Exchange-traded funds' expansion and their unintended effects over underlying stocks

Volatility, liquidity and efficiency

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All evil rooted in one product ?

The Silent Road to Serfdom : Why Passive Investing is Worst Than Marxism – Note by I. Fraser-Jenkins, *Sanford C. Bernstein & Co.*, 2016

- Abstract : the shift of a growing share of capital markets towards passive, index-based investing prevents the efficient reallocation of capital from overpriced to underpriced companies. Active management and the related research generate positive externalities.
- Are this concern and conclusion justified ?
  - What are the author's interests ? This is from the quantitative research of an asset management company, also running retail mutual funds.
  - In general:

    Everything which is exaggerated is insignificant. *Talleyrand*

Economics

Are Index Funds Communist?

There won't be much left to do once the investment robots perfect capitalism.

By Matt Levine
August 24, 2016, 9:05 PM GMT+2

Just some statues of Karl Marx. *Photographer: Hannelore Foerster/Getty Images.*

Matt Levine is a Bloomberg Opinion columnist covering finance. He was an editor of Dealbreaker, an investment banker at Goldman Sachs, a mergers and acquisitions lawyer at Wachtell, Lipton.

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> In a note titled "The Silent Road to Serfdom: Why

Figure 1: Matt Levine, Bloomberg Opinion, 24.08.2016, available at: `https://www.bloomberg.com/opinion/articles/2016-08-24/are-index-funds-communist#footnote-1472053794479`

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Research field & focus

General concerns expressed

- What effects are caused through index-tracking securities and **especially ETFs** on underlying securities ?
- Is there a new risk investors and regulators should become aware of ?

Warning

Focusing on observable indicators of the risk and loss of efficiency is needed: choice based on existing research strategies.

Research questions

Three aspects are treated over a broad and long sample of stocks:

1. Do ETFs increase underlying stocks' volatility over the short term ?
2. Do ETFs divert the liquidity and thus decrease it at the individual security level ?
3. Are there signs ETFs make prices noisier, hence less efficient ?

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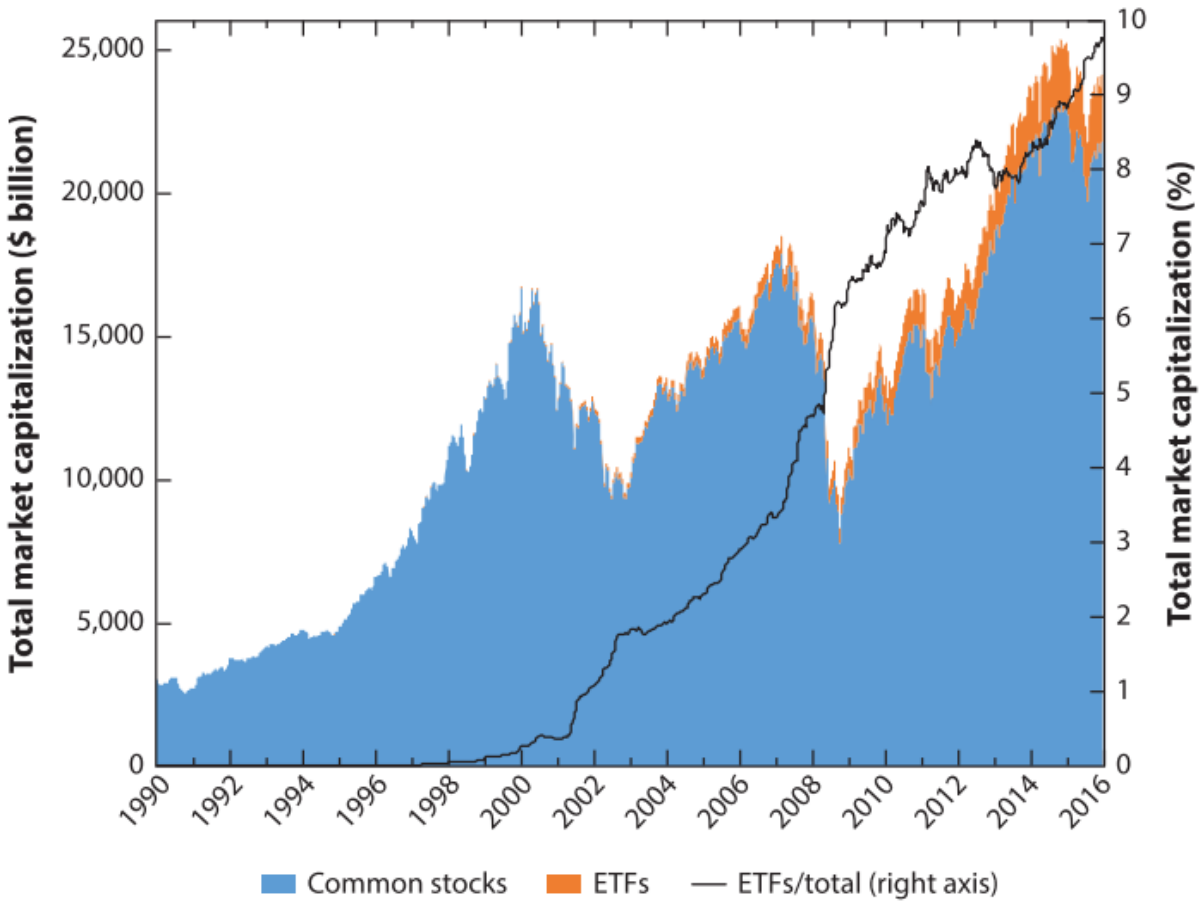
Outline

Capitalization worldwide

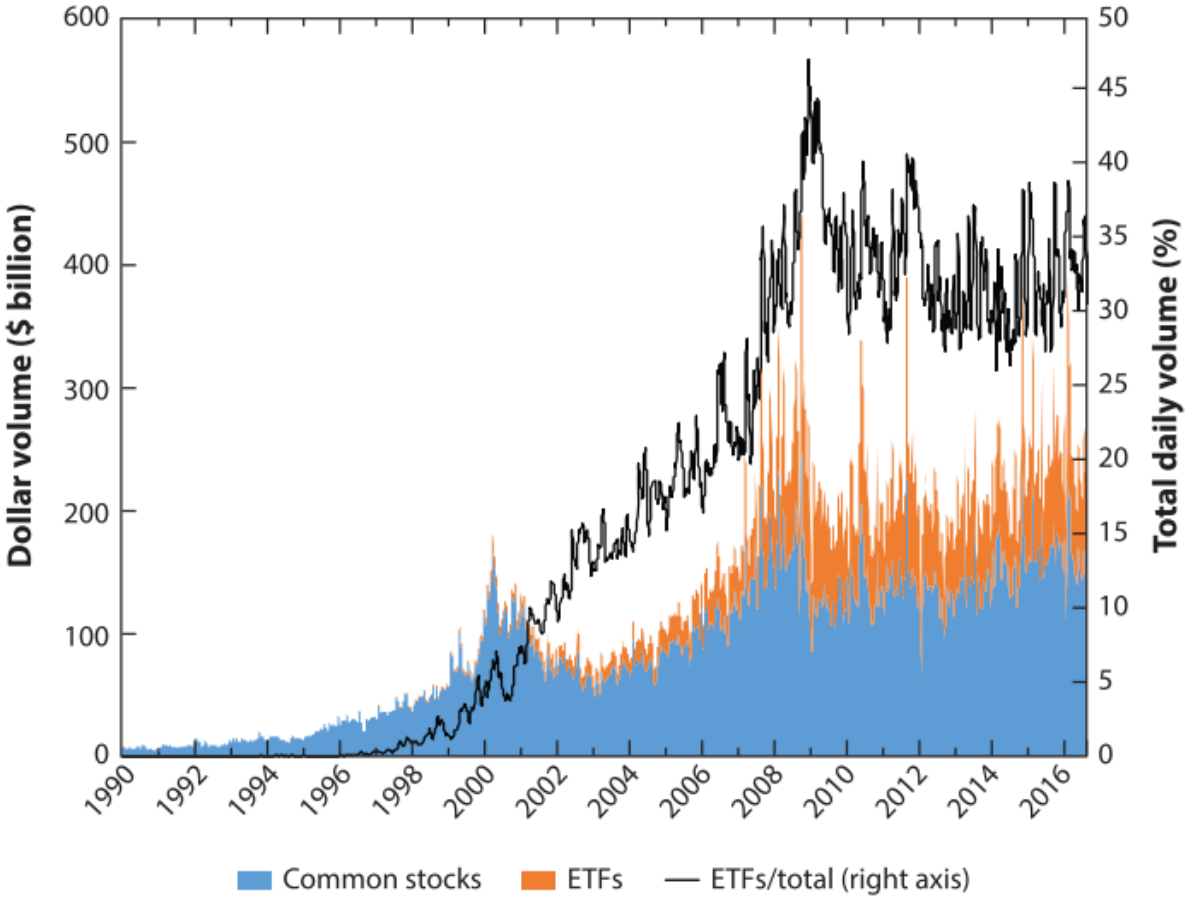
Figure 2: Comparison of total stock market vs. ETF capitalization[1]



[1] Ben-David, F. Franzoni, and Moussawi 2017, p. 172.

Trading volume, share of total

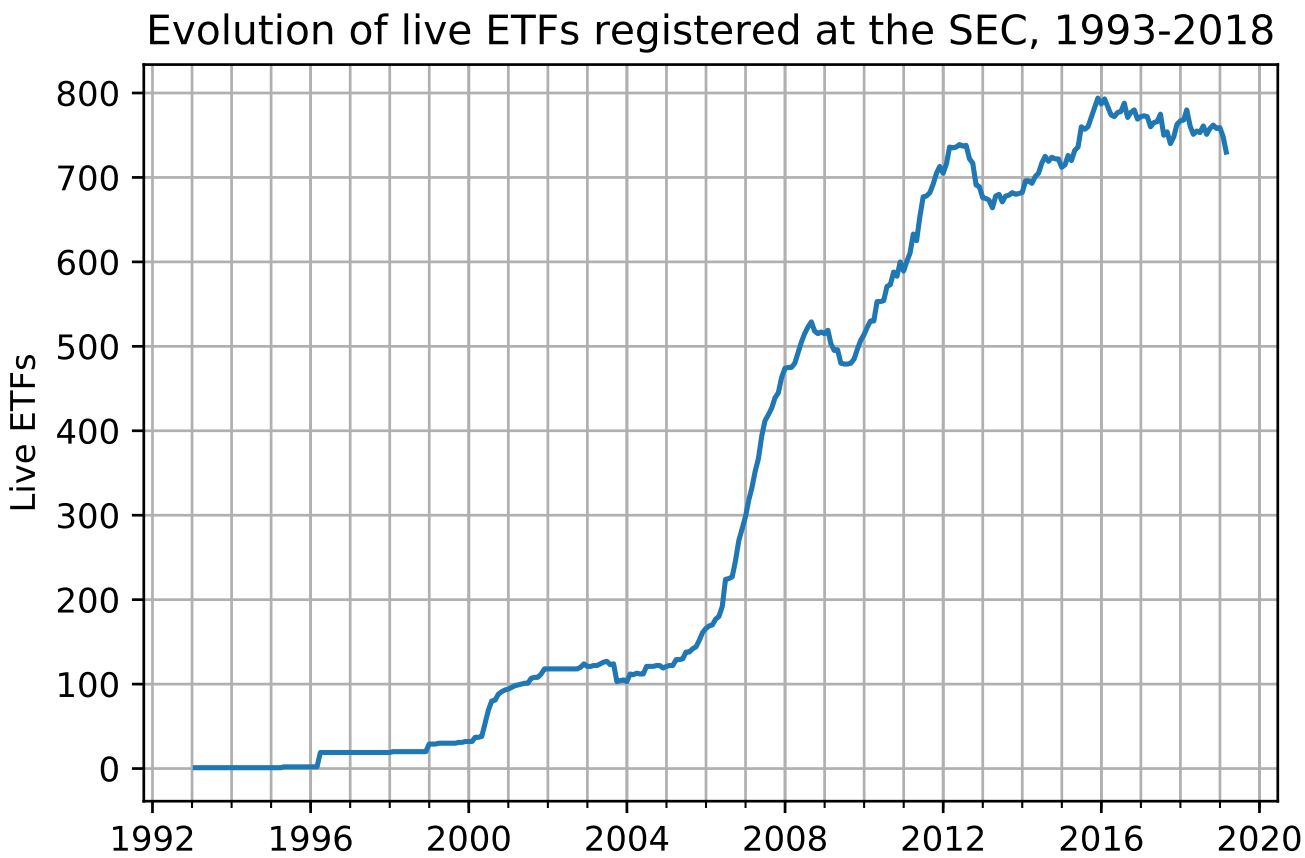
Figure 3: Comparison of total stock market vs. ETF-related daily trading volume[2]



[2] Ben-David, F. Franzoni, and Moussawi 2017, p. 173.

Entities listed in the U.S.

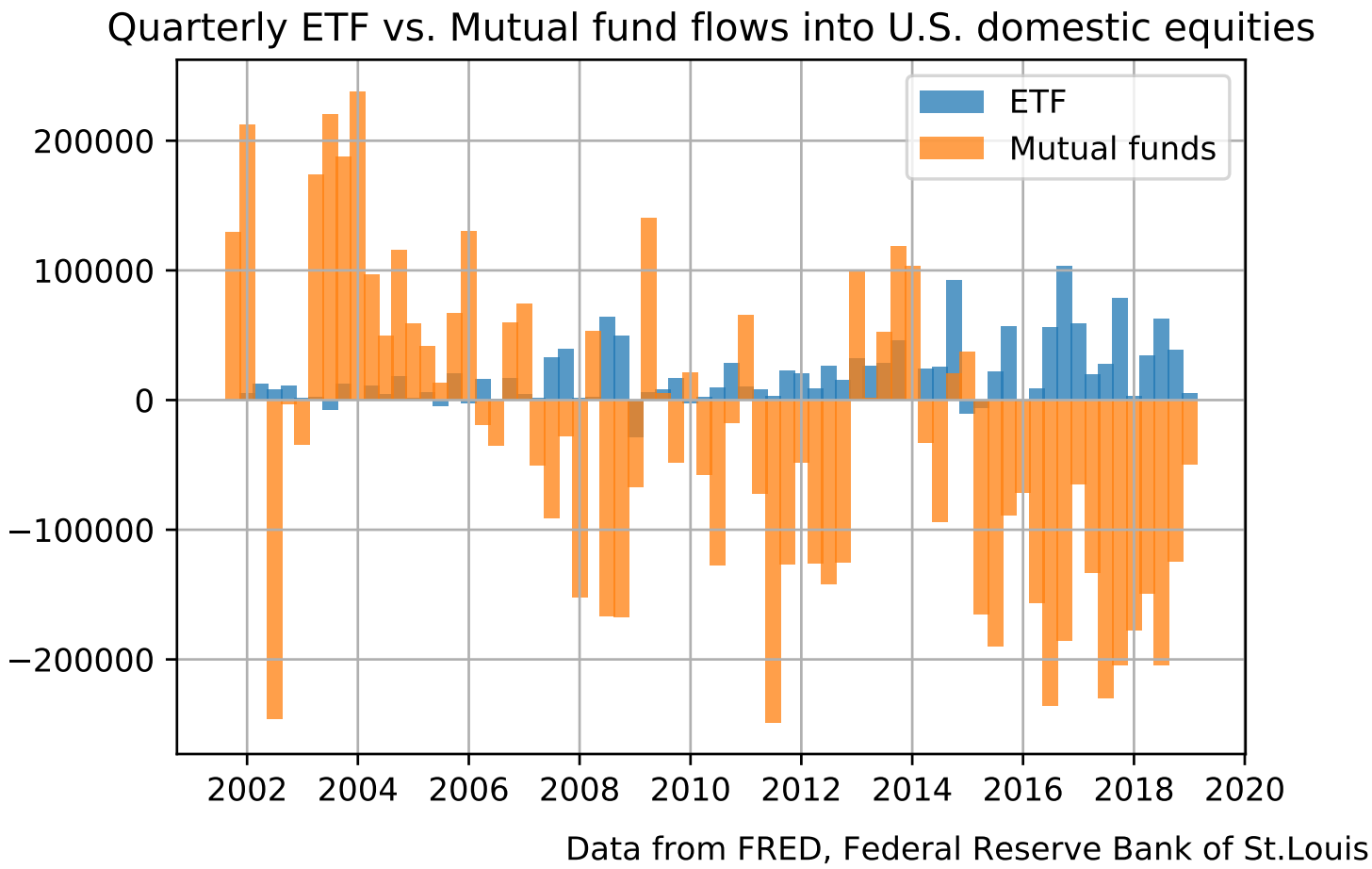
Figure 4: Number of ETFs included over the sample period[3]



[3]Data from *Eikon* fund screener, only physical- and optimized-replication ETFs listed in the U.S.

Comparing flows in U.S. equity

Figure 5: Shift towards ETF investments and steady outflows from mutual funds



Concept and history of exchange-traded funds

- Goal at the inception : track a value-weighted equity index using physical replication.
  - First ETF ever listed : Toronto Stock Exchange Index Participation Units, introduced March 1990
  - First ETF listed in the U.S. : State Street SPDR S&P 500 ETF, a.k.a. "SPY", introduced January 1993.
  - As of June 21, 2019, SPY is the largest ETF by assets under management: USD 266 B.
- A mixture of existing products:
  - As (open-end) mutual funds:
    - release their Net Asset Value and their holdings
    - registered as 1940 Act investment companies $\rightarrow$ creation/redemption of shares
  - As index-funds : track an index built with underlying securities and/or derivatives and following rules defined in a prospectus
  - As closed-end funds : traded throughout the day on an exchange

Special features

- the intraday NAV is spread out every 15 seconds, or more often.
- **standardized in-kind or cash creation/redemption process involving authorized participants' arbitrage.**

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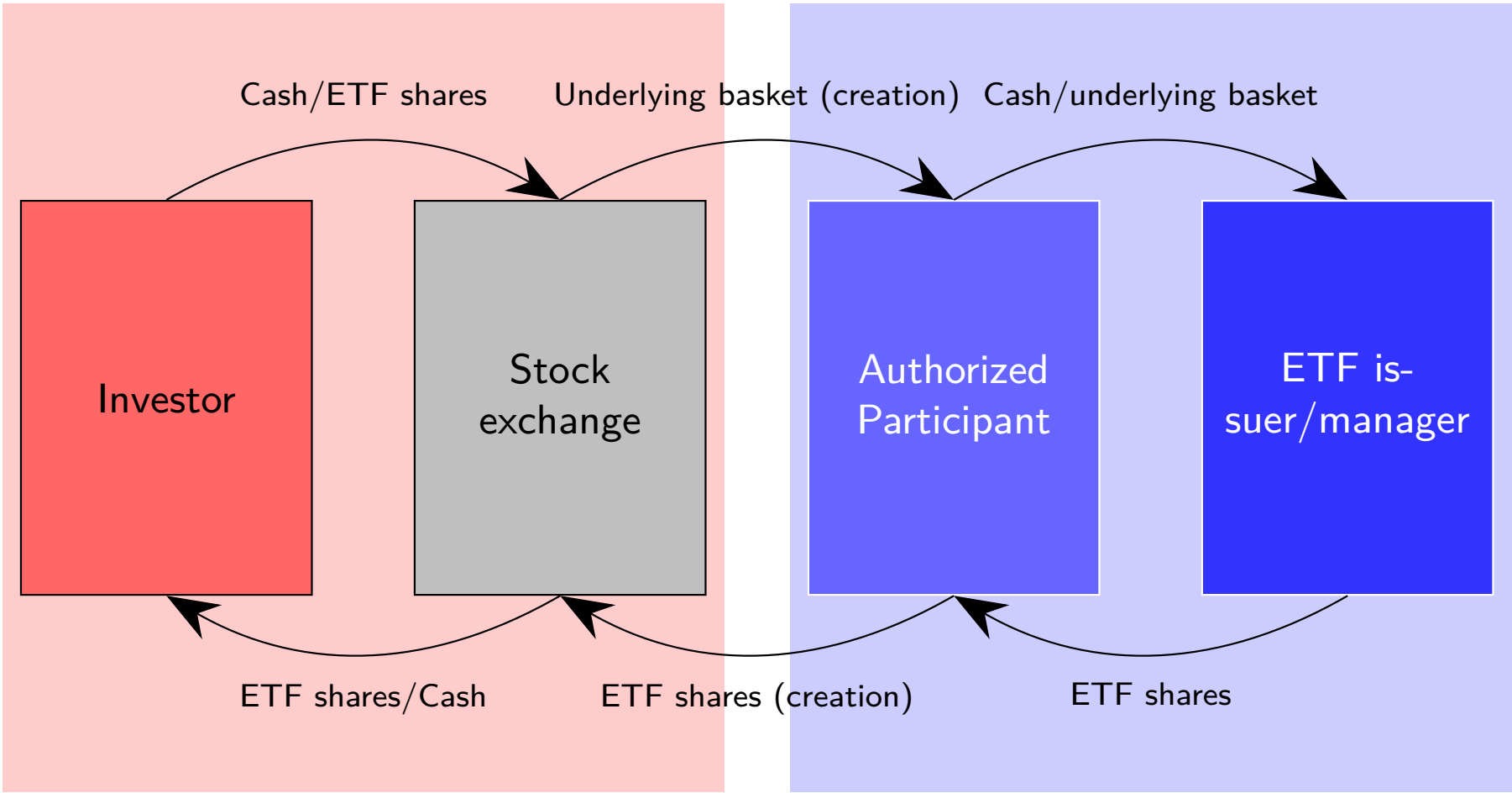
ETF pricing mechanism and trading



Concerns expressed about risks conveyed through ETFs

- Liquidity : apart from idiosyncratic events (e.g. 2010 Flash Crash), ETFs in general are very liquid thanks to the arbitrage mechanism. E.g. Ben-David, F. A. Franzoni, and Moussawi (2018) show their turnover is higher than stocks.
- What about underlying securities' liquidity ?

Under regulatory scrutiny

This asset category started to worry regulators less than a decade ago, without leading them to clear conclusions nor actions.

> *[ETFs] may transmit or amplify financial shocks originating elsewhere.*
> *[. . .]*
> *ETFs [. . .] could also potentially accelerate or amplify movements in markets during market turbulence, thus reducing market liquidity.*
>
> *U.S. Dept. of Treasury, Office of Financial Research, September 2013*

Selection of academic contributions about ETFs' effects I

- Empirical contributions
  - Agarwal et al. (2018) : quasi-natural experiments with (1) trading halts and (2) Russell indices to show an increase of the *commonality* of stock liquidity with respect to a highly ETF-owned basket of other stocks.
  - Da and Shive (2018) :
    - ETFs' turnover, but not ownership, is positively linked with the comovement of their component stocks.
    - Stock-level analysis : average turnover of ETF shareholders predictscomovement with the market; mean reversion due to ETF flows and comovement is thus *excessive*
  - Leippold, Su, and Ziegler (2015) (including a model) : introduction of equity ETF increases the average correlation among index components as well as non-index components, more than index futures did.
  - Krause, Ehsani, and Lien (2014) (idem) : variance spillovers between ETFs and their largest component stocks are positively correlated with liquidity, ETF ownership share, ETF flows and their market capitalization; the relationship strengthens for small stocks.
- Theoretical models
  - Bhattacharya and O'Hara (2017) : as ETFs provide access to otherwise illiquid securities, ETF-related information distorts those securities' prices. ("tail wagging the dog" in authors' words)
  - Chinco and Fos (2016) : ETF rebalancing cause subsequent rebalancing cascades reaching stocks held together in ETF portfolios; the direction of a stock's move is impossible to predict.

Selection of academic contributions about ETFs' effects II

Most relevant

Part of the methodology in the following articles has served for this thesis, which replicates and extends their results:

- Ben-David, F. A. Franzoni, and Moussawi (2018)
  - **Monthly volatility impact of ETF ownership** : *liquidity trading hypothesis* vs. *liquidity buffer hypothesis*
  - Robust IV setting using exogenous index membership changes (Russell 3000)
  - **Reversion of prices after a shock** : *liquidity trading hypothesis* vs. *price discovery hypothesis*
  - Price impact of ETF flows using trade-level data
  - Correction of mispricing (arbitrage) and intraday volatility
  - Asset pricing consequence : a risk premium for the volatility caused by ETF interest.
- Israeli, Lee, and Sridharan (2017)
  - Testing two hypotheses showing that ETF appeal to noise traders, who migrate from individual securities, while informed traders find less liquidity on underlying stocks.
    1. Trading costs increasing with ETF ownership
    2. Deterioration of the informational efficiency of stock prices
  - **Proxies for liquidity : bid-ask spread estimator and Amihud (2002) illiquidity ratio**
  - Proxies for firm-level informational efficiency : return synchronicity, future earnings response and analyst coverage

Data coverage

- Period : August 1999 – December 2018
- Frequency:
  - Daily price, volume and VWAP series
  - Monthly ETF and other fund holdings, and controls
  - Quarterly resampling for variance ratios (estimation of efficiency effects)
- Analysis performed at stock-level over separate samples:
  - on a U.S. stocks sample : 4784 companies
  - on an international sample of stocks: 16417 companies from Europe (EU25 + EFTA), Canada, Japan, BRICS and emerging countries (Israel, Turkey, South Korea, Hong Kong, Taiwan)
- Exchange-traded funds :
  - 3601 live funds as of 2019 Q1, from the *Lipper* database
  - Physical or optimized replication only
  - Countries of incorporation not limited to U.S. :
    - Americas (Canada, Mexico, Brazil, Colombia)
    - Europe (France, Germany, Switzerland, Ireland, Spain, Greece, Sweden, Poland, Russia)
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Methodology

$$\text{Volatility}_{i,t} = \beta_0 + \beta_1 \text{ETF\_ownership}_{i,t} + B_C^{\intercal} \text{Controls}_{i,t} + \alpha_i + \gamma_t + \epsilon_{i,t} \quad (1)$$

with:

$$\text{Volatility}_{i,t} = \sqrt{\frac{1}{N\_d_{i,t} - 1} \sum_{d=1}^{N\_d_{i,t}} (r_{i,d} - \bar{r}_{i,t})^2}$$

$$\text{ETF\_Ownership}_{i,t} = \frac{\sum_{f=1}^{N_f} \#\_\text{AdjShares\_Held}_{f,i,t} \cdot B_f}{\#\_\text{Shares\_Out}_{i,t}}$$

$\forall i = 1 : N_i$ (stocks), $t = 1 : T$ (periods) with $B_f = 1$ if fund f is an ETF, 0 else.
Controls:

- Size, Value, Momentum
- Liquidity
- Gross profitability
- Volatility lags
- Other institutional ownership : mutual funds, hedge funds, pension funds

Estimation results : U.S.

Table 1: U.S. Sample : Exchange-Traded Fund aggregate ownership share and the volatility of underlying securities' daily returns

	Baseline	**Controls +lags**	**O'ship controls**	**Standardized**
Intercept	0.2964***	0.0488***	0.0494***	-0.0154
PctETF$_{t-1}$	0.2470***	0.0385***	0.0395***	0.0081***
(t-stat)	(8.2542)	(5.9800)	(6.2940)	(6.8269)
log(**MarketCap**$_{t-1}$)	-0.0127***	-0.0018***	-0.0018***	-0.0102***
1/**Close**$_{t-1}$	0.0988***	0.0251***	0.0251***	0.1452***
$(BE/ME)_{t-1}$	5.552e-07**	7.393e-07***	1.038e-06***	5.019e-06***
Past12to1Mret.$_{t-1}$	-0.0003	-0.0004*	-0.0004*	-0.0024*
AmihudRatio$_{t-1}$		3.4590***	3.4611***	19.952***
BidAskSpread$_{t-1}$		0.1750***	0.1748***	1.0060***
G. Profitab.$_{t-1}$		-0.0005***	-0.0005***	-0.0028***
Volatility lags ($t-4$ to $t-1$)		Yes	Yes	Yes
Other funds ownership			Yes	Yes
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
No. Observations	413304	297405	297399	297247
R^2	0.0545	0.1592	0.1593	0.1594
R^2 **(Within)**	0.0565	0.1353	0.1351	0.1348
R^2 **(Between)**	0.2009	0.7626	0.7625	0.7616
R^2 **(Overall)**	0.1515	0.2716	0.2715	0.2710
F-statistic	4717.9	4643.9	3718.4	3718.6
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Estimation results : International

Table 2: International Sample : Exchange-Traded Fund aggregate ownership share and the volatility of underlying securities' daily returns

	Baseline	Controls + Vol. lags	Inst. o'ship control	Standardized
Intercept	0.0582***	0.0283***	0.0283***	0.6235***
PctETF$_{t-1}$	0.0169*	0.0072	0.0070	0.0028
(t-stat)	(1.8226)	(1.0225)	(0.9781)	(0.9781)
log(**MarketCap**$_{t-1}$)	-0.0015***	-0.0008***	-0.0008***	-0.0310***
1/**Close**$_{t-1}$	0.0045***	0.0015	0.0015	0.0585
$(BE/ME)_{t-1}$	3.446e-05***	2.54e-05***	2.538e-05***	0.0010***
Past12to1Mret.$_{t-1}$	0.0005*	0.0001	0.0001	0.0052
AmihudRatio$_{t-1}$		0.0250	0.0250	0.9984
BidAskSpread$_{t-1}$		0.0262***	0.0262***	1.0496***
G. Profitab.$_{t-1}$		-0.0001	-0.0001	-0.0056
Volatility lags ($t-4$ to $t-1$)		Yes	Yes	Yes
Mutual funds ownership			Yes	Yes
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
No. Observations	1516791	1319966	1319966	1319966
R-squared	0.0070	0.1729	0.1729	0.1729
R-Squared (Within)	0.0148	0.2100	0.2100	0.2100
R-Squared (Between)	-0.0101	0.7081	0.7079	0.7079
R-Squared (Overall)	-0.0208	0.3261	0.3260	0.3260
F-statistic	2118.7	2.274e+04	2.099e+04	2.099e+04
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Methodology

$$\text{PctBidAskSpread}_{i,t} = \beta_0 + \beta_1 \text{ETF\_ownership}_{i,t-1} + B_C^{\intercal} \text{Controls}_{i,t-1} + \alpha_i + \gamma_t + \epsilon_{i,t} \quad (2)$$

with:

$$\text{Pct\_BidAskSpread}_{i,t} = \frac{\text{Ask}_{i,t} - \text{Bid}_{i,t}}{\frac{\text{Ask}_{i,t} + \text{Bid}_{i,t}}{2}}$$

$$\text{Illiq}^{\text{Num}}{}_{i,t} = \beta_0 + \beta_1 \text{ETF\_ownership}_{i,t-1} + \beta_2 \text{Illiq}^{\text{Denom}}_{\text{i,t}} + B_C^{\intercal} \text{Controls}_{i,t-1} + \alpha_i + \gamma_t + \epsilon_{i,t} \quad (3)$$

Amihud (2002) illiquidity ratio:

$$\text{Illiq}_{i,t} = \frac{1}{N\_d_{i,t}} \sum_{d=1}^{N\_d_{i,t}} \frac{\mid r_{i,d} \mid}{\text{Volume\_\$}_{i,d}} = \frac{1}{N\_d_{i,t}} \sum_{d=1}^{N\_d_{i,t}} \frac{\mid r_{i,d} \mid}{\text{Volume}_{i,d} \cdot \text{VWAP}_{i,d}}$$

Modified version following Israeli, Lee, and Sridharan (2017):

$$\text{Illiq}^{\text{Num}}{}_{i,t} = \frac{1}{N\_d_{i,t}} \sum_{d=1}^{N\_d_{i,t}} \mid r_{i,d} \mid \qquad \text{Illiq}^{\text{Denom}}{}_{i,t} = \frac{1}{N\_d_{i,t}} \sum_{d=1}^{N\_d_{i,t}} \text{Volume\_\$}_{i,d}$$

Estimation results : U.S.

Table 3: U.S. Sample : Exchange-Traded Funds' aggregate ownership share and underlying securities' liquidity

	Amihud ratio		**Bid-Ask spread**	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.3424***	0.3425***	0.1055***	0.1057***
PctETF$_{t-1}$	0.1809***	0.1810***	0.0074	0.0073
(t-stat)	(7.5170)	(7.5198)	(0.8731)	(0.8642)
log(**MarketCap**$_{t-1}$)	-0.0153***	-0.0153***	-0.0049***	-0.0049***
$(BE/ME)_{t-1}$	2.812e-07	2.925e-07	-4.261e-08	-4.149e-08
Amihud Denominator	1.335e-11***	1.335e-11***		
Other funds ownership				Yes
Volatility$_{t-1}$			0.0498***	0.0498***
Other funds ownership				Yes
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
Dep. Variable	Amihud Numerator	Amihud Numerator	Bid-Ask Spread	Bid-Ask Spread
No. Observations	436359	436352	335170	335164
R-squared	0.0326	0.0326	0.0510	0.0510
R-Squared (Within)	0.0448	0.0448	0.0659	0.0660
R-Squared (Between)	0.1897	0.1898	0.5568	0.5572
R-Squared (Overall)	0.1291	0.1291	0.1879	0.1881
F-statistic	3643.1	2914.2	4445.9	2543.2
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Estimation results : International

Table 4: International Sample : Exchange-Traded Funds' aggregate ownership share and underlying securities' liquidity

	Amihud ratio		Bid-Ask spread	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.0776***	0.0776***	0.1446***	0.1446***
PctETF$_{t-1}$	0.0038	0.0038	0.0613***	0.0610***
(t-stat)	(0.5715)	(0.5817)	(4.9367)	(4.9518)
log(**MarketCap**$_{t-1}$)	-0.0058***	-0.0058***	-0.0061***	-0.0061***
$(BE/ME)_{t-1}$	0.0012	0.0012	1.107e-05	1.108e-05
log(**AmihudDenominator**$_t$)	0.0042***	0.0042***		
Volatility$_{t-1}$			0.1772***	0.1772***
Other funds ownership		Yes		Yes
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
Dep. Variable	AmihudNumerator	AmihudNumerator	PctBidAskSpread	PctBidAskSpread
No. Observations	1465561	1465555	1124265	1124260
R-squared	0.0285	0.0285	0.0227	0.0227
R-Squared (Within)	0.0287	0.0287	0.0375	0.0375
R-Squared (Between)	-0.3627	-0.3626	0.1785	0.1785
R-Squared (Overall)	-0.0089	-0.0089	0.0956	0.0956
F-statistic	1.064e+04	8514.8	6433.1	4289.0
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Methodology

$$VR_{iq} = \beta_0 + \beta_1 \text{ETF\_ownership}_{i,q-1} + B_C^{\intercal} \text{Controls}_{i,q-1} + \alpha_i + \gamma_q + \epsilon_{i,q} \quad (4)$$

with:

$$VR_{i,t} = \frac{Var(r_{5,i,t})}{5 \cdot Var(r_{1,i,t})}$$

$$absVR_{iq} = \beta_0 + \beta_1 \text{ETF\_ownership}_{i,q-1} + B_C^{\intercal} \text{Controls}_{i,q-1} + \alpha_i + \gamma_q + \epsilon_{i,q} \quad (5)$$

with:

$$absVR_{i,t} = |VR_{i,t} - 1|$$

Estimation results : U.S.

Table 5: U.S. Sample : Exchange-Traded Funds' aggregate ownership share and weekly mean reversion of underlying securities

	absVR		VR	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.8523***	0.8532***	0.8735***	0.8579***
PctETF$_{t-1}$	0.0096	0.0218	-0.1205	-0.1005
(t-stat)	(0.1484)	(0.3373)	(-1.4081)	(-1.1660)
log(**MarketCap**$_{t-1}$)	-0.0248***	-0.0248***	0.0044	0.0052
1/**Close**$_{t-1}$	0.1276***	0.1277***	-0.2002***	-0.1986***
AmihudRatio$_{t-1}$	9.9267***	9.9488***	-15.135***	-15.117***
BidAskSpread$_{t-1}$	0.9314***	0.9286***	-1.2190***	-1.2179***
$(BE/ME)_{t-1}$	-3.498e-06	4.433e-05***	-1.257e-05	6.777e-05***
Past12to7Mret.$_{t-1}$	0.0003	-9.153e-05	-0.0006	-0.0013**
G. Profitab.$_{t-1}$	0.0011	0.0012	0.0064	0.0062
Other funds ownership		Yes		Yes
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
No. Observations	126851	126847	126851	126847
R-squared	0.0079	0.0081	0.0040	0.0041
R-Squared (Within)	0.0106	0.0106	0.0040	0.0042
R-Squared (Between)	0.2814	0.2820	0.1376	0.1385
R-Squared (Overall)	0.0318	0.0320	0.0163	0.0165
F-statistic	123.79	91.734	61.843	46.323
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Estimation results : International

Table 6: International Sample : Exchange-Traded Funds' aggregate ownership share and weekly mean reversion of underlying securities

	absVR		VR	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.9251***	0.9250***	0.5297***	0.5304***
PctETF$_{t-1}$	0.2529***	0.2539***	-0.6122***	-0.6199***
(t-stat)	(2.7216)	(2.6854)	(-3.6541)	(-3.6808)
log(**MarketCap**$_{t-1}$)	-0.0248***	-0.0248***	0.0106***	0.0106***
1/**Close**$_{t-1}$	0.0015	0.0015	-0.0146	-0.0146
AmihudRatio$_{t-1}$	0.2138***	0.2138***	-0.2476***	-0.2475***
BidAskSpread$_{t-1}$	0.2117***	0.2117***	-0.2938***	-0.2937***
$(BE/ME)_{t-1}$	0.0001*	0.0001*	-0.0001	-0.0001
Past12to7Mret.$_{t-1}$	-6.928e-05***	-6.928e-05***	-7.459e-05*	-7.461e-05*
G. Profitab.$_{t-1}$	-0.0041***	-0.0041***	0.0036	0.0036
Mutual funds ownership		-0.0004		0.0026
Fixed Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
No. Observations	592054	592054	591848	591848
R-squared	0.0049	0.0049	0.0014	0.0014
R-Squared (Within)	0.0055	0.0055	0.0017	0.0017
R-Squared (Between)	0.0991	0.0992	0.0757	0.0758
R-Squared (Overall)	0.0099	0.0099	0.0104	0.0104
F-statistic	354.08	314.75	98.569	87.752
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Key findings

U.S.

- On average, the volatility of U.S. stocks rises with ETF ownership : + 0.8% of a std. dev. following a 1 std. dev. ETF ownership increase (3.5%)
- If the mean reversion also increased because of ETFs, this volatility would be non-fundamental and the *liquidity trading hypothesis* would hold.
- But no significant effect on variance ratios : *price discovery hypothesis ?*
- Still an effect on liquidity: only price impact rises

International

- No volatility increase correlated with ETF ownership (with controls)
- But likely increase in mean reversion over 1 to 5 days
- Positive effect on bid-ask spread
- Significance of the sample ? 0.4% of a company's equity held through ETFs on average

Limitations and further directions

Quality concerns

- Dropping up to $\frac{2}{3}$ of the observations because of missing data
- Reporting delays in institutional holdings addressed through extrapolation

Robustness checks to try

- Subsamples over time, matching regime changes
- International : developed and emerging countries apart
- Keep securities with a minimum available number of observations

Research avenues

- Discriminate by funds' strategies : passive, smart beta, active
- Focus on liquidity effects around ETF trading halts
- Intraday effects

Likely trends in the ETF universe

- Rise of alternative weighting schemes (smart beta)
- More active bets, nicknamed *passive-aggressive*
- Opaque holdings structures are at an advanced stage in the regulatory approval process in the U.S. (late spring 2019)

The Precidian model

An ETF That Hides Its Secret Sauce Is Poised for Regulator's Nod – Bloomberg News, April 8, 2019.[a]

- Positive signs that the Securities and Exchange Commission will allow the design.
- Trading permission is the next decision needed before the product is issued.
- Disagreement at the SEC and skepticism from some analysts regarding appeal to investors; reality check needed and *evidence so far has shown that awareness about ETFs can take time*.

[a] Available at `https://www.bloomberg.com/news/articles/2019-04-08/an-etf-that-hides-its-secret-sauce-is-poised-for-regulator-s-nod`

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Volatility – U.S. sample I

Table 7: U.S. Sample : Exchange-Traded Fund aggregate ownership share and the volatility of underlying securities' daily returns

	Baseline	Controls +lags	O'ship controls	Standardized
Intercept	0.2964	0.0488	0.0494	-0.0154
	(22.268)	(7.1942)	(7.2977)	(-0.4273)
$\mathbf{PctETF}_{t-1}$	0.2470***	0.0385***	0.0395***	0.0081***
	(8.2542)	(5.9800)	(6.2940)	(6.8269)
$\log(\mathbf{MarketCap}_{t-1})$	-0.0127	-0.0018	-0.0018	-0.0102
	(-20.751)	(-5.8479)	(-5.9701)	(-6.1991)
$1/\mathbf{Close}_{t-1}$	0.0988	0.0251	0.0251	0.1452
	(10.972)	(7.7261)	(7.7792)	(7.9151)
$(BE/ME)_{t-1}$	5.552e-07	7.393e-07	1.038e-06	5.019e-06
	(2.3023)	(4.1534)	(8.5166)	(5.3019)
$\mathbf{Past12to1Mret.}_{t-1}$	-0.0003	-0.0004	-0.0004	-0.0024
	(-0.6844)	(-1.8758)	(-1.8564)	(-1.8927)
$\mathbf{AmihudRatio}_{t-1}$		3.4590	3.4611	19.952
		(2.7034)	(2.7029)	(2.7038)
$\mathbf{BidAskSpread}_{t-1}$		0.1750	0.1748	1.0060
		(4.5505)	(4.5446)	(4.5471)
$\mathbf{G.Profit.}_{t-1}$		-0.0005	-0.0005	-0.0028
		(-2.6218)	(-2.6334)	(-2.6197)
$\mathbf{Volatility}_{t-1}$		0.1377	0.1378	0.1376
		(6.7584)	(6.7701)	(6.7630)

Volatility – U.S. sample II

Volatility$_{t-2}$		0.1605	0.1604	0.1603
		(16.002)	(15.972)	(15.949)
Volatility$_{t-3}$		0.1230	0.1229	0.1229
		(13.390)	(13.402)	(13.403)
Volatility$_{t-4}$		0.0819	0.0818	0.0817
		(9.8851)	(9.8688)	(9.8756)
PctOtherMutual$_{t-1}$			-0.0003	-0.0016
			(-2.5676)	(-1.1497)
PctPension$_{t-1}$			1.0330	0.0015
			(3.4034)	(3.6451)
PctHedge$_{t-1}$			-0.0284	9.023e-05
			(-3.2527)	(0.4613)
Effects	Entity Time	Entity Time	Entity Time	Entity Time

	Baseline	**Controls +lags**	**O'ship controls**	**Standardized**
Dep. Variable	Volatility	Volatility	Volatility	Volatility
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	413304	297405	297399	297247
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R^2	0.0545	0.1592	0.1593	0.1594
R^2 **(Within)**	0.0565	0.1353	0.1351	0.1348
R^2 **(Between)**	0.2009	0.7626	0.7625	0.7616
R^2 **(Overall)**	0.1515	0.2716	0.2715	0.2710

Volatility – U.S. sample III

F-statistic	4717.9	4643.9	3718.4	3718.6
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Volatility – International sample I

Table 8: International Sample : Exchange-Traded Fund aggregate ownership share and the volatility of underlying securities' daily returns

	Baseline	Controls + Vol. lags	Inst. o'ship control	Standardized
Intercept	0.0582	0.0283	0.0283	0.6235
	(10.611)	(7.7563)	(7.7708)	(4.4628)
PctSharesHeldETF_1lag	0.0169	0.0072	0.0070	0.0028
	(1.8226)	(1.0225)	(0.9781)	(0.9781)
np.log(CompanyMarketCap_1lag)	-0.0015	-0.0008	-0.0008	-0.0310
	(-6.1428)	(-4.9380)	(-4.9511)	(-4.9511)
InvClose_1lag	0.0045	0.0015	0.0015	0.0585
	(2.5792)	(1.1485)	(1.1484)	(1.1484)
BookToMarketRatio_1lag	3.446e-05	2.54e-05	2.538e-05	0.0010
	(3.6160)	(3.3179)	(3.3206)	(3.3206)
RetPast12to1M_1lag	0.0005	0.0001	0.0001	0.0052
	(1.8965)	(1.5202)	(1.5203)	(1.5203)
AmihudRatio_1lag		0.0250	0.0250	0.9984
		(0.8272)	(0.8272)	(0.8272)
PctBidAskSpread_1lag		0.0262	0.0262	1.0496
		(6.9533)	(6.9532)	(6.9532)
GrossProfitability_1lag		-0.0001	-0.0001	-0.0056
		(-0.6729)	(-0.6731)	(-0.6731)
Volatility_1lag		0.2541	0.2541	0.2541
		(21.616)	(21.615)	(21.615)

Volatility – International sample II

Volatility_2lag		0.1226	0.1226	0.1226
		(18.960)	(18.960)	(18.960)
Volatility_3lag		0.0968	0.0968	0.0968
		(11.790)	(11.790)	(11.790)
Volatility_4lag		0.0607	0.0607	0.0607
		(13.274)	(13.271)	(13.271)
PctSharesHeldOtherMutual_1lag			9.061e-05	0.0008
			(0.6096)	(0.6096)
Effects	Entity Time	Entity Time	Entity Time	Entity Time

	Baseline	**Controls + Vol. lags**	**Inst. o'ship control**	**Standardized**
Dep. Variable	Volatility	Volatility	Volatility	Volatility
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	1516791	1319966	1319966	1319966
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R-squared	0.0070	0.1729	0.1729	0.1729
R-Squared (Within)	0.0148	0.2100	0.2100	0.2100
R-Squared (Between)	-0.0101	0.7081	0.7079	0.7079
R-Squared (Overall)	-0.0208	0.3261	0.3260	0.3260
F-statistic	2118.7	2.274e+04	2.099e+04	2.099e+04
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Liquidity – U.S. sample I

Table 9: U.S. Sample : Exchange-Traded Funds' aggregate ownership share and underlying securities' liquidity

	Amihud ratio		Bid-Ask spread	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.3424	0.3425	0.1055	0.1057
	(30.114)	(30.084)	(15.863)	(15.819)
PctSharesHeldETF_1lag	0.1809	0.1810	0.0074	0.0073
	(7.5170)	(7.5198)	(0.8731)	(0.8642)
np.log(CompanyMarketCap_1lag)	-0.0153	-0.0153	-0.0049	-0.0049
	(-26.856)	(-26.830)	(-14.666)	(-14.622)
BookToMarketRatio_1lag	2.812e-07	2.925e-07	-4.261e-08	-4.149e-08
	(1.1005)	(1.1141)	(-0.9060)	(-0.8901)
AmihudDenominator	1.335e-11	1.335e-11		
	(4.3898)	(4.3890)		
PctSharesHeldOtherMutual_1lag		-1.157e-05		-2.123e-06
		(-5.2639)		(-6.0853)
Volatility_1lag			0.0498	0.0498
			(10.156)	(10.161)
PctSharesHeldPension_1lag				0.2846
				(1.1997)
PctSharesHeldHedge_1lag				0.0053
				(1.1511)

Liquidity – U.S. sample II

Effects	Entity, Time	Entity, Time	Entity, Time	Entity, Time
	Amihud ratio		**Bid-Ask spread**	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Dep. Variable	AmihudNumerator	AmihudNumerator	PctBidAskSpread	PctBidAskSpread
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	436359	436352	335170	335164
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R-squared	0.0326	0.0326	0.0510	0.0510
R-Squared (Within)	0.0448	0.0448	0.0659	0.0660
R-Squared (Between)	0.1897	0.1898	0.5568	0.5572
R-Squared (Overall)	0.1291	0.1291	0.1879	0.1881
F-statistic	3643.1	2914.2	4445.9	2543.2
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Liquidity – International sample I

Table 10: International Sample : Exchange-Traded Funds' aggregate ownership share and underlying securities' liquidity

	Amihud ratio		Bid-Ask spread	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.0776	0.0776	0.1446	0.1446
	(12.831)	(12.829)	(25.012)	(25.021)
PctSharesHeldETF_1lag	0.0038	0.0038	0.0613	0.0610
	(0.5715)	(0.5817)	(4.9367)	(4.9518)
np.log(CompanyMarketCap_1lag)	-0.0058	-0.0058	-0.0061	-0.0061
	(-21.501)	(-21.502)	(-23.176)	(-23.183)
BookToMarketRatio_1lag	0.0012	0.0012	1.107e-05	1.108e-05
	(1.0328)	(1.0328)	(0.6876)	(0.6887)
np.log(AmihudDenominator)	0.0042	0.0042		
	(16.998)	(16.998)		
PctSharesHeldOtherMutual_1lag		-1.341e-05		-1.92e-06
		(-0.9416)		(-0.2806)
Volatility_1lag			0.1772	0.1772
			(13.426)	(13.426)
PctSharesHeldPension_1lag				0.0314
				(1.1500)
Effects	Entity Time	Entity Time	Entity Time	Entity Time

Liquidity – International sample II

	Amihud ratio		Bid-Ask spread	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Dep. Variable	AmihudNumerator	AmihudNumerator	PctBidAskSpread	PctBidAskSpread
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	1465561	1465555	1124265	1124260
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R-squared	0.0285	0.0285	0.0227	0.0227
R-Squared (Within)	0.0287	0.0287	0.0375	0.0375
R-Squared (Between)	-0.3627	-0.3626	0.1785	0.1785
R-Squared (Overall)	-0.0089	-0.0089	0.0956	0.0956
F-statistic	1.064e+04	8514.8	6433.1	4289.0
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Efficiency – U.S. sample I

Table 11: U.S. Sample : Exchange-Traded Funds' aggregate ownership share and weekly mean reversion of underlying securities

	absVR		VR	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.8523	0.8532	0.8735	0.8579
	(12.280)	(12.208)	(7.6512)	(7.4328)
PctSharesHeldETF_1lag	0.0096	0.0218	-0.1205	-0.1005
	(0.1484)	(0.3373)	(-1.4081)	(-1.1660)
np.log(CompanyMarketCap_1lag)	-0.0248	-0.0248	0.0044	0.0052
	(-7.5202)	(-7.4640)	(0.8038)	(0.9458)
InvClose_1lag	0.1276	0.1277	-0.2002	-0.1986
	(5.5223)	(5.5778)	(-6.0619)	(-5.9225)
AmihudRatio_1lag	9.9267	9.9488	-15.135	-15.117
	(3.1431)	(3.1455)	(-3.0288)	(-3.0279)
PctBidAskSpread_1lag	0.9314	0.9286	-1.2190	-1.2179
	(5.5878)	(5.6027)	(-3.5732)	(-3.5633)
BookToMarketRatio_1lag	-3.498e-06	4.433e-05	-1.257e-05	6.777e-05
	(-0.5195)	(3.9695)	(-1.4303)	(3.2826)
RetPast12to7M_1lag	0.0003	-9.153e-05	-0.0006	-0.0013
	(0.5981)	(-0.2511)	(-0.9013)	(-2.2311)
GrossProfitability_1lag	0.0011	0.0012	0.0064	0.0062
	(0.2252)	(0.2454)	(1.2767)	(1.2635)
PctSharesHeldOtherMutual_1lag		-0.0053		-0.0086

Efficiency – U.S. sample II

		(-3.9260)		(-3.6908)
PctSharesHeldPension_1lag		11.292		-3.7029
		(4.1468)		(-0.5362)
PctSharesHeldHedge_1lag		-0.1294		-0.1145
		(-0.8927)		(-0.6268)
Effects	Entity Time	Entity Time	Entity Time	Entity Time

	absVR		**VR**	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Dep. Variable	absVR	absVR	VR	VR
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	126851	126847	126851	126847
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R-squared	0.0079	0.0081	0.0040	0.0041
R-Squared (Within)	0.0106	0.0106	0.0040	0.0042
R-Squared (Between)	0.2814	0.2820	0.1376	0.1385
R-Squared (Overall)	0.0318	0.0320	0.0163	0.0165
F-statistic	123.79	91.734	61.843	46.323
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000

Efficiency – International sample I

Table 12: International Sample : Exchange-Traded Funds' aggregate ownership share and weekly mean reversion of underlying securities

	absVR		VR	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Intercept	0.9251	0.9250	0.5297	0.5304
	(22.527)	(22.576)	(6.1864)	(6.1821)
PctSharesHeldETF_1lag	0.2529	0.2539	-0.6122	-0.6199
	(2.7216)	(2.6854)	(-3.6541)	(-3.6808)
np.log(CompanyMarketCap_1lag)	-0.0248	-0.0248	0.0106	0.0106
	(-13.525)	(-13.558)	(2.7762)	(2.7598)
InvClose_1lag	0.0015	0.0015	-0.0146	-0.0146
	(0.1169)	(0.1168)	(-0.6261)	(-0.6257)
AmihudRatio_1lag	0.2138	0.2138	-0.2476	-0.2475
	(3.3927)	(3.3923)	(-4.5128)	(-4.5122)
PctBidAskSpread_1lag	0.2117	0.2117	-0.2938	-0.2937
	(5.8326)	(5.8319)	(-5.4872)	(-5.4834)
BookToMarketRatio_1lag	0.0001	0.0001	-0.0001	-0.0001
	(1.6458)	(1.6464)	(-0.5935)	(-0.5995)
RetPast12to7M_1lag	-6.928e-05	-6.928e-05	-7.459e-05	-7.461e-05
	(-2.6264)	(-2.6265)	(-1.7080)	(-1.7081)
GrossProfitability_1lag	-0.0041	-0.0041	0.0036	0.0036
	(-3.2319)	(-3.2325)	(1.5214)	(1.5183)
PctSharesHeldOtherMutual_1lag		-0.0004		0.0026

Efficiency – International sample II

		(-0.2369)		(0.7347)
Effects	Entity Time	Entity Time	Entity Time	Entity Time

	absVR		**VR**	
	Baseline	**w/inst. o'ship**	**Baseline**	**w/inst. o'ship**
Dep. Variable	absVR	absVR	VR	VR
Estimator	PanelOLS	PanelOLS	PanelOLS	PanelOLS
No. Observations	592054	592054	591848	591848
Cov. Est.	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay	Driscoll-Kraay
R-squared	0.0049	0.0049	0.0014	0.0014
R-Squared (Within)	0.0055	0.0055	0.0017	0.0017
R-Squared (Between)	0.0991	0.0992	0.0757	0.0758
R-Squared (Overall)	0.0099	0.0099	0.0104	0.0104
F-statistic	354.08	314.75	98.569	87.752
P-value (F-stat)	0.0000	0.0000	0.0000	0.0000