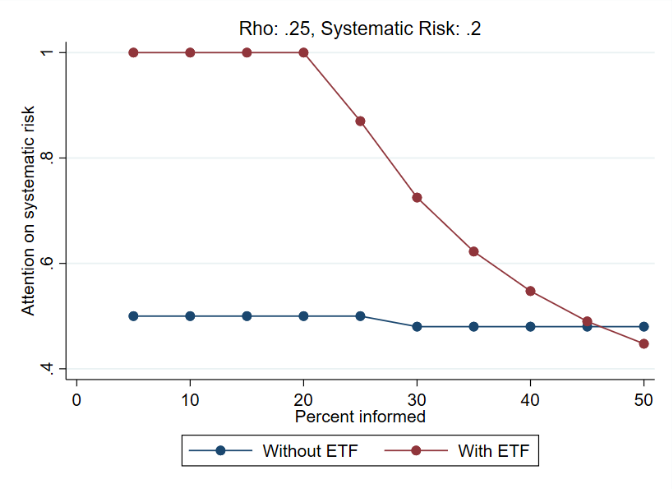
Effect of ETF on Decision to Become Informed



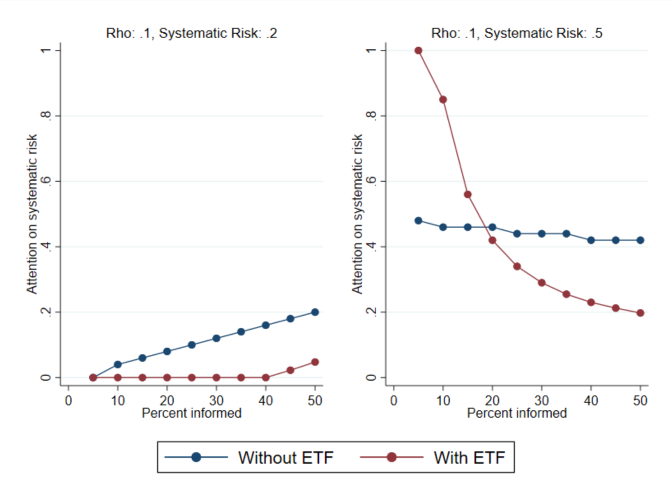
Prediction 1 (Extensive Learning Margin)

- If ρ or σ_f^2 are low: introducing the ETF will *increase* the share of agents who become informed
- Increasing σ_f^2 leads to fewer agents learning when the ETF is present
- Increasing ρ leads to fewer agents learning with the ETF is present for relatively low costs of becoming informed

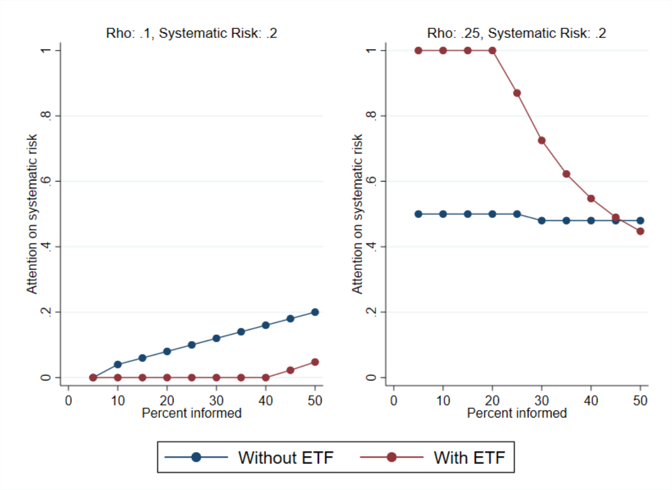
Share Informed and Attention Allocation



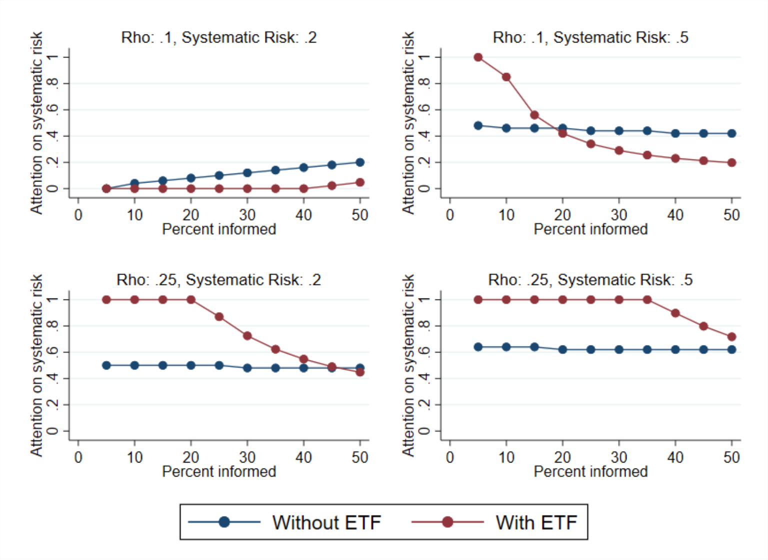
Effect of increasing σ_f^2 on Intensive Learning Margin



Effect of increasing ρ on Intensive Learning Margin



Effect of ETF on Intensive Learning Margin



Effect of Introducing the ETF on Attention Allocation

		Share Informed		No ETF		ETF	
ρ	σ_f^2	no ETF	ETF	Idio.	Sys.	Idio.	Sys.
0.1	0.2	0.05	0.2	0.125	0.000	0.125	0.000
0.1	0.5	0.35	0.2	0.070	0.440	0.073	0.420
0.25	0.2	0.5	0.2	0.065	0.480	0.000	1.000
0.25	0.5	0.5	0.2	0.048	0.620	0.000	1.000

Notes: Cost of becoming informed is set so 20% learn in equilibrium. "Idio." is attention devoted to each stock. "Sys." is attention devoted to systematic risk.

Prediction 2 (Intensive Learning Margin)

- If σ_f^2 or ρ are low: introducing the ETF will *decrease* learning about systematic risk factor
- Otherwise, introducing the ETF increases learning about the systematic risk factor
- Increasing σ_f^2 or ρ leads to more learning about the systematic risk factor, and this effect is stronger when the ETF is present

Effect of the ETF on Risk Premia

			Avg. Cumulative Return	
ρ	σ_f^2	Share Informed	No ETF	With ETF
0.1	0.2	0.1	3.73%	3.69%
0.1	0.2	0.3	3.64%	3.45%
0.1	0.5	0.1	7.92%	4.72%
0.1	0.5	0.3	6.81%	4.11%
0.25	0.2	0.1	9.75%	9.18%
0.25	0.2	0.3	9.46%	7.57%
0.25	0.5	0.1	22.74%	18.84%
0.25	0.5	0.3	21.11%	9.10%

Prediction 3 (Risk Premia)

- Introducing the ETF always decreases risk premia
- The decrease is larger if ρ, σ_f^2 or share informed is high

Defining Price Informativeness Measures

- Pre-earnings volume:
  $\sum_j \left| \mathbf{q}_j - \left(\overline{\mathbf{x}} + \mathbf{x} \right) / (J) \right|$
- Pre-earnings drift
- Share of volatility on earnings days

Defining Price Informativeness Measures

- Pre-earnings volume:
- Pre-earnings drift

$$DM = \begin{cases} \frac{1+r_{(0,1)}}{1+r_{(0,2)}} & \text{if } r_2 > 0 \\ \frac{1+r_{(0,2)}}{1+r_{(0,1)}} & \text{if } r_2 < 0 \end{cases}$$

- Share of volatility on earnings days

Defining Price Informativeness Measures

- Pre-earnings volume:
- Pre-earnings drift
- Share of volatility on earnings days $r_2^2 / \left(r_1^2 + r_2^2\right)$

Defining Price Informativeness Measures

- Pre-earnings volume:
- Pre-earnings drift
- Share of volatility on earnings days

Only defined using stocks i.e. assets 1 to $n-1$

Experiments

- Exercise 1: Fix the Cost of Becoming Informed (Extensive Margin)
- Exercise 2: Fix the Share of Informed Agents (Intensive Margin)

Work with market-adjusted returns to take out effect of ETF on risk premia

Effect of ETF on Volume (fixed c)

		Volume			
ρ	σ_f^2	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.210	0.846	0.636	558.41
0.1	0.5	1.104	0.686	-0.418	-472.67
0.25	0.2	0.603	0.165	-0.438	-874.14
0.25	0.5	0.650	0.165	-0.484	-725.18

Effect of ETF on Drift (fixed c)

		Drift			
ρ	σ_f^2	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.963	0.965	0.002	20.19
0.1	0.5	0.965	0.963	-0.001	-20.12
0.25	0.2	0.961	0.961	-0.001	-8.39
0.25	0.5	0.958	0.959	0.001	10.31

Effect of ETF on Volatility (fixed c)

		Volatility			
ρ	σ_f^2	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.876	0.710	-0.167	-64.07
0.1	0.5	0.676	0.768	0.093	56.95
0.25	0.2	0.740	0.857	0.118	55.27
0.25	0.5	0.750	0.857	0.108	49.86

Effect of ETF on Volume (fixed share informed)

			Volume			
ρ	σ_f^2	Informed	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.1	0.40	0.44	0.036	78.88
0.1	0.2	0.3	1.09	1.22	0.127	156.72
0.1	0.5	0.1	0.34	0.25	-0.093	-203.70
0.1	0.5	0.3	0.96	1.07	0.104	118.85
0.25	0.2	0.1	0.14	0.08	-0.052	-289.41
0.25	0.2	0.3	0.39	0.33	-0.057	-196.09
0.25	0.5	0.1	0.15	0.08	-0.066	-227.99
0.25	0.5	0.3	0.41	0.24	-0.162	-261.23

Effect of ETF on Drift (fixed share informed)

			Drift			
ρ	σ_f^2	Informed	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.1	0.963	0.963	0.000	19.07
0.1	0.2	0.3	0.966	0.967	0.001	44.53
0.1	0.5	0.1	0.961	0.962	0.001	38.01
0.1	0.5	0.3	0.964	0.965	0.002	64.83
0.25	0.2	0.1	0.960	0.960	0.000	12.26
0.25	0.2	0.3	0.961	0.961	0.000	25.31
0.25	0.5	0.1	0.955	0.957	0.001	88.02
0.25	0.5	0.3	0.956	0.960	0.004	91.98

Effect of ETF on Volatility (fixed share informed)

			Volatility			
ρ	σ_f^2	Informed	No ETF	w/ ETF	Change	t-Test
0.1	0.2	0.1	0.82	0.81	0.00	-49.66
0.1	0.2	0.3	0.65	0.63	-0.02	-60.54
0.1	0.5	0.1	0.85	0.89	0.04	41.95
0.1	0.5	0.3	0.71	0.68	-0.03	-64.50
0.25	0.2	0.1	0.85	0.87	0.02	42.33
0.25	0.2	0.3	0.79	0.81	0.02	44.75
0.25	0.5	0.1	0.86	0.87	0.01	31.35
0.25	0.5	0.3	0.81	0.84	0.04	34.65

Effect of Introducing the ETF on Price Informativeness

- Exercise 1: Fix the Cost of Becoming Informed (Extensive Margin)
  - Effect is ambiguous, price informativeness decreases if ρ and/or σ_f^2 sufficiently high
- Exercise 2: Fix the Share of Informed Agents (Intensive Margin)

Effect of Introducing the ETF on Price Informativeness

- Exercise 1: Fix the Cost of Becoming Informed (Extensive Margin)
- Exercise 2: Fix the Share of Informed Agents (Intensive Margin)
  - ETF almost universally decreases volume and increases earnings-day volatility
  - Introducing the ETF increases the pre-earnings drift
    - Even using market-adjusted returns, introducing the ETF decreases mean of r_c, which also increases the pre-earnings drift
    - ETF allows informed investors to bet more aggressively on private signals

Informed Investors Aggressiveness

Demand function: $G_0 + G_1 \mathbf{s}_j + G_{2,inf} \mathbf{p}$

		Share Informed		No ETF Present		ETF Present		
ρ	σ_n^2	no ETF	ETF	$G_{i,i}$	$G_{i,j}$	$G_{i,i}$	$G_{i,j}$	$G_{i,n}$
0.1	0.2	0.2	0.2	1.46	-0.19	1.75	0.00	-1.75
0.1	0.5	0.2	0.2	1.08	-0.10	1.23	0.00	-1.23
0.25	0.2	0.2	0.2	0.42	-0.03	0.20	0.00	-0.20
0.25	0.5	0.2	0.2	0.36	-0.03	0.20	0.00	-0.20

Notes: For $j \neq i$ and $i \neq n$

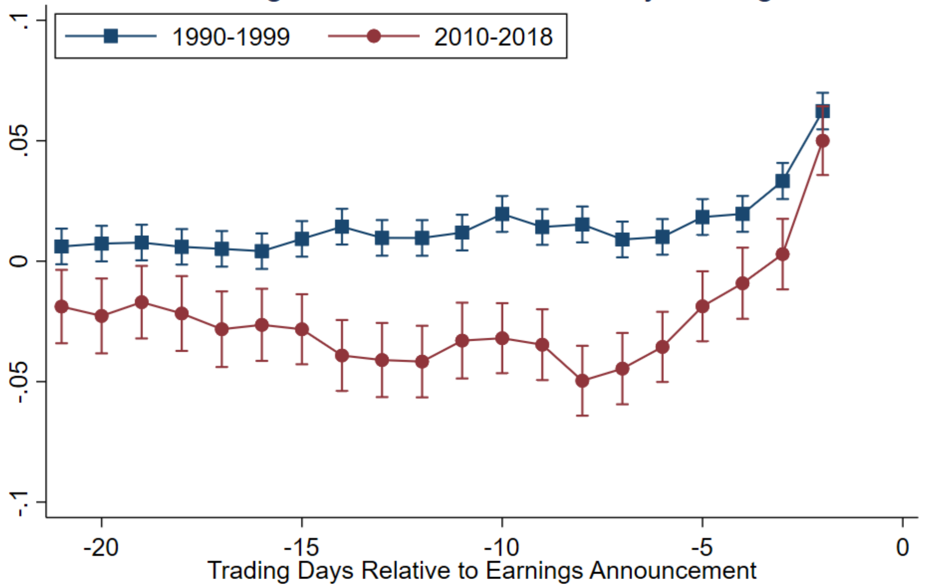
Effect of being added to the S&P 500

	Treated vs. In/Out of Index		
	Volume	Drift	Volatility
Treated	-0.813**	-0.00534**	0.0179**
	(0.369)	(0.002)	(0.007)
R-squared	0.098	0.083	0.176
Reduced Form	-2.396	-0.00965	0.0381
Model (fix c)	-0.438	-0.001	0.118
Model (fix inf=0.3)	-0.057	0.000	0.023

Notes: In "fix c" cost of becoming informed is set so 20% learn in equilibrium. $\rho = 0.25$, σ_f^2=0.2. Reduced form estimates are for a 10% increase in passive ownership. Regressions include month of index addition fixed effects.

Cross-sectional results

Trading Volume/Firm-Level Daily Average



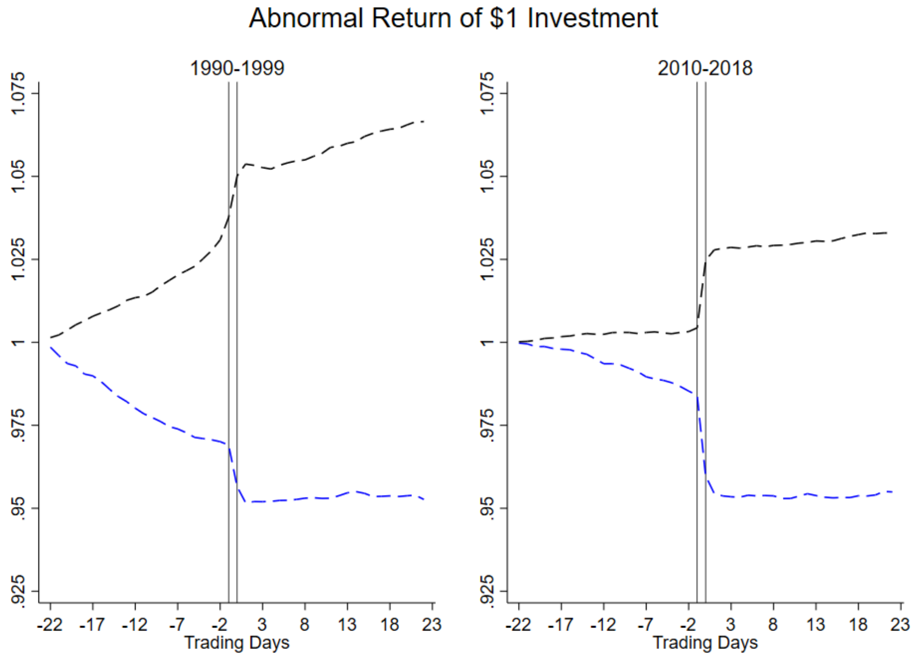
Total drop from t-22 to t-1: -2.17

$$\Delta AbnormalVolume_{i,t} = \alpha + \beta \times \Delta Passive_{i,t} + controls + \epsilon_{i,t}$$

	(1)	(2)	(3)
Inc. Passive	-12.81***	-16.09***	-23.96***
	(1.977)	(2.441)	(5.615)
Observations	239,859	239,859	239,859
R-squared	0.022	0.04	0.112
Controls	No	Yes	Yes
Firm FE	No	Yes	Yes
Weight	Eq.	Eq.	Val.

10% increase in passive ownership $\Rightarrow$ 50% of the average decline in pre-earnings trading volume.

Panel Newey-West standard errors with 4 lags. Firm-Level Controls: lagged passive ownership, lagged market capitalization, lagged idiosyncratic volatility, lagged institutional ownership, growth of market capitalization. All specifications include year/quarter fixed effects.



Abnormal Return of $1 Investment
1990-1999
2010-2018
1.075
1.05
1.025
1
.975
.95
.925
-22
-17
-12
-7
-2
3
8
13
18
23
Trading Days

$$Driftit = \begin{cases} \frac{1+r_{(t-30,t-1)}}{1+r_{(t-30,t)}} & \text{if } r_t > 0 \\ \\ \frac{1+r_{(t-30,t)}}{1+r_{(t-30,t-1)}} & \text{if } r_t < 0 \end{cases}$$

Why the asymmetry?

Consistency: larger values of drift always mean prices were more informative before the earnings announcement

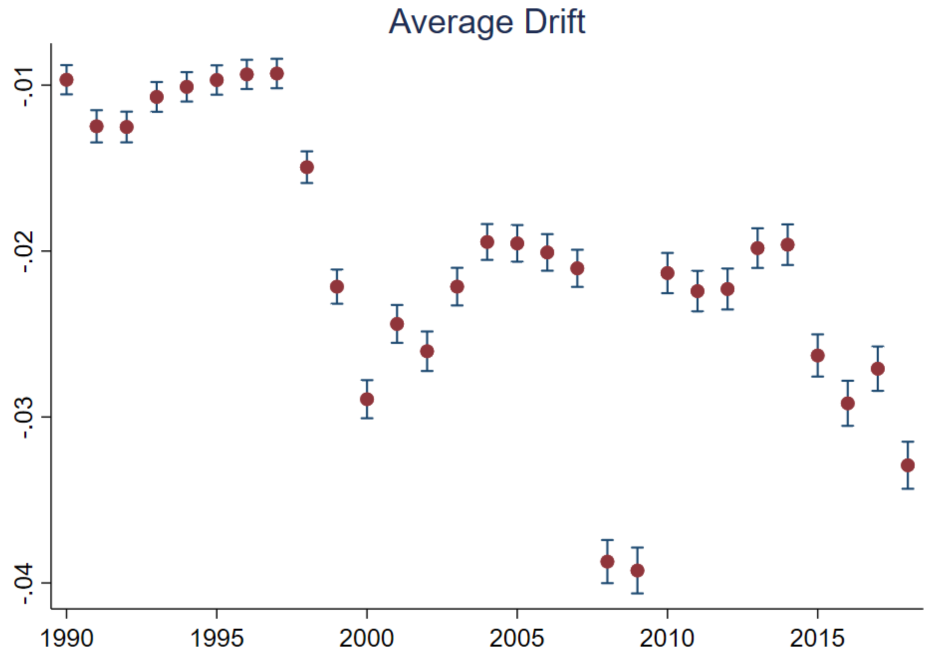
$$Driftit = \begin{cases} \frac{1+r_{(t-30,t-1)}}{1+r_{(t-30,t)}} & \text{if } r_t > 0 \\ \\ \frac{1+r_{(t-30,t)}}{1+r_{(t-30,t-1)}} & \text{if } r_t < 0 \end{cases}$$

Why the asymmetry?

Ex. $r_{(t-30,t-1)} = -1\%$ and $r_{(t-30,t)} = -5\%$

$\frac{1+r_{(t-30,t-1)}}{1+r_{(t-30,t)}} = 0.99/0.95 > 1$

$\frac{1+r_{(t-30,t)}}{1+r_{(t-30,t-1)}} = 0.95/0.99 < 1$

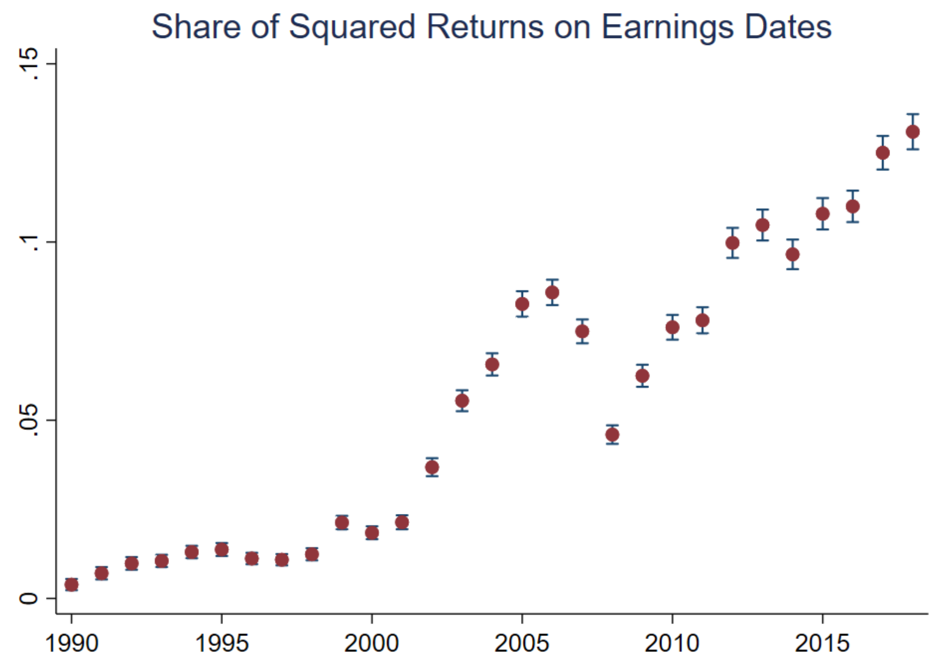

Average Drift
-.01
-.02
-.03
-.04
1990
1995
2000
2005
2010
2015

$$\Delta Drift_{i,t} = \alpha + \beta \times \Delta Passive_{i,t} + controls + \epsilon_{i,t}$$

	(1)	(2)	(3)
Inc. Passive	-0.0298**	-0.0322**	-0.0965***
	(0.012)	(0.013)	(0.028)
Observations	239,689	239,689	239,689
R-squared	0.02	0.045	0.063
Controls	No	Yes	Yes
Firm FE	No	Yes	Yes
Weight	Eq.	Eq.	Val.

10% increase in passive ownership $\Rightarrow$ 15% of the average decline in pre-earnings trading volume.

Panel Newey-West standard errors with 4 lags. Firm-Level Controls: lagged passive ownership, lagged market capitalization, lagged idiosyncratic volatility, lagged institutional ownership, growth of market capitalization. All specifications include year/quarter fixed effects.


Share of Squared Returns on Earnings Dates
0
.05
.1
.15
1990
1995
2000
2005
2010
2015

$$\Delta \frac{\Sigma_{\tau=1}^{4} r_{i,\tau,t}^2}{\Sigma_{\tau=1}^{252} r_{i,\tau,t}^2} = \alpha + \beta \times \Delta Passive_{i,t} + controls + \epsilon_{i,t}$$

	(1)	(2)	(3)
Inc. Passive	0.200***	0.106***	0.381**
	(0.030)	(0.035)	(0.171)
Observations	127,951	126,319	126,319
R-squared	0.011	0.03	0.035
Controls	No	Yes	Yes
Firm FE	No	Yes	Yes
Weight	Eq.	Eq.	Val.

10% increase in passive ownership $\Rightarrow$ 10-20% of the average increase in earnings-day volatility

Panel Newey-West standard errors with 4 lags. Firm-Level Controls: lagged passive ownership, lagged market capitalization, lagged idiosyncratic volatility, lagged institutional ownership, growth of market capitalization. All specifications include year/quarter fixed effects.

Index additions/deletions

S&P 500 index additions:

"Stocks are added to make the index representative of the U.S. economy, and is not related to firm fundamentals."

Two groups of control firms:

1. Same 2-digit SIC industry, similar market cap., not in the index
2. Same 2-digit SIC industry, similar market cap., already in the index

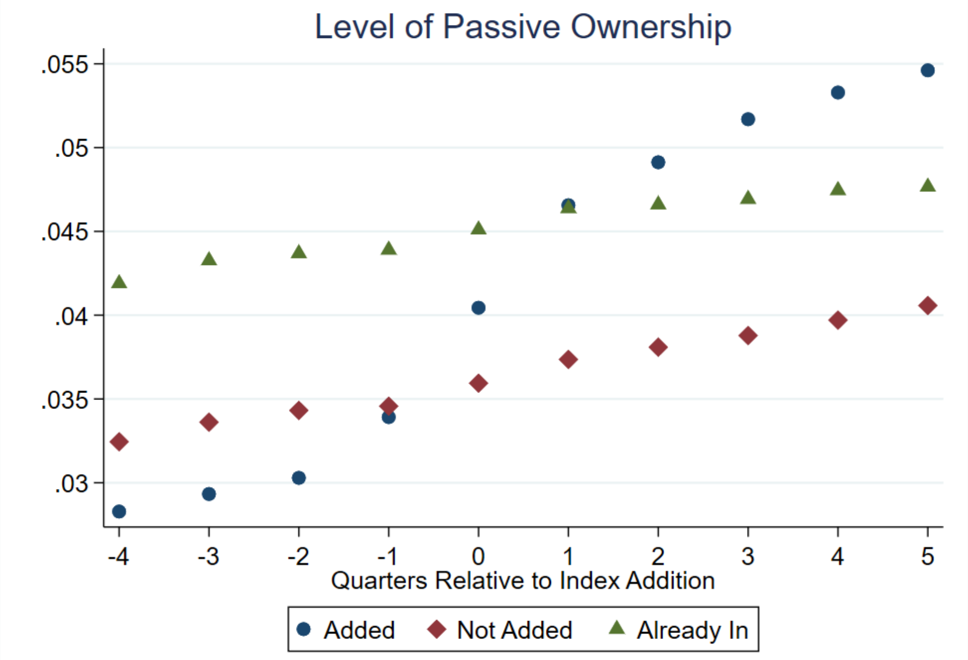
First stage:

$$\Delta Passive_{i,t} = \alpha + \beta \times Treated_{i,t} + \gamma_t + \epsilon_{i,t}$$

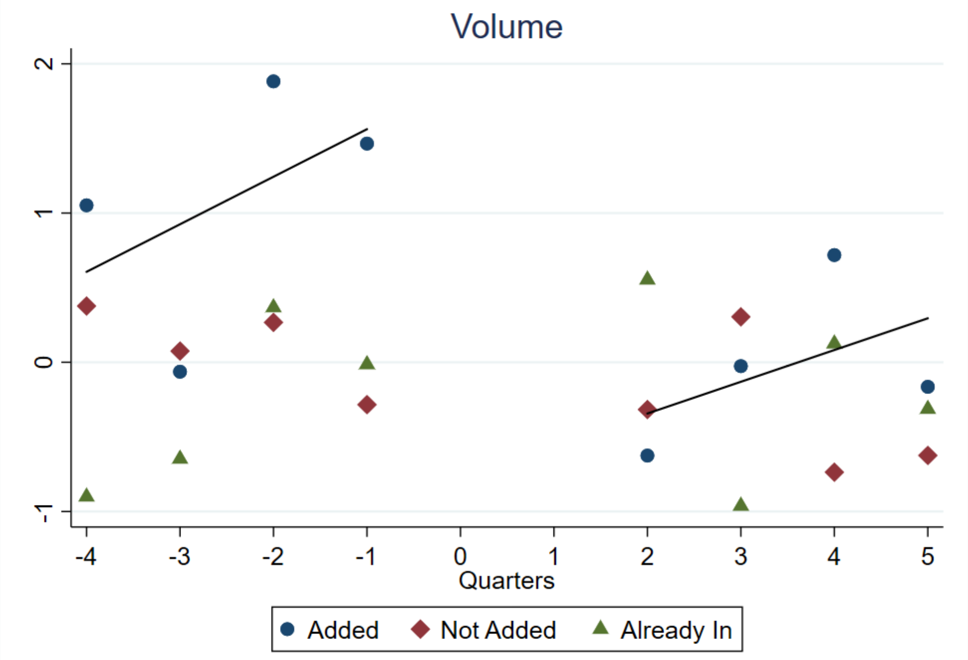
Second Stage :

$$\Delta Outcome_{i,t} = \alpha + \beta \times \Delta \widehat{Passive}_{i,t} + \gamma_t + \epsilon_{i,t}$$

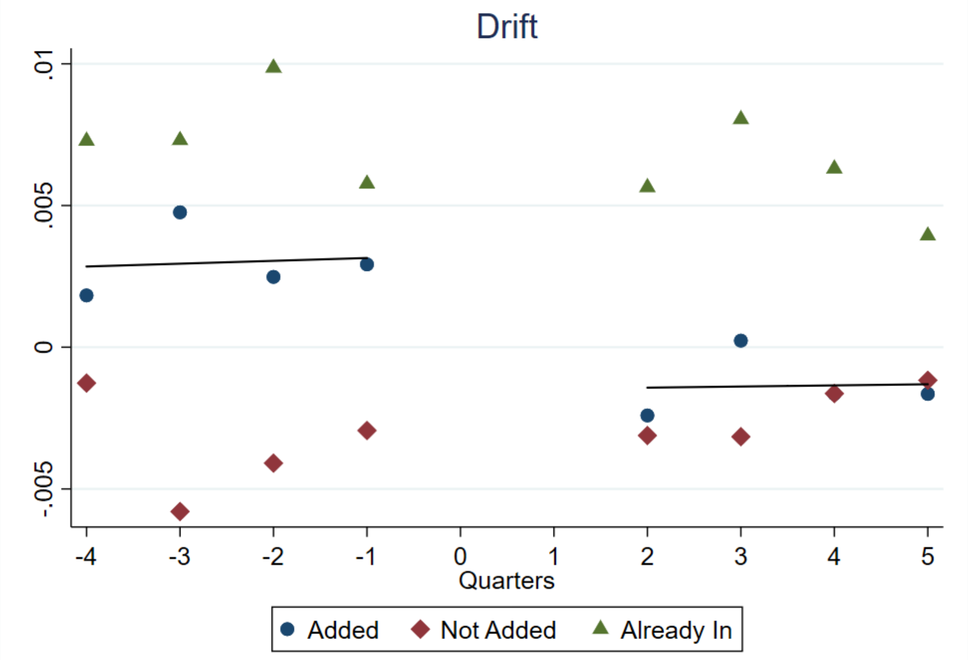
Where γ_t is a month-of-index-addition fixed effect



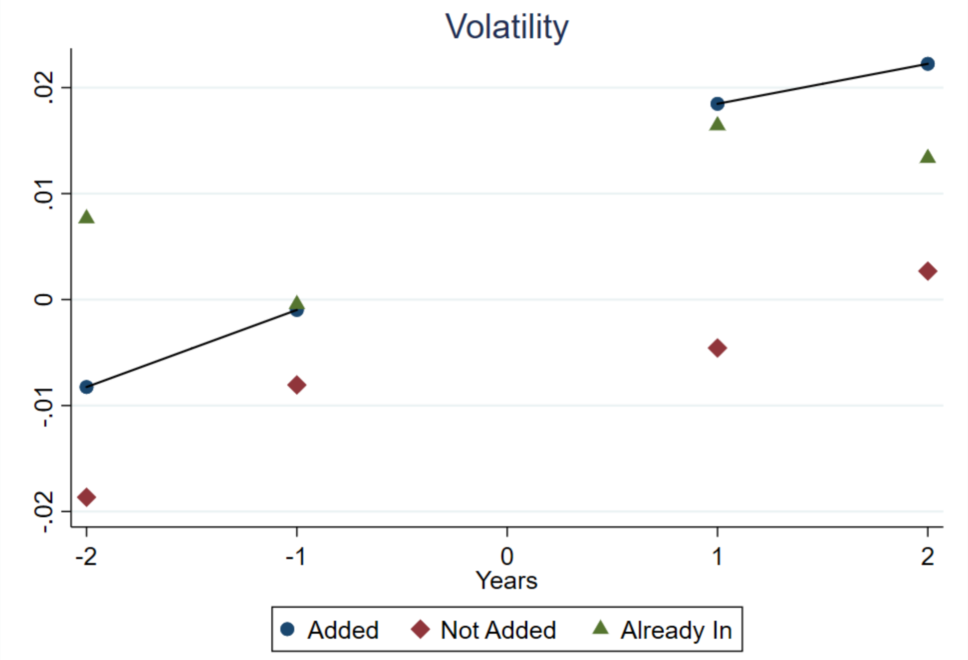
Level of Passive Ownership
.055
.05
.045
.04
.035
.03
-4
-3
-2
-1
0
1
2
3
4
5
Quarters Relative to Index Addition
Added
Not Added
Already In



Volume
2
1
0
-1
-4
-3
-2
-1
0
1
2
3
4
5
Quarters
Added
Not Added
Already In



Drift
.01
.005
0
-.005
-4
-3
-2
-1
0
1
2
3
4
5
Quarters
Added
Not Added
Already In



Volatility
.02
.01
0
-.01
-.02
-2
-1
0
1
2
Years
Added
Not Added
Already In

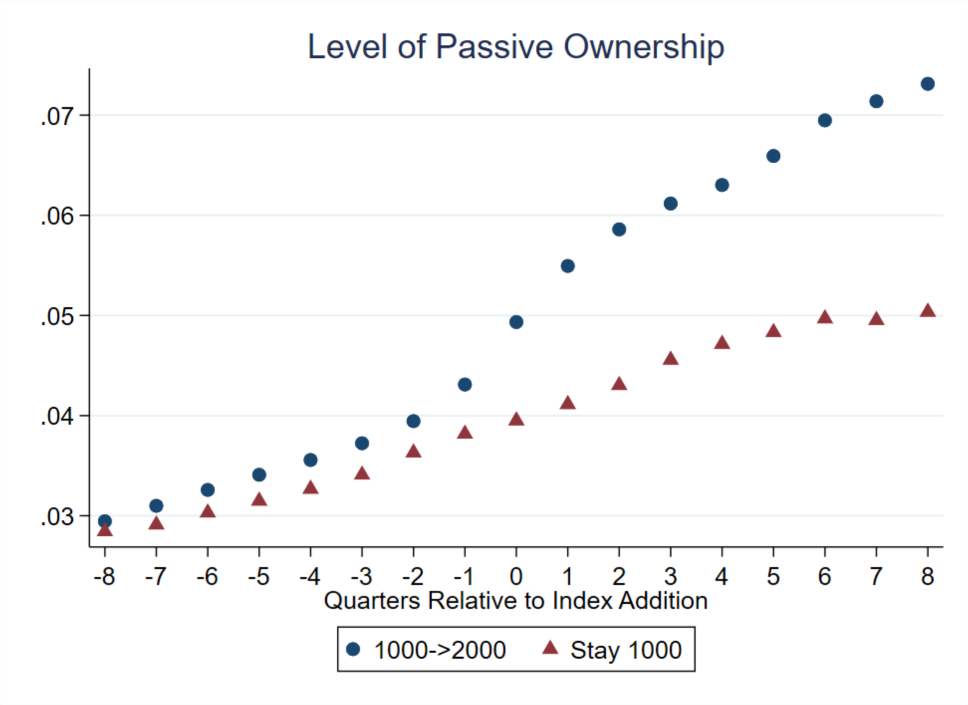
	Treated vs. In/Out of Index		
	Volume	Drift	Volatility
$\widehat{Inc.Passive}$	-51.08**	-0.322**	1.924**
	(22.550)	(0.140)	(0.768)
R-squared	0.098	0.074	0.115
Reduced Form	-23.96***	-0.0965***	0.381**

All specifications include month of index addition fixed effects. There are 419 treated firms, 906 control firms out of the S&P 500 index and 508 control firms in the S&P 500 index.

Russell 1000/2000 Index Reconstitution

Treated Group: Firms moving from the Russell 1000 to the 2000

Control group: Firms with June ranks 900-1000 that stay in the Russell 1000



Level of Passive Ownership
.07
.06
.05
.04
.03
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
Quarters Relative to Index Addition
1000->2000
Stay 1000

	Volume	Drift	Volatility
Inc. Passive	-44.71**	-0.285**	0.0109
	(20.740)	(0.125)	(0.411)
R-squared	0.099	0.126	0.073
Reduced Form	-23.96***	-0.0965***	0.381**

All specifications include month of index reconstitution fixed effects.
There are 216 treated firms and 158 control firms.

Information gathering

$$Outcome_{i,t} = \alpha + \beta \times \Delta Passive_{i,t} + controls + e_{i,t}$$

	# Analysts	Distance	Time	Downloads
Inc. Passive	-8.935***	1.557***	14.93*	-3.756***
	(0.824)	(0.244)	(8.692)	(1.185)
Observations	99,004	96,365	79,131	96,380
R-squared	0.1	0.062	0.065	0.233
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Weight	Eq.	Eq.	Eq.	Eq.

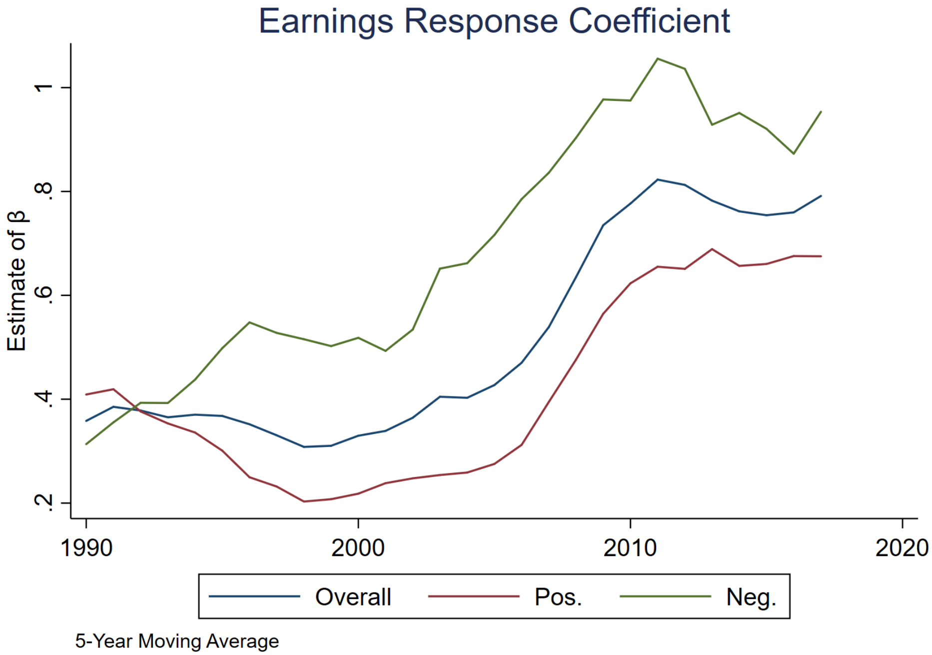
Panel Newey-West standard errors with 4 lags. Firm-Level Controls: lagged market capitalization, lagged idiosyncratic volatility, lagged institutional ownership, growth of market capitalization. Distance is the absolute deviation of earnings from the consensus estimate, normalized by the price. Time is months since the analyst's last update. Downloads is total non-robot downloads from the SEC server log.

Earnings Response Regression:

$$r_{i,t} = \alpha + \beta \times SUE_{i,t} + controls + \epsilon_{i,t}$$

Earnings Response Regression:

$$r_{i,t} = \alpha + \beta_1 \times SUE_{i,t} \times \mathbf{1}_{SUE_{i,t}>0} +$$
$$\beta_2 \times |SUE_{i,t}| \times \mathbf{1}_{SUE_{i,t}<0} + controls + \epsilon_{i,t}$$


Earnings Response Coefficient
Estimate of β
1
.8
.6
.4
.2
1990
2000
2010
2020
Overall
Pos.
Neg.
5-Year Moving Average

$$r_{i,t} = \alpha + \beta_1 \times SUE_{i,t} + \beta_2 \left(SUE_{i,t} \times Passive_{i,t}\right) + controls + \epsilon_{i,t}$$

	(1)	(2)	(3)	(4)
SUE	0.00912***		0.00314***	
	(0.000)		(0.000)	
SUE > 0		0.00745***		0.00369***
		(0.000)		(0.000)
SUE < 0		-0.00394***		0.000128
		(0.000)		(0.001)
SUE x passive	0.0545***		0.0435***	
	(0.003)		(0.007)	
SUE > 0 x passive		0.0217***		0.0246***
		(0.003)		(0.006)
SUE < 0 x passive		-0.0411***		-0.0196*
		(0.004)		(0.011)
Observations	415,961	415,961	415,961	415,961
R-squared	0.068	0.069	0.039	0.041
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Weight	Eq.	Eq.	Val.	Val.

Standard errors double clustered at the firm and year level. Firm-Level Controls: lagged market capitalization, lagged idiosyncratic volatility, lagged institutional ownership.

Conclusion

New way to measure effect of passive ownership on price informativeness

1. Time-series decrease in average price informativeness
2. Correlation between price informativeness and passive ownership
3. Causal evidence with index additions/deletions
4. Decreased information gathering for stocks with high passive ownership