

An Index-Based Measure of Liquidity

Sanjiv Das
(joint work with George Chacko
and Rong Fan, Shiny code by
Deepak Asrani)

RFinance Chicago 2016

Motivation

- The liquidity shocks of 2008-09 showed that measures of liquidity risk were inadequate.
- Standard measures such as bid-ask spreads and price impact of trades may not isolate pure liquidity effects.
- Our approach derives the “pure” liquidity spread (in basis points) using ETFs by eliminating confounding noise.
- Approach: the difference between the ETF and its NAV offers liquidity extraction at high frequency.
- Works for all markets in which ETFs trade.
- Our extracted liquidity spread (a) correlates with other measures of illiquidity, (b) explains bond index returns, and (c) reveals a systematic illiquidity component across fixed-income markets.

A New Measure of Illiquidity

Liquidity is the “**price impact of a trade.**”

Illiquidity may be measured by this price impact, which increases when the price of **immediacy** is high.

We may use the price change of an ETF relative to the price change of the underlying NAV to extract the illiquidity in the market.

Think of illiquidity as the **value of an option to exchange the ETF for the NAV**, i. e., the difference between the ETF and the NAV upon exercise of the option is the effective transaction cost, and therefore the value of this option is the value of liquidity: $Illiquidity = Call(ETF, NAV) + Put(ETF, NAV)$

$$Illiquidity^* = Call\left(\frac{ETF}{NAV}, 1\right) + Put\left(\frac{ETF}{NAV}, 1\right)$$

BILLIQ (Bond Illiquidity)

$$\begin{aligned}BILLIQ &= -10,000 \times \log \left[\frac{1}{1 + Illiquidity^*} \right] \\ &= -10,000 \times \log \left[\frac{1}{1 + Call(\frac{ETF}{NAV}, 1) + Put(\frac{ETF}{NAV}, 1)} \right]\end{aligned}$$

$$\begin{aligned}Illiquidity^* &= Call\left(\frac{ETF}{NAV}, 1\right) + Put\left(\frac{ETF}{NAV}, 1\right) \\ &= \max\left[\frac{ETF}{NAV} - 1, 0\right] + \max\left[1 - \frac{ETF}{NAV}, 0\right] \\ &= \left|\frac{ETF}{NAV} - 1\right|\end{aligned}$$

$$BILLIQ = -10,000 \times \log \left[\frac{1}{1 + \left|\frac{ETF}{NAV} - 1\right|} \right]$$

$$BILLIQ = -10,000 \times \log \left[\frac{NAV}{NAV + |ETF - NAV|} \right]$$

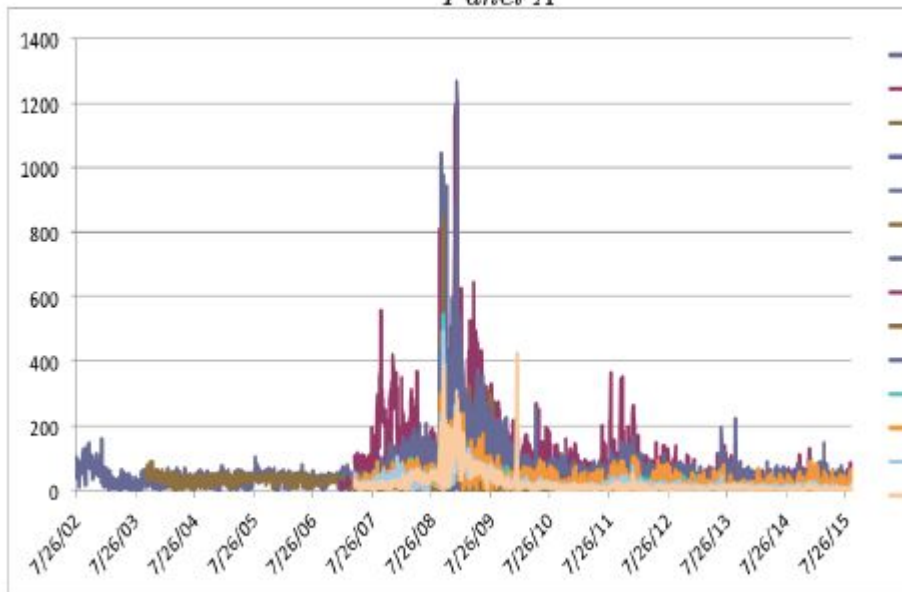
Data Description

Ticker	Full title	Issuer/industry	Replication
LQD	iShares iBoxx \$ Investment Grade Bond Fund	Corp/Pref-Inv Grade	Optimized
HYG	iShares iBoxx \$ High Yield Corporate Bond Fund	Corp/Pref-High Yield	Full
CSJ	iShares Barclays 1-3 Year Credit Bond Fund	Government/Corporate	Full
CFT	iShares Barclays Credit Bond Fund	Government/Corporate	Full
CIU	iShares Barclays Intermediate Credit Bond Fund	Corp/Pref-Inv Grade	Optimized
AGG	iShares Barclays Aggregate Bond Fund	Government/Corporate	Optimized
GBF	iShares Barclays Government/Credit Bond Fund	Government/Corporate	Optimized
GVI	iShares Barclays Intermediate Government/Credit Bond Fund	Government/Corporate	Full
MBB	iShares Barclays MBS Bond Fund	Asset Backed Securities	Full
EMB	iShares JP Morgan USD Emerging Markets Bond Fund	Emerging Market-Debt	Full
IVV	iShares S&P500 Index (NYSE)	Equity	Full
BIV	Vanguard Intermediate-Term Bond ETF	Govt/Corp Intermediate	Optimized
BLV	Vanguard Long-Term Bond ETF	Govt/Corp Long Term	Optimized
BND	Vanguard Total Bond Market ETF	Government/Corporate	Optimized
BSV	Vanguard Short-Term Bond ETF	Govt/Corp Short Term	Optimized

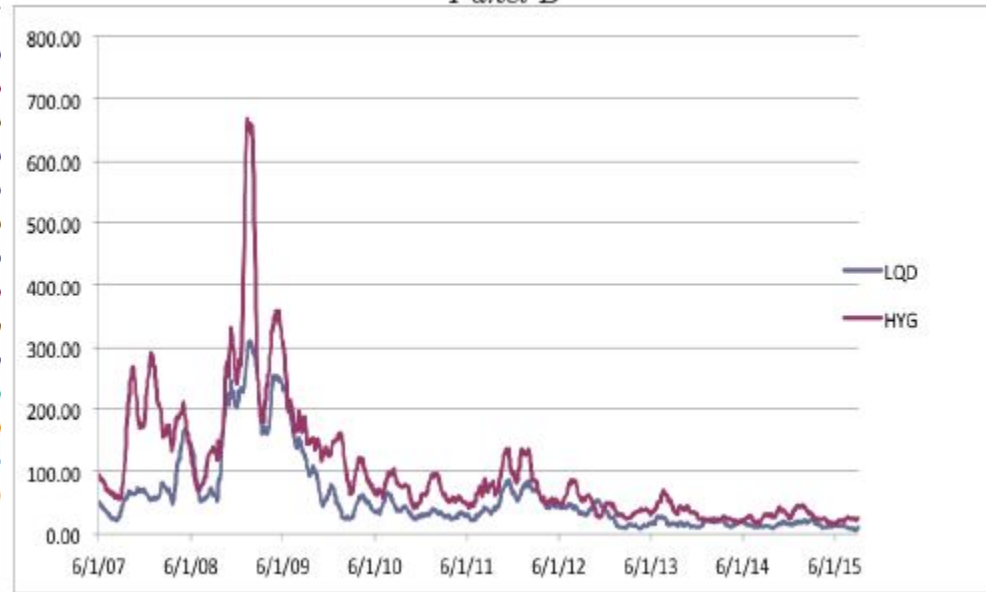
Ticker	Rating focus	Maturity focus	Start date
LQD	Investment Grade	Intermediate Term (3-10 yr)	7/25/98
HYG	Speculative Grade/High Yield	Intermediate Term (3-10 yr)	4/10/03
CSJ	Investment Grade	Short Term (1-3 yr)	1/10/03
CFT	Investment Grade	Short/Intermediate Term	1/10/03
CIU	Investment Grade	Intermediate Term (3-10 yr)	1/10/03
AGG	Investment Grade	No Restriction	9/25/99
GBF	Investment Grade	Short/Intermediate Term	1/10/03
GVI	Investment Grade	Short/Intermediate Term	1/10/03
MBB	Investment Grade	No Restriction	3/15/03
EMB	Mixed	Intermediate/Long Term	12/18/03
IVV	N/A	N/A	5/15/00
BIV	Investment Grade	Intermediate Term (3-10 yr)	4/10/07
BLV	Investment Grade	Long Term (>10 yr)	4/10/07
BND	Investment Grade	Intermediate/Long Term	4/10/07
BSV	Investment Grade	Short/Intermediate Term	4/10/07

BILLIQ Time Series

Panel A



Panel B



Summary Statistics

Ticker	Mean Price	Mean NAV	Mean Volume	Mean BILLIQ	No of Obs
LQD	109.94	109.50	944614	50.54	3300
HYG	90.17	89.47	2427205	99.84	2116
CSJ	103.74	103.24	414768	51.46	2177
CFT	105.07	104.49	58915	62.25	2172
CIU	105.20	104.64	223522	57.29	2173
AGG	104.64	104.42	746165	26.69	3005
GBF	108.49	108.24	12785	33.77	2162
GVI	107.74	107.47	41670	28.21	2173
MBB	106.11	106.04	266999	10.36	2131
EMB	106.85	106.16	481221	77.91	1938
BIV	82.48	82.24	198057	32.46	2117
BLV	83.42	83.17	74878	36.83	2117
BND	80.37	80.20	1088398	24.18	2117
BSV	79.73	79.58	614474	21.83	2117
IVV	133.39	133.38	2906255	7.51	3297

ETF Correlations

	LQD	HYG	CSJ	CFT	CIU	AGG	GBF	GVI	MBB	EMB	BIV	BLV	BND	BSV
LQD	1.000	0.378	0.402	0.641	0.591	0.623	0.519	0.532	0.480	0.270	0.598	0.549	0.575	0.264
HYG	0.399	1	0.250	0.181	0.173	0.154	-0.046	0.023	-0.011	0.359	0.005	-0.089	0.058	-0.094
CSJ	0.393	0.263	1	0.479	0.427	0.452	0.277	0.380	0.264	0.211	0.361	0.191	0.389	0.224
CFT	0.643	0.191	0.476	1	0.653	0.687	0.597	0.562	0.535	0.224	0.720	0.615	0.698	0.425
CIU	0.581	0.182	0.414	0.646	1	0.624	0.564	0.501	0.519	0.251	0.666	0.531	0.628	0.415
AGG	0.589	0.157	0.444	0.689	0.624	1	0.624	0.606	0.606	0.222	0.747	0.671	0.769	0.461
GBF	0.511	-0.046	0.261	0.592	0.564	0.596	1	0.624	0.588	0.161	0.729	0.708	0.671	0.441
GVI	0.517	0.024	0.363	0.550	0.501	0.588	0.612	1	0.624	0.215	0.702	0.605	0.692	0.455
MBB	0.470	-0.021	0.248	0.529	0.519	0.597	0.576	0.582	1	0.624	0.670	0.572	0.664	0.513
EMB	0.270	0.359	0.211	0.223	0.251	0.221	0.162	0.214	0.153	1	0.624	0.111	0.247	0.012
BIV	0.588	0.002	0.348	0.721	0.666	0.742	0.723	0.690	0.661	0.190	1	0.624	0.846	0.568
BLV	0.539	-0.100	0.176	0.612	0.531	0.666	0.704	0.595	0.559	0.110	0.796	1	0.624	0.420
BND	0.564	0.056	0.377	0.698	0.628	0.762	0.663	0.679	0.652	0.246	0.840	0.721	1	0.624
BSV	0.243	-0.096	0.204	0.415	0.415	0.445	0.425	0.433	0.504	0.012	0.554	0.408	0.416	1

Lower triangle: data over periods where all ETFs have full observations.

Upper triangle: pairwise complete data.

Bond Illiquidity (BILLIQ) Correlations

Bond liquidity series correlations. The lower triangle of the correlation matrix below comprises correlations computed for only the period over which all series had complete observations. In contrast, the upper triangle of the correlation matrix presents the pairwise correlations for all observations where complete data is available for the pair of ETFs. Hence, the upper triangle comprises correlations computed off more observations than the lower triangle. The last line and column of the table shows the correlations of the various liquidity series with the Treasury-Eurodollar (TED) spread.

	LQD	HYG	CSJ	CFT	CIU	AGG	GBF	GVI	MBB	EMB	BIV	BLV	BND	BSV	TED
'LQD'	1	0.725	0.764	0.782	0.785	0.475	0.616	0.702	0.544	0.573	0.697	0.578	0.725	0.672	0.551
'HYG'	0.755	1	0.682	0.677	0.702	0.557	0.576	0.693	0.563	0.658	0.691	0.552	0.685	0.672	0.554
'CSJ'	0.772	0.717	1	0.869	0.919	0.546	0.706	0.815	0.490	0.653	0.759	0.635	0.781	0.786	0.433
'CFT'	0.790	0.698	0.873	1	0.885	0.654	0.731	0.800	0.497	0.608	0.797	0.668	0.788	0.717	0.525
'CIU'	0.791	0.731	0.920	0.887	1	0.526	0.712	0.834	0.514	0.627	0.769	0.649	0.757	0.772	0.442
'AGG'	0.540	0.560	0.560	0.666	0.537	1	0.586	0.598	0.438	0.487	0.678	0.504	0.655	0.585	0.510
'GBF'	0.622	0.602	0.707	0.733	0.710	0.604	1	0.740	0.484	0.547	0.692	0.594	0.645	0.664	0.407
'GVI'	0.707	0.720	0.816	0.803	0.834	0.608	0.741	1	0.598	0.639	0.800	0.660	0.771	0.772	0.523
'MBB'	0.565	0.580	0.511	0.515	0.534	0.446	0.498	0.618	1	0.477	0.542	0.408	0.512	0.607	0.567
'EMB'	0.574	0.659	0.653	0.608	0.627	0.487	0.547	0.640	0.477	1	0.659	0.525	0.658	0.624	0.446
'BIV'	0.702	0.720	0.764	0.803	0.773	0.688	0.698	0.803	0.557	0.660	1	0.725	0.837	0.765	0.571
'BLV'	0.584	0.573	0.639	0.674	0.652	0.511	0.596	0.662	0.417	0.525	0.727	1	0.657	0.622	0.426
'BND'	0.732	0.702	0.794	0.796	0.767	0.661	0.654	0.776	0.521	0.658	0.843	0.662	1	0.730	0.602
'BSV'	0.675	0.706	0.789	0.722	0.775	0.596	0.666	0.773	0.631	0.624	0.768	0.625	0.733	1	0.573
'TED'	0.607	0.539	0.497	0.570	0.492	0.603	0.456	0.576	0.606	0.447	0.631	0.472	0.633	0.636	1

BILLIQ and Measures of Price Impact

$$\text{Amihud Illiquidity}_i = \frac{1}{\text{DAY } S_i} \sum_{t=1}^{\text{DAY } S_i} \frac{|\text{bndret}_{it}|}{\$VOL_{it}} \times 10^6$$

Ticker	Correlation with			
	Amihud (All US Bonds)	Amihud (Inv Grade)	Amihud (High Yield)	Abs (XLF)
LQD	0.73	0.66	0.66	0.63
HYG	0.75	0.80	0.58	0.49
CSJ	0.81	0.81	0.71	0.58
CFT	0.82	0.84	0.70	0.64
CIU	0.79	0.78	0.70	0.57
AGG	0.75	0.84	0.48	0.48
GBF	0.76	0.76	0.66	0.60
GVI	0.86	0.86	0.74	0.59
MBB	0.73	0.81	0.52	0.40
EMB	0.73	0.82	0.51	0.49
BIV	0.85	0.89	0.68	0.60
BLV	0.78	0.81	0.65	0.60
BND	0.89	0.92	0.73	0.64
BSV	0.89	0.91	0.74	0.58

BILLIQ and Volatility - 1

$$BILLIQ_t = b_0 + b_1 \text{Volatility}_t + \epsilon$$

Ticker	b_0	b_1	b_0 tstat	b_1 tstat	R^2 (%)	P-value	DW
<i>Panel A: VIX</i>							
LQD	-27.8565	3.9112	(6.33)	20.19	11.00	0.00	2.34
HYG	74.7154	1.1527	5.03	2.07	0.20	0.04	2.48
CSJ	60.2540	-0.4095	4.63	(1.64)	0.12	0.10	2.51
CFT	-1.4917	2.9713	(0.23)	11.36	5.62	0.00	2.36
CIU	59.5740	-0.1163	5.06	(0.46)	0.01	0.64	2.42
AGG	2.3781	1.2533	0.91	10.63	3.63	0.00	2.27
GBF	10.5173	1.0840	3.35	8.46	3.21	0.00	2.30
GVI	-4.5537	1.5288	(1.51)	12.62	6.84	0.00	2.49
MBB	-0.8092	0.5179	(0.98)	15.12	9.70	0.00	2.30
EMB	17.1790	2.7765	1.76	7.19	2.61	0.00	1.96
BIV	-3.0091	1.6364	(1.04)	13.92	8.40	0.00	2.10
BLV	0.5857	1.6734	0.23	15.82	10.59	0.00	2.20
BND	-14.9892	1.8063	(6.32)	18.61	14.07	0.00	2.21
BSV	-6.4635	1.3061	(1.97)	9.86	4.40	0.00	2.45

BILLIQ and Volatility - 2

Ticker	b_0	b_1	b_0 tstat	b_1 tstat	R^2 (%)	P-value	DW
<i>Panel B: 30-year bond futures implied volatility</i>							
LQD	8.9739	3.9171	1.37	6.99	1.48	0.00	2.45
HYG	41.4458	5.1753	2.32	3.73	0.67	0.00	2.47
CSJ	62.3454	-0.9690	4.65	(1.69)	0.13	0.09	2.50
CFT	-9.1390	6.3971	(1.02)	8.99	3.65	0.00	2.41
CIU	64.5536	-0.6667	5.13	(1.14)	0.06	0.25	2.42
AGG	5.2748	2.0393	1.41	6.18	1.28	0.00	2.31
GBF	-0.6368	3.0809	(0.15)	8.98	3.66	0.00	2.32
GVI	-5.9732	3.0604	(1.38)	8.80	3.50	0.00	2.54
MBB	-1.2772	1.0339	(0.97)	9.31	3.97	0.00	2.38
EMB	-9.2852	7.5124	(0.68)	6.92	2.46	0.00	1.97
BIV	5.4899	2.3853	1.19	6.39	1.93	0.00	2.18
BLV	-9.9269	4.1412	(2.49)	12.41	6.89	0.00	2.25
BND	-4.5811	2.5426	(1.12)	7.61	2.71	0.00	2.35
BSV	-11.3940	2.9413	(2.39)	7.61	2.71	0.00	2.51

BILLIQ and Volatility - 3

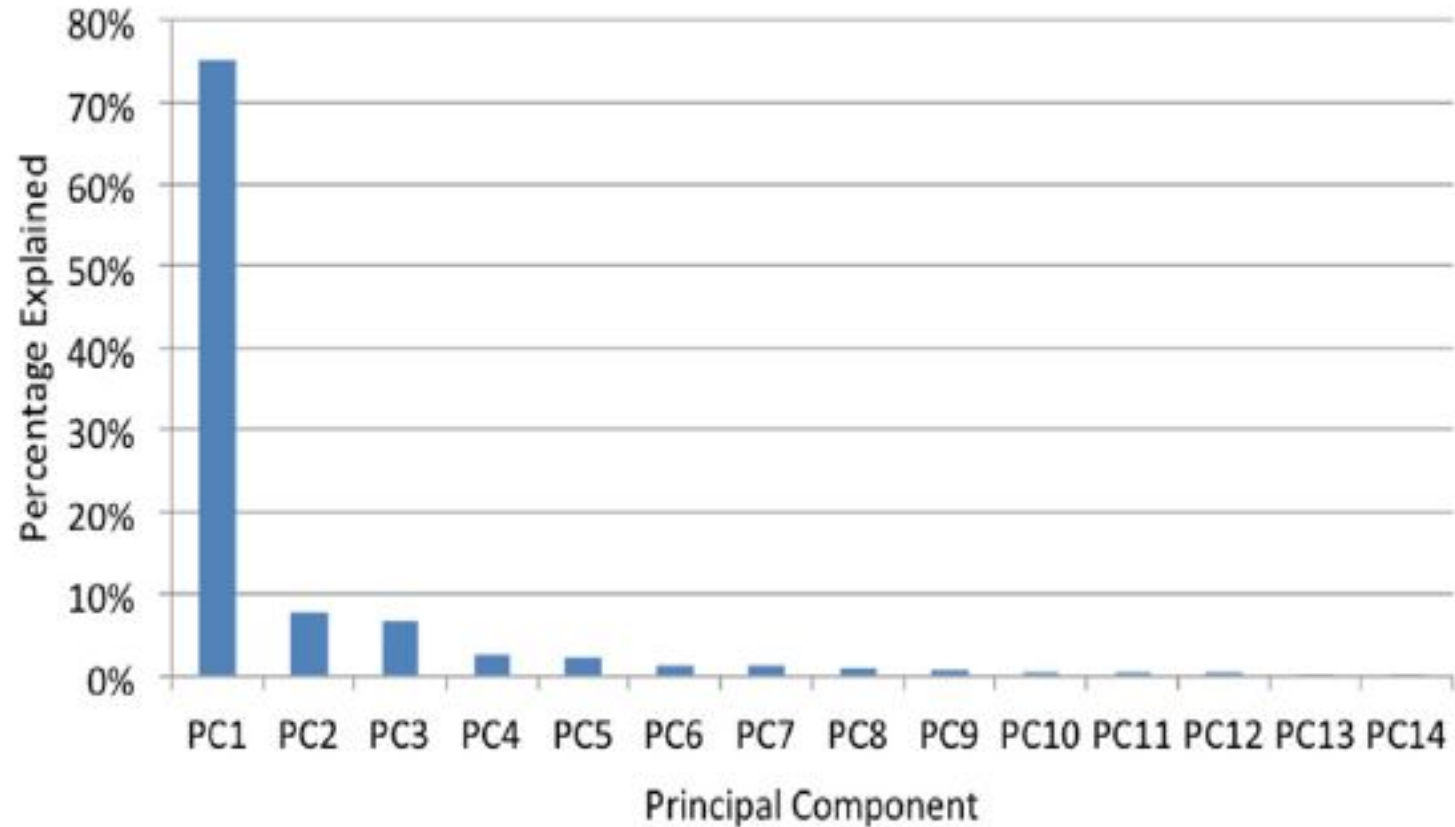
Ticker	b_0	b_1	b_0 tstat	b_1 tstat	R^2 (%)	P-value	DW
<i>Panel C: 10-year bond futures implied volatility</i>							
LQD	6.6146	6.8598	1.03	7.54	1.73	0.00	2.45
HYG	29.0550	10.8840	1.75	4.87	1.13	0.00	2.46
CSJ	61.7124	-1.5845	4.66	(1.70)	0.14	0.09	2.50
CFT	-21.1176	12.9373	(2.64)	11.62	5.96	0.00	2.38
CIU	59.5213	-0.3777	4.91	(0.40)	0.01	0.69	2.42
AGG	-4.3004	4.9601	(1.25)	9.69	3.09	0.00	2.28
GBF	-2.7710	5.6672	(0.71)	10.16	4.64	0.00	2.30
GVI	-10.5416	6.0083	(2.65)	10.83	5.21	0.00	2.52
MBB	-3.6708	2.1605	(3.12)	12.63	7.08	0.00	2.33
EMB	-15.4973	14.1570	(1.26)	8.26	3.46	0.00	1.96
BIV	-2.0691	5.2991	(0.50)	9.04	3.79	0.00	2.15
BLV	-10.2718	7.2347	(2.73)	13.28	7.82	0.00	2.23
BND	-15.9486	6.1579	(4.59)	12.41	6.89	0.00	2.29
BSV	-19.4601	6.3411	(4.61)	10.63	5.15	0.00	2.46

BILLIQ and another Liquidity Measure

Relationship of *BILLIQ* to another bond illiquidity measure. Results of regressing *BILLIQ* for each ETF on the reciprocal of the Chacko illiquidity measure. We denote this measure *ILLIQFAC*. The regression equation is $BILLIQ = b_0 + b_1 ILLIQFAC + \epsilon$. We report the coefficients, *t*-statistics, adjusted *R*-squareds, and the *P*-values of the *F*-statistics. The construction of *ILLIQFAC* is described in [Chacko \(2009\)](#). The *ILLIQFAC* series is monthly and so we have regressed the average *BILLIQ* for each month on *ILLIQFAC*. The regressions have been adjusted for autocorrelation using the Cochrane–Orcutt correction. There are 156 observations of *ILLIQFAC*.

Ticker	b_0	b_1	b_0 tstat	b_1 tstat	R-sq (%)	P-value	DW
LQD	(128.69)	647.63	(1.49)	2.09	2.1	0.04	2.22
HYG	(482.32)	2,331.21	(5.67)	6.89	31.9	0.00	2.07
CSJ	(292.05)	1,397.47	(3.02)	3.62	10.6	0.00	1.36
CFT	(298.57)	1,457.90	(4.10)	5.02	19.2	0.00	1.85
CIU	(386.65)	1,786.36	(4.58)	5.32	21.1	0.00	1.64
AGG	(45.59)	265.38	(2.78)	4.44	11.6	0.00	2.29
GBF	(106.76)	564.39	(3.42)	4.54	16.1	0.00	2.19
GVI	(156.10)	739.14	(4.84)	5.76	24.0	0.00	2.24
MBB	(22.21)	131.37	(1.78)	2.63	5.6	0.01	2.11
EMB	(297.56)	1,506.52	(4.72)	6.00	27.8	0.00	1.99
BIV	(140.79)	696.45	(4.04)	5.01	19.6	0.00	2.06
BLV	(115.68)	611.21	(4.29)	5.70	24.1	0.00	2.03
BND	(126.50)	608.20	(4.01)	4.84	18.5	0.00	2.03
BSV	(154.57)	711.44	(3.68)	4.24	14.7	0.00	2.06

BILLIQ Principal Components



BILLIQ Principal Components and VIX

The principal component and volatility. This table presents three regressions relating the first three principal components (PC1, PC2, PC3) of *BILLIQ* to the VIX. A principal components analysis is undertaken using all the ETF *BILLIQ* measures. The data is daily, and there is a common period spanning all the ETFs dates with data for all ETFs in the sample. We undertake three regressions for each PC here: (1) shows the lack of contemporaneous relationship of PC1 and VIX. (2) shows that PC1 is predictable using lagged values of VIX. (3) shows that VIX is predictable using its own lagged value but not that of PC1. Hence regressions (2) and (3) are Granger regressions suggesting that volatility forecasts illiquidity. (4) shows a strong negative contemporaneous relationship of PC2 and VIX. (5) shows that PC2 is not predictable using lagged values of VIX, but loads on its own lagged value. (6) shows that VIX is predictable using its own lagged value but not that of PC2. Hence, the second principal component is not Granger caused by VIX. (7–9) show that the VIX and the PC3 are not related in any way, though they are both autocorrelated. The numbers below the coefficient values are *t*-statistics. Results are reported after applying a Cochrane–Orcutt correction for autocorrelation.

Dependent variable	(1) PC1(t)	(2) PC1(t)	(3) VIX(t)	(4) PC2(t)	(5) PC2(t)	(6) VIX(t)	(7) PC3(t)	(8) PC3(t)	(9) VIX(t)
Intercept	–1.0897 –0.03	–25.7458 –7.17	0.5137 3.94	31.2569 4.06	3.0323 1.49	0.3492 3.55	–0.9947 –0.19	–1.0087 –0.37	0.3432 3.53
VIX (t)	–0.0841 –0.03			–1.4393 –4.6984			0.0517 0.2374		
VIX (t – 1)		1.1728 7.54	0.9766 173.05		–0.1424 –1.69	0.9842 242.06		0.0505 0.45	0.9844 245.66
PC1 (t – 1)		0.9266 117.63	0.0006 1.94						
PC2 (t – 1)					0.8022 58.90	–0.0003 –0.4196			
PC3 (t – 1)								0.5053 25.76	0.0000 0.07
Adjusted R ²	–0.0005	0.9396	0.9688	0.0108	0.6517	0.9690	–0.0005	0.2553	0.9690
F-stat p-value	0.90	0	0	0	0	0	0.81	0	0
DW	2.38	2.03	2.01	2.21	2.01	2.02	2.02	2.00	2.02

BILLIQ Principal Components and ILLIQFAC

The principal component and the bond illiquidity measure. This table presents three regressions each relating the first three principal components of *BILLIQ* to the *ILLIQFAC* factor. A principal components analysis is undertaken using all the ETF *BILLIQ* measures. The data is daily and there is a common period spanning all the ETFs resulting in 1934 dates with data for all ETFs in the sample. The first principal component extracted is denoted PC1. The value of PC1 is then averaged monthly because the *ILLIQFAC* data is monthly – this results in 93 monthly observations. We undertake three regressions here: (1) shows the strong contemporaneous relationship of PC1 and *ILLIQFAC*. (2) shows that PC1 is predictable using lagged values of *ILLIQFAC*. (3) shows that *ILLIQFAC* is predictable using its own lagged value but not that of PC1. (4) shows a negative contemporaneous relationship of PC1 and *ILLIQFAC*. (5) shows that PC2 is predictable using lagged values of *ILLIQFAC*. (6) shows that *ILLIQFAC* is predictable using its own lagged value but not that of PC2. The numbers below the coefficient values are *t*-statistics. Regressions (7)–(9) show no relationship between *ILLIQFAC* and PC3. Results are reported after applying a Cochrane–Orcutt correction for autocorrelation.

Dependent variable	(1) PC1 (t)	(2) PC1 (t)	(3) ILLIQFAC (t)	(4) PC2 (t)	(5) PC2 (t)	(6) ILLIQFAC (t)	(7) PC3 (t)	(8) PC3 (t)	(9) ILLIQFAC (t)
Intercept	–1105.16 –5.38	–1893.95 –6.19	0.02 2.00	125.88 3.33	108.45 3.16	0.00 0.66	1.74 0.06	3.69 0.18	0.01 0.97
ILLIQFAC (t)	4427.79 5.40			–509.25 –3.39			–2.67 –0.02		
ILLIQFAC (t – 1)		7633.89 6.29	0.92 23.07		–438.14 –3.21	0.98 33.23		–12.37 –0.16	0.97 33.80
PC _j (t – 1)		–0.04 –0.44	0.00 1.85		0.17 1.65	0.00 1.53		0.36 3.69	0.00 1.94
Adjusted R ²	0.2366	0.3013	0.9275	0.1034	0.1684	0.9263	(0.0111)	0.1146	0.9270
DW	1.99	2.00	2.04	1.97	2.00	2.09	1.99	1.98	2.16

BILLIQ and Asset Pricing Factors

Independent variables	USCorp Inv grade All	USCorp Inv grade Intermediate	USCorp Inv grade Long Term	USCorp High Yield All	USCorp High Yield Intermediate	USCorp High Yield Long Term
<i>PANEL A: Dependent variables</i>						
Intercept	0.000146	0.000154	0.000134	0.000364	0.000350	0.000508
T-stat	2.75	3.21	1.72	3.23	3.16	3.89
R_f	-0.006012	-0.005265	-0.008868	-0.016198	-0.015261	-0.026527
T-stat	(0.99)	(0.95)	(0.99)	(1.25)	(1.20)	(1.77)
$R_m - R_f$	-0.000014	-0.000049	0.000114	0.000287	0.000277	0.000384
T-stat	(0.53)	(1.81)	3.55	7.45	7.38	6.95
SMB	-0.000017	0.000017	-0.000121	-0.000354	-0.000369	-0.000180
T-stat	(0.34)	0.33	(1.99)	(4.83)	(5.15)	(1.71)
HML	0.000026	0.000045	-0.000032	-0.000073	-0.000105	0.000268
T-stat	0.48	0.81	(0.48)	(0.91)	(1.34)	2.33
$\Delta \text{BILLIQ}_{AGG}$	-0.000008	-0.000007	-0.000014	-0.000016	-0.000016	-0.000020
T-stat	(6.94)	(5.48)	(10.06)	(9.38)	(9.46)	(8.18)
Try LS	0.411086	0.258030	0.868544	-0.010288	-0.025261	0.134351
T-stat	94.30	57.65	161.61	(1.59)	(3.99)	14.46
Adj R^2	77.50%	56.79%	90.85%	6.02%	6.77%	9.57%
DW	2.06	2.03	2.12	2.10	2.11	2.09

BILLIQ and Equity Market Illiquidity

$$BILLIQ = b_0 + b_1 EILLIQ + \epsilon$$

Ticker	b_0	b_1	b_0 tstat	b_1 tstat	Adj R-sq	DW
<i>Panel A: Regressions of BILLIQ on EILLIQ</i>						
LQD	45.7462	0.6214	13.68	13.21	5.00%	2.50
HYG	96.4169	0.6148	10.18	4.32	0.83%	2.49
CSJ	50.3207	0.2063	4.59	4.13	0.73%	2.51
CFT	59.8825	0.4162	10.23	5.58	1.37%	2.52
CIU	55.2334	0.3390	5.43	6.72	2.00%	2.43
AGG	25.2361	0.2057	17.08	6.72	1.45%	2.32
GBF	32.5642	0.2213	16.11	4.83	1.03%	2.40
GVI	27.8464	0.0621	10.43	1.64	0.08%	2.65
MBB	9.9290	0.0824	20.07	4.01	0.70%	2.45
EMB	74.9703	0.5929	11.99	4.28	0.89%	2.03
BIV	30.9772	0.2658	13.32	6.22	1.75%	2.25
BLV	35.0720	0.3229	20.07	5.63	1.43%	2.37
BND	22.1364	0.3528	11.20	8.72	3.43%	2.40
BSV	22.1208	-0.0668	8.53	(1.48)	0.06%	2.60

BILLIQ and Equity Market Illiquidity - 2

Indep variables	VAR		Structural VAR	
	<i>BILLIQ</i> _{AGG}	<i>EILLIQ</i>	<i>BILLIQ</i> _{AGG}	<i>EILLIQ</i>
<i>Panel B: vector auto-regression</i>				
Intercept	5.704	4.048	4.027	3.437
	11.20	15.57		
<i>BILLIQ</i> _{AGG}				0.107
<i>EILLIQ</i>			0.414	
<i>BILLIQ</i> _{AGG} Lag1	0.728	0.070	0.699	-0.008
	57.69	10.84		
<i>EILLIQ</i> Lag1	0.227	0.132	0.173	0.108
	6.24	7.10		
Adj R-square	57.32%	7.47%		
F-statistic	2016.55	122.16		
F-stat P-value	0.0000	0.0000		

BILLIQ, ELLIQ, and Hedge Fund Returns

$$Return_{Strategy} = b_0 + b_1 BILLIQ_{AGG} + b_2 EILLIQ + \epsilon$$

Strategy	b_0	b_1	b_2	b_0 tstat	b_1 tstat	b_2 tstat	R^2	F-stat	P-value	DW
<i>PANEL A: PRE-CRISIS</i>										
Convertible Arbitrage	0.0266	0.0000	(0.0025)	3.44	0.31	(4.68)	25.8%	12.33	0.000	2.10
Dedicated Short Bias	(0.0366)	0.0003	0.0022	(2.89)	1.34	2.10	12.5%	5.08	0.009	1.95
Emerging Markets	0.0464	(0.0003)	(0.0027)	5.78	(1.80)	(4.07)	30.1%	15.32	0.000	2.13
Equity Market Neutral	0.0545	(0.0009)	(0.0019)	5.37	(4.08)	(2.17)	33.0%	17.49	0.000	2.22
Event Driven	0.0199	0.0001	(0.0016)	4.08	0.92	(4.30)	21.3%	9.59	0.000	2.28
Fixed Income Arbitrage	0.0309	(0.0003)	(0.0016)	5.33	(3.29)	(3.79)	36.8%	20.68	0.000	2.06
Global Macro	0.0205	0.0000	(0.0013)	4.08	0.05	(3.20)	14.5%	6.02	0.004	1.93
Long Short Equity	0.0278	(0.0000)	(0.0021)	4.34	(0.15)	(3.95)	21.2%	9.57	0.000	2.10
Managed Futures	0.0008	0.0004	(0.0012)	0.09	2.11	(1.50)	6.5%	2.47	0.092	1.92
Multi-Strategy	0.0152	0.0002	(0.0017)	2.72	1.94	(4.69)	23.7%	11.01	0.000	2.16
CS/Tremont Blue Chip	0.0208	0.0000	(0.0017)	4.15	0.55	(4.43)	23.1%	10.68	0.000	2.23
<i>PANEL B: POST-CRISIS</i>										
Convertible Arbitrage	0.0118	0.0003	(0.0034)	2.44	1.07	(2.63)	10.0%	3.57	0.034	2.05
Dedicated Short Bias	(0.0250)	(0.0012)	0.0084	(1.57)	(1.34)	1.80	5.7%	1.93	0.154	1.94
Emerging Markets	0.0154	0.0009	(0.0066)	1.90	1.97	(2.79)	12.4%	4.52	0.015	1.97
Equity Market Neutral	0.0068	0.0000	(0.0016)	1.33	0.12	(1.03)	1.7%	0.57	0.570	1.99
Event Driven	0.0197	0.0005	(0.0065)	2.60	1.23	(3.20)	14.1%	5.25	0.008	2.10
Fixed Income Arbitrage	0.0086	0.0001	(0.0016)	3.21	0.98	(2.25)	7.7%	2.68	0.076	2.17
Global Macro	0.0042	0.0003	(0.0009)	1.11	1.52	(0.81)	3.6%	1.18	0.314	1.87
Long Short Equity	0.0181	0.0005	(0.0056)	2.30	1.21	(2.45)	8.8%	3.08	0.053	1.98
Managed Futures	0.0189	0.0003	(0.0056)	1.70	0.43	(1.67)	4.2%	1.41	0.251	1.94
Multi-Strategy	0.0142	0.0002	(0.0031)	3.40	0.91	(2.66)	9.9%	3.54	0.035	2.01
CS/Tremont Blue Chip	0.0139	0.0003	(0.0040)	2.79	1.16	(2.74)	10.6%	3.79	0.028	1.96

Index-Based Illiquidity

Input ETF Ticker

LQD

Submit

Example of ETF tickers are:
LQD, HYG, CSJ, CFT, CIU,
AGG, GBF, GVI, MBB, EMB,
IVV, BIV, BLV, BND, BSV, etc.

Yield = 3.31

Price = 119.92

NAV = 119.55

BILLIQ = 30.9015989000859 (bps)

The paper that derives this measure of illiquidity is:

[George Chacko, Sanjiv Das, Rong Fan \(2016\), An Index-Based Measure of Liquidity, Journal of Banking and Finance, v68, 162-178.](#)

Index-Based Illiquidity

Input ETF Ticker

Example of ETF tickers are:
LQD, HYG, CSJ, CFT, CIU,
AGG, GBF, GVI, MBB, EMB,
IVV, BIV, BLV, BND, BSV, etc.

Yield = NA

Price = 83.08

NAV = 82.46

BILLIQ = 74.9067172915763 (bps)

The paper that derives this measure of illiquidity is:

[George Chacko, Sanjiv Das, Rong Fan \(2016\), An Index-Based Measure of Liquidity, Journal of Banking and Finance, v68, 162-178.](#)

Index-Based Illiquidity

Input ETF Ticker

AGG

Submit

Example of ETF tickers are:
LQD, HYG, CSJ, CFT, CIU,
AGG, GBF, GVI, MBB, EMB,
IVV, BIV, BLV, BND, BSV, etc.

Yield = 2.33

Price = 111.09

NAV = 110.93

BILLIQ = 14.4131184306272 (bps)

The paper that derives this measure of illiquidity is:

[George Chacko, Sanjiv Das, Rong Fan \(2016\), An Index-Based Measure of Liquidity, Journal of Banking and Finance, v68, 162-178.](#)

Thank You!