



# ETF Short Interest and Failures-to-Deliver: Naked Short-selling or Operational Shorting?

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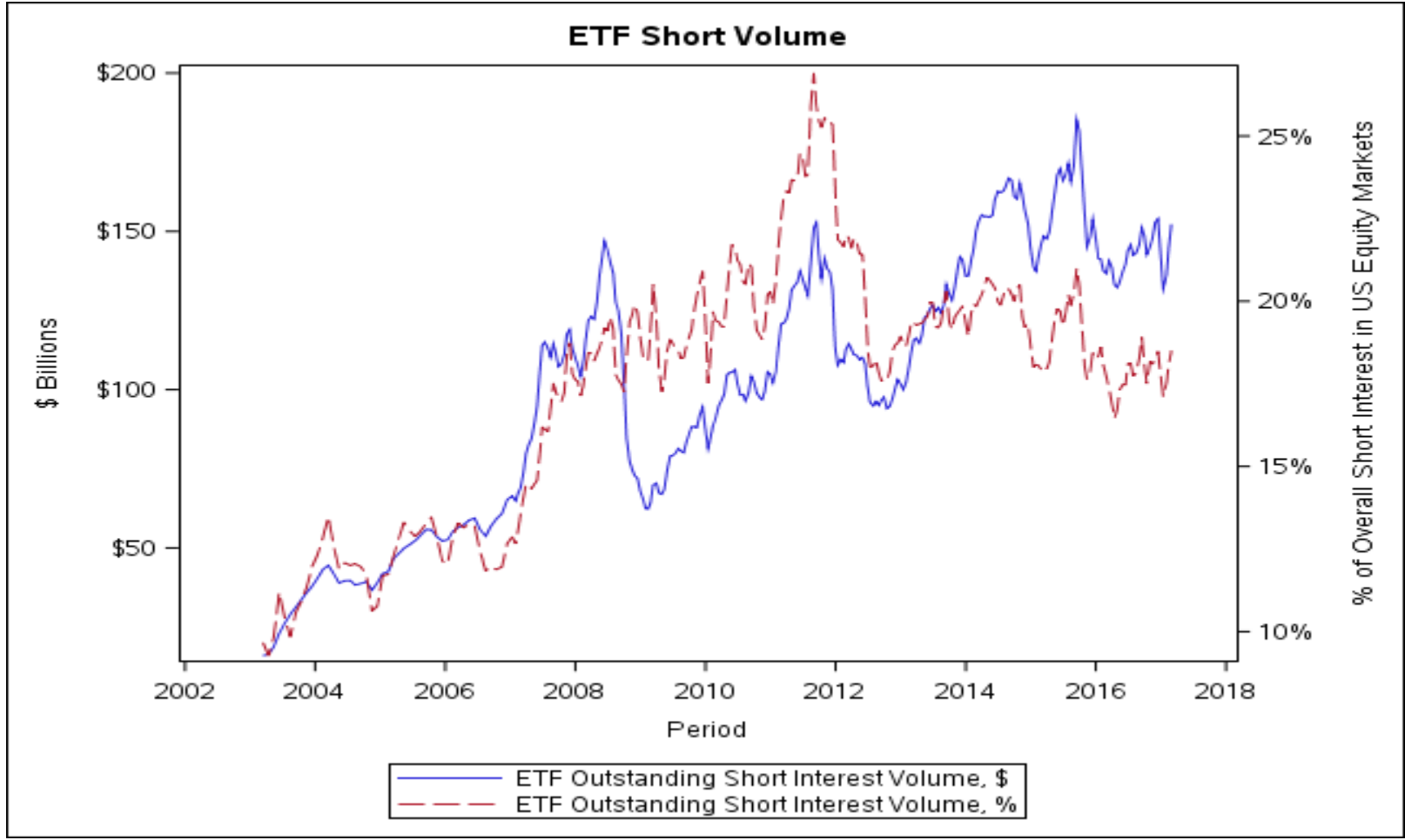


# Regulatory Concerns

- Securities and Exchange Commission (2015):  
“**Short selling is extreme in many ETFs.** The lending markets are not being properly utilized to accommodate the selling, causing **systemic risk from undisclosed leverage in the financial system** (more shares sold than exist) for the benefit of very few while creating risks for all stakeholders, including taxpayers.”

Example: **FINRA case** (April 2015) against Scout Trading and Wedbush Securities re: manipulative trading strategies with 14 leveraged and inverse-leveraged ETFs (based on prolonged short-selling & FTDs).

# Growing Short Interest in ETFs



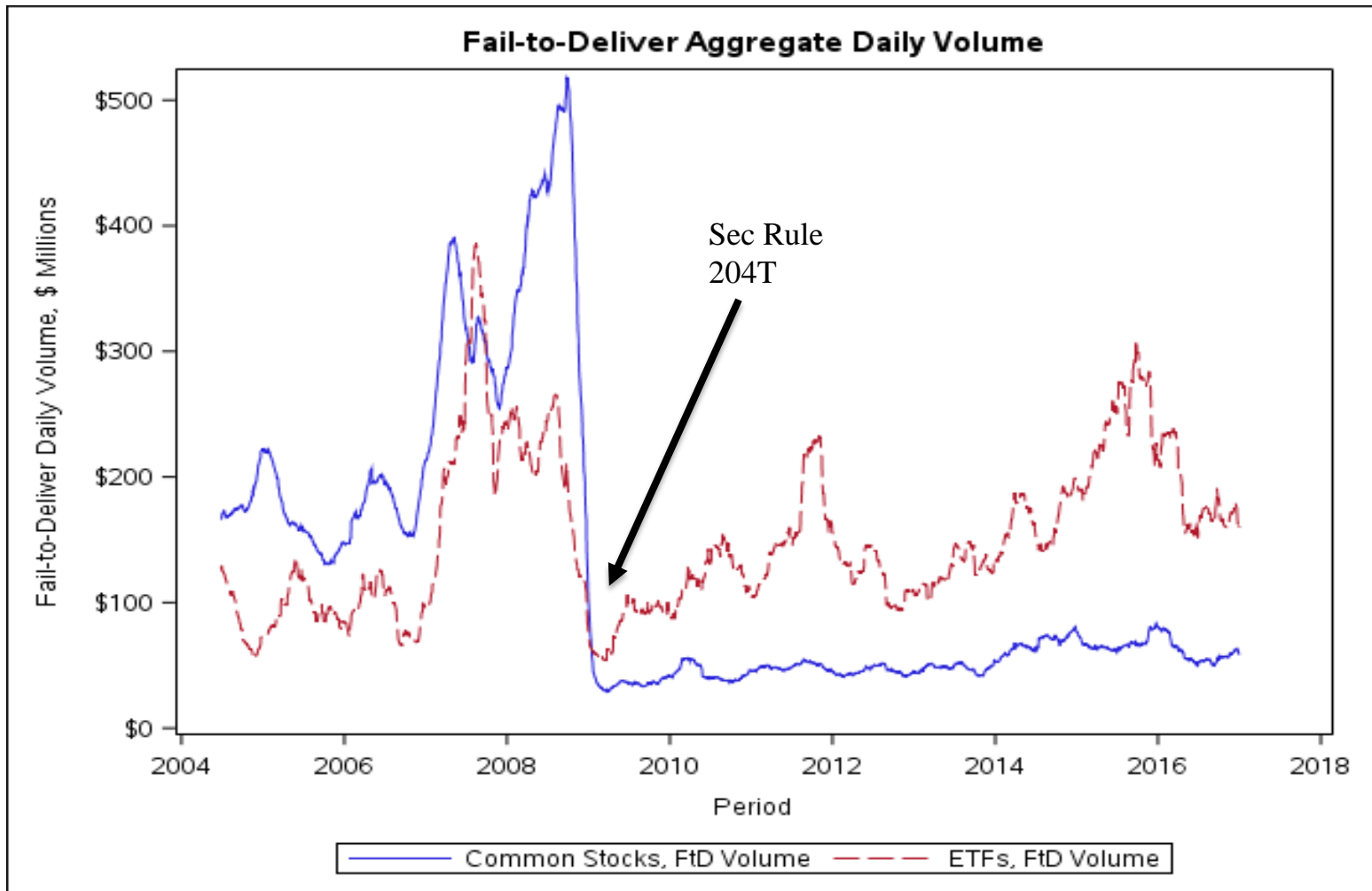
# Failure to Deliver (FTD)

FTD - a condition where two investors agree to the purchase/sale of a security at a given price but the seller **fails to deliver** the security in a timely manner.



- Stocks bought and sold must be settled **within 3 days** (or **T+6 for “bona fide” market makers**)
  - **FTD = Open Interest of Undelivered Positions, observed at T+3, after actual trades at T**
- Deliberate fail to deliver: profit from short exposure (“**strategic fails**”)
  - Naked short selling has “cost investors \$100 billion and driven 1,000 companies into the ground” per SEC comment letter
- In Sept 2008, **SEC Rule 204T**
  - **Mandated** stock borrowing arrangements **prior to** short selling
  - Close-out requirement on next business day
  - FTDs arising from long sales or market maker FTDs were given three additional days

# FTD trends for Stocks and ETFs



- ETFs' FTDs are growing since 2009 and exceed 0.5% SEC threshold

Year	Total Dollar FTD	ETF	Common Stock	OTC Stocks	Corporate Bond	ADR	Structured Products	Units and Trusts	Other Securities	# of Securities with Positive FTD
2004	\$3,439.9	\$936.0	\$2,103.8	\$36.7	\$35.9	\$212.7	\$21.2	\$102.6	\$2.8	2,739
2005	\$3,011.3	\$974.4	\$1,691.4	\$43.2	\$25.5	\$201.1	\$14.6	\$65.4	\$0.3	2,488
2006	\$3,443.6	\$994.1	\$2,040.2	\$42.6	\$88.7	\$211.1	\$19.7	\$50.7	\$1.2	2,639
2007	\$7,129.6	\$2,540.9	\$3,520.4	\$50.5	\$451.3	\$359.4	\$40.9	\$57.5	\$117.1	2,937
2008	\$6,401.6	\$1,887.7	\$3,931.2	\$47.2	\$45.8	\$342.6	\$66.1	\$46.7	\$44.2	4,545
2009	\$1,430.0	\$866.4	\$402.0	\$10.3	\$15.9	\$91.7	\$25.4	\$13.0	\$10.6	6,465
2010	\$1,953.3	\$1,272.4	\$495.0	\$14.9	\$13.9	\$114.1	\$20.2	\$15.7	\$12.4	6,265
2011	\$2,479.4	\$1,705.2	\$543.1	\$16.9	\$15.5	\$142.3	\$30.8	\$15.5	\$19.2	6,109
2012	\$1,877.0	\$1,183.7	\$509.0	\$11.3	\$20.5	\$99.3	\$23.8	\$20.8	\$18.3	5,731
2013	\$2,065.3	\$1,313.6	\$552.4	\$10.4	\$20.1	\$106.7	\$29.2	\$24.4	\$17.6	5,588
2014	\$2,704.9	\$1,734.0	\$746.4	\$11.8	\$20.0	\$137.3	\$36.3	\$14.7	\$12.0	6,074
2015	\$3,460.1	\$2,506.3	\$734.2	\$9.1	\$15.1	\$137.6	\$37.4	\$11.2	\$15.9	6,190
2016	\$3,304.1	\$2,592.5	\$522.1	\$8.2	\$10.3	\$122.0	\$32.1	\$14.5	\$7.0	5,951

ETF FTDs are now 78% of all FTDs

Year	Total FTD, % of Shares Outstanding	ETF	Common Stock	Structured Products	Units and Trusts	Other Securities	# of Securities with Positive FTD
2004	0.83%	3.94%	0.63%		0.47%	1.57%	1,943
2005	0.57%	2.40%	0.39%		0.27%	0.58%	1,756
2006	0.73%	3.35%	0.33%	1.72%	0.20%	1.42%	1,834
2007	0.99%	5.24%	0.37%	2.01%	0.22%	0.82%	2,124
2008	0.82%	4.05%	0.31%	1.66%	0.14%	0.45%	3,507
2009	0.22%	0.85%	0.03%	1.20%	0.02%	0.03%	5,400
2010	0.18%	1.02%	0.03%	0.61%	0.02%	0.00%	5,373
2011	0.23%	1.15%	0.04%	0.53%	0.02%	0.00%	5,216
2012	0.17%	0.87%	0.03%	0.28%	0.02%	0.00%	5,185
2013	0.23%	1.10%	0.03%	0.14%	0.02%	0.00%	5,061
2014	0.17%	0.80%	0.03%	0.18%	0.01%	0.00%	5,553
2015	0.17%	0.68%	0.02%	0.34%	0.01%	0.00%	5,664
2016	0.18%	0.83%	0.02%	0.31%	0.01%	0.00%	5,504

# Why study ETFs and Failures-to-Deliver (FTDs)?

- ETFs are a **growing force** in financial markets (over \$2.5 Trillion AUM)
- ETFs are a **hybrid**: a mutual fund that trades like a stock
- ETFs and their Market Makers are at the **nexus of many markets** (spot, futures, options, sec. lending)
- The effects of FTDs are **relatively unexplored**, especially for ETFs and their liquidity...  
...and failing on an ETF has greater potential to induce **contagion** than a single stock.
- Regulators are concerned: Can FTDs and their relation to Short Selling exacerbate **counterparty risk?**  
**Systemic risk?**
- Limited academic evidence is mixed for FTDs (“release valve” or “liquidity mismatch”?)

# Research Questions and Results

- What is driving ETF FTDs?
  - Prior literature shows Stock FTDs driven by naked short selling
  - We identify **an alternative reason for ETF FTDs: operational shorting**
- We propose a measure of “**operational shorting**”, and explore the underlying economics and daily dynamics behind operational shorting
- Operational Shorting is related to **increased ETF Short Interest and FTDs**
- What is the impact on the **liquidity** of an ETF’s underlying basket?
  - **Operational Shorting acts as a “buffer” and improves the basket’s liquidity**
- “**Spillovers**” can occur between AP-level and market-wide operational shorting
- We also examine the relationship of ETF FTDs and **financial markets**:
  - It doesn’t predict future risk-adjusted returns (consistent with liquidity provision incentives)
  - It does predict the **St. Louis FSI**, a measure of counterparty/systemic risk, (post-2009)



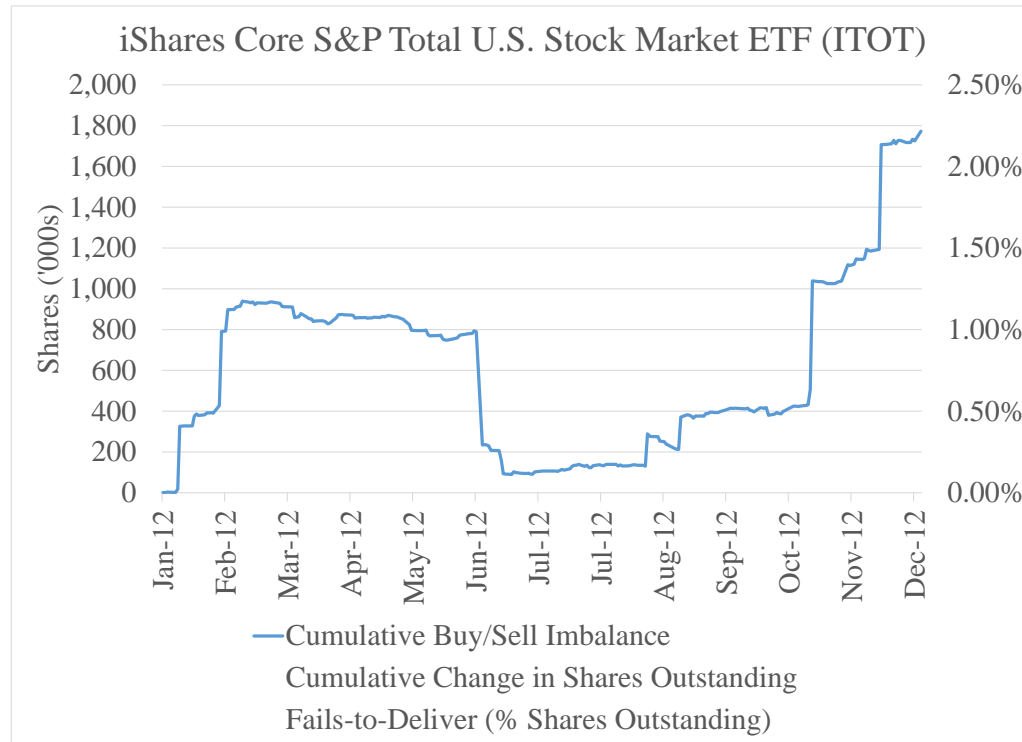
# Key Takeaways from our results

- ETF shares are **not** created immediately: “option to delay” is valuable due to order imbalances
- **Option to delay**  $\approx$  Operational Shorting
- ETF FTDs are due **primarily** to operational shorting
- ETF short interest contains operational shorting and serves as a **liquidity provision mechanism**
  - The incentives for AP / MM are arbitrage profits
- *But...* the aggregate operational shorting activity can adversely affect **market-wide financial stability**
- Potential mechanism for this impact on financial stability suggestive of broader **contagion concerns for ETFs**

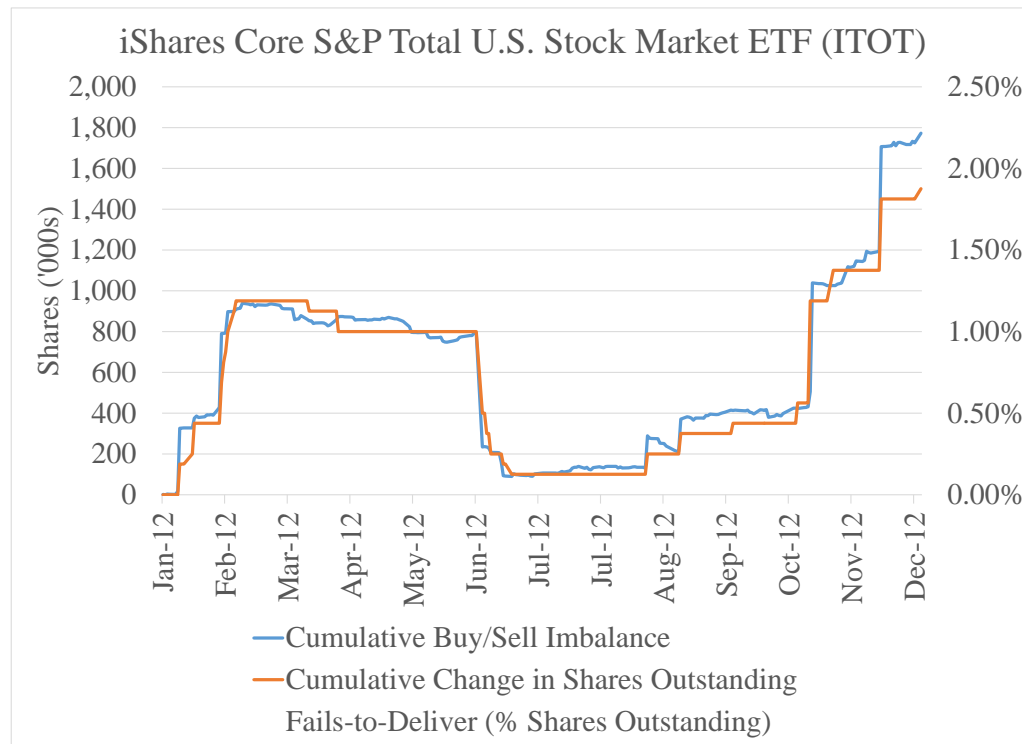
# What can an Authorized Participant do?

- When faced with “**excess buying**” pressure for ETF shares, the AP has two choices:
  - **Sell shares from its inventory or locate the shares in the secondary market (and deliver at T+3).**
- OR*
- **Sell shares “naked” and then locate or create the shares at a later time (up to T+6 for “bona fide” market making).**
- The first choice locks in a market-making profit but requires higher upfront capital outlays (safer but lower return).
- The second choice can also lock in a profit (if a futures/options hedge is used) but with less capital outlay (safe and higher return).

# Example of Operational Shorting: **ITOT**



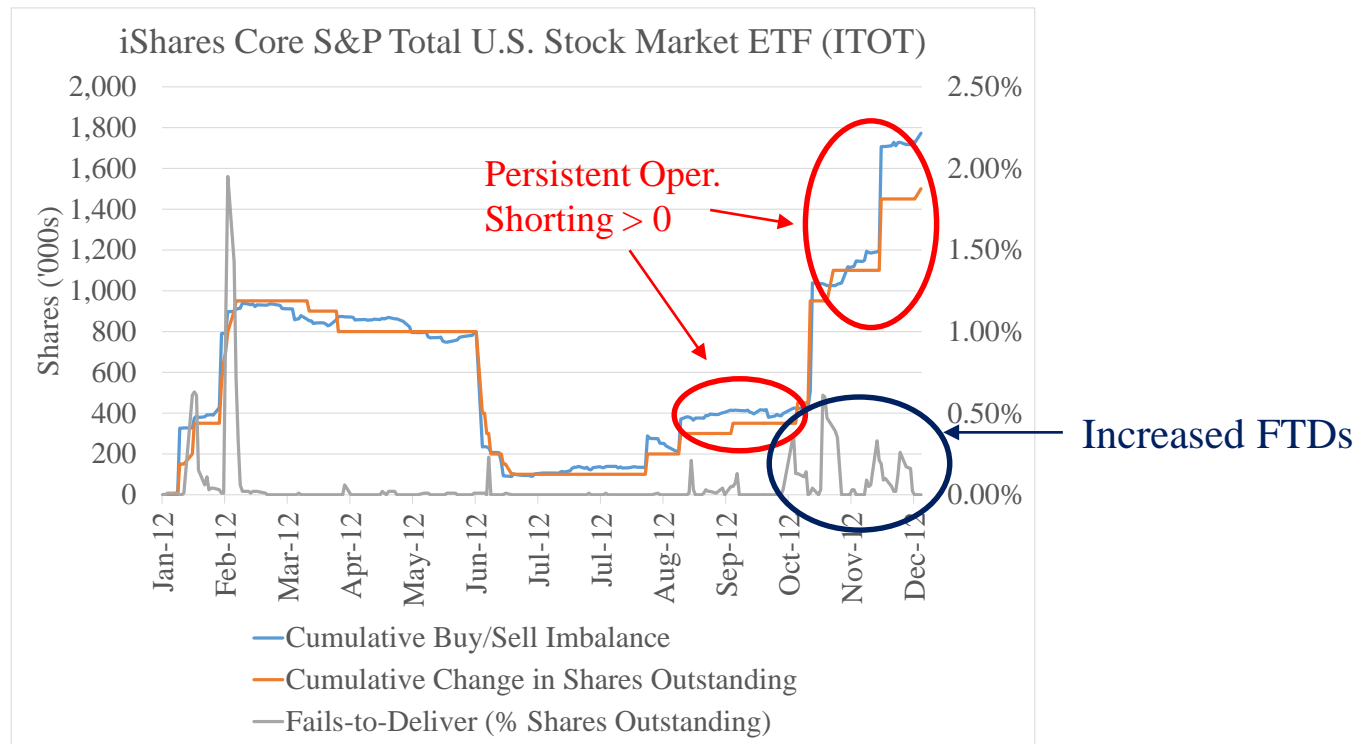
# Example of Operational Shorting: **ITOT**



# Example of Operational Shorting: ITOT

**Why doesn't ETF share creation respond perfectly to excess buying/selling?**

- Creation unit size
- Creation fee
- Trading costs
- Trading environment or market liquidity



# Measuring Operational Shorting

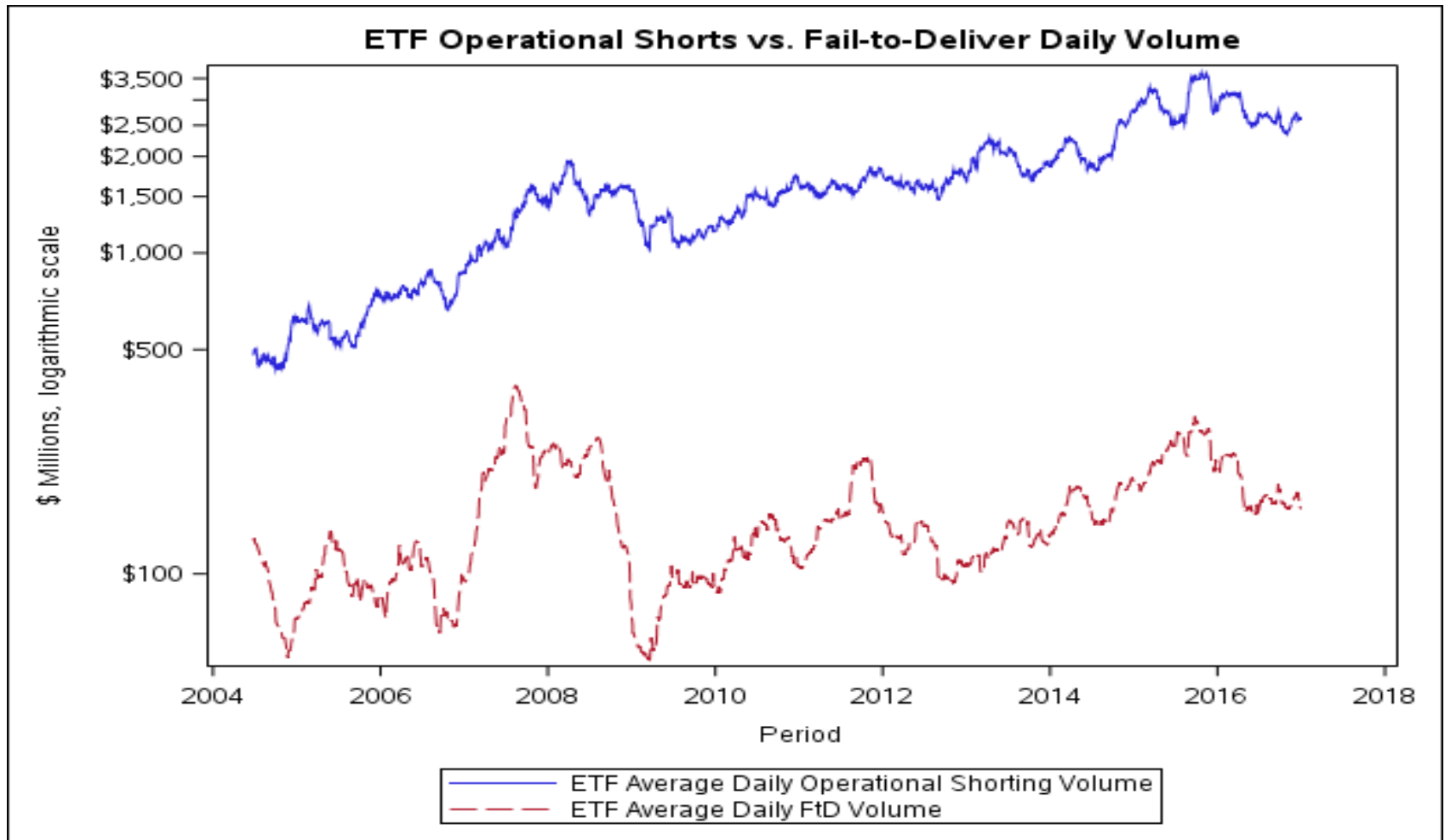
Our daily measure of operational shorting imbalance and the change in shares outstanding over a 3-day rolling window:

## *Operational Shorting*

$$= \frac{\max[0, (\text{Cumulative Buy/Sell Imbalance}(t - 3, t - 1) - \Delta\text{Shares Outstanding}(t - 1, t))]}{\text{Shares Outstanding}(t - 3)}$$

Uses the Ellis, Michaely, and O'Hara (2000) method to sign all trades on a millisecond basis and then sums all signed trades at 4:00 pm for each day.

# Operational Shorting and FTDs



# Data

- Daily SEC FTD data set dictates our sample period (2004-2016)
- Daily ETF shares outstanding from Bloomberg (better than CRSP, others)
- Compustat, CRSP, and FISD Mergent for asset class, issue size, etc.
- ETF security holdings from Thomson Reuters
- Intraday spread and return volatility from NYSE TAQ
- CRSP for stock price and trading volume
- Bi-weekly FINRA Short Interest data obtained via Compustat
- Daily Securities Lending data from Markit Securities Finance database
- Financial Stress Index (FSI) from St. Louis Federal Reserve's FRED database



# Summary Statistics

Variable	Obs	Mean	Std.Dev.	p1	p25	p50	p75	p99
Fail-to-Deliver Shares / Shares Outstanding	3,007,239	0.42%	1.53%	0.00%	0.00%	0.00%	0.11%	11.45%
Operational Shorting, as % of Shares Outstanding	3,006,555	1.01%	2.89%	0.00%	0.00%	0.00%	0.65%	20.83%
Net Create/Redeem Activity: log (1 + % change in Shares Outstanding)	3,006,045	0.11%	1.37%	-5.72%	0.00%	0.00%	0.00%	8.82%
ETF Order Imbalance: (Buys - Sells) / Average Shares Outstanding	2,772,648	0.15%	1.81%	-7.15%	-0.15%	0.03%	0.29%	10.63%
Market Capitalization, \$ million	3,007,054	\$867.19	\$2,600.87	\$1.38	\$16.81	\$86.20	\$427.69	\$18,523.09
Daily Share Turnover, % of Shares Outstanding	2,950,760	4.0%	8.6%	0.1%	0.6%	1.2%	2.8%	55.5%
Amihud Illiquidity Measure	2,756,643	0.11	0.37	0.00	0.00	0.00	0.04	2.59
% Mispricing: % difference between ETF price and NAV	2,912,330	0.029%	0.572%	-2.332%	-0.118%	0.016%	0.184%	2.115%
Maximum Rolling R-Squared with Available Futures Contracts	2,673,729	53%	29%	0%	30%	59%	77%	96%
Available Options Dummy	3,007,239	0.31	0.46	0.00	0.00	0.00	1.00	1.00
Creation Unit Size	931,999	69,602	35,005	25,000	50,000	50,000	100,000	250,000
Creation Unit Fee	931,999	\$1,577.56	\$2,664.75	\$100.00	\$500.00	\$500.00	\$1,400.00	\$15,000.00
Bid-Ask Spread, at Close	2,956,434	0.330%	0.542%	0.011%	0.067%	0.147%	0.339%	3.544%
Intraday NBBO Bid-Ask Spread, Trade Size Weighted	2,772,053	0.269%	0.395%	0.012%	0.064%	0.135%	0.288%	2.470%
Intraday Volatility, using second-by-second intraday returns	2,703,755	0.0083%	0.0083%	0.0000%	0.0037%	0.0061%	0.0100%	0.0511%
Daily Cost of Borrow Score	1,768,565	3.19	1.47	1.00	2.00	3.00	4.00	7.00
Indicative Fee	1,588,220	4.37%	3.44%	0.38%	1.75%	3.50%	6.00%	18.00%
Short Interest Ratio	2,946,535	4.66%	11.84%	0.00%	0.28%	0.90%	3.20%	83.76%

Entire ETF Sample

# The Relationship between FTDs, Short Interest, and Operational Shorting

	Short Interest / Shares Outstanding (t)			Fail-to-Deliver Shares / Shares Outstanding (t)		
	(1)	(2)	(3)	(4)	(5)	(6)
log (Market Cap) at (t-1)	-0.00203*** (-5.708)	-0.00183*** (-4.766)	-0.000878** (-2.213)	-0.00352*** (-13.78)	-0.00326*** (-8.799)	-0.00258*** (-6.923)
Share Turnover, as % of Shares Outstanding at (t-1)	0.0394*** (5.427)	0.0310*** (4.577)	0.0284*** (4.228)	0.0721*** (7.650)	0.0755*** (6.381)	0.0737*** (6.185)
Short Interest Ratio, as % of Shares Outstanding at (t-1)	0.697*** (37.34)	0.767*** (43.58)	0.767*** (43.52)	0.0469*** (8.947)	0.0332*** (6.807)	0.0322*** (6.655)
Daily Cost of Borrow Score at (t-1)		0.000558*** (2.803)	0.000536*** (2.683)		0.000421*** (3.038)	0.000408*** (2.933)
Available Options Dummy at (t-1)		0.00258*** (3.244)	0.00230*** (2.873)		-0.00282*** (-4.645)	-0.00300*** (-4.891)
Operational Shorting, as % of Shares Outstanding at (t-1)			0.105*** (7.493)			0.0753*** (9.613)
Observations	260,352	163,454	163,454	2,925,879	1,755,400	1,755,400
R-squared	0.787	0.848	0.849	0.100	0.125	0.129

# The Effect of Net Creations & Order Imbalances on FTDs

	Fail-to-Deliver Shares / Shares Outstanding (t)					
	(1)	(2)	(3)	(4)	(5)	(6)
log (Market Cap), at (t-15)	-0.00384*** (-11.07)	-0.00112*** (-10.92)	-0.00377*** (-13.99)	-0.00120*** (-14.65)	-0.00375*** (-10.85)	-0.00113*** (-10.80)
Share Turnover, as % of Shares Outstanding, at (t-15)	0.0820*** (8.638)	0.0237*** (8.098)	0.0847*** (8.768)	0.0254*** (8.658)	0.0803*** (8.490)	0.0239*** (8.206)
ETF Order Imbalance at (t-1)	0.0219*** (4.477)	0.0103*** (4.382)			0.0156*** (3.395)	0.00760*** (3.301)
ETF Order Imbalance at (t-2)	0.0368*** (6.911)	0.0215*** (7.447)			0.0174*** (3.605)	0.0167*** (5.889)
ETF Order Imbalance at (t-3)	0.145*** (13.46)	0.119*** (13.55)			0.127*** (12.59)	0.121*** (13.82)
ETF Order Imbalance at (t-4)	0.111*** (12.28)	0.00799** (2.403)			0.100*** (11.69)	0.0134*** (4.245)
ETF Order Imbalance at (t-5)	0.0867*** (11.45)	0.00726*** (2.719)			0.0804*** (10.84)	0.0113*** (3.911)
ETF Order Imbalance at (t-6)	0.0675*** (9.793)	0.00513* (1.797)			0.0634*** (9.337)	0.00736*** (2.565)
ETF Order Imbalance at (t-7)	0.0523*** (8.810)	0.00246 (1.085)			0.0489*** (8.252)	0.00365 (1.542)
ETF Order Imbalance at (t-8)	0.0469*** (7.960)	0.00641** (2.426)			0.0436*** (7.500)	0.00707*** (2.631)
Net Create/Redeem Activity at (t-1)			0.265*** (27.01)	0.101*** (17.25)	0.251*** (23.27)	0.0976*** (15.46)
Net Create/Redeem Activity at (t-2)			0.137*** (13.76)	-0.0398*** (-3.933)	0.102*** (9.605)	-0.0684*** (-5.872)
Net Create/Redeem Activity at (t-3)			0.0361*** (4.986)	-0.0531*** (-12.17)	-0.00472 (-0.584)	-0.0715*** (-13.91)
Net Create/Redeem Activity at (t-4)			0.0177*** (2.855)	-0.00280 (-0.916)	-0.0166*** (-2.304)	-0.0103*** (-2.928)
Net Create/Redeem Activity at (t-5)			0.0152*** (2.860)	0.00580*** (2.319)	-0.0102 (-1.584)	0.00242 (0.839)
Net Create/Redeem Activity at (t-6)			0.0118** (2.364)	0.00561** (2.267)	-0.00790 (-1.312)	0.00144 (0.503)
Net Create/Redeem Activity at (t-7)			0.0161*** (3.778)	0.00941*** (4.024)	0.00240 (0.476)	0.00667*** (2.512)
Net Create/Redeem Activity at (t-8)			0.0130*** (3.599)	0.00471** (2.479)	0.00491 (1.183)	0.00245 (1.147)
Fail-to-Deliver Shares / Shares Outstanding (t-1)		0.697*** (84.72)		0.699*** (88.66)		0.698*** (82.59)
Observations	2,151,271	2,151,271	2,950,592	2,950,592	2,151,271	2,151,271
R-squared	0.128	0.557	0.104	0.541	0.137	0.559

# Determinants of Operational Shorting

	Operational Shorting, as % of Shares Outstanding at day (t)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log (Market Cap), at (t-15)	-0.00730*** (-14.19)	-0.00778*** (-11.02)	-0.00806*** (-14.16)	-0.00802*** (-13.99)	-0.00899*** (-6.777)	-0.00687*** (-7.636)	-0.00962*** (-4.590)
Average Share Turnover, as % of Shares Outstanding, at (t-15)	0.0320*** (11.81)	0.0246*** (6.848)	0.0319*** (11.44)	0.0316*** (11.39)	0.0376*** (4.597)	0.0330*** (5.108)	0.0409*** (3.307)
Creation Unit Dollar Size, log, at (t-1)		0.00536*** (7.596)					0.00228 (1.433)
Creation Unit Fee, per share, at (t-1)		0.0455*** (3.165)					0.00167 (0.0784)
Maximum Rolling R-Squared with Available Futures Contracts at (t-1)			0.0112*** (7.100)	0.0111*** (7.004)	0.0129*** (3.190)	0.00912*** (3.034)	0.0149*** (2.551)
Available Options Dummy at (t-1)			0.00243*** (3.745)	0.00253*** (3.881)	0.00387*** (3.034)	0.00261*** (2.894)	0.00276* (1.690)
Mispricing at (t-1): % difference between ETF price and NAV at the close of the previous day				0.286*** (22.69)	0.243*** (5.974)		0.370*** (10.23)
Premium at (t-1), if mispricing>0, and zero						0.253*** (5.208)	
Discount at (t-1), in absolute value, if mispricing<0, and zero otherwise						-0.238*** (-3.230)	
Proxy for Liquidity Mismatch, at (t-1): Average Intraday Basket Spread - Intraday ETF Spread					0.219*** (3.674)	0.157*** (3.670)	0.250** (2.302)
Observations	2,950,667	1,988,950	2,633,071	2,624,669	787,099	820,652	499,849
R-squared	0.164	0.201	0.166	0.168	0.199	0.184	0.262

# Operational Shorting & Future Returns

	1-Month Forward Looking ETF Return (t+1, t+22)			
	Price Return		NAV Return	
	(1)	(2)	(3)	(4)
Average log (Book-to-Market) of Underlying Stocks, at (t)	-0.0143*** (-3.762)	-0.0144*** (-3.773)	-0.0159*** (-3.890)	-0.0160*** (-3.899)
Average log (Market Cap) of Underlying Stocks, at (t)	0.00685*** (3.280)	0.00685*** (3.284)	0.00719*** (3.376)	0.00720*** (3.379)
Reversal Proxy: Past 22-day Return, at (t)	-0.0546*** (-2.688)	-0.0550*** (-2.700)	-0.0523** (-2.589)	-0.0527*** (-2.602)
Momentum Proxy: Past 12-Month Return, with one month reversal, at (t)	0.0172*** (2.943)	0.0171*** (2.924)	0.0166*** (2.785)	0.0165*** (2.767)
Institutional Ownership, as % of Shares Outstanding, at (t)	-0.00305 (-0.891)	-0.00311 (-0.910)	-0.00284 (-0.842)	-0.00290 (-0.860)
Idiosyncratic Volatility, at (t)	-0.151 (-0.472)	-0.152 (-0.477)	-0.197 (-0.604)	-0.199 (-0.609)
Daily Cost of Borrow Score, at (t)	-0.000744** (-2.317)	-0.000736** (-2.297)	-0.000815** (-2.440)	-0.000806** (-2.421)
Operational Shorting, as % of Shares Outstanding at (t)		0.0143 (1.317)		0.0139 (1.272)
Observations	294,104	294,104	294,104	294,104
R-squared	0.834	0.834	0.831	0.831

# ETF Mispricing and Arbitrage

	Mispricing Change at (t)				Absolute Mispricing Change (at t)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Operational Shorting, as % of Shares Outstanding at (t)	-0.00233*** (-12.80)	-0.00225*** (-12.60)			-0.00128*** (-6.058)	-0.000877*** (-5.927)		
Operational Shorting, as % of Shares Outstanding at (t-1)			-0.000243** (-2.225)	-0.00133*** (-9.912)			-0.00115*** (-5.491)	-0.000716*** (-4.810)
log (Market Cap), at (t-15)	-2.12e-05* (-1.772)	-2.37e-05** (-2.400)	-7.31e-06 (-0.743)	-1.85e-05** (-2.130)	-0.000243*** (-9.731)	-0.000164*** (-9.629)	-0.000242*** (-9.692)	-0.000162*** (-9.553)
Average Share Turnover, as % of Shares Outstanding, at (t-15)	4.90e-05 (0.688)	5.32e-05 (0.765)	-1.10e-05 (-0.159)	1.63e-05 (0.257)	-0.000182 (-0.883)	-0.000122 (-0.853)	-0.000185 (-0.901)	-0.000126 (-0.887)
Maximum Rolling R-Squared with Available Futures Contracts at (t-1)		6.18e-05 (0.280)	3.97e-05 (0.180)	6.84e-05 (0.367)	-0.00150*** (-7.076)	-0.000969*** (-6.404)	-0.00150*** (-7.081)	-0.000971*** (-6.414)
Available Options Dummy at (t-1)		5.99e-06 (0.285)	1.00e-06 (0.0477)	6.26e-06 (0.337)	-9.36e-05* (-1.754)	-6.37e-05* (-1.746)	-9.39e-05* (-1.759)	-6.41e-05* (-1.756)
Mispricing Change at (t-1)				-0.485*** (-59.10)				
Absolute Mispricing Change at (t-1)						0.330*** (41.17)		0.330*** (41.17)
Observations	2,864,290	2,624,038	2,624,039	2,623,622	2,624,038	2,623,621	2,624,039	2,623,622
R-squared	0.039	0.040	0.039	0.266	0.369	0.438	0.369	0.438

# Operational Shorting and Underlying Stocks' Spreads

	Average Intraday NBBO Spread of Underlying Stocks in ETF Basket (t)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average ETF Ownership in Underlying Stocks in ETF Basket (t-1)	0.00216210*** (3.14)	0.00066539*** (3.03)			0.00216031*** (3.14)	0.00066489*** (3.03)	0.00066526*** (3.03)
Operational Shorting, as % of Shares Outstanding at (t-1)			-0.00026142** (-2.16)	-0.00008075* (-1.93)	-0.00023448** (-2.40)	-0.00007327** (-2.03)	
Operational Shorting, as % of Shares Outstanding at (t)							-0.00009766*** (-2.67)
log (Market Cap), at (t-15)	-0.00002512** (-2.55)	-0.00000740** (-2.30)	-0.00001784* (-1.86)	-0.00000493 (-1.59)	-0.00002668*** (-2.65)	-0.00000789** (-2.40)	-0.00000805** (-2.44)
Average Share Turnover, as % of Shares Outstanding, at (t-15)	-0.00027368** (-2.07)	-0.00008531** (-2.03)	-0.00029175* (-1.77)	-0.00008913* (-1.74)	-0.00026616** (-2.01)	-0.00008297* (-1.96)	-0.00008221* (-1.94)
Intraday NBBO Spread of ETF, at (t)	0.00493170** (2.41)	0.00239582*** (2.60)	0.00935935** (2.24)	0.00342491** (2.39)	0.00490543** (2.40)	0.00238771*** (2.60)	0.00238477*** (2.59)
Intraday NBBO Spread of ETF, at (t-1)	0.00416669** (2.20)	0.00089497 (1.08)			0.00413961** (2.19)	0.00088665 (1.07)	0.00088090 (1.06)
Intraday NBBO Spread of ETF, at (t-2)	0.00404646** (2.19)	0.00105572 (1.62)			0.00401106** (2.18)	0.00104477 (1.61)	0.00104227 (1.60)
Intraday NBBO Spread of ETF, at (t-3)	0.00442017** (2.30)	0.00131459* (1.76)			0.00438403** (2.29)	0.00130343* (1.75)	0.00130040* (1.74)
Average Intraday NBBO Spread of Underlying Stocks in ETF Basket (t-1)		0.68773597*** (28.93)		0.69196466*** (29.12)		0.68770651*** (28.93)	0.68770000*** (28.93)
Observations	837,347	837,333	853,554	852,955	837,347	837,333	837,333
R-squared	0.755	0.869	0.753	0.870	0.755	0.869	0.869

# Operational Shorting & Counterparty/Systemic Risk

	Weekly Series of St. Louis Financial Stress Index (FSI)			
	(1)	(2)	(3)	(4)
FSI (t-7)	0.989*** (42.04)	0.991*** (41.77)	0.888*** (50.37)	0.880*** (50.61)
Total ETF Fail-to-Deliver \$ Shares, % of ETF Market Capitalization (t-1 to t-7)	3.313 (0.516)	3.483 (0.537)	93.04*** (5.947)	90.83*** (6.147)
Total Common Stock Fail-to-Deliver \$ Shares, % of Common Stock Market Capitalization (t-1 to t-7)	1,708*** (3.796)	1,728*** (3.771)	425.7 (0.463)	298.6 (0.345)
ETF Operational Shorting (t-1 to t-7) <sup>†</sup>		-1.919 (-0.626)		5.829** (2.377)
Constant	-0.219*** (-5.146)	-0.202*** (-4.718)	-0.234*** (-6.612)	-0.273*** (-7.121)
Observations	289	289	302	302
R-squared	0.958	0.958	0.936	0.937
Sample Period	Before Rule 204 in 2009	Before Rule 204 in 2009	After 2010	After 2010



# Market Makers' Spillover Effects

	Fail-to-Deliver Shares / Shares Outstanding, at day (t)		Operational Shorting / Shares Outstanding, at day (t)	
	(1)	(2)	(3)	(4)
log (Market Cap), at (t-15)	-0.00233*** (-19.79)	-0.00209*** (-18.50)	-0.00644*** (-19.76)	-0.00625*** (-19.29)
Average Share Turnover, as % of Shares Outstanding, at (t-15)	0.0302*** (13.85)	0.0291*** (13.06)	0.0263*** (11.39)	0.0250*** (10.84)
Affiliated Lead Market Maker Fail-to-Deliver, % of LMM Total Volume, <i>excluding individual ETF FtDs and Volume</i>	0.00950*** (10.34)			
Market-Wide Fail-to-Deliver, % of Overall Trading Volume, <i>excluding Affiliated Lead Market Maker ETF FtDs and Total Volume</i>	0.0225*** (10.29)			
Affiliated Lead Market Maker Fail-to-Deliver, % of All Affiliated ETF Market Cap, <i>excluding individual ETF FtDs and Market Cap</i>		0.354*** (10.59)		
Market-Wide Fail-to-Deliver, % of ETF Market Cap, <i>excluding Affiliated Lead Market Maker ETF FtDs and Market Cap</i>		0.737*** (13.52)		
Affiliated Lead Market Maker Operational Shorts, % of LMM Total Volume, <i>excluding individual ETF Operational Shorts and Volume</i>			0.00119** (2.460)	
Market-Wide Operational Shorts, % of Overall Trading Volume, <i>excluding Affiliated Lead Market Maker ETF Operational Shorts and Market Cap</i>			0.0110*** (5.589)	
Affiliated Lead Market Maker Operational Shorts, % of All Affiliated ETF Market Cap, <i>excluding individual ETF Operational Shorts and Volume</i>				0.108*** (6.176)
Market-Wide Operational Shorts, % of ETF Market Cap, <i>excluding Affiliated Lead Market Maker ETF Operational Shorts and Volume</i>				0.0372 (1.171)
Maximum Rolling R-Squared with Available Futures Contracts at (t-1)	-0.00280*** (-4.056)	-0.00298*** (-4.337)	0.00601*** (5.477)	0.00501*** (4.955)
Available Options Dummy at (t-1)	-0.000829*** (-3.397)	-0.000868*** (-3.785)	0.00214*** (4.298)	0.00218*** (4.280)
Observations	2,307,010	2,307,615	2,307,010	2,307,615
R-squared	0.125	0.126	0.158	0.157
ETF Fixed Effects	Yes	Yes	Yes	Yes
Date Fixed Effects	No	No	No	No

# Conclusions

- SEC rules have reduced overall FTDs but are **growing for ETFs** since 2009 (counter to trends in Stock FTDs)
- We propose a new possible source of ETF FTDs, **Operational Shorting**
- We also propose a novel measure of operational shorting and show that it is **positively related to FTDs** (but different than “directional” shorts)
- Operational shorting can **act as a buffer** and improve basket’s liquidity
- We show **“spillovers”** between AP-level and market-wide operational shorting
- We examine the relationship of ETF FTDs and **financial markets**:
  - It doesn’t predict risk-adjusted returns (consistent with liquidity provision incentives)
  - It does predict the **St. Louis Financial Stress Index**, a measure of counterparty/systemic risk, (post-2009)
  - **Financial leverage** might be a channel which transmits counterparty risk to the broader market.