A closer look at size effect on equity anomalies

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ABSTRACT

This study investigates how firm size impact abnormal returns for three well-known anomalies, namely, the operating accruals (OA), earnings-to-price (EP), and momentum (MOM). It is demonstrated that the abnormal returns for OA and EP anomaly are mainly due to small size firms even after using NYSE breakpoints. Value-weighted returns can reduce the magnitude and significance of the abnormal returns of operating accruals, but it can only eliminate the EP abnormal returns during the sample period. There is no significant size effect on the abnormal returns of MOM. Analyses of subsamples in different size groups show significant abnormal returns only exist in small size firms, which corroborates with the results using the whole sample. The size effect is not due to survivor bias.

Keywords: Equity anomalies, size effects, accruals, earnings-to-price, momentum

INTRODUCTION:

Equity anomalies represent the predictability of stock returns by various firm characteristics. The predictability cannot be explained by classical Asset Pricing Models such as the Capital Asset Pricing Model (CAPM) (Sharpe 1964) or Multifactor Models (Fama and French 1993; Carhart 1997). In academic research, return predictability has become the heart of the market efficiency debate and a focal point in asset pricing studies. Despite numerous studies in this area, equity anomalies are still not well understood. There are hundreds of anomalies reported in the literature (Hou et al. 2017). Recent literature usually attributes the existence of anomalies to either the inadequacy in underlying asset pricing models or market inefficiency. The inadequacy in asset pricing models is usually called the rational explanation. It builds upon the traditional risk-return framework under assumptions that investors are perfectly rational, and the market is efficient. Anomalies are the consequences of shortcomings of current pricing methods or missing risk factors (Hou et al. 2011, among others). Market inefficiency attributes the existence of anomalies to investors' irrational behaviors and is referred to as the behavioral explanation (Hirshlefer 2001, Barberis and Thaler 2003, among others). Under the framework of the behavioral explanation, investors do not collect and/or process available information rationally because they suffer from cognitive biases resulting in mispriced securities. Therefore stock return predictability represents systematic mispricing in the equity market.

Besides these two main streams of explanation of anomalies, there are some studies that investigate whether these anomalies are caused by common factors (Hou et al. 2017, Stambaugh and Yuan 2017, Stambaugh 2017). Among these factors, size has been suggested to be the main factor driving many anomalies. Studies (Hou et al. 2017, Fama and French, 2008) report that many anomalies disappear after using value-weighted returns instead of equally-weighted returns. Most of these anomalies are driven by small or microcap firms. Because investors normally are reluctant to invest in small firms, the mispricing in small firms usually lasts longer or more persistent than large firm due to the uncertainty and higher risk.

This study investigates the size-effect in three well-known anomalies, namely, the Earnings-to-Price anomaly (EP) (Basu 1983), the Operating Accruals anomaly (OA) (Solan; 1996), and the Momentum anomaly (MOM) (Jagedeesh and Titman 1993). The primary objective of this study is to investigate how firm size impacts the abnormal returns of these three anomalies. This paper examines two types of abnormal returns. The first is the hedging portfolio abnormal return, which is the return of the portfolio formed on a zero-cost (long/short) trading strategy. The second is the risk-adjusted return, which is the alpha of regression of the zero-cost portfolio abnormal returns on the four factors identifies by Fama-French-Carhart. These two returns have been used widely in empirical asset pricing studies (Fama and French 1992; Fama and French 1993; Fama and French 1998; Fama and French 2008; Griffin 2002; Hirshleifer, et al. 2012; among others).

Three different methods are used to demonstrate the size effect. First, differences between equally-weighted and value-weighted returns are analyzed. Previous studies (Fama and French 2008, among others) suggest that the US publicly traded firms have a highly skewed size distribution with microcaps and small firms accounting for more than 60% of the number of stocks while the top 10% large caps account for more than 50% of the market capitalization. If firm size affects abnormal returns, then equally-weighted abnormal returns will be different from value-weighted abnormal returns. Second, this study uses different breakpoints to split firms into deciles under each anomaly. Besides using all firms (NYSE-AMEX-NASDAQ) to produce

breakpoints, the study uses NYSE only firms to generate breakpoints. Since microcaps usually have large variations in most of the anomalies, the extreme deciles mainly consist of small firms while large firms are usually grouped in the deciles towards the middle. Since the abnormal return is defined as the difference between returns of extreme deciles (highest vs. lowest deciles), the abnormal return actually results from small firms. NYSE breakpoints are introduced to alleviate this problem. Third, sample firms are divided into ten size groups and the same analyses are conducted in each size group to show how abnormal returns vary among size groups.

Results of size distribution across the anomaly deciles show that the extreme deciles (decile 1 and decile 10) have the smallest average firm size for all three anomalies. The size of the extreme deciles in OA and MOM is significantly smaller than other deciles. For example, the average size of firms in OA decile 1 is almost seven times smaller than the average size of firms in OA decile 5. The average size of decile 10 is almost four times smaller than the size of decile 5. However, the size difference between extreme deciles and deciles in the middle for EP is not as big as that of OA and MOM. It might be due to the exclusion of negative earning firms, which eliminates a large number of small firms.

Similar results are present in spite of how the breakpoints are constructed. Although NYSE breakpoints increase firm sizes in the extreme deciles, the same distribution pattern (small firms in extreme deciles and large firms in the middle) persists. For example, OA decile 1 has an average size of $638.933 million, and OA decile 10 has an average size of $1,024.125 million when all firms breakpoints used. After using NYSE breakpoints, size of decile 1 and decile ten increase to $1,046.696 million and $1,073.285 million, respectively. These extreme deciles remain the smallest compared to other deciles. This result shows that NYSE breakpoints can alleviate the size effect but they do not provide significant improvements. Since the buy-sell abnormal return is defined as the difference between the returns of decile 1 and decile 10, the abnormal return is actually due to small firms.

A comparison between equally-weighted and value-weighted returns indicates that value-weighted return can reduce the magnitude and the significance level of OA, EP, and MOM. However, only EP abnormal returns become insignificant when value-weighted return is used. These findings are observed in both portfolio abnormal returns and risk-adjusted returns, as well as with all-firm breakpoints and with NYSE breakpoints. The results provide further evidence that size effect exists in all three anomalies. More specifically, even within the extreme deciles, smaller firms contribute more to abnormal returns than bigger firms.

The same analyses are conducted at each size group to further demonstrate the size effect. Firms are split into ten size groups using either all-firm breakpoints or NYSE breakpoints. Buy-sell portfolio abnormal returns and risk-adjusted returns are calculated for each size group. The results show that the size effect is different across the three anomalies. In OA with all-firm breakpoints, there are significant abnormal returns in all smaller size groups (size less than 80 percentile) but not in large firms (size decile 8, 9, and 10). There is a similar pattern when NYSE breakpoints are used. However, the abnormal return of the largest size group becomes significant after using NYSE breakpoints. Results of EP anomaly show significant abnormal returns from medium size groups (size group 4, 5, and 6) but not from small or large size groups. For MOM anomaly, significant abnormal returns in small firms for zero-cost portfolios are observed, while the risk-adjusted abnormal returns are significant in all size groups. The same results persist in spite of the type of breakpoints used.

Is it possible that the small firm effect identified in this study is driven by survivor bias? Some argue that the size effect may be driven by those firms got delisted during the sample

period due to high distress risk (Campbell et al. 2008; Dichev 1998; Avramov et al. 2009; Avramov et al. 2013.) It is possible the size effect is partially due to firms with high distress risk and these firms are normally small size firm. To address this concern, the same analyses are done for firms that only exist through the entire study period, and there are no changes in test results. Using OA as an example, the frim size for OA decile 1 and decile ten increases, but still the smallest when using all firms breakpoints no matter which breakpoints are used. The buy-sell portfolio return and risk-adjusted return also show decreased magnitude and significant level as the whole sample is used. These results suggest that size effect is not significantly impacted by the delisted firms.

DATA AND METHODOLOGY

To construct the three anomalies, monthly return data are retrieved from CRSP and accounting data from the CRSP/Compustat Merged database from the Wharton Research Data Services (WRDS). OA has been studied extensively, and many different forms of OA measurements have been proposed (Sloan 1996; Hafzalla et al. 2011; Hribar and Collins 2002.) Following Hribar and Collins 2002, OA in this study is defined as the net income (NI) minus net cash flow from operations (OANCF) using the statement of cash flows. This measure helps mitigate errors that arise from nonoperating activities such as acquisitions and divestitures, which are used in Sloan (1996) study. OA is scaled by total assets (AT). Since the statement of cash flows is only available since 1988, the sample period is from 1988 to 2017 for all three anomalies. This study uses all firms from NYSE, AMEX, and NASDAQ, and excludes financial services firms by not using the two-digit SIC codes 60-69. The OA is defined as:

$$OA = (NI - OANCF)/AT$$

All stocks are into deciles at the end of June of each year t based on the rank of OA for the fiscal year ending in the calendar year t-1. After splitting firms into deciles, monthly returns are computed for each decile from July of year t to June of year t+1, with rebalancing in June of year t+1. The abnormal return is calculated as the difference between the return of decile 10 (with the highest OA) and the return of decile 1 (with the lowest OA) to mimic the long and short zero-cost portfolio. Monthly returns using both equally-weighted and value-weighted averages are calculated.

The study follows the same method to construct EP anomaly as Basu (1983) and defines it as:

$$EP = IB/ME$$

Where IB is the income before extraordinary items for the fiscal year ending in the calendar year t-1. ME is the market equity calculated as the number of shares outstanding multiply stock price at the end of December of year t-1. Firms with no positive earnings are excluded. Monthly return is calculated from July of year t to June of t+1. The portfolios are rebalanced in June of t+1.

Jegadeesh and Titman (1993) method is used to construct momentum anomaly. Stocks are split into deciles using prior six-month (t-7 to t-2 skipping month t-1) accumulative return at the beginning of each month t, and monthly returns of each decile for the following six months (i.e., month t to month t+5) are calculated. Deciles are rebalanced at the beginning of every month. As in Jegadeesh and Titman (1993), the holding period (six months) means that for any given decile in each month there are size sub-deciles, each of which is generated in a different month before month t. Final monthly return is the simple average of the sub-deciles.

Besides the analysis using deciles, risk-adjusted abnormal return using the Fama-French 4 Factor model for OA and EP is examined:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}RM_t + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \varepsilon_{it}$$

Where R_{it} is the long/short abnormal return, R_{ft} is the risk-free rate, RM_t is the market risk premium, SMB_t is size factor, HML_t is the value factor, and MOM_t is the momentum factor. These data are obtained from Ken French's data library. α is the risk-adjusted abnormal return. Fama-French 3 factor model is used for MOM:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}RM_t + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \varepsilon_{it}$$

RESULTS

Figure 1 (Appendix) shows the time series long/short returns of OA, EP, and MOM anomaly from 1988 to 2016. The blue line represents the equally-weighted monthly long/short returns, and the orange line represents value-weighted returns. As shown in this figure, the long/short trading strategy produces positive returns in most of the months in equally-weighted returns for OA and EP, but not as obvious for MOM. Value weighted returns have a similar pattern as equally-weighted returns, but the magnitude is less than that of the equally-weighted returns. The variation is much wider in the equally-weighted returns in all three anomalies. Patterns in Figure 1 suggest that when more weight is assigned to the large firms, the abnormal returns get smaller.

Table 1 (Appendix) presents summary statistics in different size groups for the three anomalies. Firms are divided into ten groups based on size (total market equity), where group 1 includes the smallest firms and group 10 includes the largest firms. The number of firms, average firm size, average anomaly, and the average return in each size group can be found in Table 1. Firm size varies significantly among different groups. The pattern is consistent with the previous finding that the US publicly traded firms have a highly skewed size distribution with microcaps and small firms. In the largest size group (group 10), the average size is almost nine times the second largest size group, and the majority of firms are small and microcap firms. Smaller size firms usually have lower OA, higher EP, lower MOM, and lower return.

Table 2 (Appendix) shows the average size of each anomaly decile for the three anomalies. As shown in the table, OA decile 1 and decile 10 consist of firms with the smallest average size. Decile 10 in EP anomaly has the smallest average size while decile 1 has a similar size to decile 2 and decile 9, but it is smaller than the deciles in the middle. MOM has a similar size distribution pattern as OA. Since portfolio long/short abnormal return is defined as the average return of decile 1 minus decile 10, the size distribution pattern indicates the abnormal return is actually caused by small firms. After using NYSE breakpoints, the size distribution improves, especially for OA and MOM anomalies. The size distribution in EP has no significant changes. Figure 2 (Appendix) shows that the size distribution pattern persists even though NYSE breakpoints increase the average size in extreme deciles.

Table 3 (Appendix) compared equally-weighted and value-weighted returns. Results using all-firm breakpoints and NYSE breakpoints are presented. It shows that the magnitude and significance level of abnormal returns for each anomaly decrease when the value-weighted return is used. For instance, the buy-sell abnormal return of OA using all-firm breakpoints decreases from 0.87% (t=4.37) to 0.81% (t=2.91), and the risk-adjusted return reduces from 0.78 (t=9.23) to 0.66 (t=4.98). Abnormal returns remain for OA despite the significant reduction in magnitude. There are no buy-sell abnormal returns for both all-firm and NYSE breakpoints under MOM.

The risk-adjusted abnormal returns are significant, and value-weighted returns have a reduced magnitude and significance level as in OA anomaly. For EP anomaly, the abnormal return becomes insignificant after using value-weighted return. Using NYSE breakpoints reduces the magnitude and significance level in general, but the improvement is not as big as using value-weighted return.

Table 4 (Appendix) shows value-weighted abnormal returns in each size group for each anomaly for both all-firm and NYSE breakpoints. An examination of the data reveals significant abnormal returns: 1) in small firms (up to size group 7) for OA anomaly, 2) in firms in the middle size groups (group 4 to group 8) for EP anomaly, and 3) in small firms (up to group 7) for buy-sell abnormal returns and in all firms for risk-adjusted returns for MOM anomaly.

The same analyses are done on a sub-sample of firms with complete information during the entire testing period to rule out survivor bias. After removing all delisted firms and firms with discontinuous information, the sub-sample is reduced to 35% of the full sample. Test results are consistent with that from the full sample. Only OA results are presented, and EP and MOM show a similar pattern. Table 5 (Appendix) shows the size distribution among OA deciles for the sub-sample. As shown in the table, the extreme deciles (decile 1 and 10) have the smallest firm size for both all-firm and NYSE breakpoints. Equally-weighted and value-weighted returns for both the buy-sell portfolio abnormal return and risk-adjusted abnormal returns are presented in Table 6 (Appendix). Abnormal returns are present in the sub-sample, with a smaller magnitude but remain significant. Compares to results presented in Table 3, the buy-sell portfolio value-weighted abnormal return drops from 0.81 (t=2.91) to 0.67 (t=2.38) for all-firm breakpoints, and from 0.57 (t=3.28) to 0.45 (t=2.68) when only survivors are included in the test.

CONCLUSION

This study demonstrates that size-effect exists in three well-known anomalies, and the effect is different among these anomalies. OA anomaly is impacted by firms size the most. The equally-weighted average seems to be the most effective way to reduce the impact of small firms on abnormal returns. The NYSE breakpoints do not improve the size effect as significantly as the value-weighted return does. Test results show that it is important to pay attention to firm size effect when designing trading strategies to take advantages of stock return predictability (i.e., anomaly) because the abnormal return (at least part of it) may not result from firm characteristics (i.e., OA, EP, and MOM) but the firm size. Future study will investigate how size effect changes over time since the anomalies in the sample period do not produce a similar abnormal return pattern as previous studies suggest.

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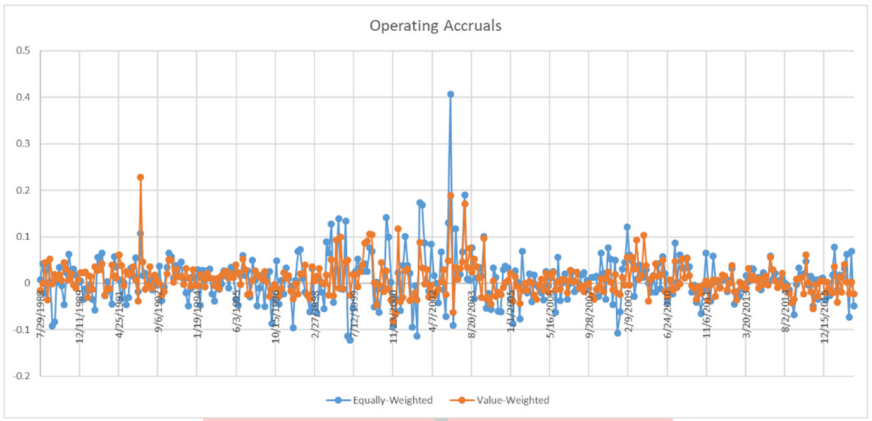
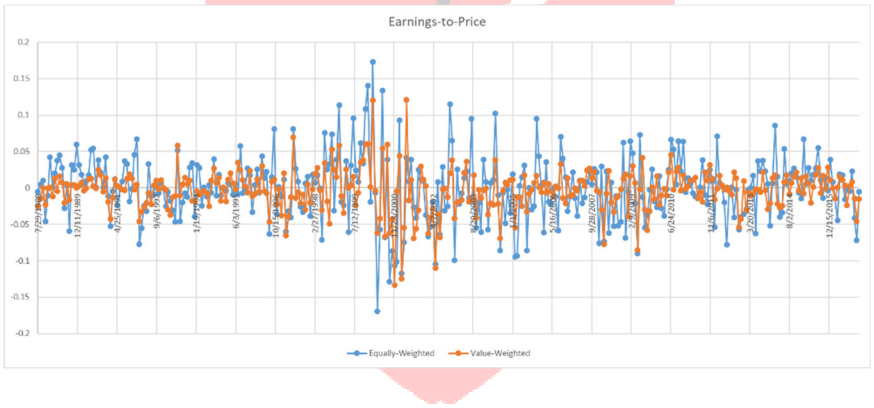
APPENDIX

Figure1. Monthly returns of long/short portfolios formed on OA, EP, and MOM
Portfolio monthly return is defined as the equally- or value-weighted return of firms in decile 1 (lowest OA, EP, or MOM) minus the value-weighted return of firms in decile 10 (highest OA, EP, or MOM.)





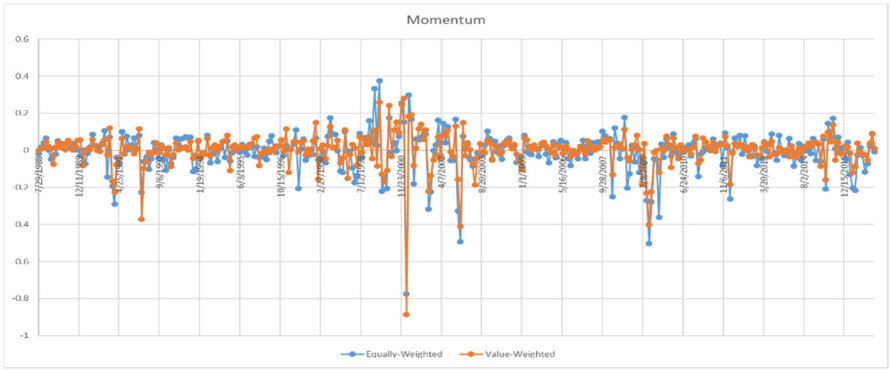


Figure 2. Size distribution across anomaly deciles for OA, EP, and MOM with all-firm and NYSE breakpoints

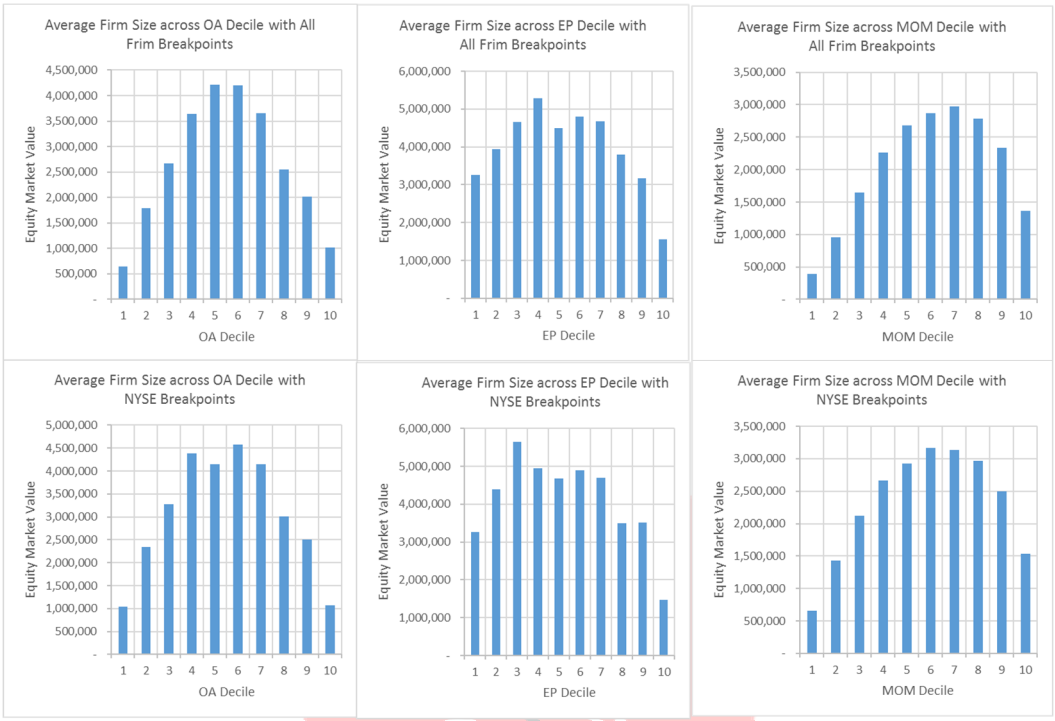


Table 1. Summary statistics in each size group for OA, EP, and MOM

	Operating Accurals				Earnings-to-price				Momentum			
sizegroup	# of Firm	Size	OA	Return	# of Firm	Size	EP	Return	# of Firm	Size	MOM	Return
1	405	11,283	-0.195	-0.016	157	20,297	0.118	0.004	589	9,253	-0.124	-0.024
2	388	31,049	-0.120	0.004	189	62,473	0.096	0.013	575	25,788	-0.004	0.003
3	383	60,881	-0.094	0.011	204	126,319	0.088	0.013	569	50,689	0.039	0.010
4	385	109,852	-0.086	0.012	209	226,629	0.082	0.014	569	91,010	0.070	0.013
5	386	189,579	-0.074	0.016	215	381,602	0.074	0.015	566	155,897	0.090	0.016
6	389	329,713	-0.066	0.017	216	609,461	0.069	0.016	567	270,088	0.107	0.018
7	393	576,917	-0.061	0.018	219	1,005,553	0.065	0.017	571	473,941	0.119	0.019
8	401	1,078,670	-0.056	0.019	212	1,758,612	0.063	0.018	575	892,735	0.126	0.020
9	415	2,430,325	-0.048	0.018	202	3,798,616	0.061	0.017	581	2,034,357	0.124	0.020
10	430	20,342,929	-0.051	0.016	181	26,701,624	0.059	0.016	586	17,230,099	0.110	0.018
All Firm	3976	2,516,120	-0.085	0.012	2004	3,469,119	0.077	0.014	5749	2,123,386	0.066	0.011

Table 2. Average anomaly size with all-firm and NYSE breakpoints

	All Firm Breakpoint			NYSE Breakpoint		
Anomaly Decile	OA	EP	MOM	OA	EP	MOM
1	638,933	3,256,094	390,293	1,046,696	3,267,823	653,942
2	1,785,993	3,935,932	955,970	2,341,029	4,397,130	1,431,740
3	2,673,867	4,651,061	1,644,979	3,281,644	5,640,053	2,125,455
4	3,646,171	5,283,879	2,263,048	4,385,123	4,943,556	2,662,560
5	4,217,011	4,502,988	2,677,325	4,154,014	4,678,855	2,922,454
6	4,204,751	4,803,533	2,872,904	4,572,991	4,886,581	3,169,135
7	3,655,680	4,679,420	2,971,648	4,143,404	4,696,187	3,132,546
8	2,549,179	3,798,148	2,781,543	3,006,243	3,493,894	2,970,809
9	2,021,086	3,163,420	2,331,373	2,513,999	3,517,227	2,493,537
10	1,024,125	1,563,424	1,362,044	1,073,285	1,465,867	1,531,368

Table 3. Equally-weighted and value-weighted abnormal returns of each anomaly with all-firm and NYSE Breakpoints

	OA				*EP*				*Mom*			
	All Firm Breakpoint		NYSE Breakpoints		All Firm Breakpoint		NYSE Breakpoints		All Firm Breakpoint		NYSE Breakpoints	
	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor
Value-Weighted	**0.81**	**0.66**	**0.57**	**0.33**	-0.24	-0.04	0.008	0.007	0	**-0.77**	0.15	**-0.48**
	2.91	*4.98*	*3.28*	*3.12*	*-0.95*	*-0.2*	*0.03*	*0.02*	*0.02*	*-2.18*	*0.46*	*-2.43*
Equally-Weighted	**0.87**	**0.78**	**0.61**	**0.45**	**-0.38**	**-0.32**	**-0.33**	**-0.29**	-0.26	**-0.89**	-0.35	**-0.78**
	4.37	9.23	5.23	7.22	-2.26	-2.51	-2.13	-3.13	-0.69	-4.17	0.96	-4.86

Table 4. Value-weighted portfolio abnormal returns and risk-adjusted returns across different size group with all-firm and NYSE breakpoints

	OA				*EP*				*Mom*			
	All Firm Breakpoint		NYSE Breakpoints		All Firm Breakpoint		NYSE Breakpoints		All Firm Breakpoint		NYSE Breakpoints	
	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor
Size Group 1	**1.01**	**0.78**	**0.84**	**0.57**	-0.14	-0.066	0.07	0.05	**-1.05**	**-1.40**	**-0.79**	**-1.04**
	2.80	*3.00*	*2.84*	*2.94*	*-0.37*	*-0.170*	*0.22*	*0.16*	*-2.69*	*-4.02*	*-2.51*	*-3.21*
Size Group 2	**1.54**	**1.32**	**1.11**	**0.88**	-0.36	-0.059	-0.41	-0.13	**-2.41**	**-2.97**	**-1.61**	**-2.04**
	4.28	*4.21*	*3.93*	*3.75*	*-1.07*	*-0.180*	*-1.48*	*-0.43*	*-5.89*	*-8.95*	*-5.11*	*-6.71*
Size Group 3	**1.59**	**1.24**	**1.27**	**0.85**	-0.45	-0.456	**-0.54**	**-0.60**	**-2.21**	**-2.87**	**-1.41**	**-1.88**
	4.73	*4.38*	*4.58*	*4.13*	*-1.49*	*-1.450*	*-2.17*	*-2.25*	*-4.71*	*-8.27*	*-4.02*	*-6.39*
Size Group 4	**1.47**	**1.21**	**1.37**	**1.01**	**-1.00**	**-1.007**	**-1.20**	**-1.25**	**-2.04**	**-2.61**	**-1.39**	**-1.89**
	4.37	*4.84*	*5.04*	*5.14*	*-3.30*	*-3.470*	*-4.63*	*-4.87*	*-4.37*	*-7.50*	*-3.64*	*-6.48*
Size Group 5	**1.46**	**1.21**	**1.24**	**0.97**	**-0.74**	**-0.700**	**-0.67**	**-0.66**	**-1.73**	**-2.61**	**-1.08**	**-1.78**
	4.42	*4.44*	*5.14*	*5.01*	*-2.53*	*-2.500*	*-2.69*	*-2.63*	*-3.45*	*-8.02*	*-2.71*	*-6.19*
Size Group 6	**1.22**	**1.06**	**1.01**	**0.75**	**-1.20**	**-1.114**	**-0.90**	**-0.79**	**-1.42**	**-2.21**	**-0.82**	**-1.48**
	3.46	*3.26*	*4.17*	*3.83*	*-3.83*	*-3.710*	*-3.27*	*-2.99*	*-3.10*	*-7.85*	*-2.25*	*-6.31*
Size Group 7	**1.24**	**1.05**	**0.83**	**0.59**	-0.25	-0.107	-0.29	-0.10	**-0.96**	**-1.80**	-0.63	**-1.30**
	3.91	*3.85*	*3.66*	*3.37*	*-0.79*	*-0.370*	*-1.01*	*-0.33*	*-2.12*	*-6.40*	*-1.72*	*-5.64*
Size Group 8	0.59	0.32	0.38	0.01	**-0.82**	-0.552	-0.39	-0.21	-0.70	**-1.45**	-0.29	**-0.91**
	1.52	*1.40*	*1.81*	*1.20*	*-2.32*	*-1.710*	*-1.36*	*-0.84*	*-1.47*	*-5.04*	*-0.79*	*-4.27*
Size Group 9	0.32	0.00	0.30	-0.05	0.20	0.492	0.11	0.47	-0.49	**-1.22**	-0.14	**-0.77**
	0.88	*0.61*	*1.43*	*0.93*	*0.61*	*1.710*	*0.41*	*1.55*	*-0.96*	*-3.68*	*-0.35*	*-3.26*
Size Group 10	0.58	0.57	**0.53**	**0.38**	-0.03	0.187	0.09	0.55	-1.03	**-1.93**	-0.19	**-0.91**
	1.32	*1.62*	*2.44*	*2.80*	*-0.09*	*0.600*	*0.30*	*1.95*	*-1.84*	*-4.82*	*-0.47*	*-3.84*

Table 5 Size distribution among OA deciles excluding delisted firms

OA Decile	All Firm Breakpoint	NYSE Breakpoint
1	1,109,093	1,276,802
2	1,769,325	2,428,292
3	2,737,787	3,217,993
4	3,548,945	3,839,683
5	4,209,521	4,240,275
6	4,316,975	4,380,366
7	3,668,148	4,140,201
8	2,621,611	3,058,104
9	2,069,244	2,436,018
10	1,009,087	1,104,570

Table 6. Equally-weighted and value-weighted abnormal returns of OA for the survivor bias-free sub-sample

	OA			
	All Firm Breakpoint		NYSE Breakpoints	
	Buy-Sell	FF 4 factor	Buy-Sell	FF 4 factor
Value-Weighted	**0.67**	**0.48**	**0.45**	**0.31**
	2.38	*3.35*	*2.68*	*3.12*
Equally-Weighted	**0.76**	**0.66**	**0.48**	**0.54**
	3.37	6.01	4.37	4.32