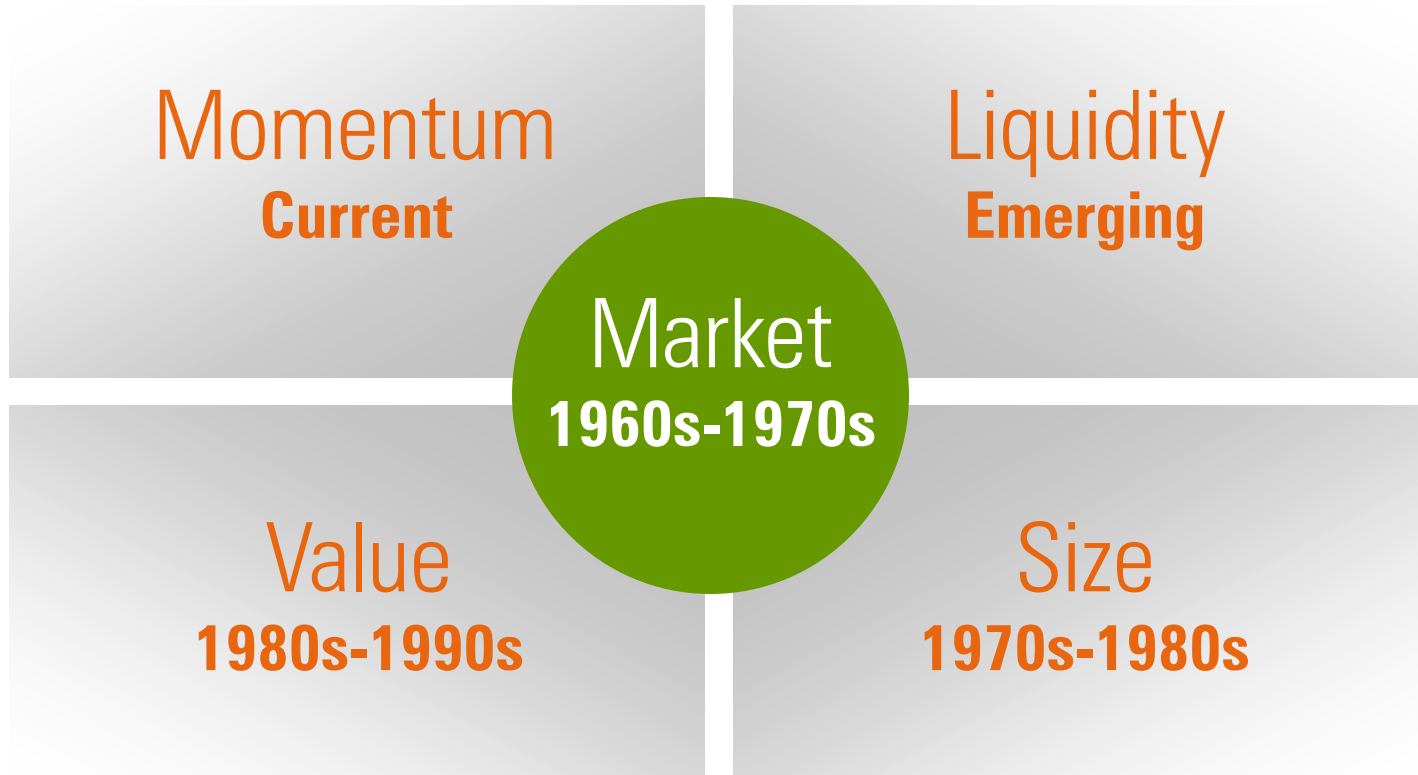


The Secret Sauce--Using Liquidity and Momentum to Pick 'Alpha' Managers

Tom Idzorek, Global Chief Investment Officer

MORNINGSTAR[®] **ibbotson.**

Explaining Long Run Stock Returns



The Liquidity Premium

- ▶ What is the Liquidity Premium
 - ▶ More liquid assets are priced at a premium
 - ▶ Less liquid assets are priced at a discount, thus having higher returns
- ▶ Where can the Liquidity Premium be found?
 - ▶ Private vs. Public Markets
 - ▶ Stocks, Bonds, Real Estate, Inc.
 - ▶ Within Public Markets

“Don’t pay for liquidity you do not need”

Illiquidity Premium Evidence

- ▶ Amihud and Mendelson (1991) shows that on-the-run treasury yield curves are lower than similar off-the-run yield curves despite an equivalent investment.
- ▶ Silber (1991) finds that that restricted stocks trade at an average discount of around 30 relative to publicly traded stocks.
- ▶ An illiquidity return premium in public equities has also been documented in Amihud and Mendelson (1986), Brennan and Subramanyan (1996), Datar, Naik, and Radcliffe (1998), and Pastor and Stambaugh (2003), and Chen, Ibbotson, and Hu (2010).

Complete references are in the Appendix

The Illiquidity Premium **At the Stock Level**

The Stock Level Illiquidity Premium

Gray Matters



The Liquidity Premium

By Zhiwu Chen and Roger G. Ibbotson

Less-liquid stocks have higher expected returns than more-liquid stocks.

Liquidity has many different meanings. In every case, it is related to the ease of movement. In the banking system, liquidity measures the degree to which loans are made. In the securities markets, liquidity is the ease with which transactions can be made. In valuation, liquidity has an impact on value. The more liquidity an asset has, the more value it has, all other things being equal. The absence of liquidity lowers the value of the asset by the amount of an illiquidity discount.

In the financial crisis, it is quite natural that the

financial media are focusing on liquidity in bonds and rates. The president and Congress are providing bailout money so that financial institutions can prop up balance sheets to make it easier for them to start lending again. Corporations, such as automobile manufacturers, are not able to meet their cash flows with their illiquid assets and cannot get sufficient financing. Presently healthy corporations or individuals are not able to get refinancing as their loans become due.

In this article, we instead focus on liquidity as the ease of executing securities in general.

especially in the case of stocks. It is a higher degree of liquidity that is needed to execute its price of its asset, if we are to sell it.

might be

Chapter 9 Liquidity Investing

This chapter is written by Zhiwu Chen and Roger Ibbotson, using research developed at Zebra Capital Management, LLC.

What is Liquidity?

Liquidity has many different, but similar meanings. In every case it is related to the ease of movement. Even within the context of financial markets, liquidity has several different meanings. In the banking system, liquidity measures the degree to which loans are made. In the securities markets, liquidity is the ease with which transactions can be made. In valuation, this liquidity impacts value, so that the more liquid an asset has the more value it has, all other things being equal. The absence of liquidity lowers the value of the asset by the amount of an illiquidity discount.

In the current financial crisis, it is quite natural that the financial press is focusing on liquidity in bonds and loans banking system. The President and Congress are providing bailout money so that financial institutions can prop up balance sheets and to make it easier for them to start lending again. Corporations, such as automobile manufacturers, are not able to meet their cash flows with their illiquid assets and cannot get sufficient financings. Various potentially healthy corporations or individuals are not able to get refinancings, as their loans become due.

In this chapter, we instead focus on liquidity as the ease of executing securities in general, especially equities. We focus on liquidity's impact on valuation and in particular its impact on security returns. We will demonstrate that less-liquid securities have higher expected returns.

Valuation as Present Value of Cash Flows

In equilibrium, an asset has a value that equals its present value, or the discounted sum of its expected cash flows. These future cash flows are unobservable, except for risk-free assets. For stocks, there is great disagreement as to what these expected cash flows might be. This disagreement is the primary reason that stocks are traded. A secondary reason is that they are bought or sold to meet liquidity needs.

The other component of a present value calculation is the discount rate. Similar to the expected cash flows, these discount rates are unobservable. We can usually observe the realized discount rates from bonds, which we unravel from bonds. But there are usually not add to the riskless term structure an equity risk premium, which in the CAPM framework. We measure and another one for value that another premium should be

The difference of opinion that in cash flows leads to the addition of the security reflects not only company cash-flow expectations of opinion that changes from risk reduces the value of a set divergence of opinion also lead a security, thereby making it liquidity increases the security

We do not mean to imply that these present value calculation simple metrics, such as the price trying to buy stocks with relative flow projections, at relatively simply feel that a stock's price its estimated value, leading the

The Liquidity Premium

Most conventional present value liquidity premium. These calculations assume that securities are somewhat liquid, an illiquidity the present value, at the end cash stock is priced at the price cash flows, discounted by the other risk premiums, such as premium, a size premium and present value is then reduced its lack of liquidity.

Liquidity as an Investment Style

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We thank Denis Sosyura for his research assistance on a previous version and Michael W. Zhang for his research assistance on the current version.

Liquidity Details

- ▶ Investment Universe: Largest 3500 NYSE/AMEX/NASDAQ stocks

- ▶ Liquidity Definition:

$$\text{Turnover Rate} = \text{Shares Traded per Year} / \text{Shares Outstanding}$$

- ▶ Size Sort:

Market Capitalization

- ▶ Valuation Sort:

PE ratio based on trailing reported earnings

- ▶ Momentum Sort:

Trailing price momentum

Liquidity vs. Size

Quartiles for NYSE/AMEX/NASDAQ

Compounded Annual Returns, 1972-2010

Size	Liquidity				Low Minus High Liquidity
	1-Low	2	3	4	
1-Small	18.17%	17.46%	13.51%	6.16%	12.01%
2	16.87%	15.15%	11.68%	6.52%	10.35%
3	15.15%	14.36%	12.87%	9.56%	5.59%
4-Large	12.49%	11.48%	11.55%	9.87%	2.62%
Small Minus Large	5.68%	5.98%	1.96%	-3.71%	

Based on <http://www.zebacapm.com/files/LiqSty091010.pdf> with updated annual numbers from Zebra Capital.

Liquidity vs. Valuation

Quartiles for NYSE/AMEX/NASDAQ

Compounded Annual Returns, 1972-2010

Valuation	Liquidity				Low Minus High Liquidity
	1-Low	2	3	4	
1-Value	20.82%	17.98%	17.02%	12.53%	8.29%
2	15.74%	14.93%	13.54%	12.45%	3.29%
3	13.97%	12.46%	10.69%	8.04%	5.93%
4-Growth	11.93%	11.85%	7.88%	3.88%	8.05%
Value Minus Growth	8.89%	6.13%	9.14%	8.65%	

Based on <http://www.zebacapm.com/files/LiqSty091010.pdf> with updated annual numbers from Zebra Capital.

Liquidity vs. Momentum

Quartiles for NYSE/AMEX/NASDAQ

Compounded Annual Returns, 1972-2010

Momentum	Liquidity				Low Minus High Liquidity
	1-Low	2	3	4	
1-High Momentum	17.41%	15.74%	12.96%	11.02%	6.39%
2	17.18%	15.77%	12.86%	9.47%	7.71%
3	15.29%	14.45%	13.74%	9.38%	5.91%
4-Low Momentum	14.31%	10.64%	9.83%	5.59%	8.72%
High Minus Low Momentum	3.10%	5.10%	3.13%	5.43%	

Based on <http://www.zebacapm.com/files/LiqSty091010.pdf> with updated annual numbers from Zebra Capital.

The Illiquidity Premium **In Mutual Funds**

The Illiquidity Premium in Mutual Funds

The Liquidity Style of Mutual Funds

Working Paper

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Current Version- October 2010

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www.ibbotson.com/research

Please note: Slides 12-36 are in reference to this Ibbotson research paper "The Liquidity Style of Mutual Funds"

Mutual Fund Liquidity Composites

- ▶ Investment Universe: 5000+ U.S. Equity Mutual Funds

- ▶ Stock Level Liquidity Definition:

$$\text{Turnover Rate} = \text{Shares Traded per Year} / \text{Shares Outstanding}$$

- ▶ Mutual Fund Liquidity Definition:

Weighted (based on holding size) Average Turnover Rate

- ▶ Organize mutual funds into composites (quintiles)

Number of Funds with Required Data

Morningstar Category	Start Date Number of Funds (Feb 1995)	End Date Number of Funds (Dec 2009)
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
All Non-U.S.*	634	815

All US Equity Funds

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
All L1 (Low)	179	10.16	9.09	15.25	0.43	0.23	2.05
All L2	179	9.24	7.98	16.56	0.35	0.08	1.06
All L3	179	8.58	7.15	17.58	0.29	-0.03	-0.75
All L4	179	9.44	7.58	20.16	0.29	-0.07	-1.19
All L5 (High)	179	9.22	6.44	24.83	0.23	-0.22	-1.33
All Average	179	9.33	7.80	18.20	0.32	--	--
L1 - L5		0.94	2.65	-9.58	0.21	0.45	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Small Value

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Small Value L1	179	12.26	10.86	17.61	0.5	0.14	2.69
Small Value L2	179	12.5	10.79	19.55	0.46	0.06	1.46
Small Value L3	179	11.91	10.17	19.63	0.43	0.01	0.26
Small Value L4	179	11.26	9.48	19.81	0.39	-0.05	-1.17
Small Value L5	179	10.05	8.09	20.75	0.31	-0.18	-2.2
Small Value Avg	179	11.59	9.91	19.27	0.42	--	--
L1 - L5		2.21	2.77	-3.15	0.18	0.32	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Small Core

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Small Core L1	179	12.67	11.25	17.74	0.51	0.24	3.21
Small Core L2	179	11.14	9.48	19.09	0.4	0.05	0.88
Small Core L3	179	10.71	8.81	20.43	0.35	-0.05	-1.35
Small Core L4	179	10.93	8.73	22.07	0.34	-0.1	-1.76
Small Core L5	179	10.13	7.94	21.98	0.3	-0.16	-2.09
Small Core Avg	179	11.11	9.29	20.02	0.38	--	--
L1 - L5		2.54	3.32	-4.24	0.21	0.4	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Small Growth

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Small Growth L1	179	11.15	9.26	20.44	0.37	0.23	2.15
Small Growth L2	179	10.43	7.88	23.91	0.29	0.04	0.81
Small Growth L3	179	9.87	6.87	25.93	0.24	-0.08	-1.77
Small Growth L4	179	11.5	8.13	27.84	0.29	0	0.01
Small Growth L5	179	10.04	6.26	29.3	0.22	-0.17	-2.58
Small Growth Avg	179	10.6	7.77	25.22	0.28	--	--
L1 - L5		1.1	3.00	-8.86	0.15	0.4	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Mid Value

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Mid Value L1	179	12.15	11.06	15.52	0.56	0.19	3.66
Mid Value L2	179	11.28	9.95	17.13	0.45	0.04	0.69
Mid Value L3	179	11.11	9.76	17.23	0.44	0.02	0.35
Mid Value L4	179	11.45	9.82	18.92	0.42	-0.04	-0.75
Mid Value L5	179	9.72	7.81	20.39	0.3	-0.24	-2.52
Mid Value Avg	179	11.14	9.73	17.56	0.43	--	--
L1 - L5		2.42	3.25	-4.87	0.25	0.43	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Mid Core

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Mid Core L1	179	11.81	10.66	15.87	0.52	0.22	2.32
Mid Core L2	179	11.58	10.06	18.29	0.44	0.07	1.13
Mid Core L3	179	12.02	10.24	19.86	0.43	0.03	0.54
Mid Core L4	179	11.12	9.22	20.49	0.37	-0.08	-1.38
Mid Core L5	179	9.65	7.47	21.86	0.28	-0.24	-2.24
Mid Core Avg	179	11.23	9.61	18.87	0.41	--	--
L1 - L5		2.16	3.19	-5.99	0.24	0.46	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Mid Growth

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Mid Growth L1	179	11.27	9.82	17.94	0.43	0.28	2.36
Mid Growth L2	179	11.26	9.14	21.82	0.35	0.11	1.87
Mid Growth L3	179	11.01	8.38	24.38	0.31	-0.01	-0.3
Mid Growth L4	179	10.39	7.35	26.15	0.26	-0.12	-2.32
Mid Growth L5	179	10.19	6.63	28.46	0.23	-0.21	-2.4
Mid Growth Avg	179	10.82	8.38	23.39	0.31	--	--
L1 - L5		1.08	3.18	-10.52	0.2	0.49	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Large Value

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Large Value L1	179	9.41	8.44	14.49	0.41	0.13	3.67
Large Value L2	179	8.75	7.65	15.38	0.34	0.04	1.59
Large Value L3	179	8.61	7.42	16.04	0.32	0	-0.15
Large Value L4	179	8.34	7.07	16.53	0.29	-0.05	-2.29
Large Value L5	179	7.52	6.11	17.32	0.23	-0.14	-2.98
Large Value Avg	179	8.52	7.35	15.88	0.31	--	--
L1 - L5		1.89	2.33	-2.83	0.18	0.28	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Large Core

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Large Core L1	179	8.95	7.95	14.69	0.37	0.14	2.88
Large Core L2	179	8.1	6.91	15.98	0.29	0.01	0.7
Large Core L3	179	7.97	6.66	16.76	0.27	-0.03	-1.21
Large Core L4	179	7.63	6.35	16.56	0.25	-0.05	-2.66
Large Core L5	179	7.84	6.3	18.12	0.24	-0.08	-1.39
Large Core Avg	179	8.1	6.86	16.31	0.28	--	--
L1 - L5		1.11	1.65	-3.42	0.13	0.23	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Large Growth

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Large Growth L1	179	8.8	7.61	16.04	0.33	0.16	2.01
Large Growth L2	179	8.36	6.92	17.64	0.27	0.06	1.24
Large Growth L3	179	7.48	5.86	18.62	0.21	-0.05	-2.01
Large Growth L4	179	8.63	6.74	20.3	0.25	-0.01	-0.44
Large Growth L5	179	8.6	5.87	24.52	0.21	-0.14	-1.38
Large Growth Avg	179	8.38	6.68	19.15	0.25	--	--
L1 - L5		0.2	1.75	-8.48	0.12	0.31	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Small

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Small L1	179	12.61	11.12	18.19	0.5	0.34	2.45
Small L2	179	11.19	9.36	20.06	0.38	0.12	1.25
Small L3	179	10.72	8.4	22.74	0.32	-0.04	-1.42
Small L4	179	10.59	7.76	25.28	0.28	-0.14	-1.68
Small L5	179	9.91	6.75	26.62	0.24	-0.25	-2.48
Small Avg	179	11	8.82	22.01	0.34	--	--
L1 - L5		2.7	4.37	-8.42	0.26	0.59	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Mid

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Mid L1	179	11.42	10.24	16.08	0.49	0.32	2.13
Mid L2	179	11.58	10	18.7	0.43	0.17	1.91
Mid L3	179	11.28	9.25	21.29	0.36	0.02	0.54
Mid L4	179	10.34	7.75	24.07	0.28	-0.17	-2.63
Mid L5	179	10.08	6.91	26.7	0.25	-0.27	-2.24
Mid Avg	179	10.94	9.01	20.69	0.36	--	--
L1 - L5		1.34	3.33	-10.62	0.25	0.59	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Large

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Large L1	179	9.35	8.34	14.81	0.39	0.2	2.1
Large L2	179	8.66	7.49	15.92	0.32	0.08	1.46
Large L3	179	7.71	6.41	16.72	0.25	-0.04	-1.29
Large L4	179	7.44	6.01	17.46	0.22	-0.09	-2.84
Large L5	179	8.11	6.03	21.23	0.22	-0.15	-1.21
Large Avg	179	8.25	6.93	16.83	0.28	--	--
L1 - L5		1.24	2.3	-6.42	0.18	0.35	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Growth

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Growth L1	179	9.38	8.1	16.67	0.35	0.2	1.72
Growth L2	179	8.78	7.18	18.61	0.28	0.05	0.8
Growth L3	179	9.36	7.34	21.02	0.28	0.01	0.3
Growth L4	179	10.5	7.83	24.46	0.28	-0.01	-0.18
Growth L5	179	9.18	5.85	27.34	0.21	-0.21	-1.88
Growth Avg	179	9.44	7.4	21.17	0.28	--	--
L1 - L5		0.2	2.26	-10.67	0.14	0.4	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Core

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Core L1	179	10.15	9.12	15.04	0.44	0.18	2.86
Core L2	179	9.1	7.84	16.54	0.34	0.02	0.42
Core L3	179	8.57	7.21	17.09	0.29	-0.05	-1.28
Core L4	179	8.9	7.43	17.81	0.3	-0.05	-1.44
Core L5	179	9.39	7.48	20.37	0.29	-0.1	-0.89
Core Avg	179	9.22	7.87	17.08	0.33	--	--
L1 - L5		0.76	1.63	-5.33	0.15	0.27	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Value

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
Value L1	179	10.3	9.29	14.86	0.46	0.15	3.28
Value L2	179	9.56	8.4	15.87	0.38	0.03	1.09
Value L3	179	9.55	8.27	16.68	0.36	0	-0.22
Value L4	179	9.26	7.92	17.03	0.34	-0.05	-1.91
Value L5	179	8.59	7.01	18.39	0.27	-0.15	-1.96
Value Avg	179	9.45	8.2	16.43	0.36	--	--
L1 - L5		1.71	2.28	-3.53	0.18	0.29	--

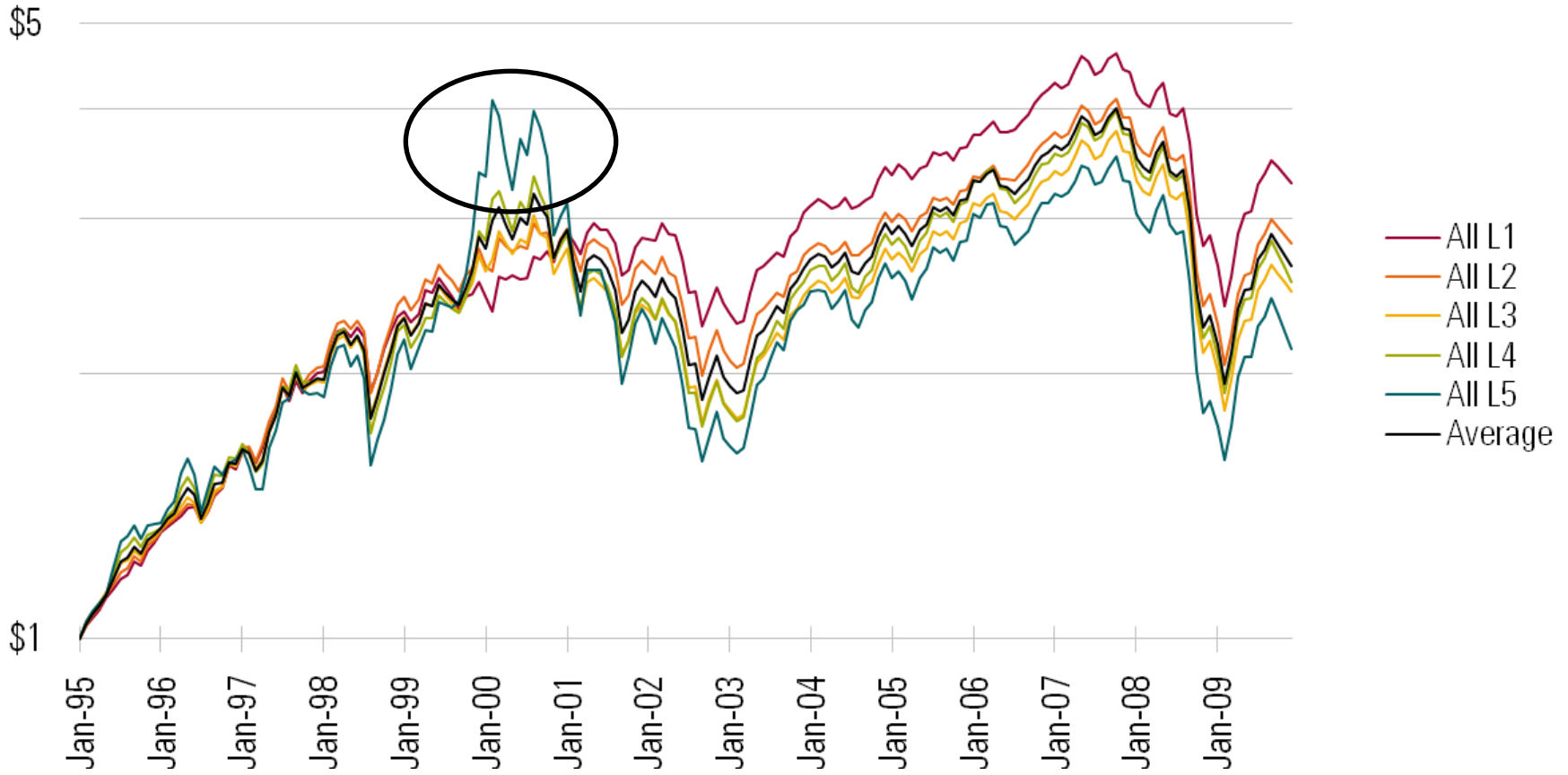
L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Growth \$1

U.S Equity Fund Universe (Feb. 1995 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity



*See Growth of \$1 disclosure.

Monthly Up-side / Down-side Capture Statistics

U.S Equity Fund Universe (Feb. 1995 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity

	Up Periods	Down Periods	Average Up Market Return	Average Down Market Return	Up- Market Capture	Down- Market Capture	Average Decline	Number of Draw downs
All L1	117	62	3.03	-3.09	86.31	75.93	91.04	28
All L2	112	67	3.3	-3.75	93.91	91.88	97.57	21
All L3	109	70	3.47	-4.19	98.73	102.57	97.28	18
All L4	107	72	3.89	-4.75	110.45	116.32	89.07	18
All L5	106	73	4.37	-5.63	123.01	138.71	75.34	10
All Average	109	70	3.61	-4.28	102.78	104.85	95.11	18

The Average Stock Level Liquidity Measure (%)

U.S Equity Fund Universe (Feb. 1995 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity

Category	Daily					Annualized				
	L1	L2	L3	L4	L5	L1	L2	L3	L4	L5
Small Value	0.43	0.57	0.67	0.83	2.18	108	143	168	208	545
Small Core	0.47	0.65	0.80	1.05	3.17	118	163	200	263	793
Small Growth	0.65	0.91	1.16	1.52	4.38	163	228	290	380	1095
Mid Value	0.44	0.55	0.65	0.81	1.97	110	138	163	203	493
Mid Core	0.47	0.66	0.83	1.04	2.44	118	165	208	260	610
Mid Growth	0.63	0.87	1.09	1.42	3.23	158	218	273	355	808
Large Value	0.37	0.45	0.52	0.60	0.88	93	113	130	150	220
Large Core	0.42	0.54	0.60	0.67	1.08	105	135	150	168	270
Large Growth	0.51	0.64	0.75	0.92	1.80	128	160	188	230	450
Small	0.50	0.72	0.93	1.26	3.71	125	180	233	315	928
Mid	0.51	0.73	0.93	1.23	2.91	128	183	233	308	728
Large	0.42	0.54	0.62	0.74	1.37	105	135	155	185	343
Value	0.38	0.48	0.55	0.65	1.31	95	120	138	163	328
Core	0.44	0.56	0.64	0.78	1.82	110	140	160	195	455
Growth	0.54	0.71	0.89	1.18	2.90	135	178	223	295	725
All US	0.44	0.58	0.70	0.92	2.29	110	145	175	230	573

Monthly-Rebalanced Composites with Quarterly Implementation Delay

U.S. Equity Fund Universe (April 1995 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
All L1	176	9.89	8.83	15.17	0.42	0.25	2.19
All L2	176	9	7.74	16.48	0.33	0.1	1.29
All L3	176	8.14	6.68	17.7	0.26	-0.03	-0.61
All L4	176	8.66	6.76	20.28	0.25	-0.08	-1.59
All L5	176	8.34	5.58	24.69	0.2	-0.23	-1.48
All Avg	176	8.8	7.26	18.24	0.29	--	--
L1 - L5		1.55	3.26	-9.52	0.23	0.48	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Annually-Rebalanced Composites – Performance Statistics

U.S. Equity Fund Universe (Jan. 1996 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
All L1	168	8.92	7.86	15.17	0.36	0.2	1.84
All L2	168	7.86	6.61	16.33	0.27	0.05	0.64
All L3	168	7.83	6.39	17.57	0.25	-0.01	-0.18
All L4	168	8.42	6.53	20.28	0.25	-0.06	-1.07
All L5	168	8.42	5.81	24.03	0.21	-0.15	-0.97
All Avg	168	8.29	6.77	18.09	0.27	--	--
L1 - L5		0.5	2.05	-8.87	0.16	0.35	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

Monthly-Rebalanced Composites – Performance

Non-U.S. Equity Fund Universe (Feb. 2000 – Dec. 2009)

Mutual Fund Quintiles, where L1 = Lowest Liquidity and L5 = Highest Liquidity

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
All L1	119	3.28	1.5	19.16	0.03	0.04	0.4
All L2	119	4.07	2.69	16.9	0.08	0.14	1.28
All L3	119	2.97	1.58	16.92	0.01	0.05	0.37
All L4	119	2.37	0.74	18.27	-0.02	-0.02	-0.15
All L5	119	1.13	-1.63	23.84	-0.07	-0.18	-0.77
All Avg	119	2.76	1.15	18.19	0	--	--
L1 - L5		2.15	3.13	-4.69	0.1	0.22	--

L1 = Low Liquidity Composite

L5 = High Liquidity Composite

A Momentum Premium **In Mutual Funds**

Combining Liquidity and Momentum

Combining Liquidity and Momentum to Pick Top-Performing Mutual Funds

Working Paper

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Please note: Slides 39 -47 are in reference to this Ibbotson research paper "Combining Liquidity and Momentum to Pick Top-Performing Mutual Funds"

Mutual Fund Momentum Composites

- ▶ Investment Universe: U.S. Equity Mutual Funds
 - ▶ Stock Level Momentum Definition:
Trailing 6 month total returns
-
- ▶ Mutual Fund Momentum Definition:
Weighted (based on holding size) Average Momentum
 - ▶ Organize mutual funds into composites (quintiles)

All US Equity Funds

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
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	--

M1 = Low Momentum Composite

M5 = High Momentum Composite

Momentum Results

Feb. 1995 – Dec. 2009

Combining Liquidity and Momentum to Pick Top-Performing Mutual Funds

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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	8.39	7.53	20.18	0.28	-0.23	-2.92
Small Value M2	179	11.19	9.93	19.12	0.42	-0.04	-0.99
Small Value M3	179	11.39	9.76	18.98	0.41	-0.02	-0.42
Small Value M4	179	10.27	10.23	18.40	0.05	1.17	1.37
Small Value M5	179	14.09	12.36	19.79	0.53	0.17	2.61
Small Value Ave	179	11.68	10.01	19.26	0.62	-	-
M5 minus M1		-6.70	-4.85	6.28	-0.26	-0.40	-
Small Core M1	179	9.84	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	10.02	10.02	20.49	0.41	0.04	1.03
Small Core M5	179	13.16	11.11	21.52	0.45	0.11	1.42
Small Core Ave	179	11.12	9.32	19.94	0.38	-	-
M5 minus M1		-3.32	-2.99	6.64	-0.19	-	-
Small Growth M1	179	8.15	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	11.82	8.93	24.64	0.33	0.19	1.86
Small Growth M5	179	13.96	9.99	28.15	0.38	0.15	2.00
Small Growth Ave	179	9.95	7.39	23.76	0.27	-	-
M5 minus M1		-6.80	-5.32	-5.21	-0.25	-0.44	-
Mid Value M1	179	10.16	8.43	19.53	0.34	-0.16	-1.94
Mid Value M2	179	10.25	8.91	17.16	0.39	-0.05	-0.88
Mid Value M3	179	10.95	9.46	17.45	0.42	-0.02	-2.39
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 Ave	179	11.14	9.75	17.65	0.43	-	-
M5 minus M1		-3.13	-3.45	-3.21	-0.25	-	-
Mid Core M1	179	7.99	5.78	19.63	0.21	-0.22	-2.51
Mid Core M2	179	10.88	9.42	17.81	0.41	0.21	0.22
Mid Core M3	179	11.48	9.89	18.74	0.42	0.31	0.81
Mid Core M4	179	11.89	10.07	18.90	0.43	0.02	0.49
Mid Core M5	179	14.42	12.52	20.25	0.52	0.18	1.87
Mid Core Ave	179	11.19	9.59	18.27	0.41	-	-
M5 minus M1		-6.44	-5.74	-1.22	-0.32	-0.48	-
Mid Growth M1	179	6.01	3.84	21.36	0.12	-0.31	-2.19
Mid Growth M2	179	8.20	7.01	21.81	0.26	-0.09	-1.24
Mid Growth M3	179	8.66	6.89	22.27	0.32	0.03	0.81
Mid Growth M4	179	12.50	10.04	23.66	0.38	0.11	2.20
Mid Growth M5	179	12.59	10.92	24.99	0.40	0.17	1.72
Mid Growth Ave	179	10.41	8.15	22.26	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	0.18	-0.24	-2.25
Large Value M2	179	8.28	6.95	18.91	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	8.46	17.75	0.36	0.04	1.15
Large Value M5	179	10.88	10.88	18.41	0.46	1.69	1.99
Large Value Ave	179	8.25	7.83	17.61	0.33	-	-
M5 minus M1		-6.18	-5.97	-1.81	-0.26	-0.43	-
Large Core M1	179	5.70	4.39	18.52	0.13	-0.21	-3.04
Large Core M2	179	7.37	6.24	18.20	0.25	-1.71	-6.05
Large Core M3	179	8.25	7.01	18.37	0.29	0.00	-0.01
Large Core M4	179	8.84	7.61	18.23	0.33	2.86	2.86
Large Core M5	179	10.20	8.60	19.83	0.40	0.15	2.11
Large Core Ave	179	7.19	6.86	18.32	0.28	-	-
M5 minus M1		-8.50	-4.92	-6.21	-0.27	-0.36	-

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Combining Liquidity and Momentum to Pick Top-Performing Mutual Funds

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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	3.37	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	9.98	7.88	19.27	0.31	0.08	2.36
Large Growth M5	179	11.34	9.28	20.91	0.37	0.18	2.09
Large Growth Ave	179	6.92	5.98	19.88	0.26	-	-
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	-1.85
Small M2	179	9.09	7.24	19.99	0.28	-0.07	-0.79
Small M3	179	11.21	9.26	20.82	0.37	0.07	1.81
Small M4	179	11.74	9.57	22.01	0.37	0.08	1.45
Small M5	179	13.65	10.92	24.99	0.45	0.12	1.11
Small Ave	179	10.59	8.52	21.20	0.33	-	-
M5 minus M1		-6.05	-5.45	-9.61	-0.22	-0.24	-
Mid M1	179	6.34	4.44	20.04	0.14	-0.30	-1.88
Mid M2	179	8.96	6.31	18.33	0.24	0.00	-0.01
Mid M3	179	10.77	8.00	18.71	0.37	0.02	0.39
Mid M4	179	12.11	10.13	21.08	0.41	0.07	1.48
Mid M5	179	14.08	11.06	23.93	0.45	0.15	1.31
Mid Ave	179	10.83	8.80	20.08	0.35	-	-
M5 minus M1		-7.74	-7.22	-3.99	-0.31	-0.46	-
Large M1	179	4.89	3.49	17.94	0.08	-0.29	-2.27
Large M2	179	6.87	5.72	18.31	0.21	-0.10	-1.70
Large M3	179	8.33	7.08	18.51	0.29	0.05	0.08
Large M4	179	9.36	8.06	18.84	0.35	0.07	2.10
Large M5	179	11.59	9.99	19.81	0.43	0.23	2.52
Large Ave	179	8.33	6.91	18.83	0.28	-	-
M5 minus M1		-6.60	-6.50	-1.07	-0.25	-0.46	-
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	19.82	0.28	0.02	0.57
Growth M4	179	10.47	8.38	21.49	0.32	0.07	1.80
Growth M5	179	12.78	10.29	23.87	0.39	0.19	2.06
Growth Ave	179	8.99	7.05	20.44	0.27	-	-
M5 minus M1		-8.87	-2.95	-3.76	-0.32	-0.51	-
Core M1	179	6.18	4.77	17.29	0.15	-0.28	-2.80
Core M2	179	7.44	6.17	16.43	0.24	-0.13	-2.07
Core M3	179	8.06	7.77	16.71	0.33	-0.01	-0.33
Core M4	179	10.90	9.93	17.39	0.42	0.11	2.88
Core M5	179	12.89	11.03	19.20	0.48	0.19	2.14
Core Ave	179	9.23	7.88	17.09	0.31	-	-
M5 minus M1		-6.46	-6.28	-1.81	-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	18.22	0.30	-0.08	-2.01
Value M3	179	9.41	8.20	18.20	0.36	-0.01	-0.25
Value M4	179	10.38	9.18	18.15	0.42	0.08	2.91
Value M5	179	11.90	10.64	17.03	0.49	0.18	2.35
Value Ave	179	8.93	8.03	18.42	0.38	-	-
M5 minus M1		-6.66	-4.78	-6.55	-0.28	-0.42	-
All M1	179	5.44	3.80	18.25	0.10	-0.29	-2.15
All M2	179	7.47	6.14	18.83	0.23	-0.09	-1.18
All M3	179	8.11	7.12	18.34	0.31	0.21	0.31
All M4	179	10.70	9.14	18.49	0.39	0.10	2.42
All M5	179	12.89	10.81	21.84	0.43	0.18	1.95
All Averages	179	7.96	7.00	17.97	0.31	-	-
M5 minus M1		-7.44	-6.95	-3.39	-0.33	-0.47	-

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Monthly Up-side / Down-side Capture Statistics

U.S Equity Fund Universe (Feb. 1995 – Dec. 2009)

Mutual Fund Quintiles, where M1 = Lowest Momentum and M5 = Highest Momentum

	Up Periods	Down Periods	Average Up Return	Average Down Return	Average Up Market Return	Average Down Market Return	Up- Market Capture	Down- Market Capture
All M1	112	67	3.31	-4.35	3.12	-4.25	88.18	104.63
All M2	109	70	3.38	-3.72	3.21	-3.97	91.17	97.22
All M3	110	69	3.59	-3.83	3.45	-4.05	98.3	99.17
All M4	109	70	3.94	-3.95	3.73	-4.2	106.11	102.83
All M5	111	68	4.45	-4.59	4.22	-4.6	119.55	113.04

Combining Liquidity and Momentum

The Secret Sauce

Mutual Fund Composites – Liquidity and Momentum

- ▶ Investment Universe: U.S. Equity Mutual Funds
- ▶ Liquidity
 - ▶ Stock Level Liquidity Definition:
Turnover Rate = Shares Traded per Year / Shares Outstanding
 - ▶ Mutual Fund Liquidity Definition:
Weighted (based on holding size) Average Turnover Rate
 - ▶ Calculate Normalized Liquidity Score
- ▶ Momentum
 - ▶ Stock Level Momentum Definition:
Trailing 6 month total returns
 - ▶ Mutual Fund Momentum Definition:
Weighted (based on holding size) Average Momentum
 - ▶ Calculate Normalized Momentum Score
- ▶ Organize mutual funds into composites (quintiles)

All US Equity Funds

Feb. 1995 – Dec. 2009

	N Periods	Arithmetic Mean ()	Geometric Mean ()	Standard Deviation ()	Sharpe Ratio	Monthly Alpha Relative to Average ()	T-Statistic of Alpha Relative to Average
All L+M 1	179	4.72	2.91	19.42	0.06	-0.44	-3.54
All L+M 2	179	7.2	5.82	17.13	0.21	-0.15	-1.98
All L+M 3	179	8.93	7.56	17.21	0.31	-0.03	-0.6
All L+M 4	179	10.78	9.34	17.82	0.41	0.1	2.81
All L+M 5	179	14.1	12.24	20.54	0.51	0.28	2.65
All Average	179	9.1	7.61	17.97	0.31	--	--
L+M 5 minus L+M 1		9.38	9.34	1.13	0.45	0.73	--

L+M 1 = High Liquidity and Low Momentum Composite

L+M 5 = Low Liquidity and High Momentum Composite

Combined Liquidity and Momentum Results

Feb. 1995 – Dec. 2009

Table 4: Liquidity and Momentum Composites – Performance Statistics
 U.S. Equity Fund Universe (Feb. 1995 – Dec. 2009)
 L+M 1 = High Liquidity Low Momentum and L+M 5 = Low Liquidity High Momentum

	N Periods	Arithmetic Mean (%)	Geometric Mean (%)	Standard Deviation (%)	Sharpe Ratio	Monthly Alpha Relative to Average (%)	T-Statistic of Alpha Relative to Average
Small Value L+M 1	179	9.36	7.38	20.84	0.28	-0.27	-3.89
Small Value L+M 2	179	9.01	10.25	19.25	0.37	-0.11	-2.22
Small Value L+M 3	179	11.86	10.24	18.92	0.44	0.02	0.43
Small Value L+M 4	179	12.94	11.36	18.86	0.5	0.11	2.44
Small Value L+M 5	179	12.69	12.06	19.14	0.52	0.18	2.64
Small Value Average	179	11.71	10.83	19.24	0.42	0.02	-
L+M 5 minus L+M 1		4.32	4.99	1.77	0.25	0.41	—
Small Core L+M 1	179	10.08	8.99	20.82	0.31	-0.13	-1.87
Small Core L+M 2	179	7.29	10.54	19.24	0.29	-0.16	-2.83
Small Core L+M 3	179	10.34	8.6	19.49	0.35	-0.08	-1.86
Small Core L+M 4	179	11.75	9.88	18.84	0.41	0.04	0.98
Small Core L+M 5	179	14.4	12.46	20.83	0.52	0.22	3.54
Small Core Average	179	11.12	9.32	19.94	0.38	0.01	-
L+M 5 minus L+M 1		4.32	0	0	0.21	0.35	—
Small Growth L+M 1	179	5.52	2.78	24	0.08	-0.4	-3.48
Small Growth L+M 2	179	8.41	5.94	23.16	0.21	-0.14	-2.83
Small Growth L+M 3	179	9.95	7.48	23.45	0.27	-0.03	-0.82
Small Growth L+M 4	179	12.18	9.96	24.26	0.36	0.13	3.03
Small Growth L+M 5	179	13.98	11.21	25.32	0.41	0.25	3.29
Small Growth Average	179	8.87	7.41	23.76	0.27	0.05	-
L+M 5 minus L+M 1		8.47	6.43	0	0.33	0.65	—
Mid Value L+M 1	179	6.97	7.1	20.12	0.27	-0.32	-3.84
Mid Value L+M 2	179	10.89	9.57	17.89	0.42	-0.04	-0.72
Mid Value L+M 3	179	10.81	8.2	17.99	0.4	-0.06	-1.29
Mid Value L+M 4	179	10.84	10.53	17	0.46	0.17	1.35
Mid Value L+M 5	179	13.73	12.48	18.76	0.51	0.25	3.53
Mid Value Average	179	11.28	10.66	18.44	0.44	0.04	-
L+M 5 minus L+M 1		4.77	5.36	-3.36	0.24	0.56	—
Mid Core L+M 1	179	8.56	6.88	20.23	0.25	-0.3	-3.09
Mid Core L+M 2	179	9.57	7.99	18.53	0.33	-0.14	-2.38
Mid Core L+M 3	179	10.53	8.89	18.87	0.38	-0.07	-1.41
Mid Core L+M 4	179	12.17	10.58	18.79	0.46	0.06	1.17
Mid Core L+M 5	179	15.21	13.8	19.17	0.51	0.3	4.05
Mid Core Average	179	11.18	9.58	18.73	0.41	0.01	-
L+M 5 minus L+M 1		6.65	6.94	-1.96	0.26	0.59	—
Mid Growth L+M 1	179	5.27	2.7	23.14	0.08	-0.46	-3.82
Mid Growth L+M 2	179	8.87	6.74	22.02	0.25	-0.15	-2.12
Mid Growth L+M 3	179	8.38	8.38	21.84	0.32	-0.4	-3.4
Mid Growth L+M 4	179	12.58	10.19	23.28	0.39	0.09	1.88
Mid Growth L+M 5	179	14.81	12.81	23.28	0.49	0.3	3.16
Mid Growth Average	179	10.41	8.15	22.33	0.31	-	-
L+M 5 minus L+M 1		9.65	9.91	0.13	0.41	0.79	—
Large Value L+M 1	179	6.28	4.87	17.3	0.18	-0.26	-4.12
Large Value L+M 2	179	7.76	6.51	16.84	0.26	-0.11	-3.4
Large Value L+M 3	179	8.88	7.7	16.04	0.33	0.01	0.32
Large Value L+M 4	179	9.1	7.99	15.48	0.36	0.05	2.02
Large Value L+M 5	179	10.7	9.7	14.8	0.48	0.44	4.44
Large Value Average	179	8.54	7.36	15.88	0.32	0.01	-
L+M 5 minus L+M 1		4.42	4.82	-2.91	0.33	0.47	—
Large Core L+M 1	179	5.59	4.17	17.28	0.12	-0.25	-3.88
Large Core L+M 2	179	6.12	4.62	16.28	0.24	-0.08	-2.71
Large Core L+M 3	179	6	6.75	16.43	0.27	-0.03	-1.42
Large Core L+M 4	179	8.61	7.4	16.08	0.32	0.13	1.41
Large Core L+M 5	179	9.12	8.44	16.56	0.46	0.23	4.14
Large Core Average	179	6.11	6.86	16.32	0.28	-	-
L+M 5 minus L+M 1		5.44	5.88	-1.08	0.34	0.49	—

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Table 4: Liquidity and Momentum Composites – Performance Statistics continued
 U.S. Equity Fund Universe (Feb. 1995 – Dec. 2009)
 L+M 1 = High Liquidity Low Momentum and L+M 5 = Low Liquidity High Momentum

	N Periods	Arithmetic Mean (%)	Geometric Mean (%)	Standard Deviation (%)	Sharpe Ratio	Monthly Alpha Relative to Average (%)	T-Statistic of Alpha Relative to Average
Large Growth L+M 1	179	4.32	2.21	20.93	0.04	-0.42	-3.83
Large Growth L+M 2	179	6.6	4.98	18.51	0.17	-0.16	-2.81
Large Growth L+M 3	179	8.85	7.78	18.54	0.29	0.05	0.85
Large Growth L+M 4	179	8.87	8.3	18.57	0.34	0.11	3.55
Large Growth L+M 5	179	11.82	10.29	18.99	0.42	0.24	2.94
Large Growth Average	179	6.26	6.6	18.98	0.25	-	-
L+M 5 minus L+M 1		7.49	7.88	-1.24	0.38	0.66	—
Small L+M 1	179	5.64	3.86	21.96	0.11	-0.43	-3.77
Small L+M 2	179	6.29	5.29	20.21	0.29	-0.09	-1.14
Small L+M 3	179	10.85	8.88	20.38	0.28	0.22	6.54
Small L+M 4	179	12.08	10.84	21.33	0.4	0.09	1.89
Small L+M 5	179	14.89	12.41	23.86	0.47	0.23	2.34
Small Average	179	10.57	8.53	21.19	0.33	0.01	-
L+M 5 minus L+M 1		8.95	8.75	2	0.36	0.66	—
Mid L+M 1	179	6.63	3.87	21.32	0.12	-0.45	-3.31
Mid L+M 2	179	8.75	6.98	18.5	0.27	-0.16	-1.81
Mid L+M 3	179	10.54	8.81	18.44	0.36	-0.03	-0.54
Mid L+M 4	179	12.86	10.83	20.28	0.45	0.11	2.95
Mid L+M 5	179	15.41	13.3	22.2	0.53	0.28	2.53
Mid Average	179	10.84	8.8	20.05	0.35	-	-
L+M 5 minus L+M 1		9.34	8.43	0.96	0.42	0.73	—
Large L+M 1	179	4.23	2.58	18.84	0.04	-0.43	-3.54
Large L+M 2	179	6.88	5.58	16.83	0.2	-0.14	-2.45
Large L+M 3	179	8.68	8.8	16.48	0.27	-0.04	-1.54
Large L+M 4	179	8.68	8.43	16.58	0.37	0.09	2.88
Large L+M 5	179	12.49	11.1	17.87	0.49	0.29	3.12
Large Average	179	8.23	6.92	16.83	0.28	-	-
L+M 5 minus L+M 1		8.26	8.54	-0.99	0.47	0.72	—
Growth L+M 1	179	4.58	2.42	21.19	0.05	-0.48	-4.05
Growth L+M 2	179	7.36	6.63	18.14	0.2	-0.18	-2.71
Growth L+M 3	179	8.29	7.58	18.22	0.3	-0.03	-0.42
Growth L+M 4	179	10.8	9.84	18.74	0.37	0.08	2.38
Growth L+M 5	179	14.58	12.49	21.82	0.51	0.22	2.55
Growth Average	179	8.27	7.45	18.89	0.29	-	-
L+M 5 minus L+M 1		8.97	10.07	0.82	0.46	0.6	—
Core L+M 1	179	6.35	4.77	18.23	0.15	-0.31	-3.61
Core L+M 2	179	7.41	6.12	18.4	0.23	-0.15	-1.55
Core L+M 3	179	8.81	8.7	18.81	0.31	-0.05	-1.19
Core L+M 4	179	10.27	8.98	18.82	0.4	0.06	1.76
Core L+M 5	179	13.55	12.05	18.37	0.55	0.29	3.52
Core Average	179	8.23	7.88	17.86	0.33	-	-
L+M 5 minus L+M 1		7.2	7.96	0.14	0.36	0.56	—
Value L+M 1	179	7.28	5.75	18.88	0.21	-0.27	-3.74
Value L+M 2	179	8.07	6.78	18.58	0.27	-0.14	-2.15
Value L+M 3	179	8.66	8.43	18.35	0.37	0	-0.02
Value L+M 4	179	10.29	9.15	18.74	0.43	0.08	2.87
Value L+M 5	179	12.22	11.01	18.35	0.53	0.23	3.14
Value Average	179	9.49	8.25	18.42	0.38	-	-
L+M 5 minus L+M 1		4.66	4.76	-0.76	0.32	0.5	—
All L+M 1	179	4.72	2.81	18.42	0.08	-0.44	-3.54
All L+M 2	179	7.2	5.82	17.13	0.21	-0.15	-1.88
All L+M 3	179	8.83	7.56	17.21	0.31	-0.03	-0.8
All L+M 4	179	10.78	9.24	17.82	0.41	0.1	3.81
All L+M 5	179	14.1	12.24	20.54	0.51	0.28	2.85
All Average	179	8.47	7.57	18.97	0.31	-	-
L+M 5 minus L+M 1		9.38	9.44	1.13	0.45	0.73	—

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Monthly Up-side / Down-side Capture Statistics

U.S Equity Fund Universe (Feb. 1995 – Dec. 2009)

L+M 1 = High Liquidity Low Momentum and L+M 5 = Low Liquidity High Momentum

	Up Periods	Down Periods	Average Up Return	Average Down Return	Average Up Market Return	Average Down Market Return	Up- Market Capture	Down- Market Capture
All L+M 1	106	73	3.68	-4.4	3.31	-4.75	93.65	116.94
All L+M 2	109	70	3.41	-3.82	3.24	-4.08	92.01	99.96
All L+M 3	110	69	3.55	-3.8	3.42	-4.03	97.28	98.55
All L+M 4	110	69	3.8	-3.83	3.64	-4.03	103.63	98.53
All L+M5	111	68	4.33	-4.17	4.12	-4.19	116.94	102.73

Conclusions

- ▶ Liquidity is a powerful investment style at the stock level
- ▶ The liquidity investment style is clearly present in mutual funds and funds that hold less liquid stocks tend to outperform
- ▶ Surprisingly, the source of outperform for the low liquidity composite, seems to be superior down market performance
- ▶ The momentum investment style is also present in mutual funds and funds that hold stocks with high momentum tend to outperform
- ▶ In aggregate, composites of mutual funds that favor less liquid, high momentum stocks significantly outperformed

Questions?

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Appendix – Upside Downside Table Statistics

- ▶ Returns show are an equally weighted average of all the mutual funds within the sample; are net of fees; assume reinvestment of all capital gains and dividends; past performance is not indicative of future results
- ▶ Up Periods and Down Periods simply report the total number of positive and negative monthly returns in the sample.
- ▶ The Average Up Return and Average Down Return statistics report the average of all positive returns and all negative returns in the sample, respectively.
- ▶ The Average Up Market Return and Average Down Market Return report similar statistics based on the performance of the “market,” which in this case is defined as the Russell 3000.
- ▶ The Up-Market Capture and Down-Market Capture what percentage of the market’s up and down movements are captured, respectively, where numbers greater than 100 indicate greater sensitivity than the Russell 3000 and vice versa.
- ▶ The Average Decline identifies the average peak to trough loss.
- ▶ The Number of Drawdowns identifies the number of peak to trough occurrences

Appendix – References

- ▶ Amihud, Yakov and Haim Mendelson, (1986). "Asset Pricing and the Bid-Ask Spread," *Journal of Financial Economics* 17, 223-249.
- ▶ Amihud, Yakov and Haim Mendelson, 1991, "Liquidity, Maturity, and the Yields on U.S. Treasury Securities." *Journal of Finance* 46, 1411-1425.
- ▶ Brennen and Subramanian, 1996, "Market Microstructure and Asset Pricing: On the Compensation for Illiquidity in Stock Returns," *Journal of Financial Economics* 41, 441-464.
- ▶ Chen, Zhiwu, Roger Ibbotson, and Wendy Hu (2010). "Liquidity as an Investment Style," Zebra Capital Management and Yale School of Management. Available: http://zebracapital.com/files/Chen_Ibbotson_Liquidity_paper.pdf
- ▶ Datar, Vinay T., Narayan Y. Naik, and Robert Radcliffe, (1998). "Liquidity and asset returns: An alternative test," *Journal of Financial Markets*, 1, 203-219.
- ▶ Pastor, Lubos, and Robert Stambaugh, (2003). "Liquidity risk and expected stock returns," *Journal of Political Economy*, 111, 642-685.
- ▶ Silber, William L., 1991, "Discounts on Restricted Stock: The Impact of Liquidity on Stock Prices," *Financial Analysts Journal*, July-August 1991, 60-64.

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