Market Frictions, Price Delay, and the Cross-Section of Expected Returns

forthcoming
The Review of Financial Studies

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Motivation

Predictability in the cross-section of returns fuels much of the market efficiency debate.

- Is predictability due to risk?
- Or, is it an "inefficiency"?

The joint hypothesis problem leaves this unresolved.

However, further complicating the debate is that traditional asset pricing theory assumes markets are frictionless and investors are well-diversified.

Yet, ample evidence points to sizeable market frictions and poorly diversified investors.

Market frictions on portfolio choice and asset prices:

- **Incomplete information** (Merton (1987), Hirshleifer (1988), Basak and Cuoco (1998), Shapiro (2002), Grullon, Kanatas, and Weston (2002))

- **Asymmetric information** (Kyle (1985), Jones and Slezak (1999), Coval and Moskowitz (2001), Easley, Hvidkjaer, and O'Hara (2002))

- **Segmentation** (Errunza and Losq (1985), Kadlec and McConnell (1994), Chaplinsky and Ramchand (2000), Foerster and Karolyi (1999), Chen, Noronha, and Singal (2002))

- **Neglect** (Arbel and Strebel (1982), Arbel, Carvell, and Strebel (1983), Arbel (1985))

- **Short sale contraints** (Miller (1977), Chen, Hong, and Stein (2002), Jones and Lamont (2002))

- **Taxes** (Brennan (1970), Constantinides (1984))

- **Liquidity** (Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Pastor and Stambaugh (2003), among many others)

- **Noise trader or sentiment risk** (DeLong, Shleifer, Summers, and Waldmann (1992), Shleifer and Vishny (1997))

How important are these features of the economy and markets for understanding the cross-section of expected returns?

We assess the impact of market frictions using a parsimonious measure of the severity of frictions affecting a stock:

* the average *Delay* with which its share price responds to information.

- Link between speed of information diffusion and market frictions:
  - incomplete markets and limited stock market participation (Merton (1987), Hirshleifer (1988), Basak and Cuoco (1998), Shapiro (2002));
  - neglected firms (Arbel and Strebel (1982), Arbel, Carvell, and Strebel (1983), Arbel (1985));
  - gradual information diffusion (Hong and Stein (1999));
  - information (learning) constraints (Peng (2002));
  - liquidity arising from many sources: (transactions costs, information, etc.).

Our objectives:

Using a parsimonious measure (*price Delay*) to capture the potential impact of all of these frictions,

1. assess empirically whether they matter for asset prices,

2. try to distinguish which frictions matter most (e.g., are most consistent with the data).

Data and Measures of Price Delay

- Data

  1. CRSP-COMPUSTAT universe
     (sharecodes 10 or 11)
     July, 1963 to December, 2001

  2. Weekly returns to estimate Delay
     monthly returns to form portfolios

     – exclude missing firm-week observations

     – minimum of one month skipped between measures and portfolio returns

  3. Traditional Liquidity variables

  4. A host of variables proxying for investor attention or recognition

- Measuring price Delay

$$r_{j,t} = \alpha_j + \beta_j R_{m,t} + \sum_{n=1}^{4} \delta_j^{(-n)} R_{m,t-n} + \epsilon_{j,t}$$

  - estimated over the prior 52 weeks ending in June of year t

  - Delay measures:

$$D1 = 1 - \frac{R^2_{\delta_j^{(-n)}=0,\forall n\in[1,4]}}{R^2}$$

$$D2 = \frac{\sum_{n=1}^{4} n\delta^{(-n)}}{\beta + \sum_{n=1}^{4} \delta^{(-n)}}$$

$$D3 = \frac{\sum_{n=1}^{4} \frac{n\delta^{(-n)}}{se(\delta^{(-n)})}}{\frac{\beta}{se(\beta)} + \sum_{n=1}^{4} \frac{\delta^{(-n)}}{se(\delta^{(-n)})}}$$

- Alternative Delay measures (robustness):
  - add leading market returns to regression
  - higher order lags
  - lagged own stock returns
  - use absolute value of the coefficient estimates
  - alternative weighting schemes on coefficient estimates

* Note: not taking advantage of *sign* of information trend $\Rightarrow$ no microstructure influence.

- Second-stage portfolio delay measures:
  - to minimize errors-in-variables problem
  - sort stocks each year into Size and Delay deciles
  - compute equal-weighted returns on the 100 portfolios
  - re-estimate Delay for each portfolio over the entire *past* sample
  - assign stocks in each portfolio the post-ranking measure over time
  - use this to rank stocks and form portfolios to examine subsequent returns

- Characteristics of Delay sorted portfolios
  - value-weighted characteristics of Delay sorted decile portfolios
  - characteristics related to average returns
  - investor attention proxies
  - liquidity proxies

Delay and the Cross-Section of Stock Returns

- raw returns
- characteristic adjusted returns
- robustness checks:
  - change in Delay
  - alternative delay measures
  - further return adjustment
  - subperiods and subsamples

- microstructure issues

  1. missing firm-weeks dropped
  2. skip minimum of 1 month to 1 year
  3. no difference in July, or skip July
  4. control of number of trading days and host of liquidity measures
  5. remove $<$ \$5 price, \$5 mill. size, and \$200 thou. volume $\rightarrow$ still profitable

- Fama-MacBeth regressions

  - standard controls
  - liquidity controls

Interaction of Delay with Other Firm Characteristics

- Delay and the size effect
- Delay premium and
  - Book-to-market equity
  - Long-term reversal
  - Momentum
  - Share turnover
  - Trading volume
  - Idiosyncratic volatility
- Post-earnings announcement drift

What Drives the Delay Premium?

- Determinants of price delay

$$D1_j = a + \sum_{k=1}^{K} b_k Att_{k,j} + \sum_{q=1}^{Q} c_q Liq_{q,j} + \epsilon_j$$

- Decomposing the impact of Delay
  - two-stage procedure using attention and liquidity variables as instruments

$$\widehat{Delay}(\text{liquidity}) = \sum_{q=1}^{Q} \widehat{c}_q Liq_{q,j}$$

$$\widehat{Delay}(\text{attention}) = \sum_{k=1}^{K} \widehat{b}_k Att_{k,j}$$

- Completely neglected firms

Trading Costs Associated with Delay

Focus on non-neglected stocks only:

- Sharpe ratios are very high (0.85!)
  - mean = 54 basis points per month, or 6.48% per year
  - σ = 2.2% per month, or 7.62% per year
- Turnover is low $\Rightarrow$ 35% per year.
- Profits come from the long side.

* However, mostly in small, low priced, illiquid, volatile stocks. Trading float may be small. Price impact costs could be important here. Returns high, but dollar profits may be low.

Conclusion

- Delay is a parsimonious measure of severity of market frictions.

- Delay is a strong predictor of average returns, captures the size effect, and interacts with other known return predictors.
  - Idiosyncratic risk priced among Delay firms.
  - Post-announcement drift increasing in Delay.

- Not explained by "traditional" liquidity.

- Most consistent with investor recognition.

Table 1:
Characteristics of Portfolio Delay Sorted Portfolios

At the end of June of each year, stocks are ranked by their delay measure ($D1$) and sorted into deciles. The value-weighted average characteristics of these decile portfolios are computed over the following year from July to June from 1964 to 2001. Average characteristics of the portfolios are reported for the delay measure $D1$, size (market capitalization in \$millions), book-to-market equity ratio (BE/ME), percentage institutional ownership, average monthly dollar trading volume (\$millions), monthly turnover (monthly number of shares traded divided by number of shares outstanding), Amihud's (2002) illiquidity measure (average daily absolute return over daily dollar trading volume) $\times 10^5$, idiosyncratic risk σ_ϵ^2 (the variance of residual firm returns from a market model regression using weekly returns over the prior year), market β (the sum of slope coefficients from a regression of each stock's return on the contemporaneous return of the market, plus four lags, estimated weekly over the prior year), number of analysts, average share price, number of shareholders (thousands), number of employees (thousands), advertising expense (\$millions), cumulative average return over the past year (skipping a month) and past three years (skipping a year), $ret_{-12:-2}$ and $ret_{-36:-13}$, respectively, average number of trading days per year, and average number of stocks per portfolio. Also reported are F-statistics for testing the equality of characteristics across deciles 1 through 10 and 1 through 9. The final two columns report the time-series average of the cross-sectional Pearson and rank correlations of each firm characteristic with the delay measure $D1$.

	Delay-sorted ($D1$) decile portfolios, July, 1964 to Dec., 2001										F-stat	F-stat	Correlation with Delay	
	1	2	3	4	5	6	7	8	9	10	(1-10)	(1-9)	Pearson	Rank
Firm characteristics														
Delay	0.002	0.011	0.022	0.037	0.053	0.074	0.103	0.144	0.196	0.341	868.82*	820.52*		
Size(\$)	18,444	9,003	3,030	1,188	690	101	51.5	33.2	12.9	6.0	185.60*	180.91*	-0.45	-0.94
BE/ME	0.635	0.691	0.756	0.794	0.819	0.892	0.937	1.028	1.164	1.375	149.22*	97.95*	0.86	0.85
σ_ϵ^2	0.008	0.010	0.011	0.012	0.014	0.016	0.017	0.020	0.023	0.027	1987.07*	1992.85*	0.94	0.95
β	1.07	1.11	1.13	1.16	1.22	1.24	1.24	1.29	1.28	1.26	117.28*	167.05*	0.31	0.49
$ret_{-12:-2}$(%)	16.42	17.72	17.05	17.20	17.17	17.06	16.71	15.88	11.45	8.92	6.47*	2.90*	-0.33	-0.25
$ret_{-36:-13}$(%)	47.85	51.04	45.08	44.96	45.25	42.83	37.43	29.83	17.24	3.01	73.33*	35.80*	-0.64	-0.55
Investor attention variables														
Inst. own(%)	52.7	47.9	40.5	34.8	27.6	23.0	18.1	13.8	9.7	6.3	1762.58*	1428.92*	-0.88	-0.99
#Analysts	22.4	13.8	10.6	6.7	3.4	2.7	2.1	1.5	1.3	1.3	1459.24*	1386.87*	-0.65	-0.97
#Shareholders	265.7	79.4	65.7	35.4	4.0	7.8	2.6	2.3	1.5	1.4	648.01*	631.70*	-0.47	-0.95
#Employees	115.7	51.7	30.8	22.3	13.1	4.0	12.4	1.8	1.0	0.5	419.97*	399.81*	-0.48	-0.94
Advertising(\$)	357.5	227.8	81.0	26.2	8.7	6.7	3.5	2.3	1.4	0.7	233.03*	226.12*	-0.50	-0.92
Liquidity variables														
Volume(\$)	913	382	99.4	27.6	11.3	5.3	4.4	1.5	0.75	0.37	75.70*	74.38*	-0.48	-0.94
Turnover	0.043	0.050	0.055	0.056	0.053	0.052	0.048	0.045	0.041	0.040	14.48*	11.66*	-0.37	-0.28
Illiquidity	0.012	0.011	0.021	0.036	0.086	0.158	0.319	1.047	1.534	3.756	344.63*	160.74*	0.91	0.96
Avg. price(\$)	126.87	78.13	37.67	29.88	27.17	19.10	17.20	11.44	7.54	4.89	113.24*	105.33*	-0.63	-0.95
#Trading Days	250.6	248.8	245.7	242.0	231.5	221.2	209.4	194.5	171.9	150.8	329.82*	276.28*	-0.96	-0.96
Avg. #Stocks	369.0	386.9	388.4	388.0	387.5	388.3	385.3	389.3	384.2	406.0				

*Indicates significance at the 1% level.

Table 2:
Price Delay and the Cross-Section of Expected Stock Returns

The equal- and value-weighted monthly returns (in %) of decile portfolios formed from various measures of delay, their t-statistics (in parentheses), and the difference in returns between decile portfolios 10 (highest delay) and 1 (lowest delay) are reported over the period July, 1964 to December, 2001. Raw and characteristic-adjusted returns of the delay-sorted decile portfolios are reported using characteristic-based benchmarks to account for return premia associated with size, BE/ME, and momentum. Panel A reports results for decile portfolios sorted on portfolio delay measures assigned to individual stocks. Stocks are assigned to one of ten size deciles and then one of ten individual delay deciles within each size category. The delay measure for the portfolio of stocks to which each stock belongs is then assigned to the stock and used to rank and form portfolios to compute returns out of sample. Returns across portfolio delay-sorted deciles are reported for delay measures $D1$, from equation (2), the annual change in $D1$, $D1$ including leading returns in equation (2), and $D2$ and $D3$ from equations (3) and (4). Panel B reports returns from decile portfolios formed solely from ranking stocks on their *individual* delay measures (e.g., no portfolio shrinkage). Results are reported for individual delay calculated from weekly returns over the past 5 years, daily returns over the past 1 year, and daily returns over the past 5 years. Panel C reports the intercepts, α, from time-series regressions of the value-weighted spread in raw and characteristic-adjusted average returns between decile portfolios 10 and 1 for portfolio $D1$ delay-sorted deciles on the Fama-French 3-factor model, the Carhart (1997) 4-factor model (which adds a momentum factor to the Fama-French factors), a 5-factor model which adds the Pastor and Stambaugh (2003) aggregate liquidity risk factor-mimicking portfolio to the Carhart model, and a 6-factor model which adds Easley, Hvidkjaer, and O'Hara's (2002) probability of informed trading (PIN) factor-mimicking portfolio (available from July, 1984) to the other factors. The characteristic-adjusted spread in returns between portfolio delay $D1$ decile portfolios 10 and 1 is also reported excluding the month of January, for the two subperiods of the sample, for NYAM and NASD stocks separately, for firms with book-to-market equity ratios (BE/ME) less than and greater than or equal to 1, for firms with average share prices above \$5, for firms with monthly dollar trading volume above \$200,000, and for firms with at least \$5 million in market capitalization.

Decile	Equal-weighted					Value-weighted					
portfolio	1	2	9	10	**10-1**	1	2	9	10	**10-1**	
Panel A: Portfolio delay measures assigned to individual stocks											
$D1$, raw	1.13	1.15	1.42	2.47	**1.34**	1.07	1.19	1.28	2.06	**0.99**	
	(4.69)	(4.42)	(4.27)	(6.61)	**(4.27)**	(4.89)	(5.05)	(4.02)	(5.69)	**(3.17)**	
$D1$, adj.	-0.01	0.03	0.29	1.32	**1.33**	-0.03	0.06	0.21	0.93	**0.95**	
	(-0.37)	(0.94)	(3.39)	(8.30)	**(7.97)**	(-1.50)	(1.72)	(2.49)	(6.63)	**(6.69)**	Rank
$\Delta D1$, adj.	0.18	0.11	0.21	0.89	**0.72**	-0.13	-0.03	0.05	0.35	**0.49**	correlation
	(2.32)	(2.33)	(3.60)	(7.73)	**(6.44)**	(-1.47)	(-0.45)	(0.89)	(4.30)	**(4.18)**	with $D1$
$D1$, adj.	-0.01	0.02	0.38	1.32	**1.34**	-0.01	-0.01	0.27	0.93	**0.94**	0.90
w/leads	(-0.37)	(0.73)	(4.31)	(8.56)	**(8.15)**	(-0.44)	(-0.33)	(3.25)	(6.89)	**(6.73)**	
$D2$, adj.	0.02	0.02	0.44	1.23	**1.21**	0.01	-0.01	0.33	0.79	**0.78**	0.91
	(0.56)	(0.57)	(4.69)	(8.27)	**(7.70)**	(0.69)	(-0.33)	(3.74)	(6.38)	**(6.12)**	
$D3$, adj.	0.01	0.02	0.48	1.11	**1.10**	0.01	0.01	0.25	0.65	**0.64**	0.89
	(0.19)	(0.72)	(4.97)	(7.89)	**(7.39)**	(0.41)	(0.29)	(2.96)	(5.52)	**(5.22)**	
Panel B: Individual stock $D1$ delay measures (characteristic-adjusted returns)											
5 Years	-0.05	-0.04	0.13	0.15	**0.20**	-0.06	-0.03	0.11	0.11	**0.16**	
weekly	(-1.16)	(-1.05)	(2.47)	(1.99)	**(2.23)**	(-1.36)	(-0.69)	(2.11)	(1.46)	**(1.90)**	
1 Year	-0.10	-0.07	0.21	0.21	**0.31**	-0.09	-0.06	0.20	0.17	**0.27**	
daily	(-2.52)	(-1.60)	(3.48)	(2.72)	**(3.40)**	(-2.43)	(-1.35)	(3.23)	(2.29)	**(3.05)**	
5 Years	-0.13	0.01	0.13	0.21	**0.33**	-0.12	0.02	0.11	0.18	**0.30**	
daily	(-2.93)	(0.35)	(2.27)	(2.35)	**(3.09)**	(-2.95)	(0.56)	(1.89)	(2.02)	**(2.79)**	

Panel C: Robustness of $D1$ portfolio delay, value-weighted 10-1 spread

	Fama-French 3-Factor α		Carhart 4-Factor α		Pastor-Stambaugh 5-Factor α		...+PIN 6-Factor α		
	Raw	Adj.	Raw	Adj.	Raw	Adj.	Raw	Adj.	
$D1$, α	0.60	1.00	0.77	0.95	0.78	0.93	1.01	1.32	
	(2.98)	(7.35)	(3.63)	(6.67)	(3.84)	(6.76)	(3.08)	(6.08)	
	Feb.-Dec.		7/64-6/83		7/83-12/01		NYAM		NASD
$D1$, adj.	0.65		0.58		1.34		0.35		1.04
	(4.96)		(3.31)		(5.98)		(2.96)		(4.77)
	Size > \$5mill.		Volume > \$200		Price > \$5		BE/ME < 1		BE/ME ≥ 1
$D1$, adj.	0.47		0.31		0.24		0.80		0.99
	(4.32)		(2.88)		(2.55)		(5.44)		(5.43)

Table 3:
Fama-MacBeth Cross-Sectional Regressions

Results from Fama-MacBeth monthly cross-sectional regressions of stock returns in excess of the 1-month T-bill rate on log of firm size (market capitalization), log of the ratio of book-to-market equity, previous year's return (from month $t-12$ to $t-2$), previous three year's return (from month $t-36$ to $t-13$), previous month's return, portfolio delay measure $D1$, and a host of liquidity variables are reported in Panel A over the period July, 1966 to December, 2001. Liquidity variables include the number of trading days of the stock over the prior year, the log of the reciprocal of the average daily share price, a Nasdaq trading dummy, and the log of the level and coefficient of variation (CV, standard deviation of liquidity measures over the past year divided by their mean) of three sets of liquidity measures: turnover (average monthly number of shares traded divided by shares outstanding over the past year), volume (average monthly dollar trading volume over the past year), and Amihud's (2002) illiquidity measure (average daily absolute return divided by dollar trading volume over the past year), each defined separately for NYAM and NASD traded firms. Panel B reports Fama-MacBeth regression results including the log of one plus the number of analysts covering the stock and log of one plus the percentage of shares held by institutional investors as regressors. These data are available only over the period July, 1981 to December, 2001. The time-series average of the coefficient estimates and their associated time-series t-statistics (in parentheses) are reported in the style of Fama and MacBeth (1973).

	Dependent variable = cross-section of monthly stock returns								
	Panel A: July, 1966 to Dec., 2001					**Panel B: July, 1981 to Dec., 2001**			
			Liquidity measures =				Liquidity measures =		
			Turnover	Volume	Illiquidity		Turnover	Volume	Illiquidity
log(size)	-0.0013	0.0003	0.0004	0.0021	0.0022	0.0015	-0.0004	0.0017	0.0015
	(-2.57)	(0.55)	(1.08)	(2.87)	(3.66)	(2.98)	(-0.78)	(1.58)	(1.84)
log(BE/ME)	0.0016	0.0015	0.0018	0.0018	0.0020	0.0021	0.0019	0.0018	0.0020
	(2.77)	(2.69)	(3.96)	(3.93)	(4.09)	(3.26)	(3.26)	(3.16)	(3.25)
$ret_{-36:-13}$	-0.0027	-0.0025	-0.0019	-0.0019	-0.0020	-0.0014	-0.0006	-0.0006	-0.0006
	(-3.80)	(-3.56)	(-3.26)	(-3.31)	(-3.35)	(-2.46)	(-1.06)	(-1.12)	(-1.21)
$ret_{-12:-2}$	0.0051	0.0052	0.0054	0.0054	0.0048	0.0048	0.0055	0.0052	0.0048
	(3.10)	(3.15)	(3.28)	(3.36)	(2.87)	(3.18)	(3.74)	(3.64)	(3.24)
$ret_{-1:-1}$	-0.0687	-0.0691	-0.0771	-0.0774	-0.0765	-0.0639	-0.0668	-0.0670	-0.0662
	(-15.91)	(-16.10)	(-18.55)	(-18.68)	(-18.24)	(-14.59)	(-16.04)	(-16.20)	(-15.82)
Delay $D1$		0.0399	0.0328	0.0309	0.0331	0.0596	0.0405	0.0402	0.0416
		(4.86)	(4.37)	(4.15)	(4.46)	(5.75)	(4.60)	(4.57)	(4.85)
#Trading days			0.0001	0.0001	0.0001		0.0001	0.0001	-0.0001
			(2.76)	(2.55)	(2.03)		(0.76)	(0.30)	(-0.34)
log(1/price)			0.0013	0.0014	0.0008		0.0012	0.0013	0.0005
			(1.40)	(1.47)	(0.88)		(2.03)	(2.05)	(1.67)
NASD dummy			-0.0351	-0.3238	-0.0561		0.0011	-0.0016	0.0202
			(-0.25)	(-1.15)	(-0.92)		(0.04)	(-0.02)	(0.59)
log(liquidity)			-0.0021	-0.0018	0.0016		-0.0027	-0.0021	0.0016
NYAM			(-3.14)	(-2.65)	(3.39)		(-3.46)	(-2.53)	(3.55)
log(liquidity)			-0.0045	0.0225	-0.0036		-0.0024	-0.0014	0.0030
NASD			(-0.14)	(1.06)	(-0.86)		(-0.33)	(-0.24)	(1.18)
CV(liquidity)			-0.0017	-0.0016	-0.0026		-0.0005	-0.0006	-0.0025
NYAM			(-3.27)	(-2.96)	(-2.89)		(-0.69)	(-0.77)	(-2.39)
CV(liquidity)			-0.0156	-0.0656	-0.0227		-0.0031	0.0078	-0.0015
NASD			(-1.37)	(-1.31)	(-1.93)		(-0.24)	(0.35)	(-0.19)
log(#analysts)							0.0009	0.0009	0.0009
							(4.61)	(4.65)	(4.68)
log(inst. own%)							0.0035	0.0032	0.0033
							(6.87)	(6.36)	(5.91)

Table 4:
Price Delay and the Size Effect

Panel A reports raw size-sorted decile portfolio returns in various subperiods. At the end of June of each year, stocks are ranked by their market capitalization and sorted into deciles using NYSE breakpoints. The equal-weighted and value-weighted monthly returns (% per month) on these decile portfolios are computed over the following year from July to June. Average monthly returns and t-statistics (in parentheses) on these portfolios, as well as the difference between decile portfolios 10 (highest ranked) and 1 (lowest ranked) are reported over the period July, 1964 to December, 2001. Returns are also adjusted for delay by subtracting the return of a characteristic-based delay ($D1$) benchmark portfolio using both the second-stage portfolio delay measure and the first-stage individual delay measure. Value weighted benchmarks are used for value weighted portfolios and equal weighted benchmarks are used for equal weighted portfolios. Average returns are also reported for the two subperiods of the sample (July, 1964 to June, 1983 and July, 1983 to December, 2001), for the month of January only, and for portfolios formed on the residual component of size orthogonal to delay (both portfolio and individual delay), determined by the error term from the regression of the cross-section of firm market capitalizations on delay measures. Panel B reports characteristic-adjusted (for size, BE/ME, and momentum) returns for delay-sorted portfolios formed on the residual component of delay (both portfolio and individual delay) orthogonal to size, size rank, and size decile dummies. These are the error terms from the regression of the cross-section of delay measures on size, size rank, and dummies for size decile membership, respectively. Panel C reports returns for double-sorted portfolios on size and delay. The raw size premium, defined as the difference in returns between the largest quintile and smallest quintile of stocks, within each delay quintile are reported for both portfolio and individual delay measures. In addition, the characteristic-adjusted delay premium within each size quintile are reported.

Panel A: Market capitalization (size)-sorted decile portfolios

	Equal-weighted portfolios					Value-weighted portfolios				
	1	2	9	10	**10-1**	1	2	9	10	**10-1**
					Raw returns					
07/64-12/01	1.57	1.12	1.06	1.00	**-0.57**	1.29	1.12	1.05	1.01	**-0.28**
	(4.83)	(3.88)	(4.73)	(4.75)	**(-2.17)**	(4.10)	(3.87)	(4.71)	(5.01)	**(-1.13)**
07/64-07/83	2.00	1.43	0.84	0.71	**-1.29**	1.76	1.42	0.82	0.72	**-1.04**
	(3.92)	(3.18)	(2.69)	(2.41)	**(-3.35)**	(3.56)	(3.15)	(2.63)	(2.62)	**(-2.77)**
07/83-12/01	1.10	0.78	1.30	1.31	**0.21**	0.77	0.79	1.30	1.32	**0.55**
	(2.82)	(2.22)	(4.04)	(4.39)	**(0.61)**	(2.08)	(2.24)	(4.08)	(4.49)	**(1.77)**
January	10.46	6.49	2.29	1.60	**-8.86**	8.96	6.45	2.25	1.64	**-7.33**
	(7.54)	(4.97)	(2.41)	(1.82)	**(-7.90)**	(6.53)	(4.91)	(2.38)	(1.96)	**(-6.66)**
					Returns adjusted for the delay premium using **portfolio** *delay*					
07/64-12/01	0.01	-0.01	-0.01	-0.04	**-0.05**	0.01	-0.01	-0.03	0.01	**-0.01**
	(1.08)	(-0.16)	(-0.13)	(-0.87)	**(-0.96)**	(0.97)	(-0.18)	(-0.54)	(0.30)	**(-0.21)**
07/64-07/83	0.01	0.03	-0.04	-0.13	**-0.14**	0.02	0.04	-0.01	-0.02	**-0.03**
	(0.98)	(0.78)	(-0.99)	(-2.11)	**(-2.12)**	(0.76)	(0.96)	(-0.01)	(-0.57)	**(-0.79)**
07/83-12/01	0.01	-0.04	0.04	0.05	**0.05**	0.01	-0.06	-0.07	0.04	**0.02**
	(0.48)	(-1.20)	(0.88)	(0.73)	**(0.66)**	(0.60)	(-1.51)	(-0.82)	(1.00)	**(0.55)**
January	0.10	0.03	0.12	-0.48	**-0.57**	0.24	0.29	0.26	-0.15	**-0.39**
	(4.24)	(0.36)	(0.86)	(-2.00)	**(-2.30)**	(3.98)	(2.12)	(0.86)	(-1.28)	**(-2.52)**
					Returns adjusted for the delay premium using **individual** *delay*					
07/64-12/01	0.16	-0.13	-0.10	-0.12	**-0.28**	-0.04	-0.10	-0.09	-0.11	**-0.08**
	(2.12)	(-2.57)	(-0.77)	(-0.81)	**(-1.34)**	(-0.49)	(-1.94)	(-0.79)	(-0.77)	**(-0.38)**
07/64-07/83	0.33	-0.11	-0.49	-0.58	**-0.90**	0.19	-0.06	-0.45	-0.55	**-0.74**
	(2.78)	(-1.93)	(-2.62)	(-2.55)	**(-2.74)**	(1.70)	(-0.94)	(-2.65)	(-2.34)	**(-2.23)**
07/83-12/01	-0.01	-0.16	0.33	0.38	**0.39**	-0.28	-0.15	0.30	0.36	**0.63**
	(-0.12)	(-1.77)	(2.14)	(2.09)	**(1.54)**	(-3.24)	(-1.73)	(2.08)	(2.00)	**(2.66)**
January	2.64	-0.73	-2.93	-3.16	**-5.80**	1.83	-0.32	-2.56	-2.57	**-4.40**
	(8.32)	(-3.82)	(-5.53)	(-4.74)	**(-6.40)**	(6.17)	(-1.52)	(-5.27)	(-3.82)	**(-4.82)**
					Raw returns of portfolios sorted on residual size orthogonal to **portfolio** *delay*					
07/64-12/01	1.16	1.22	1.89	1.17	**0.01**	1.18	1.19	1.06	1.00	**-0.17**
	(3.82)	(4.15)	(6.33)	(4.96)	**(0.04)**	(3.91)	(4.15)	(4.62)	(4.91)	**(-0.93)**
					Raw returns of portfolios sorted on residual size orthogonal to **individual** *delay*					
07/64-12/01	1.45	1.14	1.05	1.00	**-0.45**	1.20	1.13	1.04	0.98	**-0.22**
	(4.45)	(3.77)	(4.64)	(4.64)	**(-1.75)**	(3.80)	(3.73)	(4.63)	(4.80)	**(-0.90)**

Panel B: Delay-sorted decile portfolios

	Equal-weighted portfolios					Value-weighted portfolios				
	1	2	9	10	**10-1**	1	2	9	10	**10-1**
	Adjusted returns of portfolios sorted on residual **portfolio** *delay orthogonal to,*									
Size	0.02	-0.01	0.03	0.91	**0.89**	0.03	0.00	0.07	0.80	**0.77**
	(0.77)	(-0.03)	(0.50)	(8.24)	**(7.43)**	(0.81)	(-0.08)	(1.10)	(7.18)	**(6.30)**
Size rank	-0.15	-0.06	0.04	0.92	**1.06**	-0.01	0.06	0.04	0.83	**0.84**
	(-2.41)	(-1.31)	(0.94)	(8.21)	**(6.86)**	(-0.16)	(1.56)	(1.33)	(5.89)	**(5.23)**
Size deciles	-0.23	-0.28	-0.02	0.92	**1.15**	0.01	-0.09	0.04	0.80	**0.79**
	(-3.39)	(-6.21)	(-0.45)	(8.60)	**(7.18)**	(0.26)	(-2.24)	(0.59)	(6.18)	**(5.30)**
	Adjusted returns of portfolios sorted on residual **individual** *delay orthogonal to,*									
Size	-0.09	-0.10	0.22	0.20	**0.30**	-0.08	-0.08	0.20	0.17	**0.25**
	(-2.24)	(-2.10)	(3.50)	(2.64)	**(3.21)**	(-2.10)	(-1.77)	(3.27)	(2.22)	**(2.85)**
Size rank	-0.10	-0.10	0.14	0.19	**0.29**	-0.09	-0.08	0.13	0.15	**0.24**
	(-2.31)	(-1.84)	(2.49)	(2.55)	**(3.06)**	(-2.13)	(-1.61)	(2.36)	(2.09)	**(2.65)**
Size deciles	-0.09	-0.10	0.13	0.12	**0.21**	-0.08	-0.08	0.11	0.09	**0.17**
	(-1.96)	(-1.85)	(2.24)	(1.70)	**(2.28)**	(-1.75)	(-1.57)	(1.93)	(1.35)	**(1.92)**

Panel C: Double-sorted quintile portfolios of size and delay

	Equal-weighted portfolios					Value-weighted portfolios				
	1	2	3	4	5	1	2	3	4	5
	Size premium within **portfolio** *delay quintiles, raw returns*									
Size 5-1	-0.20	-0.19	-0.20	-0.56	-2.15	-0.21	-0.10	-0.16	-0.52	-1.93
	(-1.15)	(-1.12)	(-1.15)	(-3.18)	(-9.57)	(-1.14)	(-0.52)	(-0.88)	(-2.88)	(-8.83)
	Size premium within **individual** *delay quintiles, raw returns*									
Size 5-1	-0.51	-0.19	-0.53	-1.23	-1.95	-0.39	-0.08	-0.36	-0.92	-1.75
	(-1.94)	(-0.74)	(-1.80)	(-4.01)	(-6.65)	(-1.41)	(-0.29)	(-1.18)	(-2.79)	(-5.22)
	*Delay (***portfolio***) premium within size quintiles, adjusted returns*									
Delay 5-1	0.89	-0.08	-0.17	-0.07	0.05	0.70	-0.01	-0.09	-0.05	0.05
	(5.67)	(-0.75)	(-1.78)	(-0.89)	(0.86)	(4.83)	(-0.10)	(-1.00)	(-0.56)	(0.84)
	*Delay (***individual***) premium within size quintiles, adjusted returns*									
Delay 5-1	0.39	0.05	-0.08	0.09	-0.03	0.37	0.05	-0.08	0.09	-0.03
	(2.52)	(0.34)	(-0.79)	(1.04)	(-0.50)	(2.39)	(0.34)	(-0.83)	(1.06)	(-0.50)

Table 5:
Interaction of Delay with Other Firm Characteristics

Raw and characteristic-adjusted (for size, BE/ME, and momentum premia) returns for double-sorted portfolios on various firm characteristics and delay are reported. Panel A reports the delay premium, defined as the difference in adjusted returns between the highest and lowest quintile of delayed firms, within quintiles formed by first sorting on the firm characteristics of BE/ME, past three year return (skipping the most recent year), past one year return (skipping the most recent month), turnover (average monthly number of shares traded divided by number of shares outstanding over the past year), dollar trading volume (average monthly volume over the past year), and residual volatility (variance of the residual from a market model regression using weekly returns over the prior year), respectively. At the end of June of each year, stocks are ranked by each of these characteristics and sorted into quintiles. Within each characteristic quintile, stocks are then sorted into quintiles based on their portfolio delay measure $D1$. The value-weighted adjusted average monthly return differences between delay quintiles 5 and 1 within each characteristic quintile and their t-statistics (in parentheses) are reported. Panel B reports average monthly returns from the reverse sort, where portfolios are first sorted on the portfolio delay measure $D1$ and then on each of the firm characteristics. Raw return differences between the highest and lowest quintiles within each delay quintile are reported for BE/ME, past three year return, past year return, turnover, volume, and residual volatility. Average returns are in percent per month covering the period July, 1964 to December, 2001.

	Panel A: Delay premium across characteristic quintiles						**Panel B: Characteristic premia across delay quintiles**				
	(low)		Characteristic		(high)		(low)		Delay		(high)
	1	2	3	4	5		1	2	3	4	5
	across BE/ME quintiles						*Value premium across delay quintiles*				
Delay	0.35	0.30	0.25	0.34	0.71	BE/ME	0.32	0.39	0.94	0.90	0.87
5-1	(2.05)	(2.54)	(2.26)	(3.01)	(4.47)	5-1	(1.67)	(2.07)	(4.76)	(4.05)	(3.88)
	across contrarian $ret_{-36:-13}$ *quintiles*						*Contrarian premium across delay quintiles*				
Delay	0.93	0.21	0.04	0.04	0.04	Contrarian	-0.24	-0.28	-0.66	-0.59	-1.11
5-1	(4.48)	(1.57)	(0.37)	(0.40)	(0.31)	5-1	(-1.17)	(-1.47)	(-3.12)	(-2.55)	(-3.83)
	across momentum $ret_{-12:-2}$ *quintiles*						*Momentum premium across delay quintiles*				
Delay	1.94	0.24	0.07	0.01	0.14	Momentum	0.66	1.28	1.58	1.67	-0.08
5-1	(9.34)	(2.04)	(0.63)	(0.07)	(1.04)	5-1	(2.56)	(5.07)	(6.07)	(6.00)	(-0.30)
	across share turnover quintiles						*Turnover premium across delay quintiles*				
Delay	0.67	0.50	0.53	0.32	-0.29	Turnover	-0.15	-0.32	-0.50	-0.61	-0.49
5-1	(4.52)	(3.68)	(3.51)	(2.18)	(-1.85)	5-1	(-0.65)	(-1.27)	(-1.88)	(-2.16)	(-1.74)
	across trading volume quintiles						*Volume premium across delay quintiles*				
Delay	1.18	0.07	0.02	-0.20	0.01	Volume	-0.20	-0.25	-0.73	-0.67	-1.30
5-1	(5.98)	(0.43)	(0.13)	(-1.58)	(0.07)	5-1	(-1.46)	(-1.63)	(-3.92)	(-2.91)	(-4.92)
	across residual volatility σ_ϵ^2 *quintiles*						*Volatility premium across delay quintiles*				
Delay	0.08	0.20	0.17	0.58	1.63	Volatility	-0.02	-0.25	-0.37	-0.25	1.07
5-1	(0.99)	(1.32)	(0.92)	(3.05)	(7.83)	5-1	(-0.08)	(-0.79)	(-1.17)	(-0.71)	(3.06)

Table 6:
Decomposing the Impact of Delay on Returns

Panel A reports Fama-MacBeth regression results of returns on the components of delay predicted by liquidity ($\widehat{Delay}$(liquidity)) and attention ($\widehat{Delay}$(attention)) variables. Panel B reports the characteristic-adjusted returns (% per month) of decile portfolios, as well as the difference between the lowest and highest deciles, sorted by the portfolio delay measure $D1$ and the components of delay predicted by traditional liquidity and investor attention measures. The liquidity variables include the number of trading days of the stock over the prior year, the reciprocal of the average daily share price, a Nasdaq trading dummy, and the log of the level and coefficient of variation (standard deviation divided by mean) of three sets of liquidity measures: turnover (average monthly number of shares traded divided by shares outstanding over the past year), volume (average monthly dollar trade volume over the past year), and Amihud's (2002) illiquidity measure (average daily absolute return divided by dollar trading volume over the past year), each defined separately for NYAM and NASD traded firms. Attention variables include the log of institutional ownership, log of number of analysts, regional exchange membership, log of number of shareholders, log of number of employees, log of advertising expense, nearest airport distance, average air distance, and average airfare from firm headquarters to all U.S. airports (weighted by number of flights). The components of delay predicted by attention and liquidity variables are estimated in a first stage cross-sectional regression with delay as the dependent variable. The predicted components of delay due to liquidity and attention, as well as the residual from the first-stage regression, are used in the second stage Fama-MacBeth regressions in Panel A, where the time-series average of the coefficient estimates and their associated time-series t-statistics (in parentheses) are reported, and are used to form portfolios in Panel B. Panel B also reports returns on delay-sorted portfolios formed from only those firms with analyst and institutional coverage and those with no analyst coverage or institutional ownership. Portfolios are value-weighted and returns are characteristically adjusted for size, BE/ME, and momentum premia. All results cover the period July, 1981 to December, 2001.

Panel A: Fama-MacBeth Cross-Sectional Regressions

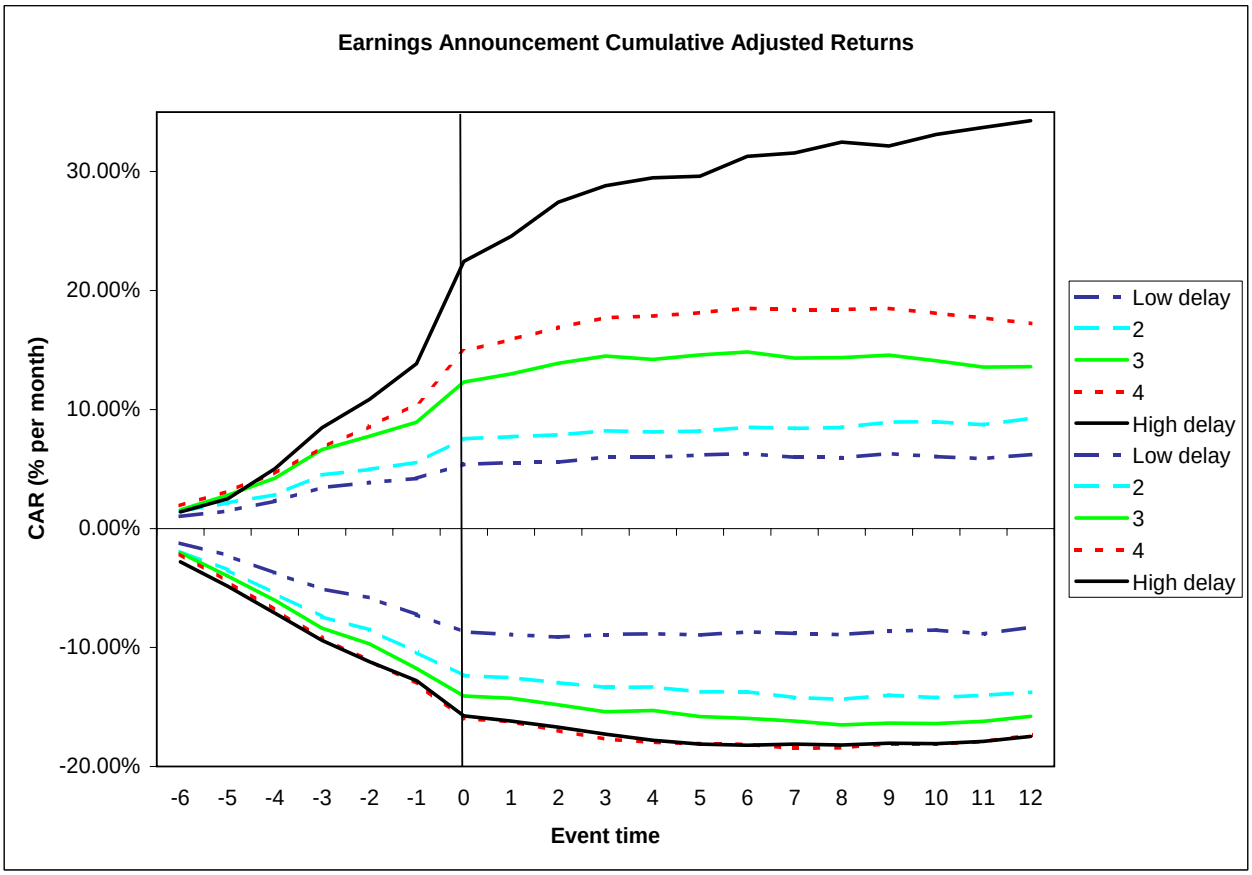
	Liquidity measures =		
	Turnover	Volume	Illiquidity
log(size)	0.0031	0.0052	0.0046
	(2.30)	(2.88)	(2.87)
log(BE/ME)	0.0017	0.0019	0.0019
	(1.62)	(1.80)	(1.77)
$ret_{-36:-13}$	0.0001	-0.0001	-0.0001
	(0.08)	(-0.06)	(-0.13)
$ret_{-12:-2}$	0.0110	0.0107	0.0107
	(5.55)	(5.37)	(5.42)
$ret_{-1:-1}$	-0.0523	-0.0528	-0.0528
	(-8.71)	(-8.71)	(-8.72)
Component of delay related to attention,			
$\widehat{Delay}$**(attention)**	**0.1592**	**0.2043**	**0.1931**
	(2.21)	**(2.46)**	**(2.43)**
Component of delay related to liquidity,			
$\widehat{Delay}$**(liquidity)**	**0.2638**	**-0.0145**	**-0.2277**
	(0.78)	**(-0.05)**	**(-0.90)**
Component orthogonal to attention and liquidity,			
Residual delay	**0.0378**	**0.0510**	**0.0476**
	(1.27)	**(1.51)**	**(1.44)**

Panel B: Delay-sorted decile portfolios, characteristic-adjusted returns					
	1	2	9	10	**10-1**
Component of delay related to attention, $\widehat{Delay}$(attention)					
Turnover	0.01	-0.01	0.38	0.63	**0.62**
	(0.09)	(-0.10)	(2.34)	(2.96)	**(2.76)**
Volume	0.01	0.08	0.43	0.66	**0.66**
	(0.01)	(0.56)	(2.21)	(2.62)	**(2.50)**
Illiquidity	-0.03	0.08	0.33	0.90	**0.93**
	(-0.24)	(0.46)	(1.44)	(3.03)	**(2.93)**
Component of delay related to liquidity, $\widehat{Delay}$(liquidity)					
Turnover	0.17	-0.06	0.03	0.05	**-0.11**
	(2.10)	(-1.14)	(0.17)	(0.25)	**(-0.50)**
Volume	0.30	-0.10	-0.06	0.14	**-0.16**
	(2.83)	(-1.69)	(-0.38)	(0.63)	**(-0.64)**
Illiquidity	0.27	0.00	-0.09	0.31	**0.04**
	(2.37)	(-0.01)	(-0.62)	(1.27)	**(0.14)**
Residual delay orthogonal to attention and liquidity					
Turnover	0.45	0.46	0.11	0.06	**-0.39**
	(2.42)	(3.15)	(1.07)	(0.55)	**(-1.81)**
Volume	0.44	0.26	0.04	0.34	**-0.09**
	(1.34)	(1.07)	(0.22)	(1.25)	**(-0.21)**
Illiquidity	0.16	0.57	0.12	0.36	**0.20**
	(0.50)	(2.48)	(0.64)	(1.17)	**(0.42)**
Total delay-sorted decile portfolios for firms,					
All	-0.02	0.11	0.26	1.35	**1.38**
	(-1.30)	(2.14)	(2.05)	(6.48)	**(6.51)**
Covered by analysts and institutions	-0.05	0.12	0.20	0.49	**0.54**
	(-1.86)	(2.51)	(2.44)	(3.53)	**(3.79)**
Not covered by analysts or institutions	-0.44	-0.80	1.52	1.34	**1.77**
	(-1.80)	(-4.70)	(4.41)	(4.51)	**(5.08)**

Figure 1

Post-Earnings Announcement Drift Across Delay Quintiles

Adjusted returns (benchmarking against a value-weighted portfolio of firms matched by size, BE/ME, and past one year returns) following earnings surprises are reported and plotted. Earnings news is measured by standardized unexpected earnings (SUE), which is the difference between current quarter's earnings and earnings four quarters prior divided by the standard deviation of unexpected earnings over the past eight quarters. Firms are sorted independently into quintiles based on their delay measure ($D1$) and on SUE. The cumulative adjusted return (CAR) on the portfolio of firms in the top and bottom quintiles of SUE intersected with each delay quintile are plotted monthly from six months before the event to 12 months after for each delay quintile group. In addition, the average monthly adjusted return over the six months following each event is reported along with its t-statistic (in parentheses) using the event study approach of Jaffe(1974) and Mandelker(1974) as suggested by Fama (1998). For each calendar month t, the value-weighted average abnormal return on all firms having an earnings announcement in calendar month $t-k$, for $k=[-6,12]$ are computed for each calendar month t and averaged across time. An F-statistic on the joint equality of means across delay quintiles is also reported (p-value in parentheses).



Calendar time portfolio returns

Average adjusted returns (% per month) over the 6 months following the event

Earnings surprise	Low delay	2	3	4	High delay	F-statistic of equal mean (p-value)
Positive	0.07	0.22	0.38	0.54	1.10	9.41
	(1.15)	(1.67)	(4.34)	(5.22)	(6.34)	(0.0001)
Negative	0.04	-0.23	-0.40	-0.41	-0.48	3.60
	(0.57)	(-2.51)	(-4.41)	(-4.18)	(-5.01)	(0.0062)