Methodology

The main procedures that were considered for the statistical analyses of this project were fixed-effects and random-effects regressions. A fixed-effect model is defined as follows:

$$Y_{it} = \alpha_i + X_{it}\beta + \mu_{it}$$

where β is the vector of model coefficients, Y_{it} is the dependent variable for stock *i* at time *t* (in this case, money flow for stock *i* at time *t*), X_{it} is the vector of independent variables (in this case, stock volatility, turnover, returns, and lagged money flows, for each day), α_i is a stock-specific effect (different for each stock) and μ_{it} is the error term. The α_i term is the "fixed effect" and represents the fact that, independently of the values of the independent variables and of time, some stocks might have higher or lower values of the dependent variable.

The coefficients for this model are commonly estimated by centering all variables around their mean and then conducting a standard OLS. It is also possible to retrieve the α_i terms from the estimation. An alternative way to estimate the model is to create a dummy variable for each stock, and conduct an OLS with those dummy variables in addition to the predictor variables.

The random-effects model follows the same structure ($Y_{it} = \alpha_i + X_{it}\beta + \mu_{it}$). However, It additionally imposes the following assumptions:

$$\alpha_i \sim IID(0, \sigma_\alpha^2)$$

$$\text{cov}(\alpha_i + \mu_{it}, \alpha_j + \mu_{js}) = \begin{cases} \sigma_\alpha^2 + \sigma_\mu^2 & \text{if i=j and t=s} \\ \sigma_\alpha^2 & \text{if i=j and t} \neq \text{s} \\ 0 & \text{otherwise} \end{cases}$$

In other words, the stock-specific effects are assumed to be independent and identically distributed. Moreover, the stock-specific effects are assumed to be uncorrelated with the error

terms and the predictor variables, and also uncorrelated with each other. This kind of model is usually estimated through Generalized Least Squares.

Given that the random-effects estimators are efficient but might be inconsistent, whereas the fixed-effects ones are consistent, it is important to compare the outcomes of both models. This is done through the Hausman test. The test is based on the following formula:

$$H = (b_{consistent} - b_{efficient})' \text{var}(b_{consistent} - b_{efficient})^{-1} (b_{consistent} - b_{efficient}) \sim \chi^2(k)$$

where *k* is the number independent variables (in this case, 4). The null hypothesis of this test is that at least one of the estimators is inconsistent. In this case, given that the fixed-effects estimators are consistent, rejecting the null hypothesis implies that the random-effects estimators are inconsistent and thus should not be used.

An additional statistic that was computed was the Root Mean Square Error (RMSE), to compare the accuracy of Models 1 and 2 in the out-of-sample data. This statistic is defined as:

$$RMSE = \sqrt{\frac{\sum_{i,t \geq t^*} Y_{it} - \alpha_i - X_{it}\beta}{\sum_{i,t} 1}}$$

where *t** is the time index corresponding to all dates greater than or equation September 1, 2010, the out-of-sample period. Note that the α_i terms and the β coefficients are those computed from estimations based on in-sample data.

Results

The objective of this analysis was to examine the impact of returns and past returns on money flow. In order to address this objective, daily data from a sample of 933 stocks was obtained. These data included daily information on the Money Flow, Market Value, Returns, Volatility and Turnover, from September 1, 2006 through August 31, 2011.

The analysis is organized as follows. First, we present descriptive statistics and correlations for all variables across the whole time period. Following that, we break down the sample into five approximately equally-sized sub-samples, based on the stocks' Market Value as of September 1, 2006, and present descriptive statistics for each of those sub-samples.

Next, results from panel fixed-effects OLS and random-effects OLS are presented along with the results of a Hausman test, used to determine whether random effects OLS could be appropriate for the remainder of the analysis. Finally, results from panel OLS for each of the 5 sub-samples are presented.

Descriptive Statistics

The following table presents descriptive statistic on the whole sample. As can be seen from the table, the sample included 1,109,275 observations. The average daily Money Flow was -238.84 (*SD* = 2914.67). Moreover, the average daily return was 0.15%, indicating a general upward trend in the stock prices.

Overall Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Money Flow	1109275	-238.8403	2914.677	-180909.8	244119.6
Market Value	1109275	6407739	2.46e+07	68982.68	9.89e+08
Return	1109275	.001472	.0354386	-.34896	.707338
Volatility	1109275	.1116495	.1368818	0	7.471253
Turnover	1109275	3.126081	3.023651	.00267	58.94259

The following table presents the same-period correlations for all variables. Although all correlations were significant at the $p = .05$ level, it should be noted that they were generally

weak. The strongest pairwise correlations between Money Flow and Returns (r = .378) and between Turnover and Volatility (r = .338).

	1	2	3	4	5
1. Money Flow	1.0000				
2. Market Value	-0.0254	1.0000			
3. Return	0.3788	-0.0019	1.0000		
4. Volatility	0.0076	-0.0474	0.0054	1.0000	
5. Turnover	0.0582	-0.1054	0.2074	0.3388	1.0000

The following table presents descriptive statistics of the study variables for each of the 5 sub-samples. The "Market Value Group" variable was defined to take one of the values between 1 and 5, with "1" representing the stocks in the lowest 20% in terms of market value as of 9/1/2006, and "5" representing the stocks in the highest 20%. As can be seen from the table, average Money Flows, as well as Returns, tended to be lower for stocks with higher Market Value.

Market Value Group 1

Variable	Obs	Mean	Std. Dev.	Min	Max
Market Value Group = 1					
Money Flow	221082	-138.027	1011.585	-54034	33062.41
Market Value	221082	1550469	1566299	68982.7	1.99E+07
Return	221082	0.001762	0.0366902	-0.349	0.707338
Volatility	221082	0.120667	0.1487998	0	5.189138
Turnover	221082	3.700356	3.48103	0.00712	46.91658
Market Value Group = 2					
Money Flow	222225	-171.66	1170.818	-42065	29792.8
Market Value	222225	2199824	1847673	155438	1.80E+07
Return	222225	0.001556	0.0361214	-0.1813	0.579633
Volatility	222225	0.116058	0.1429585	0	7.471253

Variable	Obs	Mean	Std. Dev.	Min	Max
Turnover	222225	3.457606	3.265024	0.00267	58.94259
Market Value Group = 3					
Money Flow	221608	-209.042	1554.071	-91486	38283.47
Market Value	221608	2913923	2335602	321214	2.43E+07
Return	221608	0.001456	0.0355925	-0.1353	0.629251
Volatility	221608	0.111172	0.1333882	0	4.631934
Turnover	221608	3.30504	3.035233	0.00678	44.03764
Market Value Group = 4					
Money Flow	222859	-272.531	2378.337	-144356	150858.6
Market Value	222859	4518847	3750460	572989	5.77E+07
Return	222859	0.001344	0.0350641	-0.1287	0.449174
Volatility	222859	0.109381	0.1319585	0	5.08978
Turnover	222859	2.907015	2.748259	0.00565	46.98607
Market Value Group = 5					
Money Flow	221501	-402.78	5656.593	-180910	244119.6
Market Value	221501	2.09E+07	5.23E+07	649813	9.89E+08
Return	221501	0.001243	0.0336493	-0.1265	0.240372
Volatility	221501	0.100986	0.1252563	0	2.660662
Turnover	221501	2.261648	2.21638	0.00525	42.1526

Testing for Adequacy of Random Effects

The following tables present the regression model results, for the in-sample period (9/1/2006 through 8/31/2010). Two versions of the models were tested: using fixed effects and random effects. Estimates derived from random-effects models are generally more efficient than those derived from fixed-effects models. However, they are not consistent, so using random-effects estimates might result in biased coefficients.

In order to test whether the random-effects model is adequate, a Hausman test was conducted. This test compares the estimates from both models to determine whether one of them

is inconsistent (in this case, since fixed-effects estimates are consistent, rejecting the null hypothesis of Hausman test would suggest that the random-effects estimates are inconsistent).

As can be seen from the results in the following tables, the estimated under both models were similar. However, the null hypothesis from Hausman test was rejected (Chi-Squared(4) = 8072.6, $p < .001$).

Fixed-Effects OLS Results (n = 886,702)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1042136	0.0009747	106.92	<0.001***
Return	26043.89	65.1873000	339.52	<0.001***
Volatility	229.4996	17.3840400	13.20	<0.001***
Turnover	-23.38696	0.8826095	-26.50	<0.001***
Constant	-159.3337	3.868696	-41.19	<0.001***

F(4,885765)=44548.62, $p < .001$

R^2: within = 0.1675, between = 0.0918, overall = 0.1673

Random Effects Results (n = 886,702)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1060478	0.0009741	108.86	<0.001 ***
Return	25934.81	65.02452	398.85	<0.001***
Volatility	195.2517	17.23311	11.33	<0.001***
Turnover	-17.42192	0.825681	-21.10	<0.001***
Constant	-174.5977	3.747185	-46.59	<0.001***

R^2: within = 0.1674, between = 0.1841, overall = 0.1673

A similar analyses was conducted for "Model 2," which used 20-day average returns instead of daily returns as a predictor variable. The results of the fixed-effects and random models are presented in the following tables. Once again, the null hypothesis from Hausman test was rejected (Chi-Squared(4) = 3019.2, $p < .001$). Therefore, we conclude that random-effects models are not adequate for the analyzed data. The remaining analyses will thus be based on fixed-effects models.

Fixed-Effects OLS with Cumulative Returns (n = 869,908)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1064155	0.0010692	99.52	<0.001***
Cumul. Return (20)	10026.21	334.063	30.01	<0.001***
Volatility	-215.5399	19.19174	-11.23	<0.001***
Turnover	44.535.44	1.068209	41.69	<0.001***
Constant	-306.2911	4.34174	-70.55	<0.001***

F(4,868971) = 4079.88, $p < .001$

R^2: within = 0.0184, between = 0.2346, overall = 0.0190

Random-Effects OLS with Cumulative Returns (n = 869,908)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1087577	0.0010683	101.80	<0.001***
Cumul. Return (20)	10333.04	328.470	31.46	<0.001***
Volatility	-220.6132	18.99655	-11.61	<0.001***
Turnover	41.82449	0.985717	42.43	<0.001***
Constant	-296.6257	4.18221	-70.93	<0.001***

R^2: within = 0.0184, between = 0.2519, overall = 0.0190

Regression Results

Model 1

The following five tables present the results of the proposed “Model 1”, for each of the five Market Value groups. Note that the estimates were based on the data defined as in-sample (9/1/2006 through 8/31/2010).

The results were generally consistent across the various market value groups, with some exceptions. For all groups, Money Flow was autocorrelated, with a positive and significant coefficient for lagged Money Flow. “Return” was the strongest predictor of Money Flow in all cases. The magnitude of the coefficient associated with Return was generally higher for groups

with higher Market Value, suggesting that the same variability in Returns was associated with a larger variability in Money Flow for stocks with larger Market Value.

The effects of Volatility and Turnover were less clear. Volatility was significant only for groups 2, 4 and 5 (the coefficient was positive in all cases). Likewise, Turnover was significant only for groups 1, 2, and 3, with a negative coefficient in all 3 cases.

In general, although the models for all five groups were significant as per the F test, the explanatory power of the models was relatively weak, with an overall R^2 ranging from 0.2348 (group 5) through .3178 (group 3).

Fixed-Effects OLS Results Market Value Group = 1 (n = 176,645)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0341195	0.0108943	3.13	<0.002***
Return	10538.9	330.6423	31.87	<0.001***
Volatility	-25.20644	19.07993	-1.32	0.118
Turnover	-8.797414	1.438399	-6.12	<0.001***
Constant	-84.71992	6.526032	-12.98	<0.001***

F(4,186) = 274.15, $p < .001$

R^2: within = 0.2709, between = 0.0215, overall = 0.2697

Fixed-Effects OLS Results Market Value Group = 2 (n = 177,575)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0554844	0.0096737	5.74	<0.001***
Return	14458.55	404.819	35.72	<0.001***
Volatility	45.90676	20.76672	2.21	0.028**
Turnover	-12.19412	1.73174	-7.04	<0.001***
Constant	-118.4633	6.877993	-17.22	<0.001***

F(4,186) = 330.39, $p < .001$

R^2: within = 0.3119, between = 0.0537, overall = 0.3109

Fixed-Effects OLS Results Market Value Group = 3 (n = 177,328)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0524695	0.0126306	4.15	<0.001***

Return	18955.84	514.7635	36.82	<0.001***
Volatility	50.5929	36.76679	1.38	0.170
Turnover	-9.644983	3.155035	-3.06	<0.003***
Constant	-157.0515	10.82702	-14.51	<0.001***

F(4,185)=370.01, $p < .001$

R^2: within = 0.3187, between = 0.0432, overall = 0.3178

Fixed-Effects OLS Results Market Value Group = 4 (n = 178,131)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0392042	0.0128877	3.04	<0.003***
Return	26355.77	818.9956	32.18	<0.001***
Volatility	121.4851	43.67655	2.78	<0.006***
Turnover	-2.944654	6.159436	-0.48	0.633
Constant	-243.387	19.04539	-12.78	<0.001***

F(4,186)=314.46, $p < .001$

R^2: within = 0.3086, between = 0.0003, overall = 0.3078

Fixed-Effects OLS Results Market Value Group = 5 (n = 177,023)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1110525	0.0100611	11.04	<0.001***
Return	64066.16	4235.567	15.13	<0.001***
Volatility	509.7177	122.8729	4.15	<0.001***
Turnover	-22.27341	15.0769	-1.48	0.141
Constant	-373.0717	32.36579	-11.53	<0.001***

F(4,185)=131.38, $p < .001$

R^2: within = 0.2350, between = 0.1704, overall = 0.2348

Model 2

The following five tables present the results of the proposed "Model 2" for each of the five Market Value groups. This model was similar to "Model 1," with the only exception that, instead of using Returns as a predictor variable, 20-day average returns were used. As before, fixed-effects models were used to generate the estimates.

As can be seen from these tables, "Model 2" appears to be substantially worse than Model 1 in terms of accuracy. Overall R^2 ranged from .010 (group 1) through .027 (group 5), suggesting that these variables helped explain only a tiny fraction of the variability in Money Flow. Since the only difference between Model 1 and Model 2 is that a different variable was used instead of Returns, these results underscore the importance of the Returns variable as a determinant of Money Flow.

Fixed-Effects OLS with Cumulative Returns Market Value Group = 1 (n = 173,279)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0402299	0.0117636	3.42	<0.001***
Cumul. Return (20)	582.5483	347.405	1.68	0.095*
Volatility	-216.6671	16.19112	-13.38	<0.001***
Turnover	20-40778	1.999344	10.21	<0.001***
Constant	-156.5586	7.829157	-20.00	<0.001***

F(4,186)=86.66, $p < .001$

R^2: within = 0.0108, between = 0.0086, overall = 0.0100

Fixed-Effects OLS with Cumulative Returns Market Value Group = 2 (n = 174,209)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0612188	0.0107751	5.68	<0.001***
Cumul. Return (20)	1520.648	520.774	2.92	<004***
Volatility	-269.4225	28.89344	-9.32	<0.001***
Turnover	29.37607	2.364758	12.42	<0.001***
Constant	-209.7726	8.412723	-24.94	<0.001***

F(4,186)=119.31, $p < .001$

R^2: within = 0.0152, between = 0.0012, overall = 0.0143

Fixed-Effects OLS with Cumulative Returns Market Value Group = 3 (n = 173,980)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0534776	0.0136615	3.91	<0.001***
Cumul. Return (20)	3170.306	713.168	4.45	<0.001***
Volatility	-373.3024	43.06601	-8.67	<0.001***
Turnover	46.94731	4.45602	10.54	<0.001***
Constant	-279.3568	13.41953	-20.82	<0.001***

F(4,185)=108.50, $p < .001$

R^2: within = 0.0186, between = 0.0002, overall = 0.0175

Fixed-Effects OLS with Cumulative Returns Market Value Group = 4 (n = 174,765)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0410905	0.0137501	2.99	<0.003***
Cumul. Return (20)	5488.669	1140.203	4.81	<0.001***
Volatility	-379.8205	51.28494	-7.41	<0.001***
Turnover	80.22435	8.156422	9.84	<0.001***
Constant	-409.4533	23.21365	-17.64	<0.001***

F(4,186)=135.81, $p < .001$

R^2: within = 0.0204, between = 0.0073, overall = 0.0186

Fixed-Effects OLS with Cumulative Returns Market Value Group = 5 (n = 173,675)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1125168	0.0107185	10.50	<0.003***
Cumul. Return (20)	35325.15	3898.116	9.06	<0.001***
Volatility	-156.68	122.84660	-1.28	0.204
Turnover	165.6902	17.622290	9.40	<0.001***
Constant	-718.6748	43.88474	-16.38	<0.001***

F(4,185)=110.47, $p < .001$

R^2: within = 0.0280, between = 0.10503, overall = 0.0278

In order to further compare the accuracy of both models, their Root Mean Square Error (RMSE) statistics were computed on out-of-sample data (9/1/2010 through 8/31/2011). In order to compute that statistic for the out-of-sample data, the fixed-effect term corresponding to each stock, as estimated from the in-sample data, was used in addition to the models' beta coefficients.

The following table presents the RMSE for each market value group, both for in-sample and out-of-sample data. As can be gleaned from the table, Model 1 accuracy was consistently better (i.e., RMSE was lower) across all five groups, both for in- and out-of-sample data.

Therefore, this model should be preferred over Model 2 when assessing the determinants of Money Flow.

RMSE of Models 1 and 2, by Market Value group and period

	Model 1	Model 2
In-Sample		
MV Group 1	659.309	774.875
MV Group 2	813.920	982.391
MV Group 3	1036.386	1254.896
MV Group 4	1463.543	1757.607
MV Group 5	4242.641	4827.007
Out-of-Sample		
MV Group 1	1499.032	1641.396
MV Group 2	1508.537	1720.843
MV Group 3	2116.040	2393.380
MV Group 4	3660.601	3974.921
MV Group 5	7218.033	7949.843

Additional Tables

The following tables present the regression results of Model 1 and Model 2 as conducted on the out-of-sample data.

Fixed-Effects OLS Market Value Group = 1 (n = 44,250)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0706801	0.0177746	3.98	<0.001***
Return	33288.15	2063.621	16.13	<0.001***
Volatility	30.75656	158.5299	0.19	0.846
Turnover	-87.7284	13.1531	-6.67	<0.001***
Constant	-49.72255	29.32801	-1.70	0.092*

F(4,186) = 80.43, $p < .001$

R^2: within = 0.3276, between = 0.2375, overall = 0.3255

Fixed-Effects OLS Market Value Group = 2 (n = 44,463)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0711660	0.0121557	5.85	<0.001***
Return	41805.99	1766.095	23.67	<0.001***
Volatility	384.1614	196.8527	1.95	0.052*
Turnover	-102.5135	10.2680	-9.98	<0.001***
Constant	-77.05149	26.07689	-2.95	<0.004***

F(4,186) = 149.84, $p < .001$

R^2: within = 0.4185, between = 0.2257, overall = 0.4146

Fixed-Effects OLS Market Value Group = 3 (n = 44,094)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0470635	0.0183284	2.57	<0.011***
Return	57258.37	2596.428	22.05	<0.001***
Volatility	630.2625	248.5676	2.54	<0.012***
Turnover	-117.928	13.4811	-8.75	<0.001***
Constant	-162.2629	29.57170	-5.49	<0.001***

F(4,185) = 145.16, $p < .001$

R^2: within = 0.4060, between = 0.3470, overall = 0.4045

Fixed-Effects OLS Market Value Group = 4 (n = 44,541)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0460091	0.0117562	3.91	<0.011***
Return	83833.8	7532.157	11.13	<0.001***
Volatility	571.5584	403.3115	1.42	0.158
Turnover	-213.6484	25.9087	-8.25	<0.001***
Constant	-126.5211	46.85825	-2.70	<0.008***

F(4,186) = 45.92, $p < .001$

R^2: within = 0.2982, between = 0.3138, overall = 0.2975

Fixed-Effects OLS Market Value Group = 5 (n = 44,292)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1849051	0.0333953	5.54	<0.011***
Return	185859.6	12347.670	15.05	<0.001***
Volatility	1814.139	851.7972	2.13	0.035**
Turnover	-430.2969	50.7085	-8.49	<0.001***
Constant	-111.8365	90.44643	-1.24	0.218

F(4,185) = 64.92, $p < .001$

R^2: within = 0.3438, between = 0.2036, overall = 0.3423

Fixed-Effects OLS with Cumulative Returns Market Value Group = 1 (n = 44,250)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0911421	0.0181818	5.01	<0.001***
Cumul. Return (20)	12397.68	2823.610	4.39	<0.001***
Volatility	-777.3495	189.7318	-4.10	<0.001***
Turnover	-13.8529	13.0264	-1.06	0.289
Constant	-160.6175	29.05624	-5.53	<0.001***

F(4,186) = 12.98, $p < .001$

R^2: within = 0.0120, between = 0.6821, overall = 0.0177

Fixed-Effects OLS with Cumulative Returns Market Value Group = 2 (n = 44,463)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0858367	0.0127624	6.73	<0.001***
Cumul. Return (20)	20498	3639.270	5.63	<0.001***
Volatility	-618.4089	231.1882	-2.67	<0.008***
Turnover	-12.88711	10.5728	-1.22	0.224

	Coef.	Std. Err.	t	P>|t|
Constant	-215.3958	25.43456	-8.47	<0.001***

F(4,186) = 17.69, $p < .001$

R^2: within = 0.0119, between = 0.6396, overall = 0.0160

Fixed-Effects OLS with Cumulative Returns Market Value Group = 3 (n = 44,049)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0569400	0.0187166	3.04	<0.003***
Cumul Return (20)	19172.43	4055.460	4.86	<0.001***
Volatility	-938.3825	303.2917	-3.09	<0.002***
Turnover	25.70587	17.156.76	1.50	0.136
Constant	-391.2792	37.18391	-10.52	<0.001***

F(4,185) = 12.75, $p < .001$

R^2: within = 0.0074, between = 0.0080, overall = 0.0074

Fixed-Effects OLS with Cumulative Returns Market Value Group = 4 (n = 44,541)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.0505412	0.0130391	3.88	<0.001***
Cumul Return (20)	37291.42	5461.239	6.83	<0.001***
Volatility	-1739.877	532.4039	-3.27	<0.001***
Turnover	1.801175	21.45396	0.08	0.933
Constant	-428.4581	38.89696	-11.02	<0.001***

F(4,186) = 17.70, $p < .001$

R^2: within = 0.0059, between = 0.5296, overall = 0.0084

Fixed-Effects OLS with Cumulative Returns Market Value Group = 5 (n = 44,292)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	0.1948654	0.0334108	5.83	<0.001***
Cumul Return (20)	73367.45	16157.310	4.54	<0.001***
Volatility	-1688.37	1064.9700	-1.59	0.115
Turnover	161.2755	84.24606	1.91	0.057*
Constant	-807.4458	106.12510	-7.61	<0.001***

F(4,185) = 20.33, $p < .001$

R^2: within = 0.0448, between = 0.2059, overall = 0.0460

Additional Analysis using Portfolios

In this section, we present the results of the analyses using an alternative variable instead of stock returns. Specifically, two models were considered:

- Model 3: instead of stock returns, use returns of equal-weighted winner and loser portfolios. For any given day, the "winner" portfolio is defined as the set of stocks in the top decile in terms of the average returns from the previous 20 days (without including the current day). The "loser" portfolio is defined similarly, using the stocks in the bottom decile. For these portfolios, the stocks are weighted equally.
- Model 4: instead of stock returns, use returns of value-weighted winner and loser portfolios. The winner and loser portfolios are defined as described above; however, the weighting of the stocks within each portfolio is proportional to the stocks' market value.

Since there are 933 stocks in the dataset, each portfolio had approximately 93 stocks on any given day. As in the previous analysis, the sample was broken down into two periods to compare the models' performance. The results are presented in the following tables.

Fixed-Effects OLS with Equal-Weighted Portfolio Returns (n = 869,743)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	.1050507	.009205	11.41	0.000***
Winner Port. Returns	8227.895	313.4729	26.25	0.000***
Loser Port. Returns	7375.566	554.4699	13.30	0.000***
Volatility	168.6081	34.83977	4.84	0.000***
Turnover	41.68008	2.710676	15.38	0.000***
Constant	-353.3508	10.96115	-32.24	0.000***

F(5,932) = 238.47, $p < .001$

R^2: within = 0.0446, between = 0.2196, overall = 0.0450

Fixed-Effects OLS with Value-Weighted Portfolio Returns (n = 868,975)

	Coef.	Std. Err.	t	P>|t|
Money Flow (t-1)	.1064279	.0091411	11.64	0.000***
Winner Port. Returns	9734.921	375.5668	25.92	0.000***
Loser Port. Returns	6427.961	505.9189	12.71	0.000***
Volatility	59.43585	33.27475	1.79	0.074*
Turnover	42.80533	2.725406	15.71	0.000***
Constant	-349.5075	10.82295	-32.29	0.000***

F(5,932) = 223.66, $p < .001$

R^2: within = 0.0451, between = 0.2272, overall = 0.0456

RMSE of Models 3 and 4, by period

	Model 3	Model 4
In-Sample	2405.68	2405.81
Out-of-Sample	4224.69	4223.34

As can be seen from these results, these two models are extremely similar in terms of performance, suggesting there is no significant benefit from using value-weighting rather than equal-weighting for the winner and loser portfolios. In general, the model fit was very poor, with an overall R^2 of 4.5% in both cases.

Consistent with previous results, the coefficients associated with lagged money flows and returns were positive and statistically significant. The coefficient associated with volatility was positive and statistically significant only for Model 3 (the “equal-weighted portfolio” model), whereas it was not statistically significant for Model 4 (the “value-weighted portfolio model). Finally, Turnover had a positive and significant effect in both cases.