# Do ETFs Increase Volatility?

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Itzhak Ben-David

## Education:

- PhD Finance, University of Chicago, Booth school of Business
- MBA University of Chicago, Booth school of Business
- MS in Finance, London Business school
- MS in Industrial Engineering, Tel-Aviv University
- BS in Industrial Engineering, Tel-Aviv University
- BA in Accounting, Tel-Aviv University
- Research Interests: Coeporate Finance Finance Real Estate

## **Publications:**

1.Agurwal, Sumit, Gene Amromin, Itzhak Ben-David, and Serdar Dinc, The Politics of Foreclosures, Journal of Finance

2. Agarwul, Sumit, and Itzhak Ben-David, Loan Prospecting and the Loss of Soft Information, Journal of Financial Economics

3.Ben-David, Itzhak, Justin Birru, and Andrea Rossi, Trading Skill Evidence from Trades of Corporate Insiders in Their Personal Portfolios, Journal of Financial Economics





### Education:

•PhD from the Massachusetts Institute of Technology •Bachelor and Master degrees from Bocconi University

Francesco Franzoni **Full Professor** 

**Research Interests:** Empirical Asset Pricing, Institutional Investors, Liquidity, **Financial Frictions and Asset Prices.** 

## **Publications**:

1.Franzoni F., Nowak E., Phalippou L. (2012) Private equity performance and liquidity risk, Journal of Finance, Vol. 67 (6), 2341-2374 2. Franzoni F., Adrian T. (2009) Learning about Beta: Time-Varying Factor Loadings, Expected Returns, and the Conditional CAPM, Journal of Empirical Finance





Rabih Moussawi

## Education:

- PhD in Finance from the University of Texas at Dallas
- MBA and BA in Economics, with distinction, from the American University of Beirut

Research Interests: institutional investors, hedge funds, quantitative investment, financial reporting, and corporate governance.

## Main Working:

Rabih conducts specialized empirical finance tutorials on research and data issues for academics and professionals in many forums in the U.S. and abroad. Rabih presented on effective methods to link databases and is currently developing a WRDS research platform for SEC filings.



# ABSTRACT

Due to their low trading costs, exchange-traded funds (ETFs) are a potential **catalyst** for short-horizon liquidity traders. The liquidity shocks can **propagate** to the underlying securities through the **arbitrage channel**, and ETFs may increase the nonfundamental volatility of the securities in their baskets.

We exploit exogenous changes in index membership and find that stocks with higher ETF ownership display significantly **higher volatility.** ETF ownership increases the negative autocorrelation in stock prices. The increase in volatility appears to introduce undiversifiable risk in prices because stocks with high ETF ownership earn a significant risk premium of up to 56 basis points monthly.



# 01 Introduction



Exchange-traded funds (ETFs) are increasingly popular in financial markets. Introduced in the early 1990s, today this asset class boasts \$2.5 trillion in assets under management (AUM) in the United States (\$3.5 trillion globally), accounting for about 35% of the volume in U.S. equity markets. Increased access to liquidity and diversification is undoubtedly the greatest benefit for investors.

One may wonder, however, whether the ease of trade that makes ETFs so popular has **unintended consequences** for the securities in the ETFs' baskets. The liquidity of ETFs likely attracts high-frequency demand. This demand can affect the prices of the underlying securities because ETFs and their baskets are tied by arbitrage. **The ETF-underlying securities may therefore be exposed to a new layer of demand shocks, which can make the prices of these securities more volatile**. In this paper, we explore this conjecture and its implications for asset pricing.







1.Liquidity trading hypothesis

2.Liquidity buffer hypothesis

3.Price discovery hypothesis





To disentangle the two hypotheses, we need to determine the direction of the link between the presence of ETFs and stock-level volatility.

2. Liquidity buffer hypothesis





#### Figure 1. Illustration of the propagation of liquidity shocks via arbitrage.









Figure 2. Illustration of the propagation of a fundamental shock with price discovery occurring in the ETF market.











Empirical evidence

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### ETFs versus Stocks: Liquidity, Institutional Ownership, Churn Ratio

Panel A: Liquidity and Investors' Churn Ratio Measures											
Liquidity Measures	Quarters	ETFs	Stocks	Difference	t-Statistics						
Bid-ask spread	64	0.002	0.004	-0.002	(-3.611)						
Amihud ratio	64	0.002	0.007	-0.004	(-7.408)						
Daily turnover	64	0.085	0.010	0.075	-13.682						



$$Churn Ratio_{k,i,q} = 1 - \frac{|\$Buy Trades_{k,i,q} - \$ Sell Trades_{k,i,q}|}{\$Buy Trades_{k,i,q} + \$ Sell Trades_{k,i,q}}$$



		Com	mon Stock	S		1	ETFs	
	10 12	Ownersh	ip			Ownership	0	
Type of Institution	Total	Q1:2000	Q4:2015	Churn Ratio	Average	Q1:2000	Q4:2015	Churn Ratio
Bank and trust	1.7%	1.5%	1.9%	17.9%	3.3%	2.5%	4.8%	31.2%
Insurance company	0.8%	0.8%	0.9%	11.3%	0.5%	1.1%	0.4%	37.6%
Investment advisor/investment company	38.9%	32.6%	43.0%	18.5%	16.1%	14.2%	25.2%	45.1%
Investment advisor/hedge fund	14.7%	11.0%	15.6%	26.7%	8.7%	13.7%	6.3%	48.5%
Hedge fund	2.8%	0.9%	4.2%	74.8%	1.9%	1.0%	0.7%	100.8%
Pension fund	3.7%	2.7%	3.4%	13.3%	1.4%	1.6%	1.1%	58.5%
Research firm	2.0%	0.8%	2.9%	39.7%	17.6%	7.4%	17.6%	51.0%
Other institutions	0.7%	0.4%	0.7%	23.7%	1.3%	0.8%	0.1%	62.7%
All institutions	65.4%	50.9%	72.4%	22.6%	50.7%	42.2%	56.3%	47.8%



 $Churn \ Ratio_{k,i,q} = 1 - \frac{|\$Buy \ Trades_{k,i,q} - \$ \ Sell \ Trades_{k,i,q}|}{\$Buy \ Trades_{k,i,q} + \$ \ Sell \ Trades_{k,i,q}|}.$ 

Adjusted Churn Ratio\_{k,i,q} = Churn Ratio\_{k,i,q} \* 
$$\frac{N_{k,i,q} + 1}{2}$$
,



	Panel C: Churn Ratio Regressions												
Dependent Variable:	1.3	Churn Ratio		Adjusted Churn Ratio									
	(1)	(2)	(3)	(4)	(5)	(6)							
Security is ETF	0.194***	0.197***	0.146***	0.571***	0.570***	0.372***							
	(13.764)	(14.584)	(11.060)	(10.258)	(10.142)	(7.246)							
Date fixed effects	No	Yes	Yes	No	Yes	Yes							
Manager fixed effects	No	No	Yes	No	No	Yes							
Observations	32,371	32,371	32,329	32,371	32,371	32,329							
Adjusted-R <sup>2</sup>	0.154	0.168	0.358	0.098	0.101	0.396							



Overall, the empirical evidence in this section suggests that institutions trade ETFs at a substantially **higher frequency** than stocks. This result provides initial support for the main assumption behind the liquidity trading hypothesis, namely, **that ETFs are a catalyst for short-horizon investors.** 



Empirical analysis

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5.1 The Effect of ETF Ownership on Volatility

A OLS Regressions

$$ETF \ Ownership_{i,t} = \frac{\sum_{j=1}^{J} w_{i,j,t} AUM_{j,t}}{Mkt \ Cap_{i,t}},$$



			Panel A: OLS	Regressions, Full San	mple							
Dependent Variable:	Daily Volatility (t)											
Sample:		S&I	2 500			Russe	1 3000	197				
	0)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
ETF ownership	0.164***	0.163***	0.158***	0.077***	0.087***	0.078***	0.079***	0.053***				
	(6.446)	(6.415)	(6.436)	(6.072)	(8.445)	(7.741)	(7.873)	(7.548)				
$\log(Mkt \exp(t-1))$	0.019	0.010	-0.011	-0.013	-0.077***	-0.101***	-0.114***	-0.064***				
	(0.544)	(0.306)	(-0.312)	(-0.912)	(-4.848)	(-6.216)	(-7.258)	(-6.953)				
1/Price (t = 1)	2.906***	2.848***	2.821***	1.052***	1.586***	1.603***	1.589***	0.809***				
	(4.311)	(4.237)	(4.087)	(3.574)	(10.126)	(10.299)	(9.961)	(8.625)				
Amihud $(t - 1)$	41.750***	44.412***	55.318***	21.548**	2.072***	2.108***	2.322***	1.165***				
	(2.728)	(2.897)	(3.265)	(2.540)	(8.524)	(8.635)	(9.327)	(6.717)				
Bid-ask spread $(t = 1)$	-0.601	-0.678	0.422	-0.340	3.194***	3.280***	3.374***	2.467***				
	(-0.194)	(-0.217)	(0.135)	(-0.213)	(2.639)	(2.700)	(3.340)	(4.574)				
Book-to-market $(t = 1)$	0.111**	0.114***	0.097**	-0.027	0.118***	0.115***	0.115***	0.006				
	(2,527)	(2.614)	(2.242)	(-1.338)	(5.479)	(5.324)	(5.264)	(0.478)				

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#### **ETF Ownership and Stock Volatility** . .....

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			Panel A: OLS Reg	ressions, Full Samp	le							
Dependent Variable:	Daily Volatility $(t)$											
Sample:		S&	P 500		Russell 3000							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
Past 12-month returns $(t - 1)$	-0.079**	-0.083**	-0.103***	-0.008	0.012	0.023	0.015	0.015				
	(-2.398)	(-2.489)	(-3.210)	(-0.497)	(0.751)	(1.452)	(0.926)	(1.587)				
Gross profitability $(t - 1)$	0.010	0.038	0.010	-0.043	-0.141***	-0.137***	-0.130***	-0.083***				
	(0.098)	(0.384)	(0.104)	(-1.105)	(-3.427)	(-3.359)	(-3.094)	(-3.523)				
Index fund ownership $(t-1)$		0.014	0.017	0.002		0.016***	0.017***	0.009***				
		(1.241)	(1.447)	(0.491)		(3.038)	(3.157)	(3.022)				
Active fund ownership $(t - 1)$		0.046***	0.045***	0.016***		0.048***	0.049***	0.026***				
		(3.594)	(3.517)	(2.983)		(6.570)	(6.668)	(5.945)				
Hedge fund ownership $(t-1)$		-0.013	-0.013	-0.026***		-0.027***	-0.025***	-0.023***				
		(-1.006)	(-0.989)	(-4.220)		(-5.598)	(-5.262)	(-7.985)				
Volatility Q = 1)				0.291***				0.207***				
50 C				(17.597)				(20.102)				
Volatility $(t - 2)$				0.176***				0.154***				
				(9.689)				(22.784)				
Volatility Q = 3)				0.204***				0.177***				
				(14.983)				(28.001)				
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Observations	81,243	81,243	77,675	77,675	418,748	418,748	392,684	392,684				
$R^2$	0.643	0.644	0.644	0.740	0.607	0.608	0.613	0.670				



			1	anel B: OLS	Regressions,	Sample Split	by Period					
Dependent Variable:						Daily Vo	latility (1)					
Period:		2000 t	o 2006			2007 t	o 2008			2009 t	a 2015	
Sample:	S&I	P 500	Russe	11 3000	S&I	P 500	Russe	11 3000	S&I	P.500	Russe	11 3000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ETF ownership	0.082***	0.061***	0.044***	0.033***	0.276***	0.184***	0.079***	0.071***	0.110***	0.063***	0.077***	0.057***
$\log(\text{Mitenp}(t-1))$	0.220***	0.123***	0.079***	0.025	-0.513***	-0.378***	-0.576***	-0.467***	-0.149***	-0.102***	-0.163***	-0.133***
1/Price (t = 1)	3.072***	1.813***	2.004***	1.260***	2.253***	1.171**	1.048***	0.761***	3.896***	2.186***	1.492***	0.826***
Amihud $(t - 1)$	38.208***	25.647**	1.224***	0.992***	34.758	19.100	3.779***	2.848***	249,919***	209.336***	2.761***	1.681***
Bid-ask spread $(t - 1)$	0.410	0.912	2.511***	1.621***	11.121	2.433	10.244***	6.391**	43.292**	29.276***	14.190***	10.889***
Book-to-market $(t = 1)$	-0.036	-0.086**	-0.027	-0.059**	0.269	0.040	0.093	-0.036	0.046	-0.037	0.179***	0.068***
Past 12-month returns $(t - 1)$	-0.112***	-0.056**	-0.029	-0.007	-0.036	0.031 (0.529)	0.189***	0.171***	0.007	0.047	0.095***	0.074***
Gross profitability $(t-1)$	0.290**	0.074	-0.142**	-0.104**	-0.486**	-0.284	-0.064	-0.117	-0.276**	-0.063	-0.078	-0.054
Index fund ownership $(t = 1)$	-0.014	0.001	-0.000	0.001	0.017	0.010	0.029**	0.028**	-0.025*	-0.013*	0.011 (1.502)	0.007
Active fund ownership $(t - 1)$	0.047***	0.027**	0.058***	0.038***	0.097***	0.066**	0.066***	0.046**	0.010	0.021**	0.046***	0.040***
Hedge fund ownership $(t - 1)$	-0.043**	-0.038***	-0.063***	-0.045***	-0.073*	-0.055	-0.051***	-0.040**	-0.035**	-0.025**	-0.027***	-0.025***
Volatility (2 - 1)		0.227***		0.160***		0.201***		0.141***		0.126***		0.111***
Volatility (2 = 2)		0.113***		0.107***		0.135*		0.076***		0.092***		0.098***
Volatility (2 - 3)		0.155***		0.129*** (13.769)		0.081*		0.076***		0.178*** (12.213)		0.147***
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,731	29,478	160,298	132,219	10,237	8,366	55,549	45,477	36,349	34,338	197,867	184,458
R <sup>a</sup>	0.656	0.709	0.629	0.661	0.780	0.794	0.732	0.739	0.657	0.641	0.609	0.576



*B* Identification Using a Quasi-Natural Experiment

Chang, Hong, and Liskovich (2015) propose an identification strategy that exploits the exogenous variation in membership in the Russell 1000 and Russell 2000 indexes.

Chang, Hong, and Liskovich (2015) show that, although the amount of passive assets benchmarked to the Russell 1000 is 2 to 3.5 times larger than that tracking the Russell 2000, the weights of the top stocks in the Russell 2000 are about 10 times larger than those of the bottom stocks in the Russell 1000.Consequently, a significantly larger amount of passive money tracks the top Russell 2000 stocks than the bottom Russell 1000 stocks.





Figure 3. Fund ownership around the Russell cutoff. The figure reports average ownership (in %) by ETFs (Panel A), index funds (Panel B), active funds (Panel C), and hedge funds (Panel D) for stocks ranked by market capitalization and included in the Russell 3000. The average is computed first by ranking over time, and then ranking across bins of 10 stocks. The vertical line denotes the 1,000th rank. The sample covers the period January 2000 to May 2007. (Color figure can be viewed at wileyonlinelibrary.com)



We carry out two-stage least squares estimation. In each stage, we run our regressions on two groups of stocks: those that in May, before index reconstitution, are in the Russell 1000 and those that are in the Russell 2000.

The first stage consists of a regression of ETF ownership on an indicator variable for whether the stock switches index membership in June

ETF Ownership<sub>it</sub> =  $\alpha + \beta * I(Switched)_{it} + Controls + Fixed Effects + \varepsilon_{it}$ .



In the second stage, for the same two groups of stocks, we regress volatility on the fitted value of ETF ownership from the first stage. This regression is given by:

 $Volatility_{it} = \alpha + \beta * ETF \ Ownership_{it} + Controls + Fixed \ Effects + u_{it}.$ 



			Pane	A: First-Stage	Regressions, Fir	st-Degree l	Polynomial				
Dependent Variable:					E	F Owners	hip				
Instrument:		Switz	h to the Russel	2000				Switch	to the Russell 10	00	
Bandwidth	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)		± 100 (6)	±200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
Switch indicator	0.196*** (6.214)	0.294*** (7.122)	0.407*** (7.887)	0.456*** (8.986)	0.433* (9.099)		0.180*** 3.210)	-0.405*** (-8.935)	-0.397*** (-10.052)	-0.356*** (-8.246)	-0.359*** (-8.581)
$\log(Mkteap (t-1))$	-0.193*** (-3.259)	-0.284*** (-5.868)	-0.231*** (-4.763)	-0.191*** (-4.894)	-0.195* (-5.366)	(-	0.184***	-0.090***	-0.094*** (-5.343)	-0.097*** (-5.946)	-0.100*** (-5.373)
Dependent Variable:	10					ETFOW	nership				
Instrument:			Switch to the	Russell 2000				Swi	tch to the Russell	1000	
Bandwidth	± 100 (1)	0 ± 20 (2)	) ±3 (3	00 ±	400 ±	(5) (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
Amihud (t = 1)	-6.708	-10.18	- 11.0	42*** - 10.	321*** -10	.819***	- 18.39 1***	-18.242***	- 18.757***	- 15.080***	- 10,444***
Bid-ask spread $(t-1)$	(-6.113	2) (-8.16- 7 -1.09	0 (-7.2 8 -0.7	66) (-7. 55 -2.	338) (	.485) .318***	(-11.623) 6.201***	(- 13.283) 3.892**	(-11.000)	(-8.550) 2.989***	(-9.445) 1.949**
Book-to-market (t = 1)	(-1.354	0 (-1.08 7 -0.00	5) (-0.7 5 0.0	85) (-2. 23 0.	383) (-3 022** (	L833) L017**	(2.853) 0.283***	(2.203) 0.336***	(2.742) 0.318***	(3.058) 0.351***	(2.005) 0.353***
Past 12-month returns @ -	-1) 0.042 (1.264	5 0.03 0 (1.96	9 0.0 9 (1.1	24 0. 71) (2.	052** (0 386) (0	L016 L758)	-0.064*** (-2.928)	-0.019* (-1.963)	-0.020** (-2.155)	-0.013 (-1.400)	-0.017* (-1.692)
Gross profitability $(t = 1)$	-0.160	-0.17	-0.1	62*** -0. 30) (-5)	175*** -(	128***	-0.071	-0.101***	-0.042**	-0.007	-0.004
Volatility (2 = 1)	-0.034	-0.04	-0.0	33*** -0.	028*** -(	.027***	-0.133***	-0.124***	-0.132***	-0.127***	-0.124***
Index fund ownership (t -	1) 0.110	5 0.16 7 (16.64)	3*** 0.1 20 (15.6	65*** 0. 87) (19)	179*** ( 056) (9	.197***	0.138***	0.159***	0,165***	(- 10, 200) 0, 163*** (10, 292)	0.167***
Active fund ownership Q -	-1) -0.093	-0.049 0 (-7.21)	-0.0	22*** -0. 36) (-1.	011 -(	0.020	0.095***	0.066***	0.057***	0.056***	0.068***
Hedge fund ownership (2 -	-1) -0.118	-0.10 (-20.18	-0.1 5) (-23.1	02*** -0. 43) (-22)	100*** -(	.104***	-0.093***	-0.106***	-0.080***	-0.070***	-0.072***
Month fixed effects Linear polynomials of rank	k Yes	Yes Yes	Ye	s Y s Y	es es	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Observations	4,857	10,10	3 16,1	01 22,	303 2	8,599	6,495	12,735	18,293	23,647	29,060



			Panel B: Seco	nd-Stage Regres	sions, First-Degr	ee Polynomial				
Dependent Variable:					Daily Vo	latility (?)				
Instrument:		Swit	ch to the Russell	2000		8	Swit	ch to the Russell	1000	
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
ETF ownership	0.512** (2.224)	0.384***	0.268***	0.176**	0.249***	0.717**	0.249*** (3.572)	0, 198*** (3, 252)	0.222***	0,169**** (3.394)
$\log(Mkteap(t-1))$	-0.346***	-0.404***	-0.478***	-0.512*** (-7.366)	-0.533*** (-7.322)	-0.606***	-0.731*** (-9.075)	-0.766*** (-9.783)	-0.761***	-0.728**** (-9.266)
1/Price(t-1)	2.758****	1.815***	1.550***	1.326****	1.461***	1.759****	1.395***	1.322***	1.411****	1.435****
Amihud $(t - 1)$	1.241 (0.493)	5.238** (2.413)	4.392*** (2.876)	5.737****	6.139***	13.736** (2.251)	6.568***	7.135***	7.249***	6.084****
Bid-ask spread $(t-1)$	-0.484	0.696	-2.117 (-1.293)	-2.833	-3.004 (-1.571)	-12.445****	-9.365*** (-2.662)	-8.741***	-9.558*** (-3.411)	- 10.449*** (-3.641)
Book-to-market $(t = 1)$	0.063** (2.113)	0.082***	0.095***	0.088**** (4.376)	0.109***	-0.291***	-0.248*** (-4.827)	-0.245*** (-5.323)	-0.235*** (-5.208)	-0.184**** (-4.293)
Past 12-month returns (2 - 1)	-0.014	-0.029	0.027	0.008	0.038	0.309***	0.156***	0,152***	0.153***	0.140****
Gross profitability $(t-1)$	0.004	0.049	0.064**	0.035	0.069***	0.173**	0.109***	0.090***	0.072***	0.033
Volatility (t = 1)	0.229***	0.263***	0.260*** (20.091)	0.267***	0.270***	0.376****	0.290***	0.287***	0.297***	0.294****
Index fund ownership $(t - 1)$	-0.002	-0.022	-0.013	0.001 (0.073)	-0.020	-0.059	-0.003	0,005	0.001 (0.043)	0.010
Active fund ownership $(t-1)$	0.105****	0.083***	0.082***	0.088***	0.092***	0.024	0.093***	0.098***	0.092***	0.088***
Hedge fund ownership $(t-1)$	0.088***	0.076***	0.054***	0.048***	0.050***	0.075**	0.013	0.011	0.011	0.011
Month fixed effects Linear polynomials of rank	Yes	Yes	Yes	Yes	Ness Ness	Yes	Yes Yes	Yes	Yes	Yes
Observations	4,857	10,103	16,101	22,303	28,599	6,495	12,735	18,293	23,647	29,060



		Panel C: Ic	lentification from	n Time Series V	ariation in Agg	regate Fund Own	nership			2
Dependent Variable:					Daily St	ock Volatility				
Instrument:		Swite	h to the Russell	2000		245 C	Swi	tch to the Russel	11000	
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
ETF ownership × Switch	0.231	0.401**	0.351**	0.219	0.216	-0.287*	-0.431***	-0.496***	-0.592***	-0.671***
Index funds ownership × Switch	(1.289) -0.087***	(2.450) -0.060**	(2.430) -0.053**	(1.574) -0.046**	(1.390) -0.049** (-2.195)	(-1.866) 0.067***	(-3.849) 0.016 (0.876)	(-4.169) -0.011 (-0.707)	(-4.068) -0.006 (-0.358)	(-3.769) -0.008 (-0.299)
Active funds ownership × Switch	0.237*** (3.136)	0.041 (0.657)	0.046 (0.763)	0.053 (0.856)	0.056 (0.925)	-0.092	0.020	0.083 (1.337)	0.082 (1.404)	0.125* (1.770)
Hedge funds ownership $\times$ Switch	0.176 (1.237)	0.079 (0.671)	-0.059	-0.041	-0.086	-0.121	-0.053	-0.093	-0.003	0.040 (0.483)
Switch indicator	11.776** (2.448)	12.236***	7.772**	6.098* (1.943)	4.730 (1.282)	-9.630***	-10.797***	-11.743*** (-4.811)	-11.380*** (-4.108)	-11.272*** (-3.645)
$\log(Mkteap (t - 1))$	-0.570***	-0.590***	-0.612***	-0.619***	-0.652***	-0.849***	-0.846***	-0.877***	-0.960***	-0.837***
1/Price(t-1)	2.117***	1.640***	1.373***	1.252***	1.440****	1.649***	1.492***	1.374****	1.324***	1.358****
Amihud $(t = 1)$	-1.524	0.713	1.136	3.570**	3.223**	-1.118	0.228	2.469***	3.405***	4.304***
Bid-ask spread $(t-1)$	-0.658	0.442	-1.969	-2.372	-3.742**	-8.000***	-9.079***	-8.493***	-9.282*** (-3.718)	-10.094****
Book-to-market $(t = 1)$	0.079**	0.081***	0.099***	0.091***	0.113****	-0.066	-0.171***	-0.188***	-0.150***	-0.115****
Past 12-month returns (t = 1)	0.062	0.019	0.055	0.045	0.065*	0.274***	0.160***	0.161***	0.169***	0.166****
Gross profitability $(t = 1)$	-0.086*	-0.021	0.023	0.010	0.044**	0.117***	0.083***	0.072***	0.074***	0.040**
Volatility (t = 1)	2.214***	1.596***	1.339***	1.371***	1.255****	1.258**	1.217***	1.343***	1.243***	1.295****
Index fund ownership $(t - 1)$	0.793***	0.852***	0.992***	1.053***	1.068***	1.012***	1.267***	1.280***	1.256***	1.190***
Active fund ownership (t = 1)	0.676***	0.817***	0.612***	0.722***	0.606***	0.172	-0.173	0.040	0.071	0.144
Hedge fund ownership $(t-1)$	0.221***	0.247***	0.251***	0.263***	0.262***	0.275***	0.255***	0.261***	0.268***	0.271***
Time trend, interacted with switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank Observations R <sup>2</sup>	Yes 4,858 0.634	Yes 10,107 0.609	Yes 16,107 0.604	Nes 22,315 0.594	Yes 28,615 0594	%es 6,499 0.495	Yes 12,744	Yes 18,304 0.476	Yes 23,663 0.484	Yes 29,077 0.489





				Panel D: R	atio of ETF	Ownership	o to Owners	hip by Othe	er Fund Typ	968					
Dependent Variable:	-						Daily	Stock Vola	tility						
Instrument:							Switch	to the Russ	ell 1000						
Ra tio:		ET	F/Index Fu	nd			ET	F/Active Fu	ind			ET	F/Hedge Fu	ind	
Bandwidt h:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500	±100	±200	± 300 (13)	± 400	± 500
Ratio × Switch	-0.033	-0.091**	-0.094**	-0.109***	-0.106***	-0.352	-0.268	-0.391**	-0.372***	-0.345***	-0.040***	-0.034***	-0.018**	-0.020***	-0.014*
Switch indicator	(-0.526)	(-2.143)	(-2.418)	(-3.025)	(-3.047)	(-1.485)	(-1.441)	(-2.551)	(-2.772)	(-2.857)	(-2.748)	(-3.251)	(-2.417)	(-2.674)	(-1.936)
Swaca indicator	(= 2.159)	(-1.482)	(=1.580)	(-0.960)	(-0.509)	(-2.284)	(-1.955)	(-2.033)	(=1.547)	(=1.249)	(=1.891)	(-2.471)	(-3.347)	(-2.874)	(-2,925)
Ratio	-0.203***	-0.202***	-0.211***	-0.206***	-0.208***	-0.689***	-0.946***	-0.870****	-0.880***	-0.902***	-0.013	-0.020**	-0.029***	-0.029***	-0.036***
$\log(Mkteap(t-1))$	-0.597***	-0.577***	-0.590***	-0.567***	-0.553***	-0.587***	-0.567***	-0.567***	-0.531***	-0.526***	-0.608***	-0.581***	-0.585***	-0.569***	-0.555***
1/Price (t = 1)	(-8.027) 1.459	(-7.372) 1.599	(-8.590) 1.509***	(-8.970) 1.395***	(-8.978) 1.461***	(-7.966) 1.787	(-7.257) 1.486***	(-8.267) 1.456***	(-8.463) 1.399***	(-8.739) 1.505***	(-8.493) 1.653***	(-7.355) 1.778***	(-8.470) 1.523***	(-8.969) 1.324	(-9,151) 1.360***
Amihud(t = 1)	(6.483)	(9.247)	(11.075)	(10.267)	(12.839)	(7.141)	(5.305)	(6.607)	(6.956)	(8.933)	(6.952)	(10.698)	(11.255)	(9.977)	(11.778)
	(-2.704)	(-4.049)	(-4.139)	(-3.790)	(-1.377)	(-0.852)	(0.661)	(-0.451)	(-0.731)	(0.954)	(-2.083)	(-3.219)	(-2.969)	(-2.303)	(1.347)
Hid-ask spread $(t-1)$	1.040	1.791 (0.724)	0.164 (0.078)	0.049	-0.678 (-0.522)	1.334 (0.538)	0.337	-0.561 (-0.271)	0.536 (0.358)	-1.138 (-0.928)	-0.850	-0.619 (-0.220)	-2.713 (-1.228)	-2.053 (-1.235)	-3.577
Book-to-market $(t = 1)$	-0.030	-0.113**	-0.129***	-0.078**	-0.057	-0.038	-0.081	-0.093**	-0.050	-0.049	-0.058	-0.125**	-0.130***	-0.111***	-0.089**
Past 12-month returns (t = 1)	0.240***	0.137***	0.147***	0.154***	0.151***	0.246***	0.136***	0.146***	0.157***	0.153***	0.247***	0.135***	0.144***	0.153***	0.148***
Gross profitability $(t-1)$	0.148***	0.128***	0.100***	0.126***	0.097***	0.094*	0.094***	0.084***	0.102***	0.052**	0.139***	0.131	0.114***	0.134	0.090***
Volatility $(t = 1)$	0.298***	0.264***	0.264***	0.271***	0.274***	0.293***	0.250***	0.256***	0.261***	0.265***	0.299***	0.268***	0.268***	0.272***	0.275***
Month fixed effects	Yes	Yes	Yes	(20.554) Yes	(21.726) Yes	(19.193) Yes	Yes	Yes	(20.066) Yes	Yes	Yes	(10.902) Yes	Yes	Yes	(22.366) Yes
Linear polynomials of rank Observations R <sup>2</sup>	Yes 5,609 0,437	Yes 10,850 0.396	Yes 15,520 0.401	Yes 19,957 0,402	Yes 24,355 0.414	Nes 5,459 0.433	Yes 10,574 0,391	Yes 15,067 0.397	Yes 19,496 0.396	Yes 23,874 0,404	Yes 5,532 0.435	Nes 10,635 0.396	Yes 15,194 0,399	Yes 19,478 0.401	Yes 23,609 0.409



山西大学

shanxi university

## 5.2

## ETFs Attract a High-Turnover Clientele

As detailed in before, for ETFs to impound a new layer of liquidity shocks, absent the ETFs, liquidity traders must not have directly traded the underlying stocks or gotten indirect access to them through other vehicles, such as futures.

We provide suggestive evidence that ETFs attract higher turnover investors than common stocks. These investors are likely to express their liquidity demand at a higher frequency. If the liquidity trading hypothesis is correct, then this demand should propagate to the underlying stocks through arbitrage activity, exposing the stock prices to a new layer of liquidity shocks. The question, therefore, is whether the stocks in ETF baskets are exposed to this high-turnover clientele through ETF ownership.



	Pa	nel A: OLS Specification		
Dependent Variable:		Adjusted Chu	rn Ratio (t)	
	(1)	(2)	(3)	(4)
ETF ownership $(t-1)$	0.165***	0.123***	0.084***	0.059***
an a	(3.511)	(3.330)	(4.950)	(4.359)
$\log(Mkteap(t-1))$	0.555***	0.420***	0.361***	0.261***
we transfer to any	(13.870)	(13.023)	(16 231)	(12,898)
1/Price(t-1)	0.320	0.215	0.405***	0.905***
mine ( = 1)	(0.611)	(0.557)	(3.182)	(2.746)
Amihud (t - 1)	28.446*	26.453**	0.323	0.189
	(1.825)	(2.024)	(1.350)	(0.936)
Bid-ask spread $(t-1)$	-1.529	-1.095	-1.753	-1.153
	(-0.498)	(-0.400)	(-1.333)	(-1.085)
Book-to-market $(t-1)$	-0.033	-0.013	0.005	0.010
	(-0.655)	(-0.319)	(0.247)	(0.589)
Past 12-month returns $(t - 1)$	0.117***	0.111***	0.003	0.017
	(2.664)	(2.895)	(0.205)	(1.341)
Gross profitability $(t-1)$	0.077	0.045	-0.024	-0.021
	(0.505)	(0.382)	(-0.551)	(-0.648)
Index fund ownership $(t - 1)$	1.425	1.108	-1.444**	-0.951*
1054-01-01-01-01-01-01-01-01-01-01-01-01-01-	(0.576)	(0.548)	(-2.045)	(-1.725)
Active fund ownership $(t-1)$	1.361***	0.963***	0.909***	0.581***
A STATE OF	(5.010)	(4.628)	(7.748)	(6.466)
Hedge fund ownership $(t-1)$	-0.600	-0.406	-0.226***	-0.184***
	(-1.637)	(-1.325)	(-2.667)	(-2.879)
Adjusted churn ratio $(t-1)$		0.170***		0.202***
		(18.923)		(15.215)
Quarter fixed effects	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes
Observations	25,641	25,641	130,267	130,267
$R^2$	0.469	0.500	0.489	0.529

#### ETF Ownership and Churn Ratio of Stock Traders



Dependent Variable:					Adjusted Cl	hurn Ratio (t)				
Instrument:		Switch	to the Russel	1 200 0			Switch	to the Russel	1 1000	
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
Switch indicator	0.741***	0.462***	0.200**	0.051	0.137**	0.321	-0.049	-0.080	-0.025	-0.029
	(3.172)	(3.514)	(2.444)	(0.814)	(2.139)	(1.619)	(-0.785)	(-1.381)	(-0.420)	(-0.497)
$\log(Mktcap(t-1))$	0.600***	0.582***	0.484***	0.438***	0.425***	0.286***	0.345***	0.254***	0.294***	0.309***
	(7.095)	(9.580)	(9.725)	(11.642)	(12.825)	(5.245)	(7.868)	(6.475)	(8.569)	(9.834)
1/Price(t-1)	1.832***	1.842***	1.558***	1.207***	1.316***	2.360***	1.522***	1.326***	1.432***	1.390***
	(5.270)	(5.424)	(7.152)	(7.551)	(7.701)	(9.152)	(7.769)	(7.564)	(8.199)	(9.642)
Amihud $(t-1)$	-0.215	-1.628	-2.585***	-3.355***	-1.337*	1.257	-3.382	-3.439*	-3.769**	-2.287**
	(-0.116)	(-1.152)	(-2.924)	(-4.536)	(-1.810)	(0.252)	(-1.386)	(-1.845)	(-2.370)	(-2.117)
Bid-ask spread $(t-1)$	-11.618***	-6.860***	-11.585***	-9.646***	-9.865***	-16.447***	-14.999***	-11.984***	-13.128***	-14.539***
and the second second second	(-3.467)	(-2.883)	(-5.616)	(-5.516)	(-5.801)	(-6.111)	(-8.700)	(-8.748)	(-9.024)	(-9.776)
Book-to-market $(t-1)$	0.094	0.082	0.064**	0.038	0.041**	-0.171**	-0.095**	-0.095**	-0.098**	-0.063**
	(1.203)	(1.605)	(2.028)	(1.559)	(2.560)	(-2.126)	(-2.281)	(-2.543)	(-2.523)	(-2.209)
Past 12-month returns $(t - 1)$	-0.141**	-0.001	0.030	0.036	0.060	0.199***	0.127***	0.144***	0.142***	0.134***
	(-2.290)	(-0.020)	(0.691)	(0.882)	(1.621)	(4.132)	(4.570)	(6.062)	(6.782)	(6.519)
Gross profitability $(t-1)$	0.073	0.094*	0.037	-0.015	-0.002	0.135**	-0.043*	-0.054***	-0.040**	-0.033*
	(1.175)	(1.795)	(0.954)	(-0.507)	(-0.084)	(2.501)	(-1.844)	(-3.061)	(-2.109)	(-1.718)
Lagged adjusted churn ratio	0.194***	0.209***	0.211***	0.218***	0.219***	0.292***	0.264***	0.242***	0.236***	0.239***
	(9.353)	(14,526)	(14, 598)	(19,861)	(19.900)	(14.108)	(22.414)	(27,167)	(25, 865)	(28.048)
Index fund ownership $(t-1)$	0.055*	0.063***	0.084***	0.106***	0.089***	0.026	0.108***	0.106***	0.085***	0.080***
	(1.769)	(3.039)	(6.322)	(11,103)	(7.469)	(0.871)	(7,707)	(7,766)	(6.732)	(6.725)
Active fund ownership $(t-1)$	0.175***	0.119***	0.131***	0.130***	0.135***	0.156***	0.172***	0.160***	0.148***	0.148***
	(7.490)	(9.857)	(14.279)	(13.914)	(15.288)	(11.823)	(13.826)	(15,730)	(15, 222)	(15.105)
Hedge fund ownership $(t-1)$	0.136***	0.073***	0.042***	0.027**	0.046***	0.045*	0.008	0.015	0.038***	0.045***
	(4.030)	(3,549)	(2.976)	(2.354)	(4.534)	(1.681)	(0.616)	(1.353)	(3.892)	(5.037)
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4.840	10.077	16.083	22,286	28,574	6.482	12726	18,286	23,641	29.054

Overall, we interpret this evidence as corroborating the view that a new clientele of high-turnover investors is attracted to the stocks in the ETF baskets. Under a causal interpretation of these regressions, these investors would not trade the stocks if they were not in the ETF portfolios.



5.3

## The Price Impact of ETF Flows

$$Flows_{i,t} = \frac{\sum_{j=1}^{J} w_{i,j,t} * Flows_{j,t}}{Flows_{i,t}}.$$



#### ETF Flows, Stock Returns, and Price Impact

Panel A: ETF Flows and Stock Returns												
Sample: Dependent Variable:			S&P 500				Russell 3000					
	Ret(t) (1)	$\frac{\operatorname{Ret}(t, t+4)}{(2)}$	$\frac{\operatorname{Ret}(t,t+9)}{(3)}$	Ret(t, t + 19) (4)	Ret(t, t + 39) (5)	Ret(t) (6)	Ret(t, t + 4) (7)	$\frac{\operatorname{Ret}(t, t+9)}{(8)}$	Ret(t, t + 19) (9)	Ret(t, t + 39) (10)		
ETF flows (t)	0.122***	0.111***	0.062***	0.046*	0.015	0.040***	0.034***	0.027***	0.016*	-0.000		
	(13.433)	(7.469)	(3.233)	(1.848)	(0.416)	(15.069)	(6.649)	(3.995)	(1.669)	(-0.006)		
$\log(Mktcap(t-1))$	0.048***	0.039***	0.033**	0.040	0.050	0.008***	0.022***	0.044***	0.090***	0.181***		
-	(14.352)	(4.750)	(2.003)	(1.216)	(0.736)	(6.956)	(7.371)	(7.942)	(8.579)	(8.896)		
1/Price(t-1)	-0.870***	0.209	1.471**	4.131***	9.562***	-0.316***	0.100	0.613***	1.819***	4.754***		
	(-4.084)	(0.835)	(2.555)	(3.365)	(3.386)	(-10.093)	(1.302)	(4.369)	(6.737)	(8.791)		
Amihud $(t-1)$	37.332***	1.842	-31.973	-72.013	-159.667	0.135***	-0.813***	-1.868***	-3.664***	-6.662***		
	(6.715)	(0.139)	(-1.208)	(-1.332)	(-1.482)	(2.777)	(-8.169)	(-10.661)	(-11.816)	(-11.964)		
Bid-ask spread $(t-1)$	-2.450**	2.411	6.631*	19.021***	29.763**	0.781*	0.135	0.245	1.653	4.534		
	(-2.505)	(1.132)	(1.759)	(2.671)	(2.220)	(1.853)	(0.157)	(0.186)	(0.716)	(1.048)		
Book-to-market $(t-1)$	0.020*	0.014	0.011	-0.001	-0.020	0.017***	0.039***	0.062***	0.107**	0.177**		
	(1.702)	(0.565)	(0.232)	(-0.013)	(-0.106)	(3.511)	(2.951)	(2.622)	(2.333)	(1.986)		
Past 12-month returns $(t - 1)$	-0.014	-0.016	-0.036	0.067	0.308	-0.020***	-0.007	-0.006	0.017	0.043		
	(-1.591)	(-0.567)	(-0.699)	(0.673)	(1.490)	(-5.325)	(-0.657)	(-0.306)	(0, 452)	(0.581)		
Gross profitability $(t-1)$	0.035**	0.053	0.045	0.064	0.152	0.049***	0.222***	0.403***	0.690***	1.210***		
	(2.052)	(1.254)	(0.627)	(0.481)	(0.571)	(5.425)	(9.468)	(10.277)	(9.918)	(9.200)		
Order imbalance $(t - 1)$	0.003***	0.003***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***		
5-4 1)	(20,893)	(18.073)	(13.541)	(9,855)	(4.915)	(75.636)	(61.639)	(53.132)	(41.312)	(27.932)		



Sample: Dependent Variable:	· · · ·		S&P 500	8			Russell 3000					
	Ret(t) (1)	$\frac{\operatorname{Ret}(t, t+4)}{(2)}$	$\frac{\operatorname{Ret}(t, t+9)}{(3)}$	$\frac{\text{Ret}(t, t+19)}{(4)}$	$\frac{\text{Ret}(t, t + 39)}{(5)}$	Ret(t) (6)	$\frac{\operatorname{Ret}(t, t+4)}{(7)}$	$\frac{\operatorname{Ret}(t, t+9)}{(8)}$	$\frac{\operatorname{Ret}(t, t+19)}{(9)}$	$\frac{\operatorname{Ret}(t, t+39)}{(10)}$		
$\operatorname{Ret}(t-1)$	$-2.587^{***}$ ( $-8.348$ )	2				$-3.364^{***}$ (-19.595)	2					
Ret(t = 1, t = 5)		-2.199*** (-7.195)					$-1.571^{***}$ (-10.302)					
$\operatorname{Ret}(t - 1, t - 10)$			-2.266*** (-7.337)					$-1.861^{***}$ (-12.330)				
$\operatorname{Ret}(t - 1, t - 20)$				-2.496*** (-7.010)					$-1.873^{***}$ (-11.240)			
$\operatorname{Ret}(t - 1, t - 40)$					-3.008*** (-6.340)					-1.609*** (-7.837)		
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Observations R <sup>2</sup>	1,492,313 0.033	1,492,313 0.013	1,492,313 0.011	1,492,313 0.011	1,492,313 0.013	7,759,143 0.039	7,759,143	7,759,143 0.007	7,759,143 0.006	7,759,143 0.006		

In sum, the evidence of a full reversal of the price impact of ETF flows is consistent with the liquidity trading hypothesis, and rules out the conjecture that ETFs are the vehicle of choice for expressing fundamental demand, as posited by the price discovery hypothesis.



## Indirect Evidence on the Arbitrage Channel

5.4

To assess the relevance of arbitrage activity in driving the impact of ETFs on volatility, we search for an interaction of this effect with measures of limits to arbitrage. We first proxy for the intensity of arbitrage activity using ETF mispricing. We then conjecture that the proxy for expected arbitrage activity should have a weaker effect on prices for stocks that are harder to arbitrage.

$$abs(Mispricing_{i,t}) = \frac{\sum_{i=1}^{J} w_{i,j,t} * AUM_{j,t} | Mispricing_{i,t} |}{MktCap_{i,t}}$$



		Lim	its to Arbit	rage							
Dependent Variable:	Intraday Stock Volatility										
	All (1)	All (2)	Misp > 0 (3)	Misp < 0 (4)	All (5)	Misp > 0 (6)	Misp < 0 (7)				
abs(Mispricing)(t-1)	0.023*** (6.897)	0.043*** (8.025)	0.076*** (10.300)	0.035*** (6.988)	0.020*** (4.642)	0.048*** (7.530)	0.018*** (4.302)				
× I(High bid-ask spread)		$-0.053^{***}$ (-6.554)	-0.055*** (-4.257)	-0.043*** (-6.392)							
× I(High lending fee)					$-0.009^{*}$ (-1.956)	0.003 (0.444)	$-0.010^{**}$ (-2.548)				
High bid-ask spread		0.042***	0.038***	0.045***							
High lending fee					-0.005	-0.003	-0.005 (-1.433)				
ETF ownership $(t-1)$	0.022***	0.022***	-0.004	0.031***	0.021*** (4.042)	-0.006	0.031***				
$\log(Mktcap(t-1))$	0.086*** (4.060)	0.042*** (5.940)	0.042*** (6.017)	0.041*** (5.720)	0.034*** (4.945)	0.035*** (5.110)	0.033*** (4.719)				
1/Price (t-1)	5.767*** (7.882)	4.479*** (11.778)	4.216*** (11.131)	4.718*** (12.275)	4.568*** (11.996)	4.300*** (11.333)	4.805*** (12.505)				
Amihud $(t-1)$	-19.124 (-0.795)	-8.636 (-0.399)	-3.039 (-0.139)	-13.726 (-0.634)	-15.911 (-0.712)	-9.579 (-0.427)	-21.039 (-0.942)				
Bid-ask spread $(t - 1)$	5.128 (0.796) 0.110***	4.059 (0.636) 0.078***	4.005 (0.670) 0.075***	7.552 (1.085) 0.081***	9.859 (1.515) 0.078***	9.416 (1.551) 0.075***	14.033** (1.989) 0.081***				
Past 12-month returns $(t - 1)$	(3.231) 0.009	(4.102) 0.027***	(3.997) 0.020**	(4.220) 0.036***	(4.136) 0.027***	(4.046) 0.020**	(4.244) 0.036***				
Gross profitability $(t - 1)$	(0.805) -0.018	(2.703) 0.035	(2.078) 0.038	(3.269) 0.038	(2.668) 0.033	(2.056) 0.037	(3.243) 0.035				
Return $(t-1)$	(-0.230) -0.196*** (-3.984)	(1.443) -0.246*** (-4.956)	(1.579) -0.707*** (-9.759)	(1.525) 0.249*** (3.104)	(1.342) $-0.235^{***}$ (-4.704)	(1.542) -0.697*** (-9.612)	(1.398) 0.264*** (3.280)				
Dependent variable $(t-1)$	0.408*** (20.800)	0.561*** (24.501)	0.575*** (23.836)	0.541*** (24.546)	0.565*** (24.739)	0.578*** (24.044)	0.545*** (24.734)				
abs(Mispricing)(t-2)	0.024*** (7.081)	0.021*** (5.305)	0.059*** (9.870)	0.004 (1.060)	0.018*** (4.597)	0.059*** (9.901)	0.000 (0.061)				
Day fixed effects Stock fixed effects	Yes Yes	Yes No	Yes No	Yes No	Yes No	Yes No	Yes No				
$R^2$	0.549	0.500	0.505	0.498	0.499	0.504	0.497				

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## 5.5

## **Implications for Pricing Efficiency**

The liquidity trading and price discovery hypotheses have different implications for price efficiency. According to the former, transitory demand shocks in the ETF market migrate to the underlying security prices in the form of a mean-reverting component. As a result, prices become noisier. For the latter hypothesis, prices of stocks with higher coverage by ETFs adjust to fundamentals more promptly. The fundamental demand in the ETF market propagates to the underlying basket, impounding a permanent shock. In this scenario, ETF ownership makes prices closer to a random walk. We can therefore test for the effect of ETFs on the transitory component of stock prices.



Lo and MacKinlay (1988) and O'Hara and Ye (2011), among others, use variance ratios to measure the transitory component of stock prices. The variance ratio is defined as the variance of k-period returns divided by k times the variance of the single-period returns in the same window. When prices follow a random walk, the variance ratio equals one. If the autocorrelation of returns at the chosen frequency differs from zero, the variance ratio diverges from one.

Given that ETF arbitrageurs operate on a daily basis to exploit ETF mispricing, we test for their effect on the autocorrelation of daily returns. Accordingly, we define

$$abs\left(VR_{i,t}\right) = \left| \frac{\operatorname{Var}\left(r_{5,i,t}\right)}{5 \cdot \operatorname{Var}\left(r_{1,i,t}\right)} - 1 \right|,$$



Hence, if we redefine our test statistic as

$$VR_{i,t} = rac{\operatorname{Var}\left(r_{5,i,t}
ight)}{5 \cdot \operatorname{Var}\left(r_{1,i,t}
ight)},$$



## Variance Ratio

			Pan	el A: Second-	Stage IV Reg	ression for A	bs(Variance)	Ratio)					
Dependent Variable:	Abs(Variance Ratio)												
Instrument:		Switch to the Russell 2000						Switch to the Russell 1000					
Bandwidth:	± 100 (1)		± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)		
ETF ownership	0.305		0.207	0.243*	0.235*	0.227*	0.524	0.494**	0.511***	0.563**	0.550**		
	(1.182)	82) (1.320)		(1.810)	(2.033)	(1.992)	(1.383)	(2.494)	(2.917)	(2.711)	(2.767)		
$\log(Mktcap(t-1))$	0.058		0.015	0.036	-0.022	-0.040	0.174	0.048	0.044	0.042	-0.009		
	(0.414)	1	(0.161)	(0.546)	(-0.447)	(-1.189)	(1.347)	(0.603)	(0.786)	(1.029)	(-0.209)		
1/Price(t-1)	-0.573	73 -0.719**		-0.626**	-0.801***	-0.831***	0.095	0.164	-0.176	-0.016	0.160		
	(-0.854)	(-	-2.387)	(-2.429)	(-3.139)	(-3.446)	(0.214)	(0.533)	(-0.784)	(-0.052)	(0.520)		
Amihud $(t-1)$	3.	342 315)	3.802	5.148** (2.078)	4.697**	5.254**	10.753	11.557**	13.500***	14.604***	10.343***		
Bid-ask spread $(t-1)$	-4.	951	-0.072	1.400	2.757*	1.713	-0.480	3.577	2.104	1.302	1.325		
Book-to-market $(t - 1)$	-0.	025	-0.018	-0.025	-0.022	-0.005	-0.081	-0.082	-0.085	-0.128	-0.196**		
Post 12 month returns (t.	(-0.	610) 154	(-0.629)	(-1.454)	(-1.072)	(-0.369)	(-0.537)	(-0.917)	(-1.164)	(-1.449)	(-2.767)		
ast 12-month feturns (r	(-1.	143)	(-1.635)	(-1.263)	(-0.769)	(0.169)	(0.895)	(-0.052)	(-0.165)	(-0.447)	(0.070)		
Gross profitability $(t-1)$	0.	087	0.133	0.099	0.113	0.094	0.040	0.137*	0.046	0.028	-0.002		
Index fund ownership (t –	(0. 1) -0.	640) 079*	(1.560) -0.076*	(1.444) * -0.065*	(1.683) -0.066**	(1.624) -0.069**	(0.401) -0.069	(1.838) -0.069**	(0.688) -0.088***	(0.500) -0.092***	(-0.041) -0.098***		
Active fund ownership (t -	-1) -0.	765) 043	(-2.101) $-0.054^{*}$	(-2.043) * -0.061***	(-2.368)	(-2.340) -0.054***	(-1.437) $-0.152^{***}$	(-2.327) -0.127**	(-3.461) * -0.115***	(-3.595) $-0.124^{***}$	(-3.751) -0.139****		
Hedge fund ownership (t -	(-1. -1) -0.	031) 008	(-2.058) -0.016	(-3.307) 0.009	(-3.953) 0.012	(-4.122) 0.023	(-4.217) 0.066	(-5.411) 0.057**	(-5.834) 0.031	(-6.237) 0.038*	(-6.847) 0.029		
State Manager Street Ave.	(-0.	212)	(-0.585)	(0.371)	(0.559)	(1.134)	(1.595)	(2.090)	(1.668)	(1.893)	(1.493)		
Month fixed effects	Y	es	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Linear polynomials of ran	k Y	es	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Observations	1,5	35	3,204	5,115	7,097	9,116	2,064	4,038	5,801	7,498	9,221		



		Panel I	3: Second-St	age IV Regr	essions for V	Variance Ra	itio				
Dependent Variable:	Variance Ratio										
Instrument: Bandwidth:		Switch	to the Russ	ell 2000		Switch to the Russell 1000					
	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)	
ETF ownership	-1.191*** (-3.003)	-0.867*** (-3.322)	-0.743*** (-2.977)	-0.676*** (-2.903)	-0.678*** (-2.833)	$-1.231^{*}$ (-1.834)	$-0.975^{***}$ (-3.286)	-1.051*** (-3.309)	$-1.160^{***}$ (-3.127)	-1.202*** (-3.096)	
$\log(Mktcap (t-1))$	-0.409 (-1.570)	-0.404** (-2.559)	-0.218** (-2.363)	-0.071 (-1.280)	-0.067	$-0.448^{*}$ (-1.998)	-0.225 (-1.588)	-0.211 (-1.700)	-0.169 (-1.577)	-0.117 (-1.173)	
1/Price(t-1)	-0.649 (-0.829)	0.191 (0.436)	0.101 (0.262)	0.383 (1.470)	0.313 (1.213)	-0.851 (-1.047)	-0.534 (-1.192)	-0.247 (-0.563)	-0.864 (-1.605)	-0.967* (-1.844)	
Amihud $(t-1)$	-8.841** (-2.229)	-8.987*** (-3.237)	-10.598*** (-3.453)	-9.537*** (-3.451)	-8.800**** (-3.177)	-24.204* (-1.739)	-20.393*** (-3.509)	-23.756*** (-4.111)	-25.530*** (-4.323)	-17.594*** (-2.836)	
Bid-ask spread $(t-1)$	10.485 (1.280)	5.122 (1.216)	5.812 (1.549)	3.444 (1.195)	0.711 (0.299)	8.025 (1.158)	3.549 (1.176)	0.951 (0.344)	2.288 (0.805)	1.040 (0.329)	
Book-to-market $(t - 1)$	-0.002 (-0.027)	0.015 (0.327)	0.018 (0.650)	0.018 (0.871)	0.042** (2.591)	0.379 (1.569)	0.376** (2.647)	0.304** (2.352)	0.378** (2.527)	0.447*** (2.935)	
Past 12-month returns $(t-1)$	-0.016 (-0.112)	0.011 (0.139)	-0.043 (-0.628)	-0.043 (-0.692)	-0.055 (-0.980)	-0.046 (-0.468)	-0.019 (-0.399)	-0.027 (-0.530)	-0.025 (-0.548)	-0.037 (-0.789)	
Gross profitability $(t-1)$	-0.248* (-1.858)	-0.154* (-1.811)	-0.088 (-1.266)	-0.123* (-2.013)	-0.079 (-1.193)	-0.106 (-0.537)	-0.100 (-0.915)	-0.048 (-0.522)	-0.027 (-0.307)	0.003 (0.032)	
Index fund ownership $(t-1)$	0.165*** (2.810)	0.172**** (3.570)	0.140*** (3.043)	0.139*** (3.180)	0.157*** (3.226)	0.162** (2.198)	0.157*** (4.466)	0.172*** (4.322)	0.179*** (3.810)	0.197*** (3.834)	
Active fund ownership $(t - 1)$	0.011 (0.199)	0.050** (2.077)	0.048** (2.595)	0.059*** (3.358)	0.055*** (2.984)	0.150** (2.438)	0.119*** (3.371)	0.141*** (4.100)	0.148*** (4.242)	0.189*** (4.804)	
Hedge fund ownership $(t - 1)$	-0.107* (-1.956)	-0.038 (-1.083)	-0.049 (-1.434)	-0.033 (-1.095)	-0.043 (-1.520)	$-0.124^{*}$ (-1.800)	-0.086** (-2.447)	-0.059* (-2.041)	-0.066* (-1.900)	-0.053 (-1.483)	
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Linear polynomials of rank Observations	Yes 1,535	Yes 3,204	Yes 5,115	Yes 7,097	Yes 9,116	Yes 2,064	Yes 4,038	Yes 5,801	Yes 7,498	Yes 9,221	



Overall, this analysis suggests that the increase in stock volatility we identify in before section is likely the result of the fact that ETFs impound a mean-reverting component in stock prices. The evidence therefore provides further support for the liquidity trading hypothesis and suggests that the price discovery hypothesis is less plausible..







The success of ETFs is due in large part to the fact that these investment vehicles offer an unprecedented source of diversification at low cost and high liquidity. This aspect of ETFs is undeniably beneficial for investors. However, due to their ease of trade, ETFs seem to attract a new breed of high-frequency investors, whose demand shocks can pass on to the underlying securities via the arbitrage activity continuously taking place between ETFs and their baskets. This mechanism can lead to higher volatility for the underlying securities. The increase in volatility would not be a desirable effect of ETFs if it were merely a reflection of increased noise trading.



In this paper, we start by showing that ETFs are indeed the preferred habitat of investors with relatively higher turnover, consistent with the view that they attract high-frequency demand. One of the main results of the paper is that stocks with more ownership by ETFs display higher volatility than otherwise similar securities. A quasinatural experiment based on the reconstitution of the Russell indexes suggests a causal interpretation for this finding.



We next show that the demand shocks in the ETF market impound a mean reverting component in asset prices, which plays out at the daily frequency. This result suggests that the increase in stock return volatility is not likely to be imputable to an improvement in price discovery brought about by ETFs. Rather, it is likely a reflection of the transmission of nonfundamental demand shocks from the ETF market to the prices of the underlying stocks via arbitrage. Consistent with this view, we show that proxies for the intensity of arbitrage activity between ETFs and their baskets magnify the effect of ETFs on volatility.



Finally, the paper addresses the asset pricing implications of ETFs for stocks. If the increase in stock volatility brought about by ETFs is partly nondiversifiable, it may represent systematic risk for some investors, especially for those with a short trading horizon. As such, ETF ownership may warrant a risk premium. Consistent with this conjecture, we show that portfolios of stocks with high ETF ownership display positive alphas relative to a variety of asset pricing models. These alphas are about 50 bps in the more recent sample. We confirm this finding in a regression setting and rule out the possibility that it is an ex post reflection of the growing demand for ETFs.



