Stock-Specific Price Discovery From ETFs

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University of Maryland (starting Fall 2020)

December 3, 2020

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Research Question

- How are ETFs changing price discovery?
- An ETF (Exchange Traded Fund) is a **basket** of stocks:



• ETFs are very popular: 30% of exchange trading comes from trading in ETF shares

Popular Perceptions of ETFs

- Concern that ETFs are replacing stocks:
 - Bank of America: "[from 2009-2016] clients bought a net \$160 billion worth of ETFs while selling \$200 billion worth of single stocks"
 - BIS Quarterly: "[ETF Investors] have scant interest in the idiosyncratic attributes of individual securities in an index. They do not devote resources to seeking out and using security-specific information ... Hence, an increase in the share of passive portfolios might reduce the amount of information embedded in prices, and contribute to pricing inefficiency and the misallocation of capital"
- My model and evidence show how ETFs contribute to **stock-specific** price discovery

ETFs contribute to **stock-specific** price discovery

1 Traders in **large or medium stocks** can access ETF liquidity

- Model: If noise traders switch to ETFs, informed traders follow them
- Empirics: Evidence investors trade both assets in tandem
 - Same-direction, simultaneous trades in stock and ETF
 - Driven by stock-specific information
 - Profitable: earn negative realized spreads
 - Sizeable: 1 to 2% of ETF trading volume
- **2** Concerns localized to **small** stocks
 - Model: Traders with small-stock information cannot profitably trade ETFs
 - Empirics: Do not see tandem trading evidence in small stocks

Prior Literature Review

Theory Literature: Gorton and Penacchi (1991); Subrahmanyam (1991); Back (1995); Back and Baruch (2004); O'Hara and Battacharya (2017); Cong and Xu (2018); Cespa and Foucault (2014); Malamud (2016); Johnson and So (2017), Back (1993); Easley and O'Hara 1987 My Paper:

- Investors strategically trade stock and ETF in tandem
- Tandem trade only justified for investors in large or volatile stocks

Empirics Literature: Ben-David, Franzoni and Moussai (2018); Hamm (2017); Saglam, Tuzun, and Wermers (2019); Israeli, Lee and Sridharan (2017); Huang, O'Hara, and Zhong (2018); Glosten, Nallareddy, and Zou (2016); Holden, Mao, Nam (2018); Easley, Michayluk, O'Hara, and Putnis (2019); Evans, Moussawi, Pagano, and Sedunov (2019); Shim (2018); Aquilina, Budish, and O'Neill (2020)
My Paper:

- Use trade-level data to analyze tandem stock-ETF trading
- Examine how stock-ETF relationship varies with stock-specific characteristics

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Outline

- Give practical example of model ideas
 - Investors place tandem trades only for large or volatile stocks
- ② Describe empirical identification strategy
 - Document simultaneous, same-direction stock-ETF trades

③ Highlight key results. Tandem Trades are:

- Profitable
- Driven by stock specific information
- Sizable share of ETF volume (1-2%)

When do traders trade both?



XLK: Technology Sector SPDR

Model Insights

- Investors with stock-specific info trade both stocks and ETFs in tandem
 - Tandem trading offers more liquidity than trading stock alone
 - Requires sufficient weight or informational asymmetry
- Traders in large or medium stocks can access ETF liquidity
 - Stocks like Microsoft or Paypal
 - Potential harms of ETFs are limited
- Concerns localized to **small** stocks
 - Stocks like Xerox
 - Face adverse selection in ETF
 - ETF harms localized to small stocks

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- I want to show investors trade stocks and ETFs in tandem
- NYSE Trade and Quote (TAQ) data
 - Anonymous
 - Detailed: every trade and quote
 - \sim 30 GB per day of data
 - Extremely High Resolution: trades are stamped to the microsecond
 - Data from August 2015 December 2018
- Can we tell if investors trade multiple securities?
 - What if investors traded both securities **simultaneously**?

Data

- Would investors trade asset simultaneously?
 - Michael Lewis: Flash Boys (2014)
 - If investors want a stock, they should buy from every market center simultaneously
 - Prevents front-running of their trade
 - Multi-asset version:
 - If investors buy both stock and ETF, buying both at once prevents front-running of trade



Simultaneity

- How can I rule out trades are responding to each other?
 - How fast could a trader respond to an order?



- For empirical work, I use the WRDS and MGHPCC servers
 - Sending a message between MGHPCC nodes takes $\sim 150 \mu s$
 - Exchanges have lower latency than research clusters
 - How much lower?

Simultaneity



- All traders must pass the blue double arrow. This takes time.
 - CBOE / BATS: average of 56 μ s, min of 31 μ s
 - Nasdaq: "sub-40 microsecond average", min of 25 μs
 - NYSE: average of 27 μ s, min of 21 μ s
- Simultaneous: trades less than 20 μs apart
 - Rule out that one trade is responding to the other

Rule Out Chance Trades





Signed Trades

- Rule out trades responding to each other
- Rule out trades chance
- Rule out trades are hedging or arbitrage
 - Could simultaneous trades be traders taking offsetting positions for hedging or arbitrage?
- I can sign trades as buy orders or sell orders
 - Lee Ready (91), Chakrabarty Li Nguyen and Van Ness (2007)
 - Trade at the best bid: sell order
 - Trade at the best ask: buy order

Signed Trades

- Investors either:
 - buy the stock and buy the ETF
 - sell the stock and sell the ETF
- Inconsistent with hedging
- Inconsistent with ETF arbitrage



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- **6** Highlight key results
 - Tandem trades are profitable, and a sizable share of ETF volume (1-2%)
 - Stock-specific information drives tandem trades
 - Extensions of results

Simultaneous Stock-ETF Trades

- Do simultaneous trades appear informed?
 - Yes. Earn negative realized spreads.
 - Realized Spread: trade price vs. mid-quote from 5 minutes after the trade
 - Profit of 1 penny on stock trade, half a penny on ETF trade
- Are they sizable?
 - Yes. Simultaneous trades are a sizable share of trading volume
 - $\bullet~1$ to 2% of ETF trading volume comes from simultaneous stock-ETF trades
- Show: Stock-specific information drives these tandem trades

Panel Regression

- Model: (Large information)*(Large Weight) \rightarrow Simultaneous Trades
- Measures of information:
 - Earnings Dates
 - Intraday Return
 - News Articles and Press Releases (Ravenpack)
- Test how simultaneous stock-ETF trades vary with information measures
 - SPDR, ten Sector SPDR ETFs, and their 500 underlying stocks
 - Microsecond TAQ Data available from August 2015 to December 2018

Panel Regression

For each stock i and ETFj on day t:

```
\begin{split} \text{Simultaneous Trades}_{ijt} &= \alpha_1 \text{Weight}_{ijt} + \alpha_2 \text{Information Measure}_{it} \\ &+ \alpha_3 \text{Weight}_{ijt} * \text{Information Measure}_{ijt} \\ &+ \alpha_4 \text{Controls}_{ijt} + \epsilon_{ijt} \end{split}
```

- Weight: is the ETF weight of the stock
- Information Measure: is the absolute return or an indicator for earnings announcement dates
- **Controls**: includes a fixed effect for each ETF, the ETF absolute value of ETF return, and a Weight-ETF return interaction

Theory predicts $\alpha_3 > 0$

• (Large weight)& (Information Asymmetry) \rightarrow investors trade both ETF and stock

Panel Regression

	Dependent variable: Simultaneous Trades			
	(1)	(2)	(3)	(4)
Weight	60.867^{***}	54.191^{**}	48.015***	51.383***
	(20.408)	(21.120)	(16.075)	(19.594)
Earnings Date	-12.717^{***}	-8.568^{***}		
	(2.679)	(1.486)		
Weight*Earnings Date	6.188^{***}	3.827^{**}		
	(1.659)	(1.761)		
Abs Return			21.432^{***}	3.721^{**}
			(8.247)	(1.645)
Weight*Abs Return			14.732***	10.809*
			(5.715)	(6.033)
Abs ETF Return		х		х
Weight*Abs ETF Return		Х		Х
Observations	873,196	873,196	873,178	873,178
\mathbb{R}^2	0.095	0.131	0.110	0.133
Residual Std. Error	410.309	402.051	406.833	401.431

- Consider a large stock like Exxon-Mobile
 - Typical day: 800 stock-ETF simultaneous trades
 - 15% increase on earnings dates
 - 50 to 100% increase on days with 1% to 2% return
- These increases hold controlling for the ETF return

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Extensions

- Extensions:
 - Ravenpack: stock-specific news events lead to far more simultaneous trades
 - Placebo test: test large market-weight stocks in equal-weight ETF
 - Stock-ETF Triples: better control for correlated information
- Where do the profits of simultaneous trades go?
 - Fundamental research about stocks?
 - Microwave towers arms race?
- From anonymous data, can we gain any insight?
 - Can rule out that these trades are just latency arbitrage

Conclusion

How Do ETFs Affect Price Discovery?

• Traders in large or medium stocks can access ETF liquidity

- **Empirics**: Evidence investors trade both assets in tandem
 - Same-direction, simultaneous trades in stock and ETF
 - Driven by stock-specific information
 - Profitable: earn negative realized spreads
 - Sizeable: 1 to 2% of ETF trading volume
- **Model**: Effect of ETFs is limited
- **2** Concerns localized to **small** stocks
 - **Empirics**: Do not see tandem trading evidence in small stocks
 - Model: Investors with small stock information cannot profit from ETF liquidity