Combining Liquidity and Momentum to Pick Top-Performing Mutual Funds

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Abstract

In a recent study, Idzorek, Xiong, and Ibbotson (2010) documented the liquidity investment style in mutual funds by combining data from an individual stock database with a mutual fund holding database to build composites of mutual funds based on liquidity. The study found that composites of mutual funds that hold relatively less liquid stocks dramatically outperformed composites of mutual funds that hold more liquid stocks. Using the same techniques, this paper extends that research to investigate if composites of mutual funds that hold stocks with high momentum outperform composites of mutual funds that hold stocks with low momentum. Next, we build composites of mutual funds based on a combination of liquidity and momentum factors. We find that composites of mutual funds that hold low liquidity high momentum stocks dramatically outperform those that hold high liquidity low momentum stocks.

Introduction

The two best-known market anomalies that historically have produced risk-adjusted excess returns are the Fama-French anomalies of value minus growth and small minus large. The next most-known market anomaly is momentum, which is sometimes referred to as the "Carhart factor" (Cahart (1997)). One of the pioneering articles on exploiting the momentum anomaly is Jegadeesh and Titman (1993), which details a process for overweighting recent winners (securities with high momentum) and underweighting recent losers (securities with low momentum). The momentum effect has been widely observed across global equity markets even though the exact source of the momentum anomaly is still in debate (e.g. Chordia and Shivakumar (2002), Cooper, Gutierrez and Hameed (2004), and Griffin, Ji and Martin (2005)).

Moving beyond these three market anomalies, we believe the next major market anomaly to be discovered, and one with unexplained risk-adjusted returns that rival those of the other anomalies, is liquidity. The liquidity investment style refers to the process of investing in relatively less liquid stocks within the relatively liquid universe of publicly traded stocks. A number of studies find that cross-sectionally, stock returns are decreasing in stock turnover, which is consistent with a negative relationship between liquidity and expected return. The superior returns associated with less liquid investments are documented in, for example, Amihud and Mendelson (1986), Datar, Naik, and Radcliffe (1998), Chordia, Subrahmanyam and Anshuman (2001), Pastor and Stambaugh (2003), and more recently Chen, Ibbotson, and Hu (2010).

In the precursor to this study, Idzorek, Xiong, and Ibbotson (IXI (2010)) combines data from Morningstar's individual stock database with Morningstar's mutual fund holding database to build composites of mutual funds based on liquidity, finding that composites of mutual funds that hold relatively less liquid stocks dramatically outperformed composites of mutual funds that hold more liquid stocks. Using the same techniques, this paper extends that research to investigate if composites of mutual funds that hold stocks with high momentum outperform composites of mutual funds that hold stocks with low momentum. Additionally, we build composites of mutual funds based on a combination of liquidity and momentum factors.

Data and Methodology

To investigate whether mutual funds that hold stocks with high momentum tend to outperform mutual funds that hold stocks with low momentum we combined data from Morningstar's individual stock database with Morningstar's mutual fund holdings database. For each stock in the database, we calculated its trailing six-month total return throughout time. Coupling this information with the mutual fund holdings database, enabled us to calculate each mutual fund's weighted average momentum throughout time.

We started with Morningstar's open-end U.S. equity mutual fund universe containing both live and dead funds. The Morningstar categories represented within the U.S. equity mutual fund universe included those of the nine size-valuation style boxes that form the U.S. equity universe, the three valuation-based columns from the style box (value, core, and growth), and the three size-based rows from the style box (large, mid, and small).

Morningstar has either monthly or quarterly mutual fund holdings data starting in 1983; however, wide-scale holdings data was not deemed to be available until 1995. Holdings data from January 1995 is used to form the composites of mutual funds that we begin tracking in February 1995. The constituent mutual funds of the composites are based on the previous month's holdings information. This gives us 14 years and 11 months of performance history. Table 1 summarizes the number of live funds in the various universes/categories with the required data at the start of the study and at the end of the study.

Table 1: Number of Funds with Required Data

Morningstar Category	Start Date Number of Funds	End Date Number of Funds
Small Value	42	238
Small Core	73	369
Small Growth	123	494
Mid Value	45	229
Mid Core	84	314
Mid Growth	131	527
Large Value	212	719
Large Core	322	1260
Large Growth	262	1048
Small	238	1101
Mid	260	1070
Large	796	3027
Value	299	1186
Core	479	1943
Growth	516	2069
All U.S.	1294	5198

For a given mutual fund, if we did not know the momentum for a holding, we ignored the position and rescaled the other holdings prior to calculating the mutual fund's weighted average momentum.

Armed with each mutual fund's weighted average momentum within any given category, we ranked the mutual funds based on their weighted average momentum and use this information to form evolving, monthly rebalanced, equally weighted composites (in our case quintiles) of mutual funds with similar weighted average momentum. Funds with the lowest weighted average momentum were assigned to the "M1" quintile and funds with the highest weighted average momentum were assigned to the "M5" quintile. The constituent mutual funds in the composite evolve each month as the weighted average momentum of the mutual funds evolves. Following this type of strategy would require the investor to rebalance their portfolio of mutual funds monthly.

Results

Momentum Composites

For momentum composites, Table 2 summarizes the results for our entire universe and the 15 categories within our universe of U.S. equity funds. The table displays the annual arithmetic return, annual geometric return, standard deviation, Sharpe ratio, as well as the alpha from a monthly return regression of the composite relative to its category average composite and the t-statistic of the alpha. When appropriate, we show the difference in performance statistics from the low-momentum composite (M1) and the high-momentum composite (M5).

For each of the 16 groupings, the high-momentum composite (M5) had a superior annual arithmetic return, annual geometric return, Sharpe ratio, and monthly alpha when compared to the applicable equally weighted composite for that category. The t-statistic of the alpha of the high-momentum composite exceeded 2 for nine of our 16 categories indicating that the alpha was statistically significant at the 95% confidence level. In contrast with the equivalent liquidity-based composites and analysis of IXI 2010, the t-statistic of the alpha of the low-liquidity composite exceeded 2 for 15 of the 16 categories, suggesting that from this particular lens building portfolios based on momentum is slightly less compelling than liquidity.

Comparing the performance of the "All" composites at the bottom of Table 2 representing our entire universe of U.S. equity funds, highlights the superiority of the high-momentum composites over the low-momentum composites. Comparing the All M5 composite to the All M1 composite, the annual geometric return was 6.95 percentage points better, the standard deviation was 3.39 worse, and the Sharpe ratio was significantly better (.43 vs. .10).

The largest *monthly* alpha differences between the M1 and M5 quintiles occurred within the Growth category (51basis points), while the smallest monthly alpha difference occurred for the Small Core category (19 basis points).

Table 2: Monthly-Rebalanced Composites – Performance Statistics

U.S. Equity Fund Universe (Feb. 1995 – Dec. 2009)
Mutual Fund Quintiles, where M1 = Lowest Liquidity and M5 = Highest Liquidity

	N Periods	Arithmetic Mean (%)	Geometric Mean (%)	Standard Deviation (%)	Sharpe Ratio	Monthly Alpha Relative to Average (%)	T-Statistic of Alpha Relative to Average
Small Value M1	179	9.39	7.53	20.18	0.29	-0.23	-2.92
Small Value M2	179	11.19	9.53	19.12	0.40	-0.04	-0.89
Small Value M3	179	11.39	9.76	18.98	0.41	-0.02	-0.42
Small Value M4	179	12.40	10.73	19.28	0.46	0.05	1.13
Small Value M5	179	14.09	12.36	19.79	0.53	0.17	2.61
Small Value Avg	**179**	**11.68**	**10.01**	**19.26**	**0.42**	**--**	**--**
M5 minus M1		4.70	4.82	-0.39	0.24	0.40	--
Small Core M1	179	9.94	8.13	19.89	0.32	-0.07	-0.82
Small Core M2	179	9.41	7.71	19.23	0.31	-0.11	-2.01
Small Core M3	179	11.24	9.44	19.93	0.39	0.01	0.29
Small Core M4	179	11.91	10.02	20.49	0.41	0.04	1.02
Small Core M5	179	13.16	11.11	21.52	0.45	0.11	1.42
Small Core Avg	**179**	**11.12**	**9.32**	**19.94**	**0.38**	**--**	**--**
M5 minus M1		3.22	2.99	1.64	0.12	0.19	--
Small Growth M1	179	6.15	3.67	22.94	0.11	-0.28	-2.08
Small Growth M2	179	9.00	6.49	23.36	0.23	-0.08	-1.17
Small Growth M3	179	10.13	7.64	23.49	0.28	0.01	0.25
Small Growth M4	179	11.62	8.93	24.64	0.33	0.10	1.96
Small Growth M5	179	12.96	9.99	26.15	0.36	0.16	2.00
Small Growth Avg	**179**	**9.95**	**7.39**	**23.76**	**0.27**	**--**	**--**
M5 minus M1		6.80	6.32	3.21	0.25	0.44	--
Mid Value M1	179	10.16	8.43	19.53	0.34	-0.16	-1.94
Mid Value M2	179	10.26	8.91	17.16	0.39	-0.05	-0.88
Mid Value M3	179	10.85	9.45	17.45	0.42	-0.02	-0.38
Mid Value M4	179	11.16	9.77	17.45	0.44	0.01	0.16
Mid Value M5	179	13.29	11.88	17.73	0.55	0.19	2.16
Mid Value Avg	**179**	**11.14**	**9.73**	**17.55**	**0.43**	**--**	**--**
M5 minus M1		3.13	3.45	-1.79	0.21	0.35	--
Mid Core M1	179	7.59	5.78	19.63	0.21	-0.32	-2.51
Mid Core M2	179	10.88	9.42	17.81	0.41	0.01	0.23
Mid Core M3	179	11.48	9.89	18.74	0.42	0.01	0.31
Mid Core M4	179	11.69	10.07	18.90	0.43	0.02	0.49
Mid Core M5	179	14.42	12.52	20.85	0.52	0.18	1.87
Mid Core Avg	**179**	**11.19**	**9.59**	**18.77**	**0.41**	**--**	**--**
M5 minus M1		6.84	6.74	1.22	0.32	0.49	--
Mid Growth M1	179	6.01	3.84	21.36	0.12	-0.31	-2.19
Mid Growth M2	179	9.20	7.01	21.81	0.26	-0.09	-1.24
Mid Growth M3	179	10.88	8.66	22.27	0.33	0.02	0.61
Mid Growth M4	179	12.50	10.04	23.66	0.38	0.11	2.20
Mid Growth M5	179	13.59	10.92	24.88	0.40	0.17	1.73
Mid Growth Avg	**179**	**10.41**	**8.15**	**22.35**	**0.31**	**--**	**--**
M5 minus M1		7.59	7.08	3.52	0.29	0.48	--
Large Value M1	179	6.42	4.88	18.03	0.16	-0.24	-2.25
Large Value M2	179	8.28	6.95	16.91	0.28	-0.06	-1.29
Large Value M3	179	9.13	7.76	17.24	0.32	-0.01	-0.24
Large Value M4	179	9.93	8.49	17.75	0.36	0.04	1.15
Large Value M5	179	12.60	10.86	19.84	0.46	0.19	1.99
Large Value Avg	**179**	**9.25**	**7.83**	**17.61**	**0.33**	**--**	**--**
M5 minus M1		6.18	5.97	1.81	0.30	0.43	--
Large Core M1	179	5.70	4.38	16.62	0.13	-0.21	-3.04
Large Core M2	179	7.57	6.34	16.20	0.25	-0.05	-1.71
Large Core M3	179	8.25	7.01	16.37	0.29	0.00	-0.01
Large Core M4	179	8.84	7.61	16.33	0.33	0.05	2.36
Large Core M5	179	10.20	8.90	16.83	0.40	0.15	2.51
Large Core Avg	**179**	**8.10**	**6.86**	**16.32**	**0.28**	**--**	**--**
M5 minus M1		4.50	4.52	0.21	0.27	0.36	--

Table 2: Monthly-Rebalanced Composites – Performance Statistics *continued*
U.S. Equity Fund Universe (Feb. 1995 – Dec. 2009)
Mutual Fund Quintiles, where M1 = Lowest Liquidity and M5 = Highest Liquidity

	N Periods	Arithmetic Mean (%)	Geometric Mean (%)	Standard Deviation (%)	Sharpe Ratio	Monthly Alpha Relative to Average (%)	T-Statistic of Alpha Relative to Average
Large Growth M1	179	5.34	3.57	19.27	0.09	-0.25	-2.31
Large Growth M2	179	6.82	5.22	18.43	0.18	-0.11	-2.19
Large Growth M3	179	8.34	6.74	18.56	0.26	0.01	0.17
Large Growth M4	179	9.56	7.86	19.27	0.31	0.08	2.36
Large Growth M5	179	11.34	9.39	20.91	0.37	0.18	2.09
Large Growth Avg	**179**	**8.26**	**6.59**	**18.98**	**0.25**	**--**	**--**
M5 minus M1		6.00	5.82	1.63	0.28	0.43	--
Small M1	179	7.41	5.34	21.09	0.18	-0.22	-1.65
Small M2	179	9.09	7.24	19.99	0.28	-0.07	-0.79
Small M3	179	11.21	9.29	20.62	0.37	0.07	1.81
Small M4	179	11.74	9.57	22.01	0.37	0.06	1.45
Small M5	179	13.46	10.80	24.69	0.40	0.12	1.11
Small Avg	**179**	**10.56**	**8.52**	**21.20**	**0.33**	**--**	**--**
M5 minus M1		6.05	5.46	3.61	0.22	0.34	--
Mid M1	179	6.34	4.44	20.04	0.14	-0.30	-1.88
Mid M2	179	9.98	8.31	19.03	0.34	0.00	-0.01
Mid M3	179	10.77	9.00	19.71	0.37	0.02	0.39
Mid M4	179	12.11	10.13	21.06	0.41	0.07	1.49
Mid M5	179	14.08	11.66	23.63	0.45	0.15	1.33
Mid Avg	**179**	**10.63**	**8.80**	**20.06**	**0.35**	**--**	**--**
M5 minus M1		7.74	7.22	3.59	0.31	0.46	--
Large M1	179	4.98	3.49	17.64	0.08	-0.29	-2.37
Large M2	179	6.97	5.72	16.31	0.21	-0.10	-1.70
Large M3	179	8.33	7.06	16.51	0.29	0.00	0.06
Large M4	179	9.38	8.06	16.94	0.35	0.07	2.10
Large M5	179	11.58	9.99	18.81	0.43	0.20	2.02
Large Avg	**179**	**8.23**	**6.91**	**16.83**	**0.28**	**--**	**--**
M5 minus M1		6.60	6.50	1.17	0.35	0.49	--
Growth M1	179	4.89	2.99	19.91	0.07	-0.31	-2.49
Growth M2	179	7.70	5.99	19.17	0.22	-0.07	-1.09
Growth M3	179	9.21	7.38	19.92	0.28	0.02	0.57
Growth M4	179	10.47	8.38	21.49	0.32	0.07	1.80
Growth M5	179	12.76	10.29	23.67	0.39	0.19	2.06
Growth Avg	**179**	**8.98**	**7.05**	**20.44**	**0.27**	**--**	**--**
M5 minus M1		7.87	7.30	3.76	0.32	0.51	--
Core M1	179	6.18	4.77	17.29	0.15	-0.26	-2.80
Core M2	179	7.44	6.17	16.43	0.24	-0.13	-2.07
Core M3	179	9.06	7.77	16.71	0.33	-0.01	-0.33
Core M4	179	10.90	9.53	17.39	0.42	0.11	2.68
Core M5	179	12.68	11.03	19.20	0.48	0.19	2.14
Core Avg	**179**	**9.23**	**7.88**	**17.06**	**0.33**	**--**	**--**
M5 minus M1		6.49	6.26	1.91	0.32	0.46	--
Value M1	179	7.30	5.85	17.58	0.21	-0.23	-3.09
Value M2	179	8.39	7.17	16.22	0.30	-0.09	-2.01
Value M3	179	9.41	8.20	16.20	0.36	-0.01	-0.25
Value M4	179	10.38	9.18	16.15	0.42	0.08	2.91
Value M5	179	11.96	10.64	17.03	0.49	0.18	2.35
Value Avg	**179**	**9.48**	**8.23**	**16.42**	**0.36**	**--**	**--**
M5 minus M1		4.66	4.78	-0.55	0.28	0.42	--
All M1	179	5.44	3.86	18.25	0.10	-0.29	-2.15
All M2	179	7.47	6.14	16.83	0.23	-0.09	-1.16
All M3	179	9.11	7.72	17.34	0.32	0.01	0.31
All M4	179	10.70	9.14	18.49	0.39	0.10	2.42
All M5	179	12.88	10.81	21.64	0.43	0.18	1.55
All Average	**179**	**9.09**	**7.60**	**17.97**	**0.31**	**--**	**--**
M5 minus M1		7.44	6.95	3.39	0.33	0.47	--

To aid with comparisons between equivalent ALL liquidity composites from IXI 2010 with the ALL momentum composites, Table 3 shows the two sets of results as well as the differences.[1] Table 3 demonstrates that on their own, composites of mutual funds holding low-liquidity stocks and composites of mutual funds holding high-momentum stocks outperform.

Table 3: Liquidity Composites vs. Momentum Composites
U.S. Equity Fund Universe (Feb. 1995 – Dec. 2009)
Mutual Fund Quintiles, where L1 = Lowest Liquidity, L5 = Highest Liquidity, M1 = Lowest Momentum, and M5 = Highest Momentum

Liquidity Results	N Periods	Arithmetic Mean (%)	Geometric Mean (%)	Standard Deviation (%)	Sharpe Ratio	Monthly Alpha Relative to Average (%)	T-Statistic of Alpha Relative to Average
All L5	179	9.22	6.44	24.83	0.23	-0.22	-1.33
All L4	179	9.44	7.58	20.16	0.29	-0.07	-1.19
All L3	179	8.58	7.15	17.58	0.29	-0.03	-0.75
All L2	179	9.24	7.98	16.56	0.35	0.08	1.06
All L1	179	10.16	9.09	15.25	0.43	0.23	2.05
All L Avg	**179**	**9.33**	**7.8**	**18.2**	**0.32**	**--**	**--**
L1 minus L5		0.94	2.65	-9.58	0.21	0.45	--
Momentum Results							
All M1	179	5.44	3.86	18.25	0.1	-0.29	-2.15
All M2	179	7.47	6.14	16.83	0.23	-0.09	-1.16
All M3	179	9.11	7.72	17.34	0.32	0.01	0.31
All M4	179	10.7	9.14	18.49	0.39	0.1	2.42
All M5	179	12.88	10.81	21.64	0.43	0.18	1.55
All M Avg	**179**	**9.09**	**7.6**	**17.97**	**0.31**	**--**	**--**
M5 minus M1		7.44	6.95	3.39	0.33	0.47	--
Liquidity minus Momentum							
All L5 - All M1		3.78	2.58	6.58	0.13	0.07	0.82
All L4 - All M2		1.97	1.44	3.33	0.06	0.02	-0.03
All L3 - All M3		-0.53	-0.57	0.24	-0.03	-0.04	-1.06
All L2 - All M4		-1.46	-1.16	-1.93	-0.04	-0.02	-1.36
All L1 - All M5		-2.72	-1.72	-6.39	0	0.05	0.5
All L Avg - All M Avg		**0.24**	**0.2**	**0.23**	**0.01**		

[1] To ease the comparison we list the low liquidity L1 composite (the better performing composite) results at the bottom and the high liquidity L5 composite results at the top, which is the opposite direction in which they were displayed in IXI 2010.

Liquidity and Momentum Composites

The results of Table 3 lead to a new question: do composites of mutual funds with the two good attributes, that is, funds that simultaneously hold stocks with low liquidity and high momentum do even better? To answer this question we calculated two normalized z-scores for each fund—one based on the fund's weighted average liquidity score and one based on the fund's weighted average momentum score, where low liquidity and high momentum are deemed to be good.[2] The two normalized z-scores can then be added together to form a combined score. Funds are then assigned to quintiles based on the combined score, where the L + M 1 composite represents funds with high liquidity and low momentum and the L + M 5 composite represents funds with low liquidity and high momentum.

The results of combining liquidity and momentum are displayed in Table 4. The results are impressive and arguably significantly more compelling than the results of using liquidity or momentum in isolation. For each of the 16 groupings, the lowest-liquidity, highest-momentum composite (L + M 5) had a superior annual arithmetic return, annual geometric return, Sharpe ratio, and monthly alpha when compared to the applicable equally weighted composite for that category. For all 16 categories, the t-statistic of the monthly alpha exceeded 2, with an average across the 16 categories of 3.30.

Focusing on the "All" composites at the bottom of Table 4 representing our entire universe of U.S. equity funds, highlights the dominance of the low-liquidity, high-momentum composites over the high-liquidity, low-momentum composites. Comparing the All L + M 5 composites to the All L + M 1 composites, the annual geometric return was 9.34% higher and the Sharpe ratio was significantly better (.51 vs. .06). This superior performance came at a slightly higher risk level; the standard deviation of the All L + M 5 composite was 20.54% versus 19.42% for the All L + M 1 composite.

[2] A normalized z-score is calculating by subtracting the average raw score from each individual raw score – in our case liquidity score or momentum score – by the standard deviation of the appropriate raw scores. It enables us put liquidity scores and momentum scores on equal footing and then combine them in a manner that is not influenced by the dimension of either score.