

Caught On Tape: Predicting Institutional Ownership With Order Flow

John Campbell, Tarun Ramadorai and
Tuomo Vuolteenaho

Equity Flows of Institutional Investors: Broad Research Questions

- Do institutional investors respond differently to cash flow relevant information than individuals?
- Do institutions have a destabilizing or stabilizing influence on stock prices?
- Three hypotheses:
 1. Institutions are a stabilizing influence:
 - Rational response to cash flow news.
 - Arbitraging individual investor underreaction to cash flow news.
 2. Institutions are a destabilizing influence:
 - Institutions are noise or positive feedback traders.
 - Positive feedback trading unrelated to underreaction.
 2. Institutions are neutral:
 - Institutional trades offset each other.
 - The classification is not useful.

Existing Studies

- Cashflow relevant information and stock returns:
 - Earnings surprises are generally followed by stock price drifts in the same direction
Bernard [1989,1990], Michaely, Thaler and Womack [1995], Daniel, Hirshleifer and Subrahmanyam [1998]
- Stock returns and institutional investor flows:
 - Are contemporaneously correlated at the **quarterly** frequency:
Grinblatt, Titman, and Wermers (1995), Wermers (1999, 2000), Nofsinger and Sias (1999), and Grinblatt and Keloharju (2000a, b)

Existing Studies

- Institutional flows and cashflow relevant information:
 - Institutional investors buy shares from individuals in response to good cash flow news
Cohen, Gompers and Vuolteenaho [2002].
 - Cash flow measure is a quarterly function of residuals from a VAR – likely less accurate than a higher frequency measure.

To identify what is going on...

- Need information on returns, high frequency institutional equity flows, and high frequency cash flow relevant information.
- Need to sort out relationships between:
 - Cashflow information and returns.
 - Institutional flows and returns.
 - Cashflow information and institutional flows.
- But high frequency institutional equity flows are not readily available! (Few sources such as Plexus, TORQ, NYSE Audit Trail: limited coverage)
- Need to construct...

Data

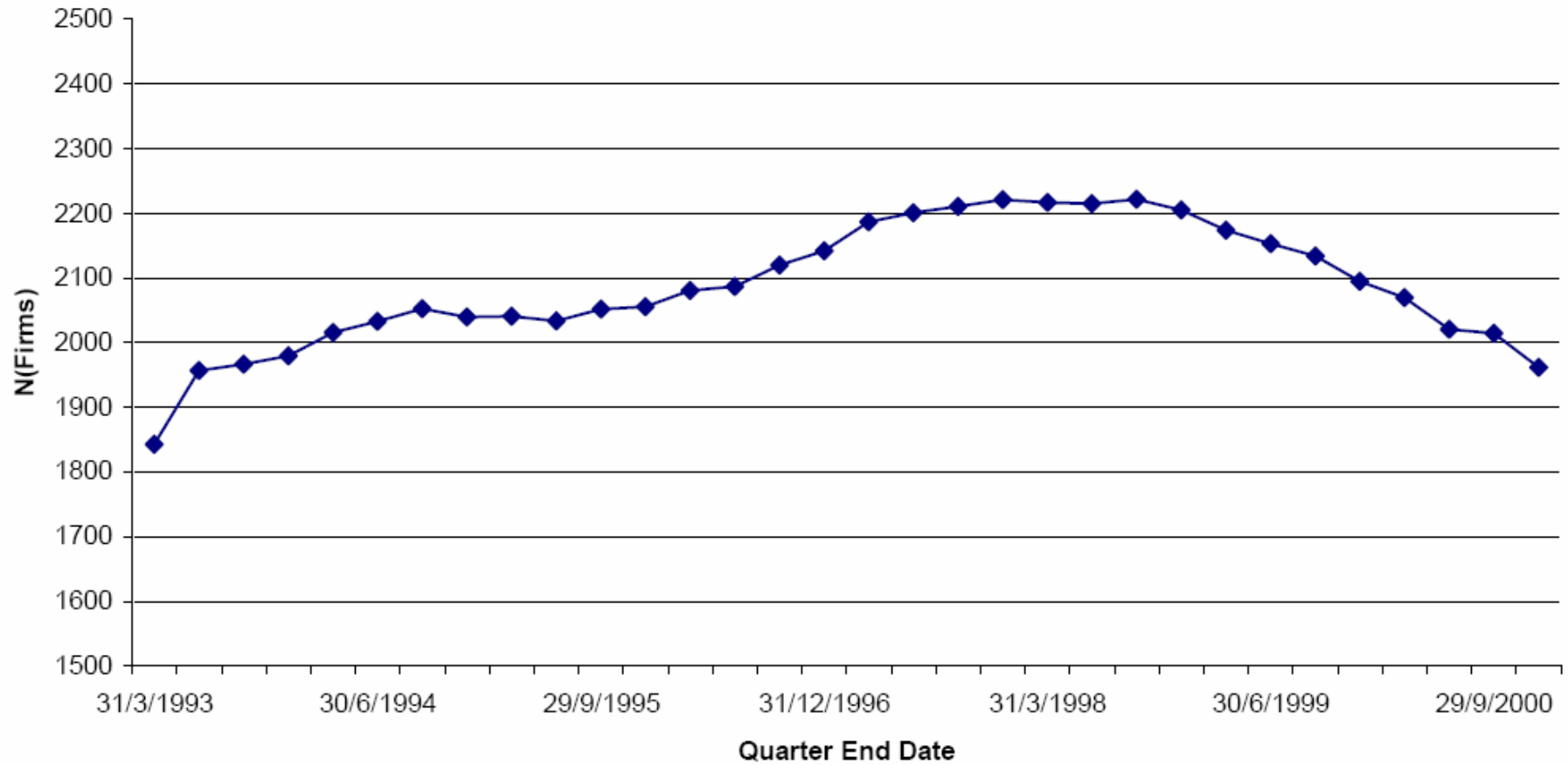
- Institutional Ownership: (SPECTRUM)
 - 13-F filings of U.S. institutional investors. Required by SEC.
 - Institutions managing > US\$ 1MM, in positions > 10,000 shares or US\$ 200K, report quarterly holdings.
- ‘Tape’: (Transactions and Quotes (TAQ))
 - All trades and quotes on NYSE/AMEX since 1993. Sample ends December 2000.
 - Buy-Sell classification using Lee and Ready [1991] algorithm. ‘Active’ side of trade.
 - Trade size ‘bins’ using dollar cutoffs (0-2000, 2000-3000, ..., 900,000-1MM, >1MM).
 - Summed to quarterly frequency.
- CRSP:
 - Shares outstanding, permanent company numbers, market capitalization.

Methodology

- **Goal:** To predict overall changes in institutional ownership from the general patterns of trading on a particular day.
- Regress changes in Spectrum ownership on cumulative quarterly trades of different sizes – from the ‘tape’.
- Find the best function mapping trade size to institutional behavior.
- How does the function vary with characteristics of the stock (size etc)?
- Function can be used in future work to track institutional trading on a daily or intra daily basis.

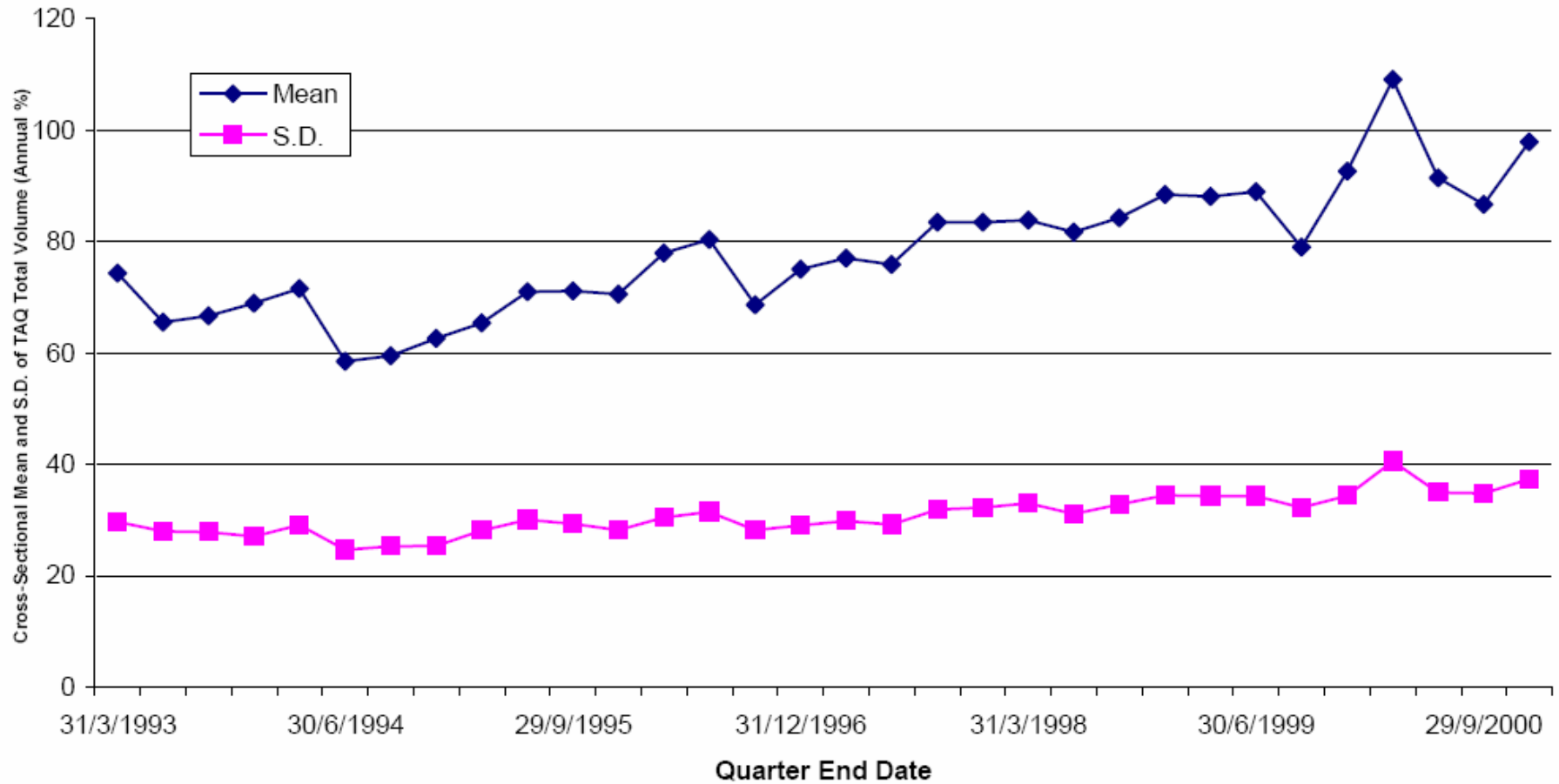
Summary Statistics

Evolution of Firms Over Time



Summary Statistics

Evolution of Mean and S.D. of TAQ Total Volume



Summary Statistics: Annualized Percent of Firm Size

	All	Small	Q2	Q3	Q4	Large
Mean						
<i>TAQ Total Buys</i>	31.83	20.88	27.42	33.56	39.20	38.04
<i>TAQ Total Sells</i>	30.99	23.13	28.58	33.00	36.45	33.75
<i>TAQ Unclassifiable</i>	15.39	9.66	13.21	15.94	18.85	19.29
<i>TAQ Total Volume</i>	78.31	53.82	69.28	82.62	94.61	91.14
<i>TAQ Net Imbalance</i>	0.96	-2.13	-1.08	0.63	2.87	4.49
<i>Spectrum Change</i>	0.60	-1.31	0.29	1.73	1.49	0.77
Median						
<i>TAQ Total Buys</i>	23.84	13.72	18.76	24.85	31.40	30.58
<i>TAQ Total Sells</i>	23.90	15.80	20.63	25.58	29.90	27.41
<i>TAQ Unclassifiable</i>	11.57	5.70	8.73	11.47	15.04	15.81
<i>TAQ Total Volume</i>	60.42	36.43	49.26	63.03	77.00	74.35
<i>TAQ Net Imbalance</i>	0.55	-1.22	-0.62	0.15	1.62	3.09
<i>Spectrum Change</i>	0.43	-0.03	0.41	1.65	1.35	0.98
Standard Deviation						
<i>TAQ Total Buys</i>	13.48	11.00	13.04	13.84	14.23	12.82
<i>TAQ Total Sells</i>	12.40	11.32	12.55	12.81	12.83	11.30
<i>TAQ Unclassifiable</i>	6.79	5.69	6.69	7.00	7.03	6.21
<i>TAQ Total Volume</i>	31.68	27.09	31.27	32.62	33.06	29.46
<i>TAQ Net Imbalance</i>	5.07	4.87	5.07	5.22	5.15	4.23
<i>Spectrum Change</i>	8.94	7.48	9.40	9.87	9.59	8.03

Summary Statistics: Annualized Percent of Firm Size

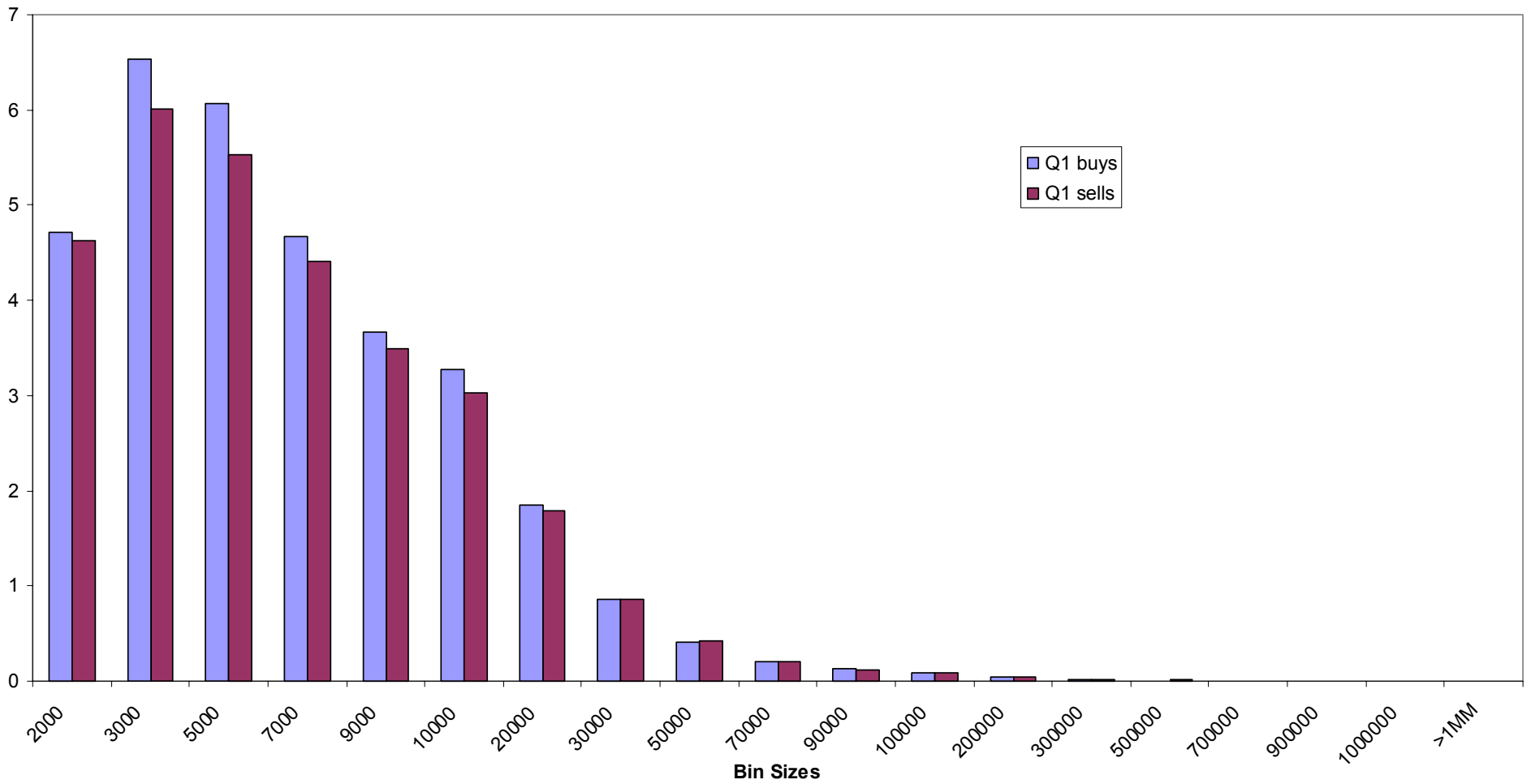
	All	Small	Q2	Q3	Q4	Large
Mean						
<i>TAQ Total Buys</i>	31.83	20.88	27.42	33.56	39.20	38.04
<i>TAQ Total Sells</i>	30.99	23.13	28.58	33.00	36.45	33.75
<i>TAQ Unclassifiable</i>	15.39	9.66	13.21	15.94	18.85	19.29
<i>TAQ Total Volume</i>	78.31	53.82	69.28	82.62	94.61	91.14
<i>TAQ Net Imbalance</i>	0.96	-2.13	-1.08	0.63	2.87	4.49
<i>Spectrum Change</i>	0.60	-1.31	0.29	1.73	1.49	0.77
Median						
<i>TAQ Total Buys</i>	23.84	13.72	18.76	24.85	31.40	30.58
<i>TAQ Total Sells</i>	23.90	15.80	20.63	25.58	29.90	27.41
<i>TAQ Unclassifiable</i>	11.57	5.70	8.73	11.47	15.04	15.81
<i>TAQ Total Volume</i>	60.42	36.43	49.26	63.03	77.00	74.35
<i>TAQ Net Imbalance</i>	0.55	-1.22	-0.62	0.15	1.62	3.09
<i>Spectrum Change</i>	0.43	-0.03	0.41	1.65	1.35	0.98
Standard Deviation						
<i>TAQ Total Buys</i>	13.48	11.00	13.04	13.84	14.23	12.82
<i>TAQ Total Sells</i>	12.40	11.32	12.55	12.81	12.83	11.30
<i>TAQ Unclassifiable</i>	6.79	5.69	6.69	7.00	7.03	6.21
<i>TAQ Total Volume</i>	31.68	27.09	31.27	32.62	33.06	29.46
<i>TAQ Net Imbalance</i>	5.07	4.87	5.07	5.22	5.15	4.23
<i>Spectrum Change</i>	8.94	7.48	9.40	9.87	9.59	8.03

Summary Statistics: Annualized Percent of Firm Size

	All	Small	Q2	Q3	Q4	Large
Mean						
<i>TAQ Total Buys</i>	31.83	20.88	27.42	33.56	39.20	38.04
<i>TAQ Total Sells</i>	30.99	23.13	28.58	33.00	36.45	33.75
<i>TAQ Unclassifiable</i>	15.39	9.66	13.21	15.94	18.85	19.29
<i>TAQ Total Volume</i>	78.31	53.82	69.28	82.62	94.61	91.14
<i>TAQ Net Imbalance</i>	0.96	-2.13	-1.08	0.63	2.87	4.49
<i>Spectrum Change</i>	0.60	-1.31	0.29	1.73	1.49	0.77
Median						
<i>TAQ Total Buys</i>	23.84	13.72	18.76	24.85	31.40	30.58
<i>TAQ Total Sells</i>	23.90	15.80	20.63	25.58	29.90	27.41
<i>TAQ Unclassifiable</i>	11.57	5.70	8.73	11.47	15.04	15.81
<i>TAQ Total Volume</i>	60.42	36.43	49.26	63.03	77.00	74.35
<i>TAQ Net Imbalance</i>	0.55	-1.22	-0.62	0.15	1.62	3.09
<i>Spectrum Change</i>	0.43	-0.03	0.41	1.65	1.35	0.98
Standard Deviation						
<i>TAQ Total Buys</i>	13.48	11.00	13.04	13.84	14.23	12.82
<i>TAQ Total Sells</i>	12.40	11.32	12.55	12.81	12.83	11.30
<i>TAQ Unclassifiable</i>	6.79	5.69	6.69	7.00	7.03	6.21
<i>TAQ Total Volume</i>	31.68	27.09	31.27	32.62	33.06	29.46
<i>TAQ Net Imbalance</i>	5.07	4.87	5.07	5.22	5.15	4.23
<i>Spectrum Change</i>	8.94	7.48	9.40	9.87	9.59	8.03

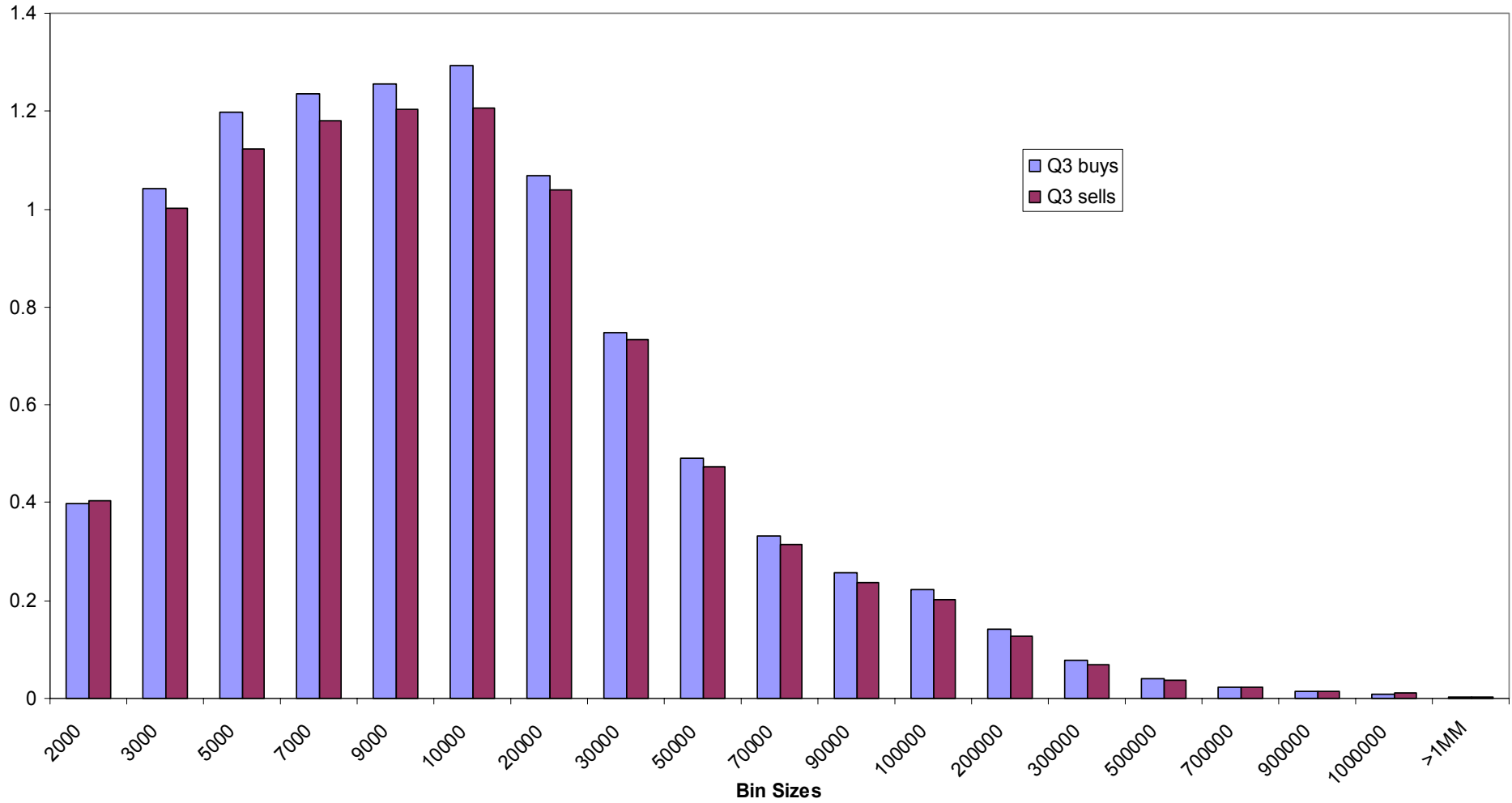
Histogram of Trade Intensities – Small Firms

Histogram of Trade Intensities - Q1 Firms



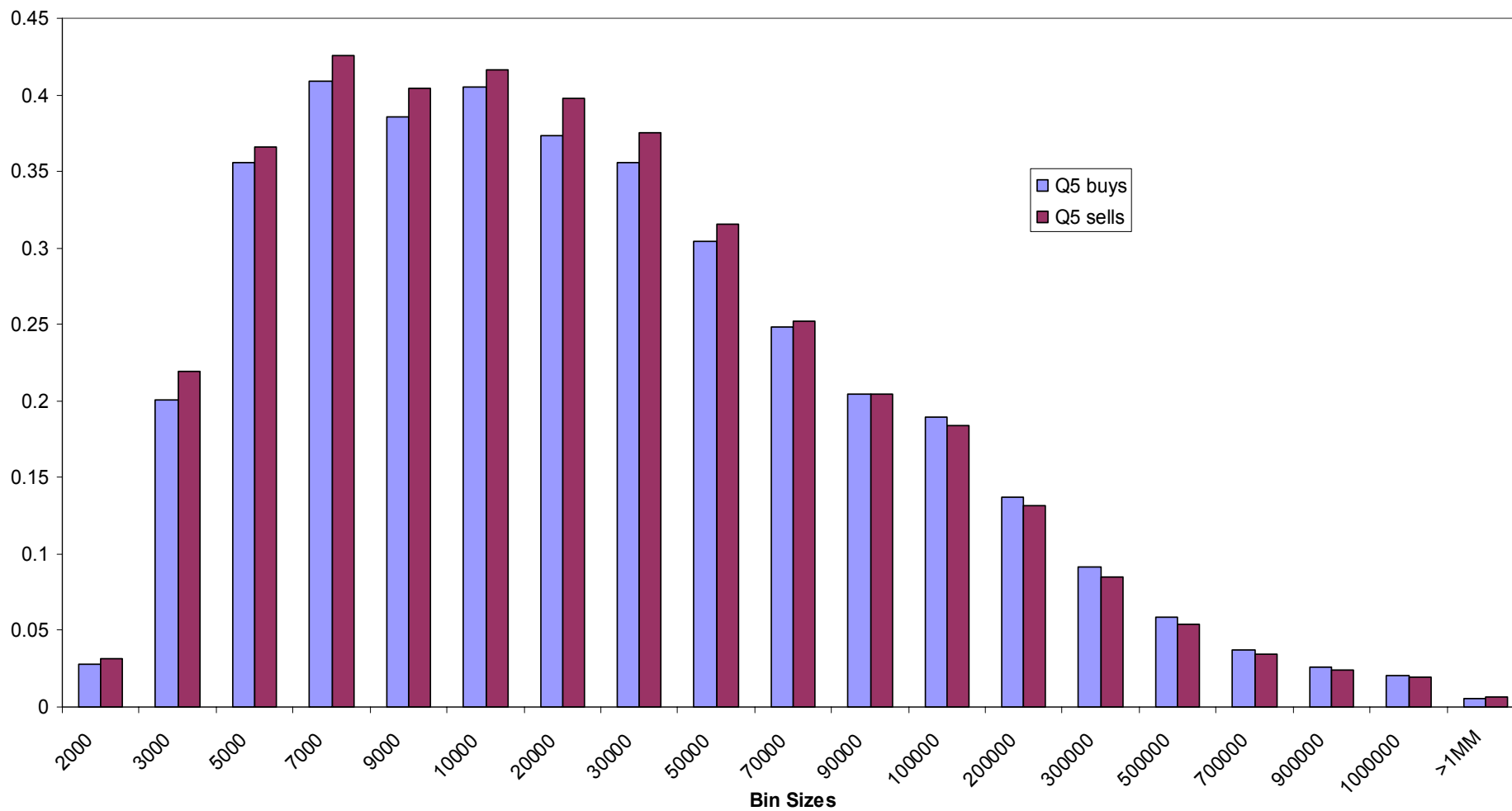
Histogram of Trade Intensities – Mid Cap Firms

Histogram of Trade Intensities - Q3 Firms



Histogram of Trade Intensities – Large Firms

Histogram of Trade Intensities - Q5 Firms



Regression Specifications – Total Flows

$$\underbrace{\Delta Y_{it}} = \alpha + \underbrace{\phi Y_{i,t-1}} + \underbrace{\beta_U U_{it}} + \underbrace{\beta_B B_{it}} + \underbrace{\beta_S S_{it}} + \varepsilon_{it}.$$

Change in
institutional
ownership

Lagged
Level

Unclassifiable
Volume

Total
Buys

Total
Sells

$$\Delta Y_{it} = \alpha + \phi Y_{i,t-1} + \beta_U U_{it} + \underbrace{\beta_F F_{it}} + \varepsilon_{it}.$$

Total Net
Flows

Note that

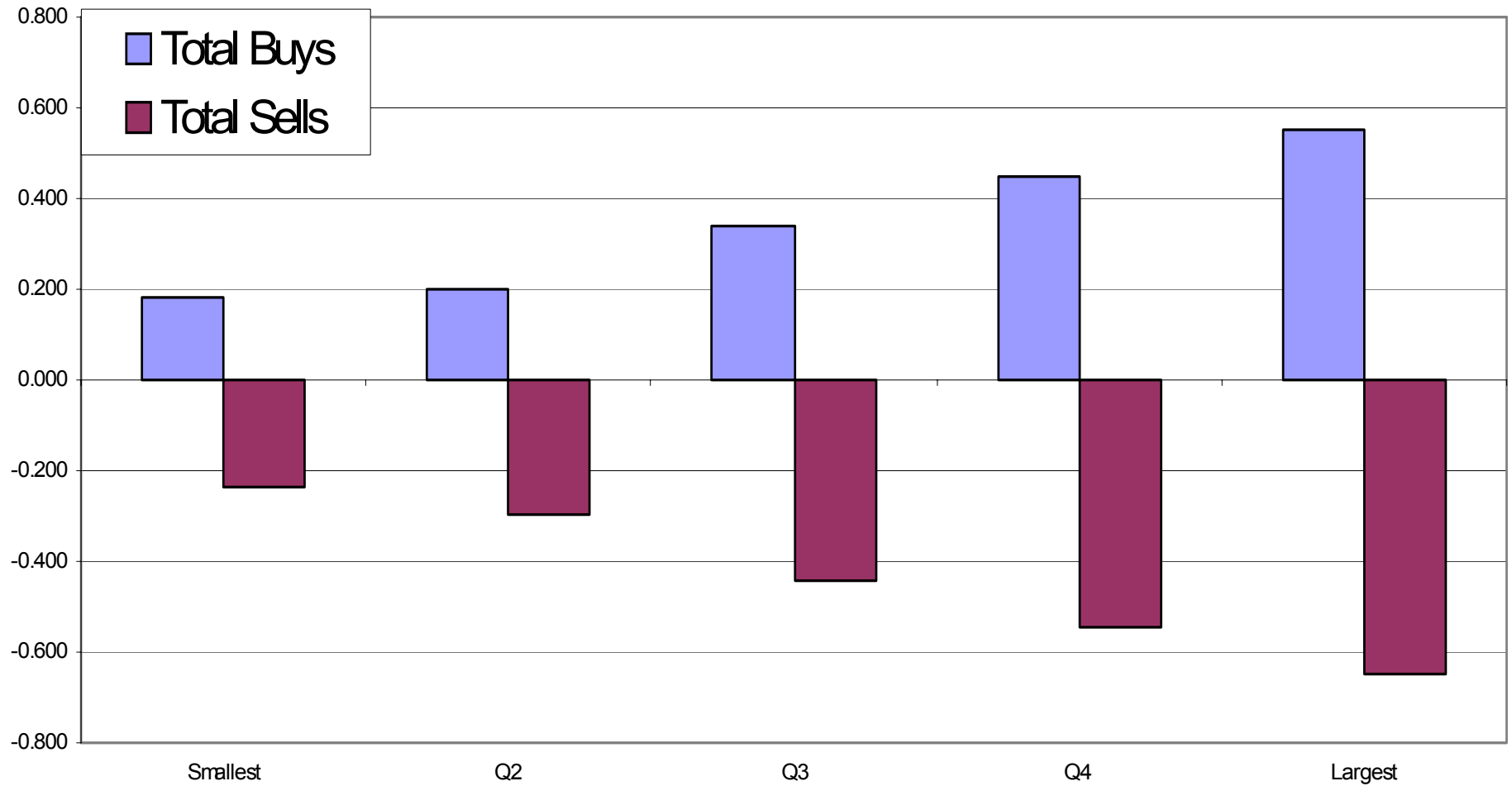
$$F_{it} = B_{it} - S_{it}$$

Specification Testing

	A	B	C	D	E	F
<i>Intercept</i>	0.007 (23.669)	0.007 (23.588)	0.012 (36.240)			
<i>Lagged Spectrum Level</i>			-0.016 (-20.386)			-0.015 (-20.174)
<i>TAQ Unclassifiable</i>		0.046 (3.213)	0.045 (3.160)		0.011 (0.669)	0.009 (0.554)
<i>TAQ Total Buys</i>	0.348 (32.879)	0.338 (29.983)	0.360 (32.022)	0.347 (32.725)	0.344 (29.965)	0.367 (31.981)
<i>TAQ Total Sells</i>	-0.429 (-36.422)	-0.441 (-36.355)	-0.438 (-36.302)	-0.422 (-35.867)	-0.425 (-34.661)	-0.423 (-34.611)
<i>R-Squared</i>	0.040	0.041	0.047	0.039	0.039	0.045
<i>N</i>	66805	66805	66805	66805	66805	66805
<i>N(Firms)</i>	3402	3402	3402	3402	3402	3402
<i>Time Dummies?</i>	No	No	No	Yes	Yes	Yes

Total Flow Coefficients Across Size Quintiles

Coefficients on Total Buys and Sells for Size groups

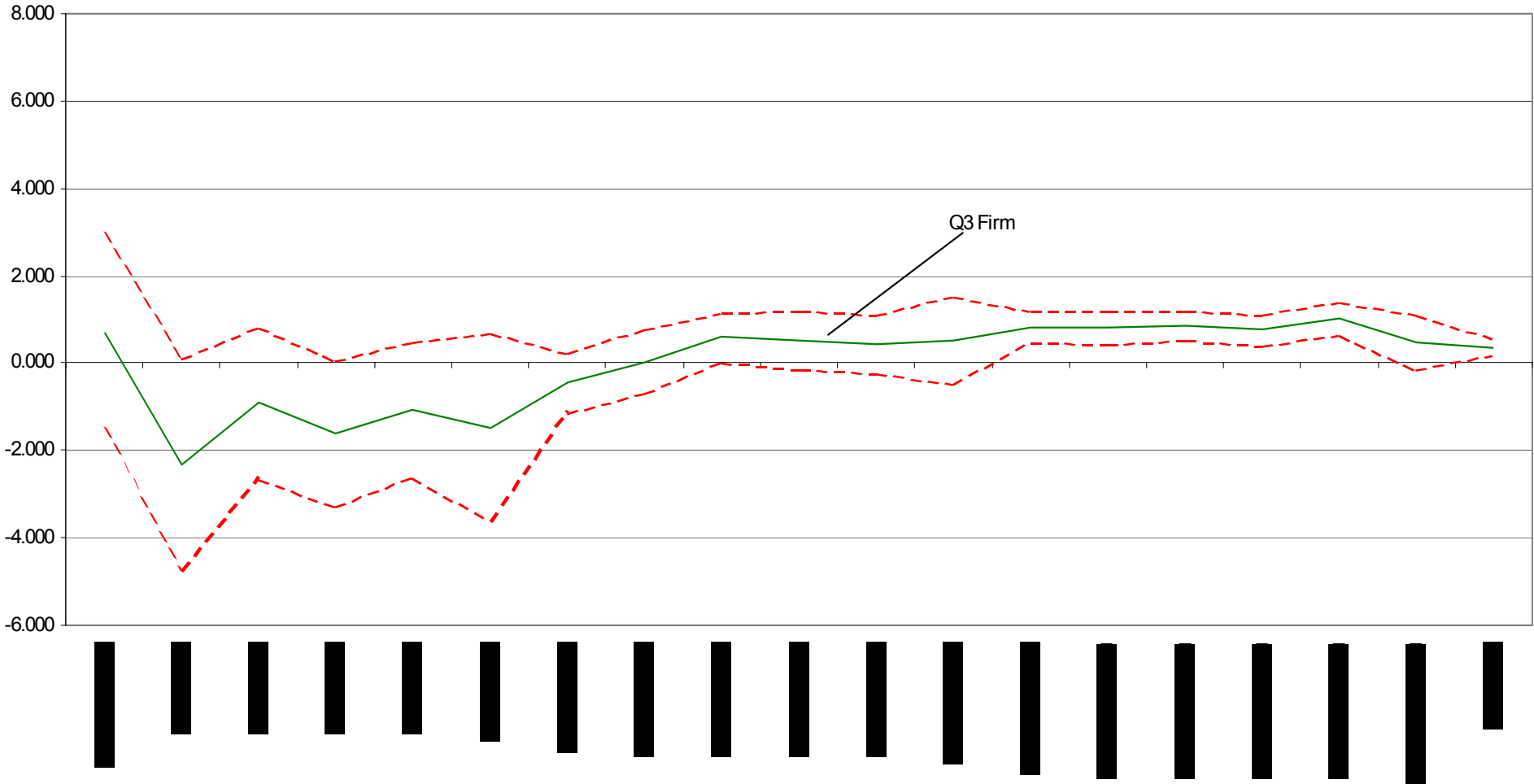


The Information in Trade Size

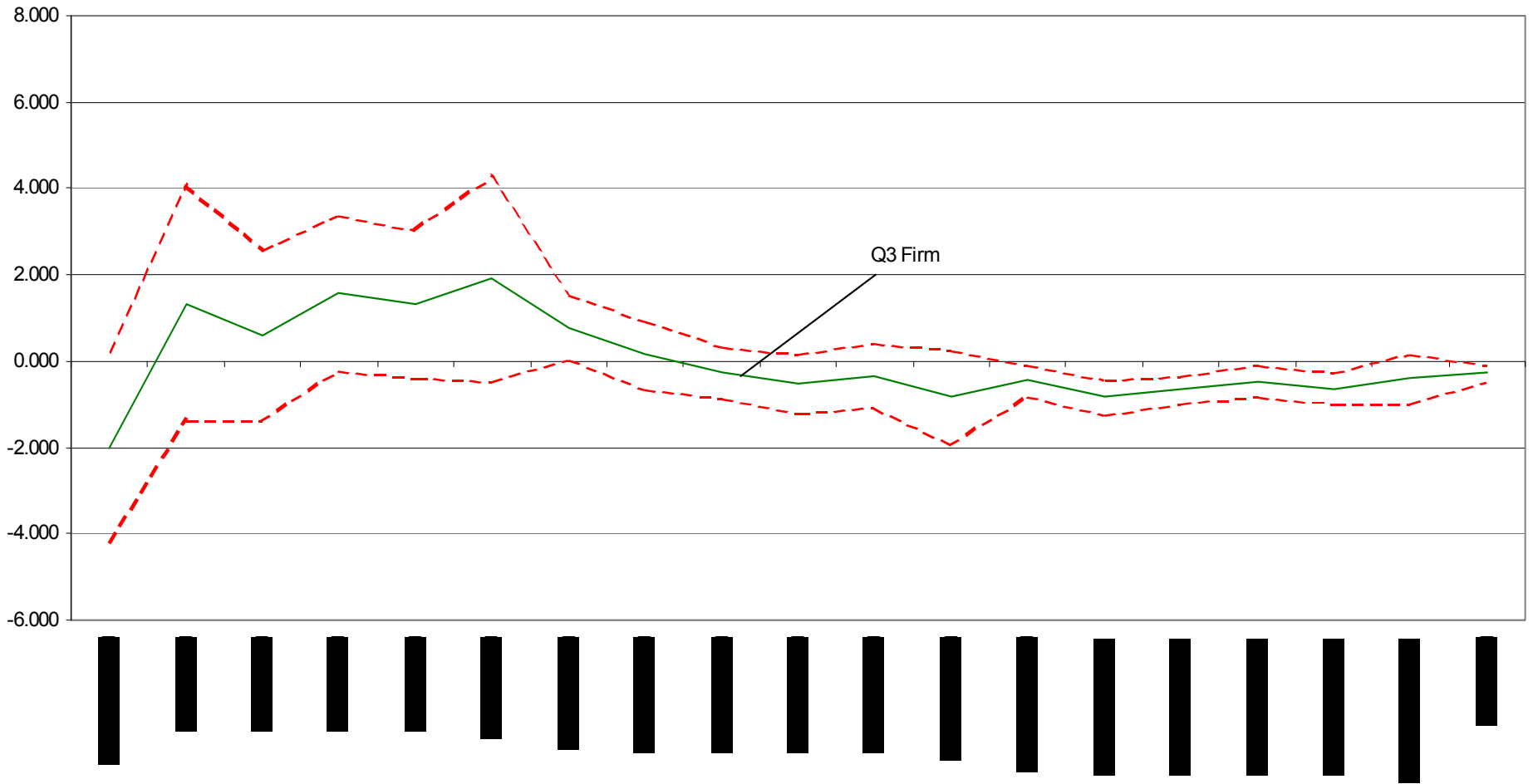
$$\Delta Y_{it} = \alpha + \phi Y_{i,t-1} + \beta_U U_{it} + \underbrace{\sum_Z \beta_{BZ} B_{Zit}}_{\text{Bin Specific Buys}} + \underbrace{\sum_Z \beta_{SZ} S_{Zit}}_{\text{Bin Specific Sells}} + \varepsilon_{it}$$

$$\Delta Y_{it} = \alpha + \phi Y_{i,t-1} + \beta_U U_{it} + \underbrace{\sum_Z \beta_{FZ} F_{Zit}}_{\text{Bin Specific Net Flows}} + \varepsilon_{it}$$

Standardized Buy Coefficients For Different Trade Sizes



Standardized Sell Coefficients For Different Trade Sizes



The Story So Far:

- Total buy (sell) volume predicts increasing (decreasing) institutional ownership
 - Institutions tend to buy at the ask and sell at the bid (or buy on upticks and sell on downticks).
 - Suggests that institutions demand liquidity rather than provide it.
- Buy volume in sizes between \$2,000 and \$30,000 is associated with decreasing institutional ownership
- Buy volume in larger sizes predicts increasing institutional ownership.
- Extremely small buys below \$2,000 also predict increasing institutional ownership.
 - Scrum or stealth trades?
- All patterns are amplified as size of the firm increases

But how good is the method?

R^2	Small	Q2	Q3	Q4	Large
Matched Pairs of Cutoffs					
<i>Lower: 2,000;Upper 5,000</i>	-0.109	-0.107	-0.061	-0.017	-0.002
<i>Lower: 3,000;Upper 10,000</i>	-0.077	-0.084	-0.039	-0.006	0.005
<i>Lower: 3,000;Upper 20,000</i>	-0.049	-0.059	-0.017	0.008	0.014
<i>Lower: 3,000;Upper 50,000</i>	-0.024	-0.035	0.007	0.024	0.026
<i>Lower: 5,000;Upper 100,000</i>	-0.023	-0.021	0.025	0.035	0.038
CRV Method	0.087	0.075	0.114	0.103	0.108
<i>N</i>	13341	13370	13361	13349	13384
<i>N(Firms)</i>	1198	1422	1366	1194	744

Smoothing the Effects of Trade Size

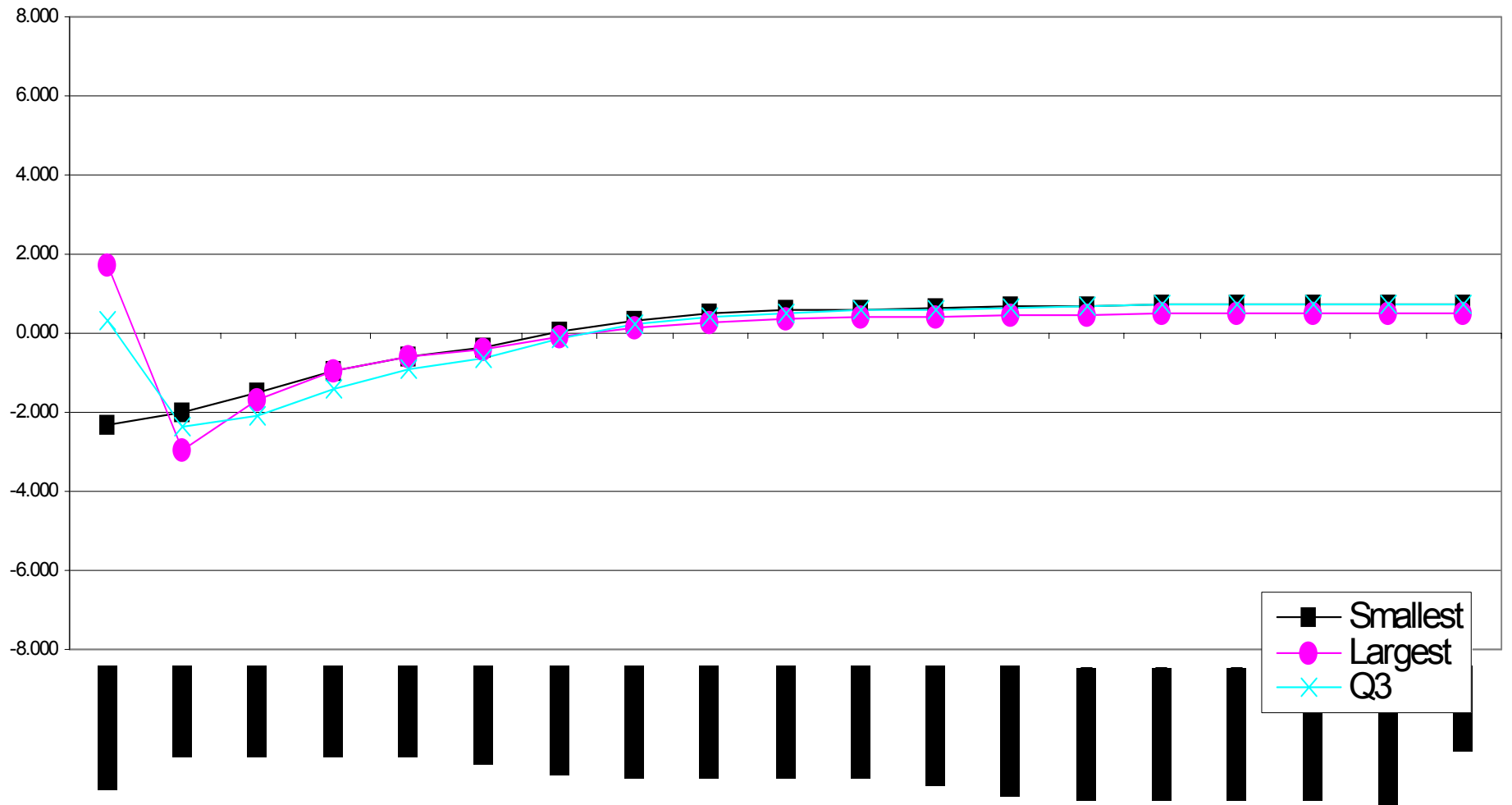
- Refine specification for a more accurate cutoff rule.
- Use Nelson and Siegel's [1987] nonlinear function (originally used for parsimonious yield-curve modeling).

$$\beta(Z) = b_0 + \underbrace{(b_1 + b_2) \left[1 - e^{-Z/\tau} \left(\frac{\tau}{Z} - b_2 e^{-Z/\tau} \right) \right]}_{\text{Negative Exponential Function: Can Capture a Range of Shapes}}$$

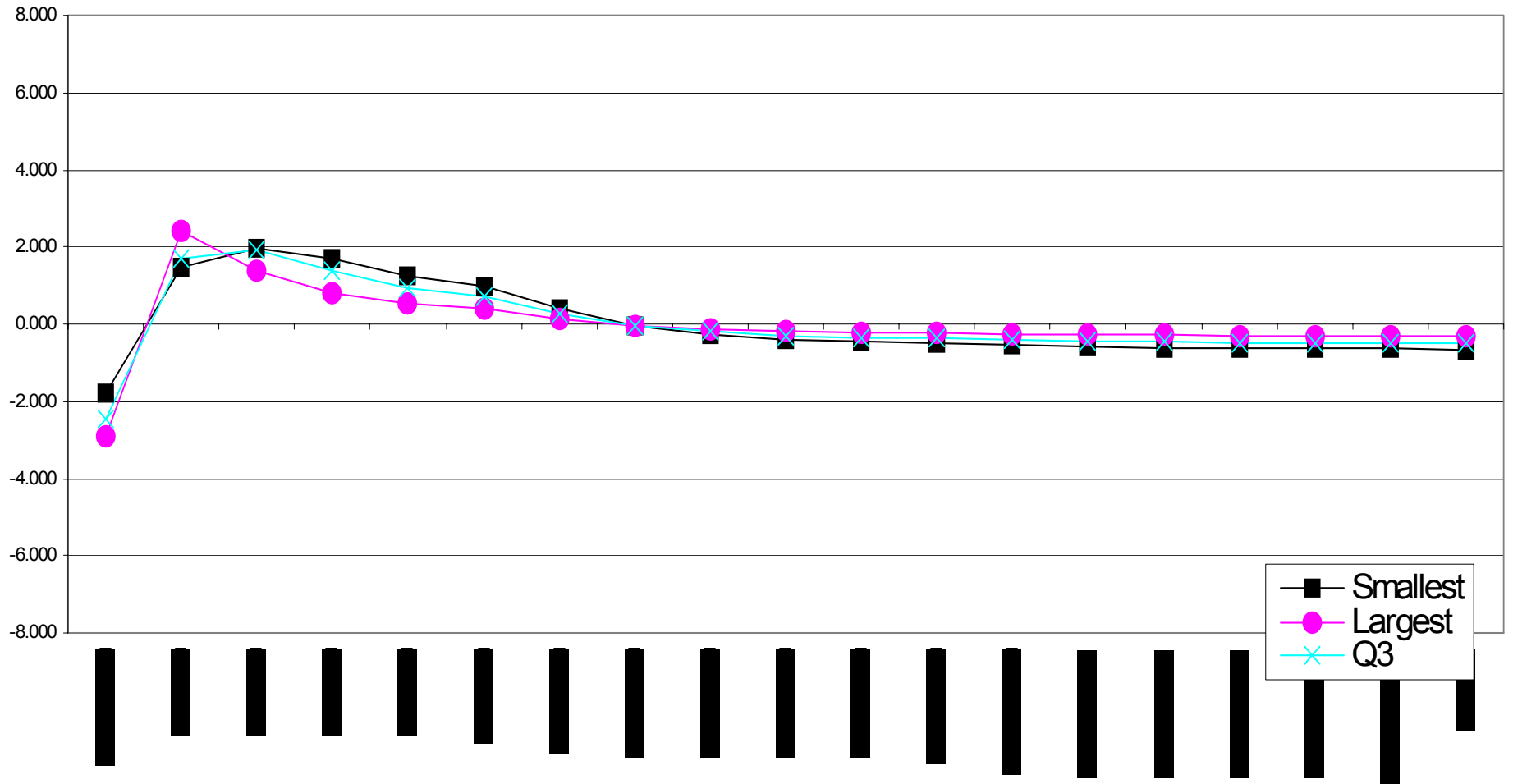
Coefficient for
bin Z

Negative Exponential Function: Can Capture a
Range of Shapes

Standardized Buy Coefficients For Different Trade Sizes



Standardized Sell Coefficients For Different Trade Sizes



Next Steps

- Identify variation in institutional trading behaviour with stock and time specific factors
 - Explore how the Nelson-Siegel function varies with daily volume, volatility, and over time
- Apply refined method to TAQ flows to get inferred high frequency institutional ownership.
- Use these daily/intra daily flows as an indicator of institutional trading behaviour for a broad cross section of stocks.
- See how institutions trade around cash flow announcements (earnings announcements) and corporate actions. Do institutions 'arbitrage' individual underreaction to cashflow news?