Losing is Optional: Retail Option Trading and Earnings Announcement Volatility

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April 29, 2024

OVERVIEW

1. Motivation
   ‣ Broader Agenda: Better understand the activities & consequences of retail behavior
   ‣ Interest: Further clarity on the drivers of retail demand across assets and over time

2. Literature on Retail Investors
   ‣ Evidence: Commonly focused on stock trading, including around earnings announcements
   ‣ Our Study: Shifts focus toward retail behavior in options markets

Backdrop: Rapid growth in option trading

Cumulative growth rate of trading volumes

- **Options** (red)
- **All stocks** (yellow/orange)
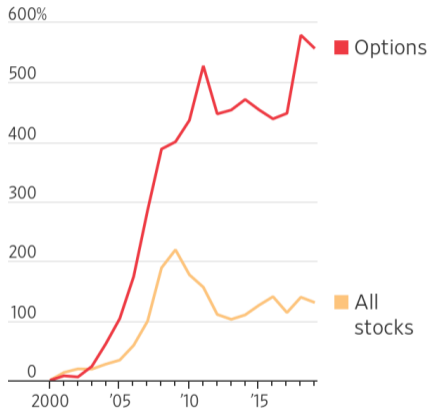
Sources: Annual equity options contract volume (Options Clearing Corp.); Consolidated average daily trading volume of all stocks (New York Stock Exchange)

THE WALL STREET JOURNAL.

MARKETS | FINANCIAL REGULATION

Investors Are Using Robinhood, Other Platforms to Jump Into Options Trades, Worrying U.S. Regulators

Options contracts are swapping at highest level on record, with retail traders making a quarter of all activity

Fidelity accused of 'unethical' process for options trading approvals

Customers were able to manipulate personal data to win access to brokerage platform, Massachusetts regulator says

PREVIEW OF RESULTS

▷ **Main Findings: Determinants of Retail EA Option Demand**

1. Retail investors purchase large quantities of options prior to a subset of earnings announcements: those with high **expected announcement volatility (EAV)**
   ‣ Appears to result from attention effects or direct preferences for volatility

2. Retail continues to hold these options for an extended period following the announcements; consistent with disposition effect and transactions costs

▷ **Main Findings: Consequences of Retail EA Option Demand**

1. Retail demand pushes up option prices prior to high EAV announcements, leading to strong predictability in option returns

2. Retail takes losses on three fronts: enormous bid-ask spreads + price decay on and after the announcements; leads to retail losses of 10-to-14% or $\approx$ 3 billion in 10 years

Road Map

DATA SOURCES

- **Nasdaq & PHLX Option Trade Outline** (summarized by clientele-option-day): ‣
    - Retail ("non-professional customers" e.g., Robinhood)
    - Market makers (e.g., Citadel)
    - Professional customers (e.g., Cubist)
    - Broker/Dealers (e.g., Morgan Stanley's client services)
    - Firms (e.g., Morgan Stanley's prop trading desk)
  - ‣ Allows us to approximate (i) current position, (ii) counterparty, & (iii) daily profit/loss

- **Main sample**:
  - ‣ OptionMetrics: option prices, open interest, and implied volatilities
  - ‣ Compustat-CRSP-IBES: firm fundamentals, stock prices, earnings dates
  - ‣ ~ 32K EAs from 2010-2021

MEASURING POSITIONS

Changes: Daily changes in net option positions by clientele:

$$\Delta\text{Trader Position}_t = 100 * \Big[\text{Trader Opening Buys}_t + \text{Trader Closing Buys}_t$$
$$- \text{Trader Opening Sells}_t - \text{Trader Closing Sells}_t\Big]$$

Levels: Cumulate changes in net option positions by clientele up to t:

$$\text{Trader Position}_t = \sum_{s=\underline{t}}^{t} \Delta\text{Trader Position}_s$$
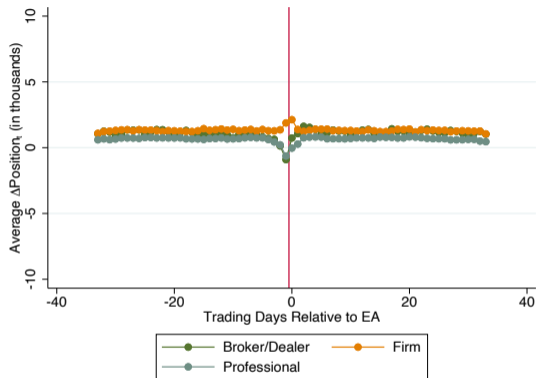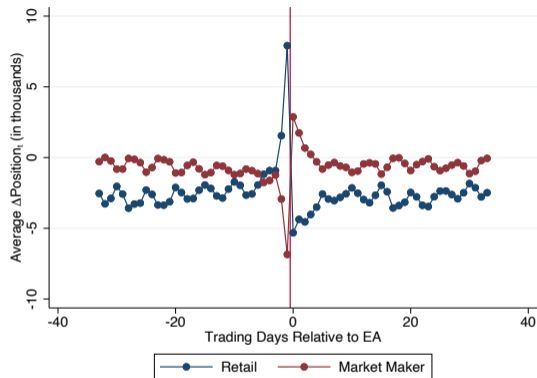
Weights: We use total positions across all options on each announcement (robust to delta-weighting)

FOCUS ON RETAIL AND EARNINGS ANNOUNCEMENTS
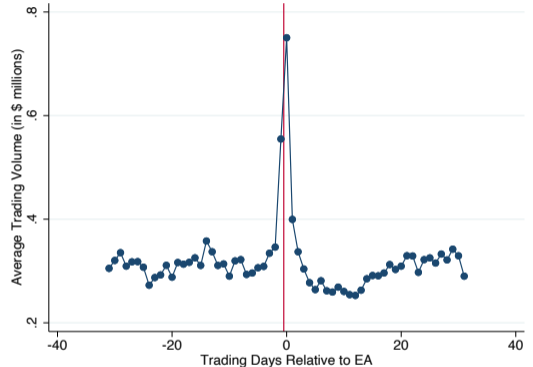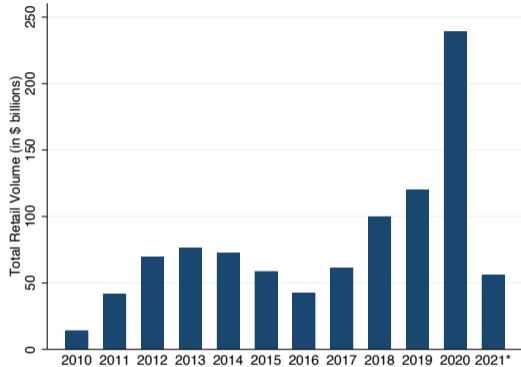
- Left: Retail volume rose ~ 10X in our sample, reflecting a dramatic uptick in invested capital
- Right: Option volume, for all clienteles, concentrates around EAs

TRADING AROUND EARNINGS ANNOUNCEMENTS

- **Left**: Retail tends to buy options immediately before EAs, mostly from market makers
- **Right**: Retail and market makers are most active clienteles around EAs in terms of volume

ROAD MAP

EXPECTED ANNOUNCEMENT VOLATILITY (EAV)

Main construct of interest in explaining retail option demand: expected announcement volatility.

- Main Proxy:

$$AbnormalIV_t \equiv \frac{IV_{t,30} - IV_{t,60}}{\frac{1}{30} - \frac{1}{60}},$$

  $IV_{t,\tau}$ = implied variance at $t < \text{Date}_{EA}$ of option with τ days to maturity

  - ‣ Intuition: High $AbnormalIV \Rightarrow IV_{\text{short-term}} > IV_{\text{long-term}} \Rightarrow$ volatility expected at EA
  - ‣ Theory: Measures expected **abnormal** variance of stock return at EA (Dubinsky et al. 2019)
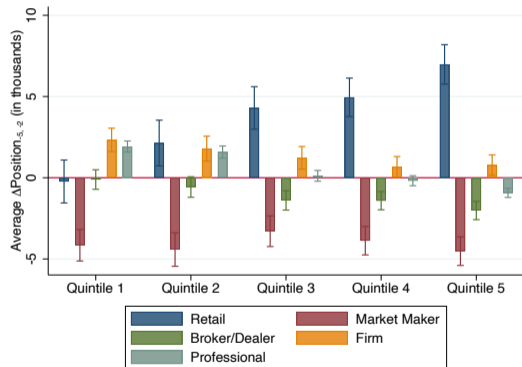
- Secondary Proxy:

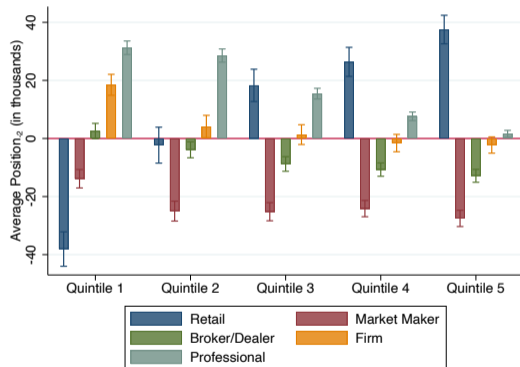 $MAX_{EA} \equiv$ Largest absolute EA return for a given firm in past 5 years

  - ‣ Intuition: Expected price movements likely shaped by recent extreme outcomes

EAV and Retail Demand: Evidence

Pre-Announcement Option Buying

Pre-Announcement Option Exposure

- Retail buys (left) + accumulates net long positions (right) before high EAV announcements

EAV and Retail Demand: Potential Explanations

Theories predicting expected announcement volatility (EAV) drives retail demand:

1. **Attention-Driven Demand** (Bordalo et al. 2012, Gabaix 2014)

   ‣ EAV increases investor attention

2. **Preference-Driven Demand** (Barberis and Xiong 2013, Frydman et al. 2014)

   ‣ EAV attracts demand due to heightened volatility

3. **Alternative Explanations**

   ‣ Hedging against big stock moves
   ‣ Demand for lottery-like payoffs (Han and Kumar 2013)
   ‣ Private information (Kaniel et al. 2012; Kelley and Tetlock 2013)

In the News: Earnings Previews

EARNINGS

Weekly Preview: Earnings to Watch This Week (C, DAL, JPM, WFC)

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PUBLISHED
JAN 9, 2022 8:35AM EST

Earnings Outlook
Delta Air reports this week, giving investors a first look into U.S. airlines' performances

Last Updated: Jan. 12, 2022 at 8:11 a.m. ET
First Published: Jan. 11, 2022 at 2:35 p.m. ET

By Claudia Assis

Earnings Preview: What To Expect From JPMorgan Chase On Friday
Adam Sarhan · 11:21am EST

389377 09. People walk past a sign outside the JP Morgan Chase headquarters July 5, 2001 on Park ...
[+]
Getty Images

JPMorgan Chase & Company JPM +0.1% is scheduled to report earnings before Friday's open. In 2021, the stock hit a record high of $172.96 in 2021 and is currently trading near $169. The stock is prone to big moves after reporting earnings and can easily gap up if the numbers are strong. Conversely, if the numbers disappoint, the stock can easily gap down. To help you prepare, here is

"The stock is prone to big moves after reporting earnings and can easily gap up if the numbers are strong. Conversely, if the numbers disappoint, the stock can easily gap down."

Finding: 31% increase in # of pre-announcement news articles per SD of EAV

EAV and Retail Demand: Evidence

|	ΔRetail Position$_{-5,-2}$				ΔRetail Position$^{Calls}_{-5,-2}$		ΔRetail Position$^{Puts}_{-5,-2}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$log(AbnormalIV_{-5})$	1691.7		1400.3		1393.5		-81.37	
	(4.68)		(4.77)		(5.93)		(-0.72)	
$log(MAX_{EA})$		7143.5		5913.2		5601.5		184.6
		(7.52)		(7.26)		(8.47)		(0.57)
Volatility$_{-60,-5}$			-13383.3	-14628.7	-6129.4	-7114.4	-7536.4	-7584.6
			(-2.48)	(-2.58)	(-1.14)	(-1.29)	(-2.25)	(-2.55)
$log(AT)$			-236.6	-137.8	1036.3	1210.9	-1491.8	-1525.8
			(-0.53)	(-0.32)	(2.69)	(3.09)	(-7.10)	(-7.16)
β_V			-212.4	-316.2	149.9	34.41	-339.2	-312.5
			(-1.17)	(-1.95)	(0.89)	(0.21)	(-3.59)	(-3.25)
EAOrder			6096.9	6901.0	6892.0	6693.1	1474.2	2349.3
			(0.90)	(1.10)	(1.18)	(1.26)	(0.60)	(1.07)
IdioVol			186887.6	169776.2	170194.3	168715.6	-1821.0	-20405.9
			(2.24)	(2.07)	(1.88)	(1.86)	(-0.03)	(-0.43)
skew$_{BV}$			134.5	125.2	192.2	187.8	-65.25	-76.64
			(2.58)	(2.74)	(4.13)	(4.18)	(-1.91)	(-2.60)
Year-Quarter Fixed Effects			✓	✓	✓	✓	✓	✓
Firm and Year-Quarter Clustering	✓	✓	✓	✓	✓	✓	✓	✓
Total Observations	29158	32493	25397	28474	25397	28474	25397	28474
Adjusted R-Squared	0.00236	0.00712	0.00545	0.00869	0.00806	0.0112	0.0159	0.0177

- Primarily calls + clientele variation + stronger relation w/ risk controls **inconsistent** with hedging ‣ ‣
- Significant buying of > 2 month options **inconsistent** with lottery-like preferences ‣
- As we will see, also difficult to reconcile with private information

EAV and Retail Demand: EAs vs. Non-EAs

Actual Announcements
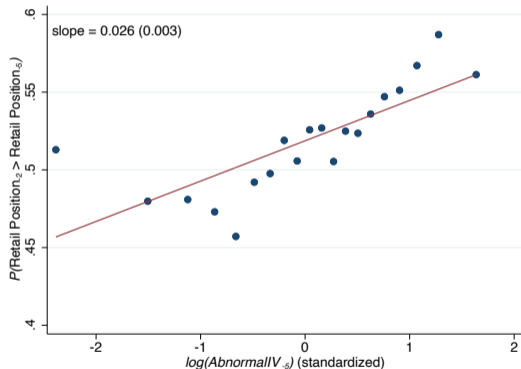
Pseudo Announcements
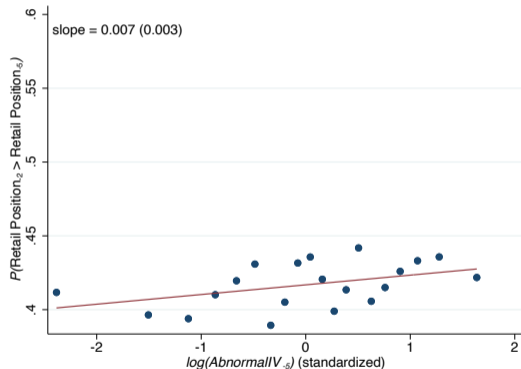
- Takeaway: Pattern concentrates around EAs consistent with salience
- EAV-retail demand link increasing over time (behavior is not "learned away") ‣

Continued Holdings Post EA

	Retail Position$_5$					
	(1)	(2)	(3)	(4)	(5)	(6)
$log(AbnormalIV_{-1})$	12289.3 (7.84)	11180.4 (6.99)	11557.7 (6.82)			
$log(MAX_{EA})$				26133.7 (5.30)	23100.4 (4.82)	23714.9 (4.81)
$log(AbnormalIV_{-1}) \times$ Retail Loss$_0$		11391.4 (2.85)	10985.4 (2.75)			
$log(AbnormalIV_{-1}) \times$ Average Bid-Ask Spread$_{1,5}$			-2758.3 (-5.54)			
$log(MAX_{EA}) \times$ Retail Loss$_0$					21747.8 (2.43)	20576.7 (2.32)
$log(MAX_{EA}) \times$ Average Bid-Ask Spread$_{1,5}$						-8971.7 (-5.79)
Main Effects Included		✓	✓		✓	✓
Controls	✓	✓	✓	✓	✓	✓
Year-Quarter Fixed Effects	✓	✓	✓	✓	✓	✓
Firm and Year-Quarter Clustering	✓	✓	✓	✓	✓	✓
Total Observations	26673	25886	25883	30071	29088	29085
Adjusted R-Squared	0.0273	0.0597	0.0606	0.0266	0.0571	0.0582

- Retail continues to hold the positions for over a week post EA
- Volatility subsides very quickly, so this behavior is unlikely to be rational speculation
- Evidence consistent with disposition effect + transaction costs to closing

Road Map

RETAIL IMPACT ON PRICES AND RETURNS: INTUITION

Demand Pricing Model Redux: Let $p_t \equiv$ observed price and $p_t^* \equiv$ price absent frictions

$$\underbrace{p_{-1} - p_{-1}^*}_{\text{Price dislocation}} \approx \underbrace{\gamma}_{\substack{\text{MM risk} \\ \text{aversion}}} * \underbrace{var_{-1}(\overline{p}_0)}_{\substack{\text{Unhedgeable risk} \\ \text{(e.g. price jumps)}}} * \underbrace{Inv_{-1}}_{\substack{\text{MM net option} \\ \text{position}}}$$

Compounding Effect: Both increase with EAV

High EAV announcements generate large risk for market makers

- Moreover, this risk is concentrated in a very short period of time (i.e., a price jump), which makes hedging difficult
- Thus, demand-based theory predicts price impact will be at its peak!

Retail Price Impact: Evidence

	$log(AbnormalIV_{-1})$					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔRetail Position$_{-5,-2}$	0.123	0.0802	0.0841			
	(8.83)	(8.82)	(7.81)			
Q5 ΔRetail Position$_{-5,-2}$				0.416	0.336	0.392
				(10.29)	(11.88)	(14.86)
$log(AbnormalIV_{-5})$		0.555	0.474		0.549	0.465
		(38.00)	(29.76)		(38.13)	(30.47)
Positions Standardized	✓	✓	✓			
Controls			✓			✓
Year-Quarter Fixed Effects			✓			✓
Firm and Year-Quarter Clustering	✓	✓	✓	✓	✓	✓
Total Observations	29114	27285	24372	30946	28939	25337
Adjusted R-Squared	0.00717	0.298	0.316	0.0124	0.296	0.320

- Option-implied variances escalate by roughly 40% more in the days immediately prior to announcements in the top quintile of retail option purchases, compared to announcements with no such purchases

EAV and EA Day Straddle Returns

At-the-Money Straddles: Narrows in on pricing of volatility, rather than directional moves
- **Prediction**: Returns to selling straddles increase w/ EAV due to compounding effect
- Put-call parity motivates our focus on straddles, despite retail's bias toward calls

Univariate: mean (t-stat)	
1 (low $AbnormalIV_{-1}$)	0.07
2	0.08
3	0.11
4	0.14
5 (high $AbnormalIV_{-1}$)	0.18
5 - 1 (long-short)	0.11 (19.55)

Univariate: skew (excess kurtosis)	
1 (low $AbnormalIV_{-1}$)	0.16
2	-0.14
3	0.20
4	-0.03
5 (high $AbnormalIV_{-1}$)	-0.57
5 - 1 (long-short)	0.07 (0.11)

$SRET_t$: Returns to *selling* a straddle at time t

$$-1 * \left[\frac{\text{Call Price}_t + \text{Put Price}_t - \text{Call Price}_{t-1} - \text{Put Price}_{t-1}}{\text{Call Price}_{t-1} + \text{Put Price}_{t-1}} \right]$$

Results: Returns to selling straddles increase in EAV
- Long-short portfolio exhibits high Sharpe ratio and no apparent skewness
- Not explained by standard controls ‣

POST EA HOLDINGS AND PRICE DECAY

Univariate: mean (t-stat)	
1 (low *AbnormalIV*$_{-1}$)	0.07
2	0.08
3	0.11
4	0.14
5 (high *AbnormalIV*$_{-1}$)	0.17
5 - 1 (long-short)	0.09 (8.26)

Univariate: skew (excess kurtosis)	
1 (low *AbnormalIV*$_{-1}$)	-1.60
2	-0.68
3	-1.13
4	-0.99
5 (high *AbnormalIV*$_{-1}$)	-1.40
5 - 1 (long-short)	0.49 (0.71)

Results: Straddle prices continue to rapidly decay following high EAV announcements

- Returns dissipate over the two weeks following the announcement; aligns with the period over which retail close their positions
- Consistent with market makers continuing to charge a premium due to sustained inventory risk

1. Data and motivating evidence

2. Determinants of retail option demand around EAs

3. Consequences for prices and returns

4. Quantifying the total impact on retail wealth

Sources of Retail Wealth Depletion

So far, we have seen two ways in which retail traders lose money as a result of buying options prior to high-EAV EAs:
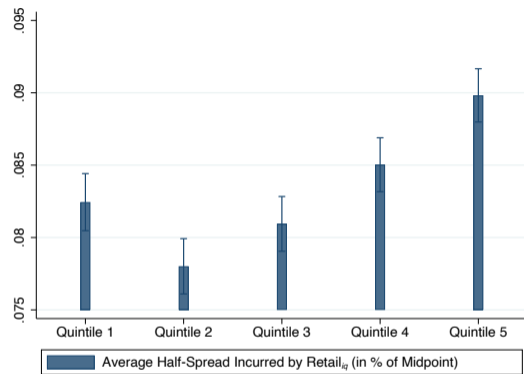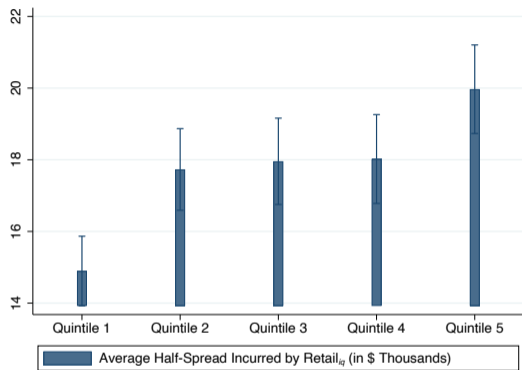
1. Price impact and negative EA date returns
2. Post-announcement holdings and price decay

We next document an additional driver of retail losses:

3. Transaction costs (i.e., bid-ask spreads)

We then quantify the total impact these forces have on retail wealth.

TRANSACTION COSTS INCURRED BY RETAIL

Average Half-Spread Incurred by Retail$_{iq}$ (in $ Thousands)

Average Half-Spread Incurred by Retail$_{iq}$ (in % of Midpoint)

- **Conservative Assumption**: Retail opens positions, but does not close them, and thus only pays half of the bid-ask spread
- **Compounding Effect**: Retail losses from bidding up prices are compounded by enormous bid-ask spreads in options ahead of high EAV announcements.

Retail Losses in Dollars
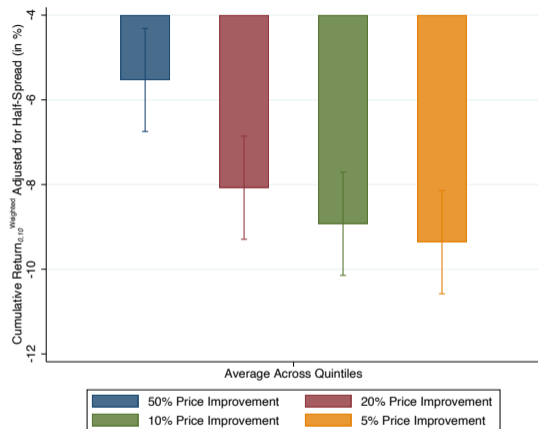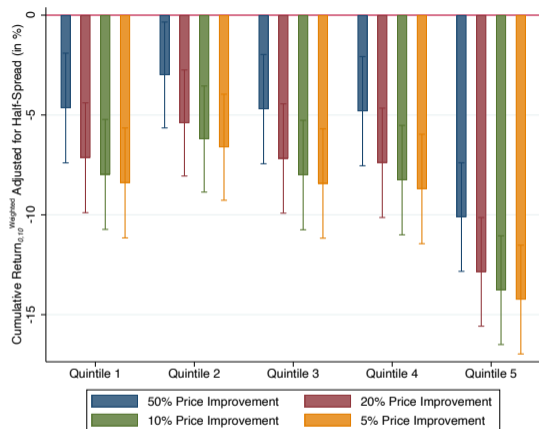

Before Transaction Costs
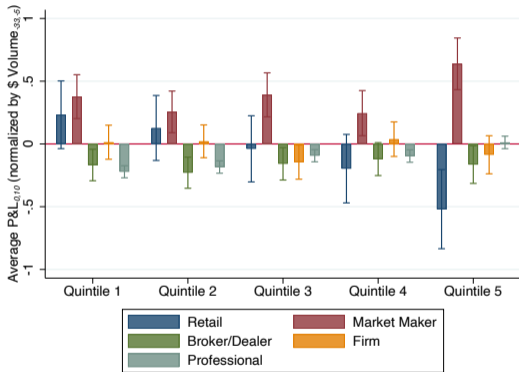
After Transaction Costs
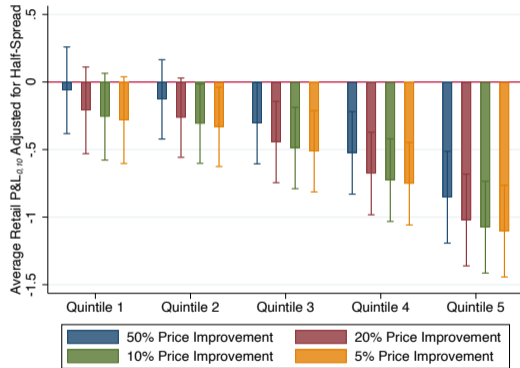
- Retail loses modestly on average, but faces concentrated losses in high EAV quintile ›
- Billions in losses from retail to market makers at high EAV EAs (~ 1% per day) ›

Retail Losses in Return Space

- Retail losses of 5-to-9% for the average earnings announcement
- Retail losses of 10-to-14% around high EAV announcements

Conclusion

- Main Takeaways
  1. Losing is Optional: Retail is drawn to options by expected abnormal volatility but incurs substantial losses due to large price impact + bid-ask spreads + sluggish response to EAs
  2. Retail Demands: Shape EA option price and wealth dynamics, which are central for answering normative questions surrounding regulatory discussions

- Future Directions
  1. Increasing recognition that retail can meaningfully influence prices for sustained periods; deeper roots in finance and economics, but lesser explored in accounting research
  2. Strategic use of disclosure when disclosure can shape retail demand